

**INVESTIGATING PHYSICAL ACTIVITY COMMUNICATION BREAST CANCER
SURVIVORS RECEIVE FROM THEIR ONCOLOGY PROVIDERS**

by

Kayla Marie Fitzpatrick

BSc., The University of British Columbia, 2015

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

in

THE COLLEGE OF GRADUATE STUDIES

(Interdisciplinary Studies)

THE UNIVERSITY OF BRITISH COLUMBIA
(Okanagan)

August 2017

© Kayla Marie Fitzpatrick, 2017

The following individuals certify that they have read, and recommend to the College of Graduate Studies for acceptance, a thesis/dissertation entitled:

INVESTIGATING PHYSICAL ACTIVITY COMMUNICATION BREAST CANCER
SURVIVORS RECEIVE FROM THEIR ONCOLOGY PROVIDERS

submitted by Kayla Marie Fitzpatrick in partial fulfillment of the requirements of

the degree of Master of Science .

Dr. Cristina Caperchione, School of Health & Exercise Science

Supervisor

Dr. Joan Bottorff, School of Nursing

Supervisory Committee Member

Dr. Colin Reid, School of Health & Exercise Science

Supervisory Committee Member

Dr. Maya Libben, Irving K. Barber School of Arts and Sciences

University Examiner

Dr. Jeff Vallance, Athabasca University

External Examiner

ABSTRACT

Physical activity (PA) has been shown to combat the negative side effects (e.g., fatigue, pain, depression) often faced by breast cancer (BC) survivors following BC treatment. Several studies have demonstrated that physician promoted PA significantly improves PA participation among BC survivors; however, it is rare that oncology providers recommend or provide advice about PA to survivors. The purpose of this study was to gain a better understanding of the PA communication oncology providers relay to their patients, and to investigate the relationship between this communication and the PA levels of BC survivors. This study was exploratory in nature and used a cross-sectional design. Participants (n=60) were self-identified BC survivors, 18 years or older, and lived in the Okanagan Region of British Columbia, Canada. The adapted, 30-item Oncology Provider Physical Activity Communication (OPPAC) questionnaire was used to assess participants' perceptions concerning PA communication and advice they receive from their oncology provider. PA was assessed using accelerometers. Data were analysed using descriptive statistics and one-way ANOVA's were conducted to assess the relationship between PA communication and PA levels. A small proportion of participants (20%) indicated that their oncology provider recommended PA, and only 11.7% indicated that their oncology provider referred them to an exercise professional. Upon further evaluation, data revealed that those who were asked about their PA routines by their oncology provider (35%) had significantly higher PA levels ($P=0.038$) compared to BC survivors who were not asked. Qualitative results showed that the majority (89%) of survivors thought PA should be a part of treatment. The findings suggest that the PA communication BC survivors receive from their oncology provider is limited; however, a positive relationship does exist between oncology provider

communication and minutes of moderate/vigorous physical activity per week.

Establishing effective and efficient ways to assist oncology providers with integrating PA promotion into their practice is needed.

PREFACE

Ethical approval for this study was provided by the Behavioural Research Ethics Board at the University of British Columbia Okanagan (#H14-02502).

TABLE OF CONTENTS

THESIS COMMITTEE.....	i
ABSTRACT	iii
PREFACE	v
TABLE OF CONTENTS	vi
LIST OF TABLES.....	viii
LIST OF ABBREVIATIONS	ix
GLOSSARY OF TERMS.....	x
ACKNOWLEDGEMENTS.....	xii
DEDICATION	xiii
CHAPTER 1 INTRODUCTION.....	1
1.1 Layout of thesis	1
1.2 BC Overview	1
1.3 The current study.....	3
1.4 Significance and contribution to research literature.....	4
CHAPTER 2 REVIEW OF LITERATURE	5
2.1 Breast cancer	5
2.1.1 Non-modifiable risk factors for breast cancer	5
2.1.2 Modifiable risk factors	6
2.1.3 Other risk factors.....	9
2.2 Prevalence and incidence of breast cancer.....	10
2.3 Side effects of breast cancer and treatment	11
2.3.1 Physical side effects of breast cancer and treatment.....	11
2.3.2 Psychological side effects of breast cancer and treatment.....	13
2.4 Physical activity for breast cancer survivors	17
2.4.1 Physical benefits of physical activity for breast cancer survivors.....	18
2.4.2 Psychological benefits of physical activity for breast cancer survivors.....	20
2.4.3 Barriers to physical activity for breast cancer survivors	22
2.5 Physical activity recommendations from health care professionals	24
2.5.1 Physical activity communication from oncology providers.....	26
2.5.2 Challenges oncology providers face in communicating physical activity	28
2.6 Summary.....	30
CHAPTER 3 METHODS	31
3.1 Preface	31
3.2 Study Design	31
3.3 Setting and Participants	31
3.3.1 Recruitment and consent.....	32
3.4 Data Collection Procedures and Outcome Measures	34
3.4.1 Data Collection Procedures.....	34
3.4.2 Measures	36
3.5 Analyses.....	41
3.6 Data Storage.....	42
CHAPTER 4 RESULTS.....	43

4.1 Sample Characteristics.....	43
4.1.1 Demographic characteristics.....	43
4.1.2 Breast cancer history and treatment.....	45
4.2 Primary outcome	46
4.3 Secondary outcome	48
4.3.1 Quantitative results	49
4.3.2 Qualitative results	50
4.4 Summary of main findings	53
CHAPTER 5 DISCUSSION	54
CHAPTER 6 CONCLUSIONS	64
6.1 Overview.....	64
6.2 Strengths and limitations	64
6.3 Clinical Implications.....	66
6.4 Future research recommendations	67
REFERENCES	69
APPENDICES.....	95
Appendix A: Consent Form.....	95
Appendix B: Accelerometer Information.....	99
Appendix C: Accelerometer Log Sheet.....	100
Appendix D: Demographics Questionnaire	101
Appendix E: Breast Cancer Information Questionnaire	103

LIST OF TABLES

Table 3.1	Adapted OPPAC questions.....	39
Table 4.1a	Demographic Characteristics.....	45
Table 4.1b	Individual Breast Cancer Related Characteristics.....	47
Table 4.2	Oncology Provider Dichotomous Questions.....	49
Table 4.3	Means, Standard Deviations, and Analysis of Variance for Oncology Provider Communication as a Function of MVPA.....	51
Table 4.4	Frequency Distribution Displaying Importance of Oncology Provider Communication.....	52
Table 4.5	Frequency Distribution – “When do you think your oncology provider should discuss PA with you?”	53

LIST OF ABBREVIATIONS

BC: Breast Cancer

PA: Physical Activity

QoL: Quality of Life

RCT: Randomised Control Trial

CRF: Cancer Related Fatigue

BMI: Body Mass Index

CADS: Combined Anxiety and Depressive Symptoms

SF-36: Medical Outcomes Study-Short Form Survey

OPPAC: Oncology Provider Physical Activity Communication Questionnaire

PPBS: Physician Psychosocial Beliefs Scale

MVPA: Moderate to Vigorous Physical Activity

GLOSSARY OF TERMS

Body Mass Index: A ratio of a person's weight to height. BMI is commonly used to classify weight as "healthy" or "unhealthy" (Hiza, Pratt, Mardis, & Anand, 2001).

Breast Cancer: the uncontrolled division and growth of abnormal breast cells originating in the breast tissue (Canadian Cancer Society, 2016).

Cancer Survivor: Anyone who has been diagnosed with cancer, from the time of diagnosis through the rest of life (Rock et al., 2012).

Exercise: A form of leisure-time physical activity that is usually performed on a repeated basis over an extended period of time with the intention of improving fitness performance or health (Bouchard & Shephard, 1994).

Health Anxiety: Traits where the individuals worries about chronic disease (i.e., cancer) worsening or returning (Grassi, Rossi, Sabato, Cruciani & Zambelli, 2004)

Oncology Provider: Health care provider for someone who has cancer. This includes: medical oncologists, haematologists, surgeons, radiation oncologists, and oncology nurses

Physical Activity: Any bodily movement produced by skeletal muscles resulting in substantial increase in energy expenditure over resting levels (Bouchard & Shephard, 1994).

Histology: A branch of anatomy that deals with tissue structure or organization (Merriam-Webster, 2016)

Prevalence: The proportion of a population who have (or had) a specific characteristic in a given time period (National Institute of Mental Health, 2016).

Prognosis: The prospect of recovery as anticipated from the usual course of disease or peculiarities of the case (Merriam-Webster, 2016).

Quality of Life: A multi-dimensional construct comprised of one's physical, emotional, economic, and spiritual wellbeing (Courneya & Hellsten, 1998).

Rehabilitation: The action of enabling a person to recover to optimal physiological, psychological, social and vocational status (Segal et al., 1999)

ACKNOWLEDGEMENTS

There are several people whom I would like to express my deepest gratitude for their support and guidance through my graduate experience. First I would like to acknowledge the faculty and my supervisory committee Dr. Cristina Caperchione, Dr. Joan Bottorff, and Dr. Colin Reid. Your guidance and support was much appreciated, thank you for taking the time to answer my many questions and for passing on your knowledge and resources. I would especially like to thank Dr. Cristina Caperchione for her unwavering support and encouragement throughout the completion of this thesis. Special thanks to Tanya, Paul, Kait and the rest of the PHAB Lab for all of the advice and wonderful times.

Thank you to my sister, brother, grandfather, godmother, and countless other relatives that have been the foundation for me throughout this process. To my beautiful nieces Kaebrie and Sophia, thank you for inspiring me to set the best example. Much appreciation goes to Kody and my support network of friends for the confidence and consolation they continuously provided to me.

Most importantly to my incredibly supportive parents my mother (Michelle) and father (Sean), without you none of this would be possible, thank you for loving and supporting me unconditionally to reach all of my goals, I know you share my joy in reaching this milestone. I love you both.

DEDICATION

I would like to dedicate this thesis to my older Sister Leanne who fought cancer and won

– Leanne you are my inspiration, thank you.

CHAPTER 1 INTRODUCTION

1.1 Layout of thesis

This thesis is composed of six chapters. Chapter one provides an introductory overview, purpose of study and the significance to the research literature. Existing literature concerning breast cancer (BC) is reviewed in detail in chapter two, including the burden, risk factors, prevalence, and side effects of BC. Chapter two also highlights literature outlining the benefits of physical activity (PA) for a BC survivor and oncology providers' communication concerning this topic. Chapter three outlines the methodology used for this research, indicating the study design, recruitment, participants, procedures, measures, data analysis and data storage. Chapters four and five present and discuss the results observed from this research. Finally, the sixth chapter provides a summary of the findings, highlighting strengths and limitations, and recommendations for future research directions.

1.2 BC Overview

The most common cancer faced by females is BC, equating to 25.5% of all cancer that affect women (Canadian Cancer Statistics, 2017). BC is the result of an abnormal, uncontrolled growth of breast cells. These abnormal cells typically form a tumour that can develop further and spread to other locations of the body; this may be fatal if cells invade surrounding tissue and spread (i.e., metastasize) (Fillmore & Kuperwasser, 2008). A variety of non-modifiable and modifiable factors can lead to an increased risk of a BC diagnosis. Non-modifiable factors include sex, age of menarche or menopause, and family history (Biro, Huang, Wasserman, & Pinney, 2016; McPherson, Steel, & Dixon, 2000; Pharoah et al., 1997) and modifiable factors include physical inactivity,

poor diet, smoking, and alcohol consumption (Bianchini, Kaaks, & Vainio, 2002; Key & Reeves, 2016; Morimoto et al., 2002; Reynolds, 2013; Shield, Soerjomataram, & Rehm 2016). Research indicates that 87% of women are living five or more years after their BC diagnosis, representing 1% of the Canadian population (Canadian Cancer Society, 2017; National Cancer Institute of Canada, 2008; Rock et al., 2012). Impressively, BC survival rates have increased more than 10% in the last 10 years due to earlier diagnosis and advancements in treatment (Canadian Cancer Society, 2017; Howlader et al., 2014).

BC survivors have reported fatigue, pain, and weight gain as common physical complaints, and body image concerns, depression, anxiety and overall reduced quality of life (QoL) as common psychological side effects (Bower, Ganz, Desmond, Rowland, Meyrowitz, & Belin, 2000; Cleeland et al., 2013; Rock et al., 2012). As BC diagnosis' and survival rates increase, it is important for medical communities to understand and consider the substantial burden of BC on QoL both short and long term for a survivor (Demark-Whanefried et al., 2015; Rock et al., 2012). A priority for health care providers is to limit physical decline and manage side effects associated with treatments for BC (Canadian Medical Association, 2001). Innovative programs that support BC survivors through treatment, recovery and remission are required to improve health in this population. It is well recognised that PA plays a significant role in mitigating repercussions of BC and BC treatment (Schmitz, Courneya, & Matthews, 2010). Regular participation in PA has been associated with decreases in fatigue, pain, weight gain, body image concerns, depression, and anxiety, as well as improvements in overall QoL of BC survivors (Demark-Whanefried et al., 2015; Stan, Loprinzi, Ruddy, 2013; Taghian, Miller, Jammallo, O'Toole & Skolny, 2014). Despite research evidence

supporting the benefits of PA in this population, Irwin and researchers (2004) revealed through self-report that only 32% of BC survivors engage in recommended levels of PA.

A BC diagnosis often prompts women to reflect on their lifestyles and begin to make a positive behavioural change in their life both pre and post treatment (Demark-Whanefried et al., 2015). This provides opportune moments for healthcare providers, specifically oncology providers, to promote lifestyle changes to enhance BC survivors' recovery and overall health. Several researchers have published literature indicating that oncology providers have a strong influence over health behaviours for this population, as they are responsible for prescribing and managing patient treatment (Demark-Whanefried et al., 2015; Jones et al., 2004; Nyrop, Deal, Williams, Guerard, Pergolotti, & Muss, 2016; Park et al., 2015). Promoting PA can be a simple cost effective, non-pharmaceutical approach to help improve the general wellbeing of women who have experienced BC. However, several researchers have shown that PA communication from oncology providers to BC survivors is rare (Daley, Bowden, Rea, Billingham, & Carmicheal, 2008; Jones et al., 2005; Nyrop et al., 2016; Royak-Schaler et al., 2008).

1.3 The current study

The overarching purpose of this study was to investigate the PA communication BC survivors receive from their oncology providers. The primary objectives of this research aimed 1) to determine if oncology providers engage in PA communication, and 2) to investigate the relationship between PA communication from oncology providers and the PA levels of BC survivors. The secondary objective was to gain a greater understanding of BC survivors' perceptions about PA communication from oncology providers. The research hypotheses addressing the aims of the current study were:

- 1) Oncology providers rarely discuss PA to BC survivors.
- 2) BC survivors who have received PA communication from their oncology provider will have significantly more minutes of MVPA per week than BC survivors who do not receive PA communication from their oncology provider.

1.4 Significance and contribution to research literature

This study is significant as the target population, who report low levels of PA participation (Irwin et al., 2004), could benefit greatly from increased PA during and post BC treatment. More importantly, engaging in PA discussions during oncology treatment appointments represents an opportune time for BC survivors to fully understand the need and importance of PA post-treatment. Current literature is limited regarding the exchange of PA communication between oncology providers and BC survivors; of the literature that does exist, patients consistently report that PA communication is very limited, most likely because it is not a routine component of BC treatment (Jones et al., 2005; Nyrop, et al., 2016; Park et al., 2015; Royak-Schaler et al., 2008). This study will help to address the research gap among PA communication from oncology providers and PA levels of breast cancer survivors, and provide further information concerning PA communication provided by oncology providers to BC survivors. This study will also offer recommendations for including PA communication in future practice.

CHAPTER 2 REVIEW OF LITERATURE

2.1 Breast cancer

BC is the result of a cellular mutation that leads to an abnormal overgrowth of cells in the breast tissue and cell lining (Fillmore & Kuperwasser, 2008). These cells form a tumour that can be either malignant (cancerous) or benign (non-cancerous) (Owen, Punt, Stranford, Jones & Kuby, 2013). When a malignant tumour forms, it can start to metastasize through the body worsening the cancer prognosis (Gupta & Kuperwasser, 2004). BC is classified into four distinct stages; the stages are dependent upon the size of the tumour and if the cancer has spread from its point of origin (American Cancer Society, 2008; Canadian Breast Cancer Foundation, 2016). The higher the stage, the larger the tumour size and distant spread of the cancer. The lower the stage the greater the chance of survival (Canadian Breast Cancer Foundation, 2016). BC is commonly diagnosed by clinical breast exams using mammograms, ultrasounds, blood tests and sometimes biopsies of the tissue (Desanti, et al., 2014; Owen et al., 2013). The Canadian Cancer Society (2016) suggests that mammograms be performed every two years once a woman turns 50 years old. Treatments that are available for BC include surgery, chemotherapy, radiation, and hormonal therapy (Desanti, et al., 2014; Owen et al., 2013). Both modifiable and non-modifiable risk factors have been identified that increase the chance of an individual being diagnosed with BC (Brown et al., 2003; Mayo Clinic, 2015; McPherson et al., 2000; Shield et al., 2016; Rock et al., 2012).

2.1.1 Non-modifiable risk factors for breast cancer

The most obvious non-modifiable risk factor for BC is being a female. Although females are at a greater risk for BC diagnosis, in a rare occurrence BC can develop in

males (Canadian Breast Cancer Foundation, 2016; Weiss, Moysich, & Swede, 2005). Like the majority of cancer types, age is also a risk factor; for women their BC risk is doubled every 10 years (Armstrong, Eisen, & Weber, 2000; Hurria et al., 2008). However, women who are diagnosed at a younger age (≤ 40 years) tend to present with more aggressive tumours than those diagnosed at older ages (≥ 60 years) (Chen, Zhou, Tian, Meng, & He, 2016). In addition, the age at which a female begins menarche and menopause is a significant risk factor (Biro, Huang, Wasserman, & Pinney, 2016; McPherson et al., 2000). Females who begin menstruating at an early age (≤ 11 years) are at an increased risk compared to those who begin menarche at a later age (> 11 years) (Biro et al., 2016). Furthermore, women who experience menopause after age 55 are more likely to develop BC than those who develop menopause at 45 (McPherson et al., 2000). Family history is also a risk factor; if a first or second degree relative has had a history of BC it is more likely for a female to be diagnosed, usually at an earlier age (> 40 years) (Heisey & Carrol, 2016; Pharoah et al., 1997). Although these risk factors are non-modifiable there are factors that can be modified to reduce the risk of a BC diagnosis.

2.1.2 Modifiable risk factors

Smoking, consuming alcohol, unhealthy diet, and physical inactivity are well known modifiable risk factors for both pre and post-menopausal BC (Bianchini, Kaaks, & Vainio, 2002; Brown et al., 2003; Key & Reeves, 2016; Reynolds, 2013; Shield et al., 2016). Cigarettes contain tobacco and include chemicals that have been shown to be mammary carcinogens, which enhance cellular mutation in the breast tissue (Hecht, 2002; Reynolds, 2013). It has been reported that women who begin smoking at a younger age and/or are long-term smokers have an increased risk of developing BC

(Cox, Hunter, Marchand, Hoover, Ziegler, & Thun, 2011; Luo et al., 2011; Reynolds, 2013). In a longitudinal study, Gaudet and colleagues (2013) analysed 3721 invasive BC survivors and discovered that those that began smoking before menarche had a higher incidence of BC. In addition, they concluded BC was higher in current and past smokers compared to women who were non-smokers ($P < 0.001$) (Gaudet, Gapstur, Sun, Diver, Hannan, & Thun, 2013).

In terms of alcohol consumption, researchers conducted a longitudinal examination in Denmark of postmenopausal women ($n = 21,523$) and revealed that even low levels of consumption can be harmful (Dam, Hvidtfeldt, Tjønneland, Overvad, Grønbæk, & Tolsstrup, 2016). Globally in 2012, researchers estimated that 144 000 BC cases and 38 000 BC deaths were partially attributable to alcohol (Shield et al., 2016). An observational study ($n = 7,690$) conducted by Hamajima, Hirose and Kungu (2002) found that as little as 3-6 alcoholic beverages per week increased BC risk. Further complicating this high-risk behaviour is the strong association between alcohol consumption and tobacco use together (Hamajima et al., 2002).

There is evidence that a body mass index (BMI) above 25kg/m^2 increases BC incidence, which most often can be attributed to both unhealthy diets and physical inactivity (Arnold et al., 2016; Chelbowski, 2013). Epidemiological researchers have indicated that obesity and low levels of PA can lead to an increased chance of BC diagnosis (Brown et al., 2003). More specifically, it has been shown that obesity is a serious risk factor for a BC diagnosis for postmenopausal women (Morimoto et al., 2002). Neuhouwer and colleagues (2015) observed 67,142 participants in the Women's Health Initiative and found an increased risk of invasive BC in postmenopausal women who were overweight (BMI 25.0kg/m^2 to 30.0kg/m^2 or obese (BMI $> 30.0\text{kg/m}^2$)).

compared to women of a healthy weight ($\text{BMI} < 25.0\text{kg/m}^2$). They determined that women who were obese had significantly larger tumour size, cancer positive lymph nodes, and distant stage diagnosis, signifying a more advanced BC.

The evidence on diet and BC risk is less clear, however researchers have indicated that consuming healthier foods, such as fruits and vegetables, have beneficial effects on health (Key & Reeves, 2016). Amaral and colleagues (2010) found a significant correlation between low intake of green leafy vegetables and fatty acid food sources with more aggressive BC histology. They noted that the BC subjects that enrolled in the study ($n=77$) had a low intake of foods that were rich in whole grains (17%), and white bread was consumed by almost half of the subjects (46%). In addition, a majority of participants had low levels of vegetable consumption, leading to poor fibre and phytochemical intake (Amaral et al., 2010). Moreover, in a meta-analysis it was determined that BC occurrence was lower in those women who had a high prudent/healthy dietary pattern compared to those with a low prudent/healthy dietary pattern (Brennan, Cantwell, Cardwell, Velenzis, & Woodside, 2010).

Physical inactivity is a strong predictor of an above healthy BMI, in fact an above healthy BMI has been estimated to be the cause of 10% of BC cases worldwide (Lee, Shiroma, Lobelo Puska, Blair, & Katzmarzyk, 2012). Since as early as 1985, PA has been shown to be effective at reducing BC risk (Frisch et al., 1985). For the most physically active women, researchers have shown that their risk for BC decreases by 20-40%, regardless of menopausal status, type, or intensity of PA (Bianchini, Kaaks, & Vainio, 2002). There are several biological mechanisms that may be responsible for reducing BC incidence in those that have higher PA levels; this includes a positive impact on adipose tissue, insulin resistance, adipokins, inflammatory markers, and sex

hormones (Friedenreich, 2010). Evidence from several sources determined that PA is a protective behaviour against BC (Feigelson, Jona, Teras, Thun, & Calle, 2004; Peters et al., 2009; Pijpe et al., 2010; Pronk et al., 2011). For instance, researchers used a Cox proportional hazards model with the Cancer Prevention Study – II (n=1,934) and revealed an increase in BC incidence of 40% with a weight gain of 21 to 30 pounds compared to women who had maintained their weight within a 5 pounds range since age 18; this risk doubled for women who gained more than 70 pounds since age 18 (Feigelson, Jona, Teras, Thun, & Calle, 2004). In addition, researchers analysed self-reported lifetime sports activity and found women who are carriers of the BRCA1/2 mutation, a breast cancer related gene, are especially susceptible to a BC diagnosis if inactive below age 30 (Pijpe et al., 2010). Peter and colleagues (2009) administered a self-report PA questionnaire to 182,862 American women, and found that the most active women had a 13% lower BC risk in comparison to inactive women.

2.1.3 Other risk factors

Other risk factors for BC include geographical location, reproductive history, and long-term oral contraceptive use (Canadian Cancer Society, 2015; Ferlay et al., 2012; Karim, Baeshen, Neamatullah & Bin, 2015; Kobayashi et al., 2012; Lillberg et al., 2003; McPherson, Steel, & Dixon, 2000; Preston et al., 2002). In relation to geographical location, BC incidence has been found to be higher in developed countries compared to underdeveloped countries (Ferlay et al., 2012). This suggests that environmental risk factors may be more of a problem than genetic risk factors (McPherson et al., 2000). Reproductive history of women can be also a factor in BC diagnosis. Women who have never had children or who have had children later in life (>35 years) have an increased chance of BC diagnosis (Kobayashi et al., 2012; McPherson et al., 2000). Furthermore,

long-term oral contraceptive use (>10 years) was been shown to increase the chances of BC incidence (Karim et al., 2015). Additional possible risk factors of BC include, radiation exposure, hormone replacement therapy, psychological or emotional stress, and high socioeconomic status (Canadian Cancer Society, 2015; Lillberg et al., 2003; Preston et al., 2002). These additional risk factors are not as well studied as the modifiable and non-modifiable factors mentioned above; therefore, they should be interpreted with caution as further research needs to be conducted to establish stronger evidence for their impact on BC development.

2.2 Prevalence and incidence of breast cancer

BC is the most commonly diagnosed cancer in females worldwide and it is the second leading cause of female cancer deaths worldwide (Ahmedin, Center, DeSantis, & Ward, 2010; Ferlay et al., 2012). In Canada, an estimated one in nine women will be diagnosed with BC. It is predicted that 5,000 BC deaths occur each year, representing 14% of all cancer deaths among women (Canadian Cancer Society, 2015). To emphasise the severity of this disease, 70 Canadian women will be diagnosed with BC and 13 will die from BC daily (Canadian Cancer Society, 2016). Despite these staggering statistics, it is important to note that a large percentage (87%) of Canadian women remain alive 5 years after their diagnosis (Canadian Cancer Society, 2017; Ellison, 2010; Rock et al., 2012). This is the lowest the BC mortality rate has been since 1950, an improvement that has been related to increased education and improvements in early screening techniques (Canadian Cancer Society, 2017). As survival rates in Canada continue to improve, more than 15,000 women currently require long-term surveillance and treatment for the negative side effects experienced by BC survivors

(Canadian Breast Cancer Foundation, 2015; Canadian Cancer Society, 2017; Demark-Whanefried et al, 2015).

2.3 Side effects of breast cancer and treatment

Treatment of BC can include surgery (breast-conserving surgery, mastectomy, and lymph node surgeries) with the addition of hormonal replacement therapy, and chemotherapy and/or radiation to kill the cancerous cells (Owen et al., 2013). The treatment for BC depends on the type and stage of BC, and can result in a number of physical and psychological side effects (Bower et al., 2000; Cleeland et al., 2013; Demark-Whanefried et al., 2015; Rock et al., 2012).

2.3.1 Physical side effects of breast cancer and treatment

Treatment for BC can be physically taxing on a woman's body, and often results in physical side effects including fatigue, pain, lymphoma, and weight gain (Demark-Whanefried et al., 2015; Stan, Loprinzi, Ruddy, 2013; Taghian et al., 2014). Fatigue is the most frequently reported physical symptom, and the most distressing side effect experienced by BC survivors (Cleeland et al., 2013; Longman, Braden, & Mishel, 1999; Stan et al., 2013). Cancer-related fatigue (CRF) is distinctive from fatigue in a healthy patient, as rest or sleep does not provide relief and it is perceived as more severe (Ceela, Peterman, Passik, Jacobsen, & Breitbart, 1998). In one study, self-report surveys aided researchers in determining that approximately one third of BC survivors (n=1,957) report cancer-related fatigue; in addition those with higher fatigue scores, had significantly higher levels of depression, pain, and sleep disturbance (Bower et al., 2000). Abrahams and colleagues (2016), reviewed 27 studies (n=12,327) and concluded that one in four BC survivors suffers from severe fatigue. Fatigue was more pronounced in those receiving a combination of treatments and those diagnosed with a

more advanced disease state. Fatigue was shown to significantly increase after radiotherapy ($p=0.001$) compared to fatigue before radiotherapy in BC survivors ($n=51$), and energy subscale scores significantly decreased after radiotherapy ($p=0.001$). In a separate review of literature, the authors concluded that fatigue is experienced by 80%-96% of BC survivors undergoing chemotherapy and 60%-93% of BC survivors receiving adjuvant radiotherapy (Bardwell & Ancoli-Israel, 2008). An additional concern for health care providers is the long-term symptoms of fatigue for a BC survivor. Bower and researchers (2006) found that approximately 34% of BC survivor participants ($n=763$) had significant fatigue 5-10 years after diagnosis.

Pain is also a common prevailing complaint among BC survivors. More specifically, lymphedema which is defined as sore arm(s) causing limitations of the upper limbs, is commonly reported by BC survivors (Hayes, Janda, Cornish, Battistutta, & Newman, 2008; Rock et al., 2012). Those that have undergone surgery or radiation are at a lifelong risk of developing lymphedema compared to BC survivors who are treated with hormone replacement therapy and chemotherapy (Taghian et al., 2014). In a study in Denmark, researchers measured pain as an outcome using questionnaires, and reported that 46% of BC survivors ($n=3,253$) who finished treatment in the last two to three years experienced BC related pain (Gärtner, Jensen, Nielsen, Ewertz, Kroman, & Kehlet, 2009). Factors that were significantly associated with pain included young age, adjuvant radiotherapy, and node dissection. They concluded that two to three years after treatment, persistent pain was still common and clinically significant (Gärtner et al., 2009). Chachaj and associates (2009) examined the consequences of lymphedema pain, and revealed that BC survivors with lymphedema ($n=117$) were

significantly more disabled and experienced a poorer QoL compared to BC survivors without lymphedema (n=211).

Weight gain is another frequent physical side effect among BC survivors. Weight gain can be the result of hormonal therapy and adjuvant chemotherapy (Makari-Judson, Braun, Jerry, & Merten, 2014). Freedman and colleagues (2004), measured weight gain before and immediately after BC treatment. The results showed that there was a statistically significant weight gain (1.09 ± 2.46 kg) and increase in fat mass compared to healthy controls immediately after treatment (Freedman et al., 2004). One study of females aged 40-54, who were treated with chemotherapy (n=49) had a mean weight gain of 1.95 kg and an increase in body fat. Interestingly enough, they found that women who were closer to ideal BMI at diagnosis experienced the greatest weight gains (Nissen, Shapiro & Swenson, 2011). Weight gain following a diagnosis can influence other medical conditions such as heart disease and diabetes, impacting overall survival (Erikson, Patterson, Natarajan, Lindsay, Heath & Caan, 2012; Makari-Judson et al., 2014). Evidence has shown that being overweight (>25 kg/m²) or obese (>30 kg/m²) at the time of diagnosis, as well as post diagnosis, is linked to poorer survival (Demark-Whanefried et al., 2015). In addition to fatigue, pain, and weight gain, women receiving treatment for BC also commonly report physical changes such as hair loss and skin irritation. These physical side effects alone and in conjunction can have a negative impact on a BC survivors' psychological wellbeing (Makari-Judson et al., 2014; Rock et al., 2012).

2.3.2 Psychological side effects of breast cancer and treatment.

BC survivors that report physical complaints and side effects have higher rates of body image concerns, depression, anxiety, and a lower QoL (Aerts, de Vries, Van der

Steeg, & Roukema, 2011; Bardwell & Ancoli-Israel, 2008; Longman, Braden, & Mishel, 1999; Makari-Judson et al., 2014). For example, Aerts and colleagues (2011) found that patients who experienced limited range of motion reported poorer psychological wellbeing compared with patients without limitations in range of motion. Hence, weight gain following a diagnosis has been shown to negatively impact a survivor's overall health, self-image, and QoL (Makari-Judson et al., 2014). Patients rarely return to pre diagnosis weight, leading to increased self-image problems (Fobair et al., 2006; Makari-Judson et al., 2007). Decreased self-esteem and body image concerns is a common disturbance for survivors as treatment can lead to weight gain, loss of breast(s), premature menopause, loss of fertility, and hair loss (Male, Fergus & Cullen, 2016; Rock et al., 2012). These side effects can be either temporary or permanent but regardless have a significant negative impact on a BC survivor's body image. In a qualitative study by Ashing-Giwa and colleagues (2004), survivors described negative feelings about their bodies including decreased self-worth and attractiveness, as well as feeling deformed and inadequate. It has also been reported that BC survivors that were sexually active (n=127) experienced feelings of unhappiness with their body (88%) and reported feeling sexually unattractive (34%) (Boquiren, Esplen, Wong, Toner, Warner & Malik, 2016). Furthermore, in a review of the literature on sexual identity and body image, the authors pointed to women's concerns regarding sexual health (32-93%) and body image (27-88%) and described how these concerns negatively impacted sexual identity among BC survivors. They noted that these effects of treatment on women's sexual health and identity persisted throughout survivorship, and did not resolve with the passage of time (Male, Fergus & Cullen, 2016). According to researchers that analysed a sample of 248 BC survivors, four years after an active diagnosis, several survivors

(31%) expressed body image concerns (Falk-Dahl, Reinersten, Nesvold, Fossa & Dahl, 2010). These negative body image perceptions can contribute to increases in depression and anxiety (Ashing-Giwa, 2004; Baqutayan, 2012).

Depression and anxiety symptoms are more common among cancer survivors than the healthy population (Gold et al., 2016). These symptoms can be categorised as psychological distress, or combined anxiety and depressive symptoms (CADS) (Brintzenhofe-Szoc, Levin, Li, Kissane, & Zabora, 2009; Gold et al., 2016). When compared to healthy women, the prevalence of depression in women with BC (n=170) was found to be twice as high in one study in London. These researchers found that during the first year following a BC diagnosis, nearly 50% of BC survivors scored high on depression and/or anxiety scales (Burgess, Cornelius, Love, Graham, Richards, & Ramirez, 2005). One study reported that survivors with higher levels of pain intensity had higher levels of body dissatisfaction, which in turn led to increased depressive symptoms (Teo, Novy, Chang, Cox, & Fingeret, 2014). Also prevalent among BC survivors is health anxiety. Health anxiety includes traits where the individuals worry about the BC worsening or returning. In a study examining health anxiety, researchers found that 38% of women with BC in the previous 18 months (n=105) had health anxiety (Grassi, Rossi, Sabato, Cruciani, & Zambelli, 2004). More recently, Jones and colleagues (2013) estimated that more than 20% of women who have been diagnosed (n=127) in the past five years met the criteria for health anxiety (Jones, Hadjistavropoulos & Gullickson, 2013). Gold and colleagues (2016) determined that higher levels of anxiety were apparent with increased fear of recurrence, hopelessness, uncertainty, loss of control and a reduction in life satisfaction. In addition, they showed that 44.5% of survivors (n=335) had symptoms of CADS, which resulted in a lower QoL

scores. Therefore, impairments in physical functioning, self-image concerns, depression and anxiety may all contribute to a lower QoL for BC survivors.

Bardwell and Ancoli-Israel (2008) concluded that cancer-related fatigue has a strong negative impact on QoL for a BC survivor. One study of 2,230 BC survivors investigated the impact of QoL on mortality, and found that after follow up (mean=4.6 years) those with the highest QoL scores had a 38% decreased risk of mortality ($p=0.002$) and a 48% decreased chance of recurrence ($p<0.001$) (Epplein et al., 2010). Moreover, a study investigating the impact of BC on QoL, researchers found that BC survivors ($n=127$) scored worse on the Medical Outcomes Study-Short Form survey (SF-36), compared to older women who were never diagnosed with cancer ($n=87$) (Robb et al., 2006). Montazeri and associates (2008) administered a QoL questionnaire to 99 BC survivors at time of diagnosis and 18 months post diagnosis and found an overall decrease in global QoL ($P<0.001$). Decreases in QoL among BC survivors may be due to problems related to the disease, treatment side effects, self-image concerns and a variety of complex scenarios, including weight gain influencing other conditions such as diabetes and heart disease (Bardwell & Ancoli-Israel, 2008; Makari-Judson et al., 2014; Rock et al., 2012).

As with many illnesses, modifiable behaviours such as diet, healthy lifestyle, and regular PA can reduce a variety of BC related side effects outlined above, while also reducing the incidence of recurrence, and improving the chances for survival (Ibrahim, & Al-Homaidh, 2011). In particular, PA interventions with BC survivors have been extensively studied and have shown to be effective in decreasing several negative physical and psychological symptoms and side effects of BC (Demark-Whanefried et al., 2015; Irwin et al., 2004; Rock et al., 2012). Specific to this population, PA can decrease

pain and fatigue, reduce weight gain, and improve psychological distress such as self-image concerns, depression, and anxiety leading to an overall improvement in QoL (Barnes, & Schoenborn, 2012; Demark-Whanefried et al., 2015; Irwin et al., 2004; Rock et al., 2012; Travier et al., 2015). Most importantly, researchers have indicated that PA can reduce reoccurrence of BC and improve the chances of survival (Ibrahim & Al-Hodmaidh, 2011; McNeely et al., 2006 Schmitz et al., 2010).

2.4 Physical activity for breast cancer survivors

Regular PA is essential to aid in the recovery process and to improve fitness and survival in cancer survivors (Rock et al., 2013). PA guidelines for cancer survivors have been outlined by the Canadian Society of Exercise Physiology (Segal, Zwaal, Green, Tomasone, Loblaw, & Petrella, 2015):

- 150 minutes of moderate-intensity aerobic exercise spread over three to five days and resistance training at least two days per week
- Resistance session should involve major muscle groups two to three days per week
- Each session should include a warm up and cool down

Several studies have shown the physical and psychological benefits of PA, including the increased rate of survival among BC survivors (Ibrahim & Al-Hodmaidh, 2011; McNeely et al., 2006 Schmitz et al., 2010). Most importantly, Irwin and colleagues (2003) found a 50% risk reduction in mortality among women who were regularly active by participating in sports and household activities, compared with those who remained inactive post-diagnosis. Further, in an observational study of 933 BC survivors' researchers showed that women who increased PA after diagnosis had a 45% lower risk of death compared to those who were inactive (Irwin et al., 2008). Holmes and team

(2005) indicated that the greatest benefit occurred in women who walked 3 to 5 hours per week at an average pace. A meta-analysis of six studies that included randomised, case-control, cohort and observational peer reviewed clinical studies, looking at PA and survival after BC by Ibrahim and Al-Homidh (2011), concluded that during post-diagnosis, exercise was associated with a 34% lower risk of BC deaths, a 41% lower risk of all-cause mortality, and a 24% lower risk of BC recurrence.

2.4.1 Physical benefits of physical activity for breast cancer survivors

There is growing research evidence suggesting that PA improves patient reported physical complaints, body composition and physical capacities. Patient reported physical complaints, including fatigue and pain, have shown improvement when PA is incorporated into a BC survivor's life (Forsythe et al., 2013; McNeely et al., 2006; Mock et al., 2005; Travier et al., 2015). Relief from fatigue by participating in PA has been a profound finding, as fatigue is the most commonly reported side effect of BC treatment (Cleeland et al., 2013). In a study of 119 BC survivors, participants were randomised into a moderate intensity-walking group or a usual care group. Using a pre-test to post-test design, the walking group showed a statistically significant change in fatigue levels compared to the usual care group (Mock et al., 2005). Additionally, an 18-week randomised control trial that included both strength and aerobic PA assessed physical fatigue in BC survivors. The results showed that compared to the control group (n= 77), the intervention group (n=87) that participated in 2 times per week in aerobic, and 2 times per week in strength training, had significantly lower levels of fatigue (Travier et al., 2015). Another randomised control trial showed the benefits of resistance training for 60 minutes twice weekly; researchers were interested in self-reported fatigue, cognitive functions, and QoL in BC survivors (n=95) with an average age of 53

years. Positive outcomes were observed in all three categories compared to the control group (Schmidt et al., 2015). One investigation observed the longitudinal patterns of pain in long term BC survivors (n=1,183), and the associations of PA and BMI using SF-36 bodily pain scores and self-reported weight and PA. The results indicated that overweight and obese BC survivors reported higher levels of pain than did BC survivors with a BMI $\leq$ 25. Furthermore, they determined that those BC survivors who met the PA guidelines were less likely to report above average pain than did BC survivors that did not meet these guidelines (Forsythe et al., 2013). Branstrom and colleagues (2015) found similar results, they determined that physical inactivity was related to reduced health status and increased symptoms of pain in BC survivors (n=726).

Unfortunately, evidence consistently shows a decline in PA after a BC diagnosis; the decline in PA combined with increases in fatigue and reducing energy expenditure leads to weight gain (Makari-Judson et al., 2014). However, researchers have concluded that PA has positive outcomes on body composition such as BMI, muscle mass, and fat mass for BC survivors (Battaglini et al., 2014; Goodwin et al., 1998; Hojan Milecki, Molinska-Glura, Roszak & Leszczynski, 2013). In a randomised control trial undertaken by Winters-Stone et al. (2011), 106 BC survivors who were assigned to moderate intensity resistance and impact training experienced significant improvements in bone mass and lean muscle mass compared to the control group who did light stretching (p=0.001). Hojan and associates (2013) investigated the influence of aerobic and resistance training on body fat in 41 premenopausal BC survivors receiving endocrine treatment. Measurements were taken during endocrine treatment without PA and again during endocrine treatment with PA, and they found that the introduction of aerobic therapy reduced body fat and resulted in a decreased rate of bone strength

decline. When resistance training was added 6 months later to the aerobic training, bone strength increased and BMI decreased (Hojan et al., 2013). Furthermore, Goodwin and team (1998) found that weight gain was prevented in BC survivors (n=61) and some even lost weight when an additional 30 minutes of aerobic exercise per week were added to their routine.

Physical capacities such as cardiac function and muscular strength are often compromised in BC survivors due to the severe effects of BC treatment; these capacities have been shown to improve with the addition of a PA regime in a BC survivor's routine (Battaglini et al., 2014). In one study with a group of BC survivors the effects of a Tia Chi Chaun a martial arts moderate form of exercise. This intervention was compared to a psychosocial control support group. Participation in the Tia Chi Chaun intervention resulted in a positive change in functional capacity, as well as improvements in aerobic capacity, muscular strength, and flexibility compared to the control group, who saw declines in aerobic capacity and muscular strength at 12 weeks (Mustian, Katula, & Hongwei, 2006). McNeely and colleagues (2006) reviewed 14 RCT's conducted between 1989 and 2005 that evaluated the effectiveness of PA interventions on QoL and physical functioning for BC survivors (n=717). Based on this review, researchers concluded that PA interventions with BC survivors can lead to improvements in QoL, physical functioning, peak oxygen consumption, and a reduction in symptoms of fatigue (McNeely et al., 2006). These physical benefits of PA can translate into psychological benefits as PA promotes self-efficacy and reduces physical side effects that negatively affect QoL (Demark-Whanefried et al., 2015).

2.4.2 Psychological benefits of physical activity for breast cancer survivors.

PA has been reported to relieve many psychological complaints described by the BC survivor population. Specifically, PA has been associated with improvements in body image, self-esteem, depression, anxiety, and overall QoL (Canadian Cancer Society, 2015; Daley et al., 2007; McNeely et al., 2006; Rock et al., 2012). For instance, Awick, Phillips, Lloyd, and McAuley (2016) recruited 370 BC survivors in America to wear accelerometers to measure PA and complete a self-report measure of self-efficacy, self-worth, and self-esteem at baseline and 6 months. The results indicated that women who were more active reported higher self-efficacy, self-worth, and self-esteem, than the less active women (Awick et al., 2016).

Daley and colleagues (2007) conducted a RCT across three different conditions: an exercise therapy group (n=34), which consisted of 50 minutes of aerobic one-on-one sessions with an exercise specialist; an exercise-placebo group (n= 36) that included 50 minute one-on-one sessions of light stretching, instead of aerobic exercise; and a usual care group (n=38). QoL and depression were measured using questionnaires at baseline and eight weeks. At eight weeks, results indicated a significant increase in QoL for the aerobic exercise group as well as significance in the placebo-exercise group compared to the usual care. In another RCT trial of 222 BC survivors, researchers measured fatigue, depression and anxiety and its association with PA at baseline, 3-months and 6-months (Rogers et al., 2016). Participants were randomised into either a usual care group or a 3-month Better Exercise Adherence after Treatment (BEAT) for cancer group. The intervention consisted of 12 supervised exercise sessions every 2 weeks with an exercise specialist, with the goal of gradual increases in exercise to eventually obtain 150 minutes weekly of PA. Results showed that the BEAT cancer group had a reduction in fatigue ($p<0.001$), and improvements in depression ($p<0.001$)

and anxiety ($p < 0.001$) post intervention compared to the usual care group, and these results were maintained at 6 months (Rogers et al., 2016).

Group PA has been shown to improve QoL in BC survivors because it creates feelings of connectedness to others, which has also been shown to reduce depression and anxiety (Canadian Cancer Society, 2015; McNeely et al., 2006; Rock et al., 2012). Culous-Reed and colleagues (2006) showed that in a sample of BC survivors, group yoga practice had a greater positive impact on mood, QoL, and stress ($p < 0.05$) within the intervention group ($n = 20$) compared to the control group ($n = 18$). In addition, resistance training was shown to maintain QoL in BC survivors who met twice per week for 12 weeks to participate in a PA intervention compared to a relaxation group who did progressive muscle relaxation without any aerobic or muscle strengthening exercise (Schmidt et al., 2015). PA appears to be an important component during and after BC treatment, as well as in the long term. However, despite strong evidence showing the numerous physical and psychological benefits of PA for BC survivors, only 32% of BC survivors engage in the minimum PA recommendations for cancer survivors (Canadian Cancer Society, 2015; Denmark-Wahnefried et al., 2015; Irwin et al., 2010; Rock et al., 2012). With such low PA participation rates reported for BC survivors, it is important to consider the barriers to PA participation in this population.

2.4.3 Barriers to physical activity for breast cancer survivors

Specific to BC survivors, researchers have identified a number of barriers affecting the propensity of persons in this population to participate in PA. Based on self-report survey data in a sample of 162 BC survivors, Ventura and colleagues (2013) concluded that lack of time, lack of self-discipline, and lack of energy or fatigue, were the most frequent barriers to PA participation for BC survivors. In addition, they found

that procrastination, lack of interest in exercise, family responsibilities, pain, and lack of enjoyment were also common barriers (Ventura et al., 2013). Researchers used qualitative methods and interviewed seven BC survivors during the first and last week of an 8-week exercise program to explore perceived barriers for participating in a group based PA program in the community. Three types of barriers emerged: physical barriers (e.g., distance and travel), institutional factors (e.g., competing roles and responsibilities), and internal barriers (e.g., cancer specific limitations such as self-image issues and pain due to lymphedema) (Wurz, St-Aubin, & Brunet, 2015). In another qualitative study researchers utilised in-depth semi-structured interviews to gain further insight into barriers to PA participation among BC survivors (n=9) and identified different types of physical barriers (e.g., perceived weight management and increased energy), in addition to environmental/organizational barriers (e.g., bad weather, time constraints, lack of knowledge) and psychosocial barriers (e.g., lack of motivation, low social support) (Brunet, Taran, Burke, & Sabiston, 2013). Knobf (2006) described symptoms of adjuvant therapies toxicity through review of the literature and clinical observation and described symptoms such as vomiting, fatigue, hair loss, and weight gain which can all be barriers for PA participation.

Experts have advised that these unique barriers need to be considered in order to achieve better adherence to PA programs for this population (Brawley, Culos-Reed, Angove, & Hoffman-Goetz, 2008). Brawley and team (2008), reviewed 9 studies to understand the barriers to PA for cancer patients and concluded that a major issue for PA participation is lack of adherence to a PA regime. They discussed that the lack of structure in cancer rehabilitation compared to other chronic conditions such as cardiac rehabilitation as a major barrier for adherence to PA programs. Unlike other chronic

disease conditions, encouraging PA is not usually included in treatment and rehabilitation for cancer survivors (Brawley et al., 2008; Irwin et al. 2010).

2.5 Physical activity recommendations from health care professionals

PA participation has the potential to be strongly influenced by physicians. Demark-Whanefried and colleagues (2015) found that the majority of patients (80%) desired advice regarding PA from a physician, and in addition there was a preference for a face-to-face recommendation. PA recommendations from health care professionals have led to improvements among the inactive population. In one RCT, inactive participants (n=161) were randomised into physician advice or physician advice plus a behaviourally staged matched leaflet. Results showed that PA increased from baseline and 7 weeks and 14 months in both groups, indicating that inactive individuals can be reached effectively through primary healthcare with or without additional resources (i.e., leaflets) (Jimmy & Martin, 2004). Similarly, in a RCT conducted in Spain researchers evaluated the effectiveness of PA advice and PA prescriptions by physicians. Researchers randomised physicians (n=29) into an intervention group, that included 2,248 inactive patients or standard care group (n=27) that included 2,069 inactive patients. The intervention physicians prescribed exercise and offered PA advice while physicians in the standard care group did not offer any PA communication (Grandes, Sanchez, & Sanchez-Pinilla, 2009). A 7-day PA recall and semi-structured interview at baseline and 6 months was administered to all inactive patients. Results indicated that overall, inactive patients in the intervention group increased their PA more than the inactive patients in the standard care group (Grandes et al., 2009).

Researchers from several studies examining patients with chronic diseases, such as type 2 diabetes, heart disease, obesity, and cancer, have shown that physicians

and/or health care providers have a strong influence on health behaviours (Barnes, & Schoenborn, 2012; Glasgow, Eakin, Fisher, Bacak & Brownson, 2001). For example, a survey study of non-small cell lung cancer survivors (n=175) resulted in patient preference to receive advice regarding PA from a physician (80%) face to face (95%) in a cancer care center (92%) (Philips, Coups, Feinstein, Park, Wilson, & Ostroff, 2013). Furthermore, Dunn and colleagues (2017) administered self-reported surveys at baseline and 3 months to 251 coronary heart disease patients, the surveys measured self-reported physician recommendation, patient's perception of strength of recommendation (i.e., strong, moderate, or no recommendation) and self-reported PA participation during hospitalization. The results displayed evidence that those patients with a strong physician referral were more likely to participate in an exercise intervention (Dunn et al., 2016).

Appointments with physicians can serve as an ideal opportunity to recommend PA and provide additional resources. Ideally, an individualised written prescription has been shown to be a simple and effective way to encourage and promote PA (Elley, Harkness, Arroll, & Robinson, 2003). For instance, researchers evaluated the effectiveness of PA prescriptions in two types of physician practices. The intervention practice physicians were prompted to deliver a PA prescription while the control practice physicians did not deliver PA prescriptions (Elley et al., 2003). The patients that visited the intervention physician increased their moderate to vigorous self-reported PA by 14.6%, while the patients that visited the control physicians only increased their PA by 4.9% (Elley et al., 2003). Unfortunately, a sample of American adults who attended medical clinics (n=1,818) recalled receiving physician advice to increase PA only 28% of time, and of those that did, only 38% had a PA prescription and 42% had follow up PA

support (Glasgow et al., 2001). Similar results have been published regarding oncology providers and their patients.

2.5.1 Physical activity communication from oncology providers

Research is well documented showing that oncology provider PA communication is low and needs improvement (Daley et al., 2008; Jones et al., 2005; Nyrop et al., 2016; Royak-Schaler et al., 2008). In 2010, the national health survey data showed a smaller proportion of U.S. cancer survivors (35.8%) received PA recommendations from health care providers compared to patients with other chronic conditions such as hypertension (44.2%), cardiovascular disease (41.2%), and diabetes (56.3%) (Barnes, & Schoenborn, 2012). Moreover, scientists conducted a retrospective study and reviewed health records of breast, colon, and prostate cancer patients (n=55) to observe any record of PA communication. They found that oncology provider records showed that discussions concerning PA occurred only 35% of the time (Nyrop, et al., 2016). Interestingly, medical oncologists recorded discussing PA with their patients 55% of the time compared to only 20% of the time with other clinicians. The results also indicated that PA recommendations were more common as patient age increased (Nyrop et al., 2016). In a Canadian national survey of oncologists (n=659), the majority reported that even though they agreed that PA could benefit a survivor, only 42% recommended it and as little as 26% acknowledged that they recommended PA to their patients in the past month (Jones et al., 2005). Furthermore, a convenience sample of 120 consultant BC oncologists in the UK completed a questionnaire that asked “do you routinely provided advice to patients about PA during consultations” and to indicate the nature and context of any advice provided. They found that only 44.1% (n=45) regularly provided their patients with advice (Daley et al., 2008). Lastly, results of a qualitative

study investigating patient-physician communication in BC care for African American women (n=39) following treatment, revealed that they wanted to become healthier but 90% felt there was a lack of recommendations regarding diet and PA from their oncologists and physicians (Royak-Schaler et al., 2008). As BC survivors spend a great deal of time with oncology providers for their cancer-related treatments and regular check-ups this is a great opportunity to provide PA advice/counselling and/or provide further recommendations and resources (i.e., PA leaflets, pedometers, referral to exercise physiologist).

Few studies have analysed the communication that BC survivors receive from their oncology providers and the impact this communication has on PA outcomes. However, the few that do exist have shown promising results in increasing PA levels using health promotion tactics in oncology settings (Jones et al., 2004; Park et al., 2014; Vallance, Courneya, Plotnikoff, Yasui, & Mackey, 2007). Jones and colleagues (2004) investigated the efficacy of oncologists' exercise recommendations using self-reported questionnaires. Participants (n=675) were randomised into three treatment groups; usual care (n=148), exercise recommendation only (n=140), and recommendation plus referral (n=135). The results indicated an increase in total exercise (3.4 MET hours per week) in the recommendation only group compared to the usual care group. Surprisingly, no significant difference was found between the usual care and recommendation plus exercise referral group (Jones et al., 2004). Additionally, in a 3-armed RCT, researchers investigated the impact of an oncologist's exercise recommendation alone or exercise recommendation plus motivational package (e.g., print resources) on the PA of BC survivors (n=168) and colon cancer survivors (n=59). They found that the recommendation alone did not result in a significant change, but the

recommendation plus motivational package significantly increased exercise by 80 minutes per week compared to the control group (Park et al., 2015). Similarly, Vallance and colleagues (2007) conducted a 12 week pre-post 4 armed RCT to evaluate the efficacy of PA recommendations, print materials, and step pedometers on PA and QoL in BC survivors. Participants (n=377) all received a standard public health recommendation for PA (30 minutes, 5 days a week) and were randomised into one of the following: standard public health recommendation for PA only, BC specific PA print materials, step pedometer, or combination of BC specific print materials and step pedometers. They found that all groups increased in self-reported PA and QoL, and the combination group demonstrated the highest increase in PA (87 minutes/week) after 12 weeks (Vallance et al., 2007). Based on these three studies, PA recommendations with the addition of resources such as print materials and pedometers could increase the effectiveness of PA promotion in the oncology setting. Notwithstanding, although positive results have been associated with PA communication from oncology providers to cancer survivors, researchers have suggested that there are barriers that can limit this communication exchange, and thus further impact patients' engagement in PA behaviours. The following section provides further details concerning these challenges and/or barriers.

2.5.2 Challenges oncology providers face in communicating physical activity

Recent research has indicated that there are particular barriers associated with the PA communication and/or counselling provided by oncologists. Specifically, these include, lack of knowledge, time constraints and lack of resources (Demark-Whanefried et al., 2015). Other challenges faced by physicians include perceived ineffectiveness, lack of confidence, and little or no reimbursement (Pinto, Goldstein, & Marcus, 1998). In

a survey of medical and radiation oncologists (n=199) in the United States, insufficient time was rated as the most salient barrier for promotion of PA (Karvinen, DuBose, Carney, & Allison, 2010). Similarly, surveys used to determine the barriers for oncology nurses (n=274) also revealed lack of time as the number one barrier to PA promotion (Karvinen, McGourty, Parent, & Walker, 2012).

Researchers in Sweden explored barriers to psychosocial communication from an oncologist's perspective (Fagerlind, Kettis, Glimelius, & Ring, 2013). They distributed the Physician Psychosocial Beliefs Scale (PPBS) and barriers against psychosocial communication questionnaires by mail to actively practicing oncologists (n=537) and found that insufficient consultation time, lack of resources, and lack of methods to evaluate physical health and activity were the most prominent barriers. Furthermore, results revealed that oncologists who had supplemental education addressing psychosocial factors perceived fewer communication barriers than did oncologists who did not have psychosocial education ($p=0.001$) indicating the importance of supplemental education about PA and psychosocial factors for oncology providers (Fagerlind et al., 2013). To further strengthen the importance and need for supplemental education addressing PA promotion, a survey given to medical students found that the students believed PA was important and should be prescribed, but did not feel confident in prescribing PA (Vallance, Wylie, & Macdonald, 2008). In order to enhance and improve the PA communication from oncology providers to their patients, it is important to consider these challenges. More research to improve the knowledge translation from research to oncology provider to cancer survivor is needed.

2.6 Summary

With an increasing number of BC survivors, there is a crucial need for health care providers to address the symptoms and side effects associated with treatment, and to support women's wellbeing and quality of life in the years following treatment for BC. With the mounting evidence of the positive benefits of PA amongst BC survivors, clinicians need to take a proactive approach by engaging women in discussions of the importance of PA and promote PA in this population (Daley et al., 2007; Forsythe et al., 2013; Mock et al., 2005; McNeely et al., 2006; Rock et al., 2012; Travier et al., 2015). Oncology providers are a trusted source of information, and thus they have a unique opportunity to provide PA advice and recommendations during treatment and follow-up appointments (Park et al., 2015; Jones et al., 2004; Nyrop et al., 2016). Integrating PA communication into BC treatment, and management post-treatment, will help address the physical and psychological issues often experienced by BC survivors (Jones et al., 2004; Nyrop et al. 2016).

CHAPTER 3 METHODS

3.1 Preface

The following chapter outlines the methods used to conduct this research project. This study was exploratory in nature and utilised a cross-sectional design to gain further insight regarding PA communication amongst oncology providers and BC survivors. Additionally, the relationship between PA communication and the PA levels of BC survivors was also examined. Self-reported questionnaires were utilised to collect information concerning demographics, and quantity and quality of PA communication received from oncology providers. PA was objectively assessed using accelerometry. The Behavioural Research Ethics board at the University of British Columbia approved this study (#H14-02502). The following sections describe the study design, participants and setting, recruitment, procedures, scientific methodologies and data collection, management and analysis.

3.2 Study Design

This exploratory study was conducted as part of a larger study evaluating the effectiveness of a micro-grant intervention to promote PA among BC survivors (Caperchione et al., 2016). For the purposes of this exploratory study, a cross sectional design was used. This design is suitable when survey measures are used and the purpose of the research is to observe and record health behaviours, attitudes or lifestyle choices and estimate the prevalence of behaviour in a population (Sedgwick, 2014).

3.3 Setting and Participants

This study was undertaken in the Okanagan Region of British Columbia, Canada. The Okanagan Region primarily consists of three main cities (Vernon, Kelowna and Penticton) within the interior of the province of British Columbia. Participants included

BC survivors who were enrolled in a PA intervention program called Project MOVE (Caperchione et al., 2016). Participants self-identified as BC survivors based on the National Coalition for Cancer Survivorship (2014) definition, which defines a BC survivor as someone who has lived with, through and beyond a cancer diagnosis. Specific eligibility criteria included:

- 1) Self-identified BC survivor
- 2) Female
- 3) 18 years of age or older
- 4) Living in the Okanagan Region.

Participants were BC survivors that were actively going through treatment or in remission. This sample was chosen because despite accumulating evidence describing the benefits of PA amongst this population, BC PA participation is low (Canadian Cancer Society, 2015; Denmark-Wahnefried et al., 2015, Ibrahim & Al-Hodmaidh, 2011; McNeely et al., 2006; Schmitz et al., 2010). Furthermore, there is limited research examining PA communication provided by oncology providers as well as the effect that this communication has on BC survivors' PA outcomes.

3.3.1 Recruitment and consent

Participants were recruited via an on-going PA intervention for BC survivors called Project MOVE (Caperchione et al., 2015). Project MOVE was developed with the aim of making PA more accessible for female BC survivors living in the Okanagan Region of British Columbia by providing an opportunity for survivors to obtain financial support through micro-grants; small parcels of money awarded to successful applicant groups to develop and implement their own group-based PA program/initiative. Groups of 8-12 BC survivors applied for up to \$2,000 to develop or extend a program/initiative

that would help to get their group more physically active on a regular basis. After a grant review committee reviewed the submitted applications, recommendations were made and funds were awarded to successful applicant groups. Details regarding the Project MOVE protocol have been reported elsewhere (Caperchione et al., 2016).

Project MOVE recruited participants in June 2015-December 2015 using a variety of recruitment techniques, including face-to-face meetings between researchers and community stakeholders with existing connections to BC survivors (e.g., local health and fitness centres, community activity centres, established community groups), news items in local print and radio media, paid advertisements in local news media and online media, social media announcements (Facebook and Twitter), pamphlets and posters distributed to local businesses, community centres and medical clinics, and an information booth was set up at the 2015 Run for the Cure¹ event. Two public “drop in” information sessions were also held at a local community centre to allow prospective participants to meet the researchers, connect with potential group members, and ask questions about the study.

Informed consent (Appendix A) was obtained from all Project MOVE participants at the baseline measurement session, prior to undertaking baseline testing. Participants were provided with an information sheet outlining the purpose of the project, as well as, potential risks, benefits, and confidentiality. They were asked to carefully read the information form and sign the attached informed consent form. During this time, participants were also made aware that they could withdraw from the study at any time, for any reason without question or consequence.

¹ The CIBC Run for the Cure is a 5K or 1K walk or run that raises funds for the Canadian Cancer Society

3.4 Data Collection Procedures and Outcome Measures

3.4.1 Data Collection Procedures

Data collection took place from September 2015-February 2017. Assessments for Project MOVE were conducted at baseline, six months and one year post-baseline. For the purpose of this thesis, baseline measures were utilised for analysis, and the Oncology Provider Physical Activity Communication (OPPAC) questionnaire was completed at the six-month data collection time period. The data collected at 12 months from Project MOVE was not used for the current study.

Successful micro-grant groups (~8-12) were contacted and given a time and a place to meet to complete required baseline measures. Dependant on the group and participant's availability, these locations varied and included community centres, recreational facilities, and on one occasion, in a participant's home. Those that were unable to meet at the agreed upon time and place met with researchers separately to complete the measures. At the baseline measures session, the women were given an envelope with a participant number, accelerometer number, and a space to optionally write their name. The envelopes included self-report questionnaires, an accelerometer and accelerometer instruction sheet (Appendix B), as well as an accelerometer log sheet (Appendix C). The accelerometer is an electromechanical device that measures movement in the x, y, and z axes and provides an objective measure of PA (Karantonis, Narayanan, Mathie M., Lovell, & Celler, 2006). The questionnaires included demographics and BC information questionnaire, physical and mental wellbeing questionnaire and the OPPAC Questionnaire. The OPPAC questionnaire also included open-ended questions to gain further insight regarding this topic. For the specific purpose of this study, only the demographics (Appendix D) and BC information

(Appendix E) and the OPPAC questionnaire (Appendix F) were utilised. Further details concerning the questionnaires are outlined in the measures section below (section 3.4.2). Researchers were present during completion of the questionnaires to provide clarity and feedback for any concerns about the questions; this took approximately 20 minutes. The questionnaires were completed on site.

Following completion of the questionnaires, researchers communicated instructions for accelerometer use. In addition, participants were encouraged to record the accelerometer wear time on an accelerometer log sheet that was provided. Specifically, they were instructed to record the time they put on the accelerometer and the time they took it off to help improve compliance. The women were also instructed to document minutes spent doing activities that could not be captured by the accelerometer (e.g., swimming, stationary biking). Furthermore, the log sheet had space for the participants to record whether they had a more active day than usual, or a less active day than usual (e.g., sick day). In order for the accelerometers to record data, they first had to be charged for three hours and initialised. Initialisation is completed on the computer program ActiLife 6 Data Analysis Software (ActiGraph, Pensacola, FL) and it requires setting a time period for recording activity as well as a participant ID. Researchers initialised the accelerometer for 10 days as a precautionary measure in the event a participant forgot to wear their accelerometer. This ensured that at least 7 days of activity was recorded. Accelerometer log sheets were also given to participants which provided space for participants to record the date and time the accelerometer was put on in the morning and taken off in the evening. Accelerometers and accelerometer log sheets were returned to community centres or picked up individually by researchers 10 days after the initial data collection date. Questionnaire data were entered into SPSS

(Version 21) and accelerometer data were downloaded using the program ActiLife 6 Data Analysis Software (ActiGraph, Pensacola, FL).

3.4.2 Measures

Demographics and BC information. Demographic information was collected by self-report from all participants and included date of birth, ethnicity, education, marital status, and employment status. In addition, participants were also asked to report their weight and height, which was then used to calculate Body Mass Index (BMI). BMI is a measure of body fat based on the weight of an individual in relation to their height calculated by dividing weight in kilograms by height in meters squared, and is often used in community-based research as an estimate of body fat (McAdams, Van Dam, & Hu, 2007). BMI is also required when using accelerometers to analyse PA data. Although self-reported height and weight is not as reliable as objectively measuring, self-report was more feasible in this research setting and is a protocol that has been utilised in previous intervention work undertaken with this population (Mutrie et al., 2007; Philips & McAuley, 2015) Self –reported BC information, including date of the most recent diagnosis, stage of cancer, and type of treatment received (i.e., lymph node dissection, single mastectomy, chemotherapy) was also collected by self-report from each participant.

PA communication. The Oncology Provider Physical Activity Communication (OPPAC) Questionnaire (see appendix F) was used to measure participants' perceptions of PA communication they have received from their oncology provider (Glasgow, Eakin, Fisher, Bacak, & Brownson, 2001; Jones & Courneya, 2002). As there was not a published questionnaire that addressed the research questions, the researchers developed an investigative questionnaire that was named the oncology

provider physical activity communication questionnaire (OPPAC). The questionnaire was developed based on information collected from prior research (Glasgow et al., 2001; Jones et al., 2002). Two studies that previously assessed physician-counselling behaviours regarding PA, cancer and other chronic disease risk factors had questions that were adapted and added to the OPPAC questionnaire (Table 3.1).

The OPPAC questionnaire consists of three sections. The first section assesses women's experiences related to PA communication from oncology providers and includes 15 items that ask participants to respond with yes or no answer. For example, participants were asked to respond to questions such as: "My oncology provider recommends that I become more physically active", and "My oncology provider has provided me with instructions for a PA program" (Appendix F). The second section assesses women's perceptions of the importance of PA communication and included 13-items, for example "It is important to me that my oncology provider asks me about my PA routines" where 1= not important and 5= very important. The last section included two open-ended question to gain richer insight about BCS perceptions about oncology provider PA communication. The first question asked survivors who received PA communication from their oncology provider what they thought was most helpful and least helpful in regards to PA communication from their oncology provider. The second question asked all participants to provide suggestions for oncology providers relating to advice and support regarding PA for women who have been diagnosed with BC.

Table 3.1 Adapted questions for OPPAC questionnaire

Reference	Original Question	Adapted Question
Glasgow, R., Eakin, G. E., Fisher, B. E., Bacak, J. S., & Brownson, C. R. (2001). Physician advice and support for physical activity: Results from a national survey. <i>American Journal of Preventative Medicine</i> , 21(3), 189-95.	“Have you ever been advised within the last year by a doctor or other health professional to exercise more” (Yes/No)	“My oncology provider recommended that I begin a physical activity program” (Yes/No)
		“My oncology provider recommended that I participate in at least 150 minutes of moderate or 75 minutes of vigorous physical activity per week” (Yes/No)
		“My oncology provider provided me with instructions for a physical activity program” (Yes/No)
		“My oncology provider recommended that I use a physical activity website or web-based exercise/fitness app” (Yes/No)
		“My oncology provider Recommended that I use a physical activity monitoring tool (e.g., fitbit, pedometer, step counter)” (Yes/No)
Jones, L. W., & Courneya, K. S. (2002). Exercise counseling and programming preferences of cancer survivors. <i>Cancer Practice</i> , 10(4), 208-215.	“Would you prefer to be counseled about exercise” (yes/maybe/no/no preference)	“My oncology provider recommended that I join a local walking or sport related group (e.g., dragon boating)”
		“Please rate the importance of the following action by your oncology provider provides me with verbal or written instructions for a PA program” (Likert 1-5)

Table 3.1 *Adapted questions for OPPAC questionnaire*

Reference	Original Question	Adapted Question
	“When would you prefer to receive exercise counseling the first time” (Before treatment/during treatment/Immediately following treatment/3-6months/7-12months/at least 1 year after treatment)	“When do you think your oncology provider should discuss PA with you?” (I do not believe my oncology provider should discuss PA with me/before treatment/after treatment/every opportunity/other)

This questionnaire has not been validated, however, a pilot test was conducted prior to distributing the questionnaire to participants in order to gain feedback and make necessary refinements. The first version of the OPPAC was distributed electronically to BC survivors who were not enrolled in Project MOVE (n=7). Participants were asked to respond to the following questions concerning the questionnaire:

- 1) Were the questions clear and easy to understand? If not, can you indicate which questions require attention?
- 2) Was the flow/organisation/order of the questions suitable? If not, can you indicate which questions require attention?
- 3) Is there anything else you would like to comment on concerning how the questions are presented here?

Based on the responses from the pilot test, the items within the questionnaire were deemed to be clear and easily understood by the pilot study participants. Minor refinements were made to the organisation of questions and sentence structure (i.e., grammar). For instance, the term “Oncologist” was revised to “Oncology provider” to include medical oncologists, haematologists, surgeons, radiation oncologists, and oncology nurses.

Physical Activity. PA was measured objectively using the Actigraph GT3X accelerometer (ActiGraph, Pensacola, FL). The Actigraph GT3X™ accelerometer (Pensacola, FL) provides an objective measure of PA with the ability to accurately record number of steps, frequency and duration of sedentary, moderate and vigorous activity (Freedson, Melanson, & Sirard, 1998; Toriano et al., 2008;) Participants were instructed to wear the accelerometer above their right hip, facing up, for a minimum of 7

days (including at least one weekend day and two week days) during all waking hours, and only removing it for bed and/or any activity involving water (i.e., showering, swimming). The accelerometers were initialised to record steps, inclination, wear time, and acceleration in tri-axial mode using 60 epochs (Toriano et al., 2008; Freedson, Melanson, & Sirard, 1998). The ActiLife 6 Data Analysis Software (ActiGraph, Pensacola, FL) was used to download all accelerometer data. Several studies have shown accelerometers to be a valid and reliable measure of PA across a number of settings and clinical populations (Marshall, Miller, Burton & Brown, 2010; Bassett & John, 2010; Lyden, Kozey, Staudenmeyer, & Freedson, 2011).

3.5 Analyses

Descriptive analyses were performed using IBM's Statistical Package for the Social Sciences (SPSS Version 21.0) and presented as frequencies, proportions, means and standard deviations (SD). Descriptive variables included demographics and BC information while outcome variables included oncology provider communication and PA behaviour. Variability was examined using the frequency and proportion of each dichotomous question on the OPPAC to meet one assumption for running one-way analysis of variance (ANOVA) in order to analyze oncology communication and its relationship to minutes of MVPA per week. Dichotomous questions that revealed to have over 25% that answered yes were deemed appropriate for analysis by the researcher. An alpha level of $p \leq 0.05$ was used to determine statistical significance.

With regard to the qualitative data, a summative content analysis was used to analyse the data. Common patterns in data were identified from the responses to the qualitative questions in the OPPAC questionnaire. Qualitative methods can be a valuable approach for health science research as it places importance on participant

experiences and views (Baxter & Jack, 2008). The summative content analysis approach offers techniques for identifying, analyzing and describing patterns or themes observed in the data by counting and comparing keywords (Hsieh & Shannon, 2005). To ensure rigour and reduce bias, two experienced qualitative researchers in the Physical Activity and Behaviour Lab monitored, reviewed and reevaluated the themes (Mayan, 2009).

3.6 Data Storage

Data used for this study will remain confidential and securely stored. Participants were identified by code numbers only. Paper-based data are stored in a secure and locked filing cabinet located on the University of British Columbia Okanagan campus in the Physical Health and Activity Behaviour lab, directed by Dr. Cristina Caperchione. Electronic data, such as the accelerometer data and SPSS files, are stored on a password-protected computer also located in the PHAB lab. Only the researcher (Kayla Fitzpatrick) and supervisor (Dr. Cristina Caperchione) will have access to these data. Destruction of data will occur at the end of 5 years after publication.

CHAPTER 4 RESULTS

The aim of this descriptive research was to understand the prevalence of PA communication from oncology providers to BC survivors, and whether or not this communication has a relationship with minutes of MVPA per week for BC survivors. Furthermore, BC survivors' perceptions of PA communication from oncology providers were explored. The following chapter summarises participant demographic and BC information as well as the results for both primary and secondary research questions.

4.1 Sample Characteristics

4.1.1 Demographic characteristics

Data from 60 female BC survivors in the Okanagan Region of British Columbia, Canada were collected. The majority of the participants were white (93.3%), married/living with life partner (71.7%), and completed post-secondary education (i.e., college/technical school or university) (66.7%). Approximately two thirds of participants were either retired (33.3%) or employed full-time (30%). The participants had a mean age 58.5 ± 8.8 years, were predominately post-menopausal (75%) with a mean BMI of $25.5 \pm 5.2 \text{ kg/m}^2$. Sufficient PA for health benefit (≥ 150 minutes of PA/week) was noted in 60% of the participants (Canadian Society for Exercise Physiology, 2012). Table 4.1a shows the frequencies and percentages of individual demographic characteristics including age, ethnicity, level of education, marital status, main activity, menopausal status, BMI, and PA levels.

Table 4.1a *Demographic Characteristics*

Variable	Participants %, (n=60)
Age (years) ^a	
35-44	6.9 (4)
45-54	22.4 (13)
55-64	43.1 (25)
65-74	27.6 (16)
Racial Background	
White	93.3 (56)
Asian	5.0 (3)
Black	1.7 (1)
Highest level of education	
Some high school or less	1.7 (1)
High School Diploma	11.7 (7)
Some Post-secondary without diploma or degree	13.3 (8)
College or technical diploma or certificate	36.6 (22)
University degree	30.0 (18)
Other	6.7 (4)
Marital Status	
Married or living with a life partner	71.7 (43)
Living alone	23.3 (14)
Widowed	5.0 (3)
Main Activity	
Full time work	30.0 (18)
Part time work	16.7 (10)
Caring for family/managing household	5.0 (3)
Recovering from illness/on disability	8.3 (5)
Retired	33.3 (20)
Other	6.7 (4)
Menopausal Status ^b	
Pre-menopause	8.8 (5)
Going through menopause	12.3 (7)
Post-menopausal	78.9 (45)
BMI (kg/m^2) ^c	
Underweight (<18.5)	5.1 (3)
Healthy (18.5 -24.9)	45.8 (27)
Overweight (25-29.9)	32.2 (19)
Obese (>30)	16.9 (10)
Physical Activity Levels ^d	
Insufficiently Active (< 150 min/week)	40 (24)
Sufficiently Active (≥ 150 min/week)	60 (36)

^a 2 participants unresponsive, ^b 3 participant unresponsive, ^c 1 participant unresponsive, ^d determined using accelerometers.

4.1.2 Breast cancer history and treatment

The majority of participants were diagnosed with BC from 2007-2016 (54.9%). Stage II BC was the most commonly diagnosed stage (30%) and treatment type varied (Table 4.1b). Lower PA levels were reported in 55% of participants compared to PA levels pre-diagnosis. Table 4.1b outlines year of diagnosis, BC stage, BC treatment type, and self-reported PA levels following diagnosis for individual participants.

Table 4.1b *Individual Breast Cancer Related Characteristics*

Variable	Participants %, (n=60)
Year of Diagnosis ^a	
1987-1991	10.5 (6)
1992-1996	1.8 (1)
1997-2001	14.0 (8)
2002-2006	8.8 (5)
2007-2011	29.8 (17)
2012-2016	35.1 (20)
Breast Cancer Stage	
Stage 0	10.0 (6)
Stage I	18.3 (11)
Stage II	30.0 (18)
Stage III	16.7 (10)
Stage IV	6.7 (4)
Unknown	18.3 (11)
BC treatment ^b	
Lymph or axillary node dissection	80 (48)
Lumpectomy	56.7 (34)
Single Mastectomy	33.3 (20)
Double Mastectomy	25 (15)
Reconstructive Surgery	35 (21)
Chemotherapy	61.7 (37)
Radiotherapy	68.3 (41)
Hormonal Therapy	35 (21)
Other	6.7 (4)
PA levels compared to pre-diagnosis ^c	
Much less active	22.0 (13)
A little less active	23.7 (14)
About the same	15.3 (9)
A little more active	18.6 (11)
Much more active	20.4 (12)

^a 3 participant unresponsive, ^b 2 participants unresponsive, ^c 1 participant unresponsive.

4.2 Primary outcome

The primary outcomes for this research were whether oncology providers engaged in PA communication and whether or not such communication was related to the PA levels of BC survivors. The primary objective was determined using the dichotomous OPPAC questions (15-item). Results revealed that these 15 items had limited variability, with the majority of participants answering “no” for most questions (Table 4.2). The lack of variability among these questions (when few said yes) suggested that oncology providers do not regularly engage in PA communication. To determine the relationship amongst PA communication and PA levels of BC survivors three separate one-way ANOVAS were conducted on variables that showed a significance level ≥ 0.05 on a Levene’s Test of Homogeneity of Variances. This included, “My oncologist asked me about my PA routines”, “discussed the physical health benefits associated with being physically active (e.g., reduced tiredness and pain, weight control, increased strength)”, and “discussed the mental health benefits associated with being physically active (e.g., reduced anxiety and depression, improved social interaction).” Assumptions of ANOVA were met:

- Participants provided only one score on each measure
- The dependent variable was normally distributed
- According to Levene’s Test of Homogeneity of Variances the variability of each condition was about the same.

Table 4.2 *Oncology provider dichotomous questionnaire*

Variable (my oncology provider...)	Participants %, (n=60)	
	Yes	No
Asked me about my PA routines	35 (21)	65 (39)
Assessed my fitness (e.g., as part of a physical exam or fitness test)	13.3 (8)	86.7 (52)

Referred me to other exercise professionals (e.g., exercise physiologist, physiotherapist, exercise specialist)	11.7 (7)	88.3 (53)
Discussed the physical health benefits associated with being physically active (e.g., reduced tiredness and pain, weight control, increased strength)	33.3 (20)	66.7 (40)
Discussed the mental health benefits associated with being physically active (e.g., reduced anxiety and depression, improved social interaction)	26.7 (16)	73.3 (44)
Discussed ways to overcome potential barriers to being physically active during and after my cancer treatment	13.3 (8)	86.7 (52)
Recommended that I begin a physical activity program	20 (12)	80 (48)
Recommended that I participate in at least 150 minutes of moderate or 75 minutes of vigorous physical activity per week	10 (6)	90 (54)
Recommended that I reduce the time I spend sitting	13.3 (8)	86.7 (52)
Provided me with instructions for a physical activity program	1.7 (1)	98.3 (59)
Recommended that I visit a community fitness centre (e.g., GoodLife, local pool)	3.3 (2)	95 (57)
Gave me physical activity booklets or handouts	10 (6)	90 (54)
Recommended that I use a physical activity website or web-based exercise/fitness app	0 (0)	100 (60)
Recommended that I use a physical activity monitoring tool (e.g., fitbit, pedometer, step counter)	0 (0)	100 (60)
Recommended that I join a local walking or sport related group (e.g., dragon boating)	1.7 (1)	98.3 (59)

A statistically significant difference was found among PA levels and “my oncology provider asked me about my physical activity routines,” $F(1, 58) = 5.74$, $p = .020$ (Table 4.3). A mean of 173.5 minutes per week of MVPA was reported for survivors who indicated their oncology provider did not ask them about their PA routines, while a mean of 255.8 minutes/week of MVPA was reported for BC survivors who indicated that they were asked about their PA routine by their oncology provider. No significant relationship was observed in both “my oncologist discussed the physical health benefits associated with being physically active” and “my oncologist discussed the mental health benefits associated with being physically active” with total MVPA minutes/week.

Table 4.3 Means, standard deviations, and analysis of variance for oncology provider communication as a function of MVPA.

Variable	M (SD)	95% CI	F	p	Sig. ^a
Asked about my PA routines			5.7	.02	.40
Yes	255.8 (139.5)	[192.2, 319.3]			
No	173.5 (119.6)	[134.7, 212.3]			
Discussed the physical health benefits			.05	.83	.07
Yes	207.5 (160.2)	[132.5, 282.5]			
No	199.7 (117.4)	[162.1, 237.3]			
Discussed the mental benefits			.13	.72	.42
Yes	212.4 (140.5)	[137.5, 287.3]			
No	198.6 (130.1)	[159.1, 238.2]			

^a Significance for Levene Statistic Test of Homogeneity of Variances

4.3 Secondary outcome

The secondary outcome for this research aimed to describe BC survivors’ perceptions about PA communication from oncology providers. BC survivors’ perceptions were analysed using quantitative and qualitative OPPAC survey measures. A Likert-type, 8 item importance scale and 2 open ended questions gathered information concerning this.

4.3.1 Quantitative results

Importance Scale. Of the 60 participants, 51 responded to the importance questions. The 5 point scale was collapsed and ranged from not important (1-2), neutral (3) to important (4-5). The majority of women felt it was important that oncology providers discussed ways to overcome barriers to PA (65%), discussed the physical (68.3%) and mental (68.3%) health benefits of PA, asked about PA routines (60%), assessed fitness (58.3%), had referrals to other exercise professionals (43.3%), provide written (45.0%) and verbal (38.3%) PA instructions (Table 4.4).

Table 4.4 *Frequency distribution displaying importance of oncology provider communication*

Variable	Participants %, (n)		
	Not important	Neutral	Important
Asked me about my PA routines	13.3 (8)	11.7 (7)	60 (36)
Assesses my fitness	13.3 (8)	13.3 (8)	58.3 (35)
Refers me to other exercise professionals	15 (9)	26.7 (16)	43.3 (26)
Discusses the physical health benefits associated with being physically active	8.3 (5)	8.3 (5)	68.3 (41)
Discusses the mental health benefits associated with being physically active	6.7 (4)	10.0 (6)	68.3 (41)
Discusses ways to overcome potential barriers to being physically active during and after my cancer treatment	10 (6)	10 (6)	65.0 (39)
Provides me with verbal instructions for a physical activity program	21.7 (13)	25.0 (15)	38.3 (23)
Provides me with written instructions for a physical activity program	23.3 (14)	16.7 (10)	45.0 (27)

Table 4.5 provides BC survivors' perceptions about when PA communication from oncology providers should occur. The majority of participants specified that oncology providers should discuss PA at every opportunity (55%), and only a small proportion (8.3%) believed that their oncologist should not discuss PA at all.

Table 4.5 *Frequency distribution – “When do you think your oncology provider should discuss PA with you?”*

Variable	Participants %, (n)	
	Yes	No
I do not believe my oncologist should discuss PA with me	8.3 (5)	83.3 (50)
Before treatment	35 (21)	56.7 (34)
During treatment	33.3 (20)	58.3 (35)
After treatment	42.1 (24)	55 (33)
Every Opportunity	55 (33)	35 (21)
Other	1.7 (1)	81.7 (49)

4.3.2 Qualitative results

Content analysis was used to examine data from two open-ended response questions. The first question asked women who had conversations with their oncology providers to report what they found was the most helpful and what they felt was the least helpful with respect to PA. The second question asked all participants what suggestions they had for oncologists in regards to providing advice and support for PA for women with BC. A low response rate was noted for the first qualitative question. Only six participants responded to what was the least helpful, while only 13 responses were captured for what was the most helpful. There were no common patterns when asked what participants thought was the least helpful. A common response among what was the most helpful was when oncology providers gave their patients additional

resources or referrals. Although the first open ended question did not result in much feedback, the second question generated 55 responses. Patterns observed in the data were identified and supported with direct quotes from the participants. Participant numbers were used for participant anonymity.

Participants provided insight on the role of PA communication from oncology providers throughout survivorship. Out of the 55 women who responded, 49 indicated that PA should be a part of BC treatment. Conversation about PA from oncology providers, referral to other health providers, and additional resources were common topics among this sample. Majority of the women (65.5%) reported that conversation and discussion about PA from their oncologist provider would be beneficial, *“I believe maybe mentioning physical activity would be beneficial to my overall health for recovery”* (BC survivor 53). Another BC survivor (#18) stated that *“it would have been helpful if I had been told it was okay to exercise during treatment.”* Many women identified that discussion would be helpful for oncology providers to give *“support”*, to gain understanding of the *“many benefits like stress relief and sleeping better”* and to know *“what type of activity”* is appropriate. Furthermore, PA promotion would be valuable to *“prevent symptoms such as lymphedema”*.

Several participants (36.5 %) suggested that referral to other health care providers would be valuable. One BC survivor (#89) suggested, *“A referral to a physical fitness program or professional is very important and can be incorporated into the cancer care program.”* Some women described the need for collaboration between oncology providers and other health care providers in regards to PA as stated by one BC survivor (#28); *“Physical activity communication between PT (physical therapist) and oncologists is very important.* Ultimately this finding indicates that referral to other health

professionals from oncology providers is not common in practice, however, BC survivors perceive that they would benefit from referrals.

Some of the women enrolled in this study (27.3%) expressed that they would value additional resources from oncology providers about PA. One BC survivor (#48) shared:

“As a personal trainer and working at the [name] and leading the survivor group for 10 weeks walking/running program, you see these ladies shine once they start exercising. I was shocked nothing was ever mentioned about exercise.

Pamphlets at least need to be handed out, and more one on one conversations.”

Noteworthy, some suggested additional resources included “pedometers,” “websites,” “reading material,” and “support and PA programs.” A BC survivor (#87) stated, “*[oncology providers] should take every opportunity to share resources especially Inspire Health (an integrative cancer center).*” These results suggest various types of resources supplied by oncology providers are sought after and valued by survivors to help support and improve their PA engagement.

On the contrary, a small proportion of this sample (16.4%) did not believe that it was the role of the oncology provider to communicate about PA. There was indication that oncology providers “*may not have a lot of time to offer specific programs but could refer to other programs or professionals*” (BC survivor #49) or should “*refer to another department if they are too busy*” (BC survivor #43). Time limitations were commonly expressed by 10.9% of the sample “*They [oncology providers] have enough to do and many patients. They can’t be expected to give fitness testing and have conversations about getting active*” (BC survivor #12). Furthermore, the participants suggested a way to minimize the burden on oncology providers would be using other resources. One

woman stated: *“they [oncology providers] are so very busy, it would be helpful to all if there was a package of info and contacts for programs...”* (BC survivor #93).

Some participants (5.5%) believed that PA recommendations from oncology providers were irrelevant because they are responsible for providing other information, one BC survivor (#29) explained *“At the moment you are diagnosed, you probably would not care [about PA] you just want to know if you will live.”* Others felt that it is your own responsibility *“I take responsibility for my own health, I tell the oncologists what I am doing”* (BC survivor 13) and just, *“common sense” to be physically active “It seems obvious that PA is important for anyone recovering from any kind of treatment, including treatment for BC. Not sure if this advice should come from the oncologist or from GP follow up team”*

Although these responses came from a small proportion of participants, it is interesting to find that some did not perceive that the promotion of PA was a role of oncology providers.

4.4 Summary of main findings

This study revealed a lack of PA communication from oncology providers to BC survivors in the Okanagan region. Results displayed a positive relationship between minutes of MVPA per week and BC survivors who were asked about their PA routines by their oncology provider. Moreover, a large proportion of this population recognised the importance of PA during survivorship. BC survivors commonly suggested in the qualitative findings that oncology providers should engage in conversation about PA at every given opportunity, and highlight PA benefits and limitations with provision of additional resources such as PA print material or referral to other health care professionals.

CHAPTER 5 DISCUSSION

In the following chapter the main findings of this study are discussed in reference to the research literature. The results of the present study revealed that PA communication from oncology providers is minimal, however; BC survivors who did receive some PA communication from their oncology provider showed greater minutes of MVPA per week than those who did not receive PA communication. Moreover, the findings from this study highlight that the majority of BC survivors' perceived PA communication to be an important part of treatment, which aligns with previous research (Jones & Courneya, 2002; Jones et al., 2004; Nyrop et al., 2016).

It is well known that PA is beneficial for BC related side effects, overall prognosis, and mortality (Segar et al., 1998; Velthuis et al., 2010). Unlike previous research (Irwin et al., 2004), 60% of this sample of BC survivors were meeting recommendations for PA based on accelerometer data. These higher PA levels may be due to the fact that the sample used may not be an accurate representation of the BC survivor population because participants for this study were recruited for a PA intervention program (Project MOVE). This means that participants were motivated to be active since they signed up for a PA intervention, therefore those survivors who were not motivated to be active were not included in this sample. Other research that has been conducted with a well-represented sample of BC survivors shows that PA participation declines substantially during BC treatment and less than 40% of BC survivors are meeting the recommended PA guidelines for cancer survivors (Irwin et al., 2004). One notion behind the low levels of PA among BC survivors is the lack of PA promotion by health providers, specifically oncology providers (Jones, et al., 2004a; Jones et al., 2004b). Despite the known benefits of PA among this population it has been suggested that oncology providers do

not routinely discuss PA communication (Jones & Courneya, 2002; Nyrop et al., 2016; Park et al., 2015; Young-McCaughan & Sexton, 1991). The results of the current study revealed the majority of participants (65%) indicated that they received no communication regarding PA from their oncology provider, which closely aligns with previous research (Jones et al., 2004; Jones et al., 2005; Nyrop et al., 2016). For instance, Nyrop and colleagues (2016) viewed medical charts and found only 35% of cancer survivors received PA communication from their oncology provider. Similarly, Jones and associates (2002) found that only 28.4% of cancer survivors reported that their oncologist initiated a discussion about exercise, while Young-McCaughan and Sexton (1991) showed 41% of BC survivors reported that their physician mentioned exercise to them as part of their rehabilitation. Furthermore, in a study examining specific PA recommendations from oncology providers to BC patients, less than half (46%) of participating oncology providers self-reported recommending PA to patients, this may suggest that few oncology providers believe that health promotion is not part of their clinical role (Park et al., 2015). In addition, low communication may be due to the barriers associated with incorporating PA communication into treatment practice.

Two main barriers that prevent PA communication from oncology providers are lack of time due to competing treatment or health concerns, and lack of knowledge/training (Park et al., 2015). Lack of time is the most commonly reported barrier for PA communication (Karvinen, McGourty, Parent, & Walker, 2012), which may be due to the more demanding clinical issues present with survivors, thus limiting time for PA counselling during appointments (Grady et al., 1992; Sabatino et al., 2017). Specifically, oncology providers have to discuss crucial topics such as the disease itself, treatment options (e.g., chemotherapy, radiation), prognosis and the side effects often

associated with post-treatment (e.g., pain, fatigue, depression), leaving little time to discuss the benefits and importance of PA. Further compounding the issue is the lack of training provided in medical schools regarding PA counselling. One study surveyed medical students and determined that the students believed exercise was important and that it should be prescribed however, they did not feel confident in prescribing PA (Vallance et al., 2008). Nadler and team (2017) administered surveys to oncology providers (n=120) in Hamilton, Ontario and determined that 69% of oncology providers (n=120) were not aware of any exercise guidelines in cancer and 51% expressed limited knowledge in the area and hesitation about where to refer patients to exercise. As oncology providers continue to demonstrate a lack of time and knowledge surrounding exercise, research to address these issues is needed.

To combat the time and lack of training/knowledge barriers, a potential solution could be to provide referrals to other health professionals in the exercise field. Only 15% of participants in this study recalled being referred to other exercise professionals (e.g., exercise physiologist, physiotherapist, occupational therapist), a result similar to the work undertaken by Jones and colleagues (2002) who found that only 13.6% of patients were referred to other health care professionals. Referrals to these health professionals would be ideal as this would not only save time during oncology appointments, but also attend to the lack of training as many of these health professionals (e.g., exercise physiologist, physiotherapist, occupational therapist) are already trained to work with those who have a chronic disease/condition, or those who require special modifications due to their illness or disease (Nadler et al., 2017). This referral process could be further extended to include health professionals at specific cancer-exercise related programs and facilities such as Wellspring, which is located in Toronto, Edmonton, London, and

Calgary (www.wellspring.ca), Ellicsr: Health, Wellness & Cancer Survivorship Centre, which is located at the Toronto General Hospital (www.ellicsr.ca) and Inspire Health Supportive Cancer Care in Vancouver, Victoria, and Kelowna (www.inspirehealth.ca). Wellspring, Ellicsr, and Inspire Health are facilities which have either no cost or low cost and aim to support and educate people during and after cancer treatment by offering a variety of collaborative cancer support programs, including group exercise programs such as yoga, strength and aerobic training, as well as healthy eating education, cooking related classes, mindful meditation and sex and intimacy support. They employ dietitians, nurses, exercise physiologists, research scientists, psychologists, physiotherapists, and kinesiologists who have specific training in the delivery and facilitation of health promotion (e.g., PA and healthy eating) tailored to the specific needs of cancer patients and survivors. Having centres such as the ones listed above provides oncology providers with reliable referral options for their patients. By referring survivors to such programs, oncology providers can be confident that their patients are receiving cancer specific care in terms of exercise, within a safe and supportive environment. This also provides an opportunity for oncology providers to engage in PA communication with their patients in the most efficient way.

BC survivors present unique needs as a result of the cancer diagnosis itself as well as the treatment-induced side effects. Unlike other disease prognosis (e.g., heart disease) rehabilitation services are not a routine part of treatment for cancer survivors. Rehabilitation is defined as the action of enabling a person to recover to optimal physiological, psychological, social and vocational status (Segal et al., 1999). The National Heart, Lung, and Blood Institute (2016) describes cardiac rehabilitation as a program that involves adopting a heart healthy lifestyle through the use of exercise

training, education, and stress-reduction counselling. Similar to cardiac rehabilitation, inclusion of PA in a rehabilitation program for BC survivors could improve functional status and QoL. Several studies have shown that oncology rehabilitation is effective and allows survivors to return to home, work, and to have a greater sense of control over cancer treatment and outcomes (Fu & Morishita, 2017; Segal et al., 1999). If these rehabilitation programs were a routine part of oncology treatment, oncology providers could emphasise the important role PA plays in cancer rehabilitation and survivorship and refer BC survivors to rehabilitation centres. Further, having oncology rehabilitation centres could improve knowledge translation of PA and reduce the lack of time burden for oncology providers. Currently existing facilities such as Wellspring, ELICSR, and Inspire Health act similarly to rehabilitation services, but are not routinely mentioned by oncology providers and are not as prevalent as cardiac centres. This may be due to a lack of awareness of these facilities by oncology providers, lack of accessibility for survivors, or lack of support from government agencies.

There has been some conflicting research revealing that referrals to other health professionals from oncologists are not as effective at increasing PA compared to an oncologist recommendation alone (Jones et al., 2005). This may be due to the notion that oncology providers are held in higher regard compared to other health care professionals and are a trusted source of cancer information (Zon et al., 2009). However, perhaps if oncology providers emphasised the benefits of PA during survivorship and referred patients to an oncology rehab or supportive cancer centre as a part of treatment, PA adoption and adherence may improve. Survivors in the present study perceived that referrals would help to increase their PA levels and lower the burden for the oncology provider and 43.3% of participants felt that it was important that

oncology providers refer them to other exercise professionals. This is similar to findings from Jones and Courneya (2002) indicating that cancer survivors in their sample preferred to receive exercise counselling at some point during their cancer experience and had a preference to receive this counselling from an exercise specialist affiliated with a cancer centre. These findings are important as other researchers have suggested that discussions related to PA in an oncology setting should involve a multidisciplinary approach (Nadler, Bainbridge, Tomasone, Cheifetz, Juergens, & Sussman, 2017). Cancer survivors require unique exercise counselling that provides reassurance that PA is safe and beneficial. Having reliable sources that include an oncologist, exercise specialist, and physiotherapist to translate PA knowledge may be a crucial component to increase or maintain PA in BC survivors.

Additional resources such as step pedometers, community resource lists, and educational print materials may also help to overcome the time and knowledge barrier experienced by oncology providers. Park and colleagues (2015) suggested that a 30 second recommendation alone may not be enough to illicit a significant change, but suggested that providing resources in an oncology setting leads to increased PA. Print materials and pedometers (e.g., step counters) were suggested by the participants in the current study, and have been previously shown to be an effective strategy to increase PA in BC survivors (Vallance et al., 2007). Research has frequently indicated that simple resources used provided in oncology settings (e.g., telephone advice, written exercise prescriptions, pedometers and web based programming) can encourage the cancer patient population to engage in PA behaviours (Lee et al., 2013; Arrow, Kinmonth, Sanderson, & Sutton, 2012; Vallance et al., 2007). Resources for survivors such as print or web materials that provide information about PA benefits, types and

intensities may mitigate the need to allocate a large amount of time to PA communication during oncology appointments. A promising study which used motivational packages revealed a significant increase in PA (mean increase of 80 minutes) compared to a control group without a motivational package, emphasizing the potential benefit for additional resources in an oncology setting (Park et al., 2015). The current study showed that less than 5% received any kind of additional resources, despite the fact that the majority of BC survivors felt that it was important for oncology providers to add verbal or written PA instructions into treatment plans. This combined approach (i.e., brief exchange of PA communication between the oncology provider and patient, a referral to a health professional and the distribution of a motivational/informational package) would provide BC survivors with credible PA information, the resources and tools to support their engagement in PA, and more importantly, would not require an extensive time commitment from their oncology provider.

Concerning the lack of PA knowledge and training for medical doctors, it has been suggested that this barrier may originate from the limited health promotion training doctors receive in medical school (Thorton, 2016). A recent review of 109 studies from 1965 to 2011 discovered that PA was the least addressed topic in health behaviour counselling curricula for medical students in comparison to drug use, smoking, alcohol and nutrition (Hauer, Carney, Chang, & Satterfield, 2012). This aligns with similar research in general primary care highlighting that a lack of knowledge is a reason for not providing exercise counselling (Lobelo, Duperly, & Frank, 2017). The Canadian Medical Association stated in 2001 that physicians must play an essential role in promoting health and disease prevention including PA promotion and prescription, however; health

promotion education, particularly PA and exercise, in medical school is not a routine component of the medical curriculum (Thorton, 2016). Furthermore, the American College of Sports Medicine set in motion a major initiative to encourage physicians to counsel patients about exercise and prescribe exercise (Lobelo, Stoutenber, & Hutber, 2014). Most recently, the Canadian Medical Association introduced a new policy that as of 2018 the Licensing Exam for Medical Students will include up to 20% on disease prevention/health promotion with one part including exercise to examine medical students' knowledge concerning the promotion of physical activity/exercise and other preventive health behaviours as part of patient care. This major change will also require a shift in the curriculum delivered in medical school so students are sufficiently prepared for their board exams. A policy change of this magnitude could have a major positive impact on patient care/treatment for cancer patients and the general public, particularly if PA communication/counselling from family doctors is delivered as a means of disease prevention.

As PA in the oncology world is becoming a prominent topic, more and more resources are becoming available to clinicians working with the cancer survivor population. Segal and colleagues (2015) developed guidelines surrounding exercise for people with cancer with the intended users being: oncologists, exercise consultants, primary care providers, and other members of the healthcare team (i.e., physiotherapist, kinesiologists, social workers, psychologists, nurses, oncology providers). These guidelines can be accessed and used by all clinicians, and provide clinicians with a thorough evidence-based PA guidelines. Further, Culous-Reed (2002) developed a yoga teacher training for cancer survivors' workshop as well as an online cancer and exercise training for health professional's course. These resources provide an

accessible opportunity to clinicians who lack knowledge about PA during cancer survivorship. It is important that options are available for clinicians to further educate themselves about exercise with cancer survivors as research has shown the benefits of PA counselling among this population (Jones & Courneya, 2002; Jones et al., 2004a; Nyrop et al., 2016) as displayed by the current study.

The findings from this study revealed a significant relationship between increased MVPA and PA communication for those who reported that their oncology provider inquired about PA routines. Although the current studies differs very much from previous research, the results concur with previous work regarding PA communication from oncology providers and an increase in PA (Jones, Courneya., et al., 2004; Nyrop et al., 2016; Park et al., 2015). Jones and colleagues (2004) found that BC patients who received an oncologist recommendation to exercise had a mean increase of 3.4 metabolic equivalents per week compared to those who did not receive a recommendation ($p=0.011$). A similar study analysing the effects of clinician exercise referral for prostate cancer survivors showed an increase in vigorous exercise ($p=0.010$) (Livingston et al., 2015). These results can be explained by prior research that has indicated that physicians are powerful tools for initiating and promoting behaviour change (Pinto et al., 2001). Oncology providers can be a crucial source of motivation to inspire patients to be physically active by conveying the importance of a healthy lifestyle during cancer treatment and into remission. The present study revealed the majority of survivors felt it was important that oncology providers asked about PA routines, discussed the physical and mental benefits of PA, and ways to overcome barriers of being physically active during and after treatment. These findings are not surprising as research shows that BC survivors are highly motivated to receive PA information from

their oncologist immediately after treatment (Jones & Courneya, 2002). Adding to this research, when survivors in the current study were asked, “*When do you think your oncology provider should discuss PA with you?*” the majority of survivors (55%) chose at every opportunity while only 8% did not believe their oncologist should discuss PA with them. Those survivors who did not believe their oncology providers should discuss PA with them also expressed that PA is not important during cancer treatment displaying a gap in knowledge of the benefits of PA for a cancer survivor.

Perhaps BC survivors are receptive to oncology providers’ recommendations because of their credibility and role in treating life-threatening conditions. Research evidence indicates that when clinicians participate in a “teachable moment” survivors are more likely to report an attempt to eat healthier, exercise more, and lose weight after being diagnosed with cancer (Demark-Whanefried et al., 2015; Nypro et al., 2016). Additionally researchers have revealed that advice from an oncology provider has been perceived as reassuring, informative and motivational, thus patients are more receptive to the information presented during these “teachable moments” (Demark-Whanefried et al., 2015; Jones et al., 2005). As oncology providers have exposure to a high proportion of BC survivors and are recognised as credible sources for health information oncology providers should expand their focus and take advantage of the “teachable moment” to encourage PA participation to their patients.

CHAPTER 6 CONCLUSIONS

6.1 Overview

Research has shown the numerous benefits of being physically active during and after a BC diagnosis (Demark-Whanefried et al., 2015; Rock et al., 2012; Stan, Loprinzi, Ruddy, 2013, Taghian et al., 2014); therefore PA promotion should be a crucial component of oncology treatment. The overarching aims of the present research were to

1) determine if oncology providers engage in PA communication 2) to investigate the relationship between PA communication from oncology providers and the PA levels of BC survivors and 3) to gain a greater understanding of BC survivors' perceptions about PA communication from oncology providers. The results showed that oncology providers rarely engage in PA communication; however PA was related to higher PA participation among this population. Further, BC survivors do believe that PA communication is an important part of treatment and should be discussed at every available opportunity during oncology treatment and follow up. Barriers that may limit the PA communication from oncology providers to their patients include the lack of time and lack of exercise specific knowledge of the oncology provider. Suggestions, from the study sample, to overcome these barriers included the use of referrals and additional resources.

6.2 Strengths and limitations

A major strength for this study was that PA was measured objectively using accelerometers unlike other studies that examined oncology provider PA communication and PA outcomes utilising subjective self-report measures of PA and pedometers (Jones et al., 2004; Park et al., 2015; Vallance et al., 2007). Objective PA

measures are more accurate and representative of PA than subjective PA self-report measures (Innerd et al., 2015). To the best of the researcher's knowledge this was the first study to use accelerometers to look at the relationship of PA and PA communication from oncology providers. Specifying oncology provider instead of a general health care provider was also a strength because oncology providers are identified as the major source for cancer information and may have a stronger influence over health behaviours during and after a cancer diagnosis than other health professionals. Oncology provider was specifically defined on the OPPAC for consistency and clarity for participants. Furthermore, the mixed methods (accelerometers and surveys) used in this study were non-invasive and allowed for rich data to be collected concerning PA participation and information about PA communication from oncology providers. The cross sectional design of this study enabled feasibility of data collection.

Although this study had many strengths, it was not without its limitations. First, the small sample size (n=60) limits the generalizability of the findings. Additionally, this sample only included BC survivors from the Okanagan region of British Columbia, and is not representative of the larger BC population throughout BC and Canada. For instance, this sample was primarily white women and thus these results may not be representative of indigenous populations or men, both of which represent a large segment of the Canadian population and have increased risk of BC mortality (Ahmen, Shahid & Episkenew, 2015). Second, a selection bias is likely to be present as the purpose of project MOVE (i.e., increase PA in BC survivors) was made quite clear during recruitment leading those who are most interested in physical activity/exercise likely to participate, thus limiting responses from other BC survivors. Thirdly, recall bias,

in which participants may under or over report questionnaire data (Coughlin, 1990), may also be present. Recall bias may be especially due to the fact that some survivors were recalling oncology provider interactions that had occurred 5 or more year's prior. Lastly, as this study was an exploratory, cross-sectional design, it is not possible to conclude cause and effect concerning the relationship between the PA communications provided by an oncology provider and the PA behaviours of BC survivors'. Although the finding that PA communication may have a relationship with PA outcomes it is important to understand that this was only one question and the analysis did not take into account covariates such as age, time of diagnosis, and BMI. These extraneous variables may have influenced this relationship. Further experimental research, such as a RCT, is warranted.

6.3 Clinical Implications

The findings from this research have a number of clinical implications for health professionals that provide oncology care. Findings suggest that simply asking BC survivors about their PA routines may increase their PA levels. Further, BC survivors felt that it is important for oncology providers to discuss the potential benefits of PA during survivorship, to outline ways to overcome potential PA barriers and to provide referrals to other exercise professionals. Hence, it would be constructive for oncology providers to offer PA referrals in cancer related centers to their patients as part of standard oncology care. Moreover, taking a multidisciplinary approach and including other exercise professionals as part of the oncology health care team would enable survivors to have contact with professionals who have the education to prescribe PA. Although BC survivors consider PA to be as important as other health services, most cancer care centres do not offer PA as part of treatment or follow up. Cancer care centres should

consider programs and options for integrated cancer care or oncology rehab that is modeled after existing programs for other chronic diseases such as cardiovascular rehabilitation. Additionally, having resources such as PA print material, web-based material, phone applications or motivational packages for cancer survivors at oncology centers for oncology providers to give to patients could potentially alleviate time and knowledge barriers and improve PA participation in the cancer patient population.

6.4 Future research recommendations

Based on the findings from this study and its identified limitations, there are a number of future recommendations that should be considered to progress this research area. In order to gain a greater understanding about BC survivors' perceptions concerning PA communication from oncology providers, future cross-sectional research with a larger and more diverse sample is needed. For instance, gathering similar data from other BC survivors throughout Canada such as indigenous populations and those from culturally and linguistically diverse groups would provide more accurate National level data from a cross-section of people representative of Canada's diverse population. Moreover, as men are also being diagnosed with BC and are known to have very different experiences than women, it would be important to understand their experiences and perceptions regarding PA communication from oncology providers. Furthermore, in order to determine true cause and effect concerning PA communication and PA behaviour, conducting a RCT with objectively measure PA to investigate PA behaviours between oncology providers who engage in PA communication vs. those who do not engage in PA communication, would significantly contribute to the literature. Despite established PA guidelines for cancer survivors, and the documented research indicating that engaging in PA is beneficial at diagnosis, during treatment and into

survivorship (Segal et al., 2015) future intervention work is needed to test more effective and efficient methods for incorporating PA communication, referrals and resources into standard oncology care. Lastly, development of a resource package as well as educational workshops for actively practicing oncology providers to educate them about PA could greatly benefit oncology providers PA prescribing skills.

REFERENCES

- Abrahams, H. J. G., Gielissen, M. F. M., Schmits, I. C., Verhagen, C. M., Rovers, M. M., & Knoop, H. (2016). Risk factors, prevalence, and course of severe fatigue after breast cancer treatment: a meta-analysis involving 12 327-breast cancer survivors. *Annals of Oncology*, 27(6), 965-974. doi: 10.1093/annonc/mdw09
- Aerts, P. D. M., de Vries, J., Van der Steeg, A. F. W., & Roukema, J. A. (2011). The relationship between morbidity after axillary surgery and long-term quality of life in breast cancer patients: The role of anxiety. *European Journal of Surgical Oncology*, 37(4), 344–49. doi 10.1016/j.ejso.2011.01.016
- Ahmedin, J., Center, M. M., DeSantis, C., & Ward, M. E. (2010). Global patterns of cancer incidence and mortality rates and trends. *Cancer Epidemiology, Biomarkers & Prevention*, 19(8), 1893– 07. doi: 0.1158/1055-9965
- Amaral, P., Miguel, R., Medad, A., Cruz, C., Grillo, M. I., Camilo, M., & Ravasco, P. (2010). Body fat and poor diet in breast cancer women. *Nutricion Hospitalaria*, 25(3), 456-461.
- American Cancer Society (2008). Global cancer facts & figures. Retrieved on 05/08/2016 from <http://www.cancer.org/acs/groups/content/@epidemiologysurveillance/documents/document/acspc-027766.pdf>
- Armstrong, K., Eisen, A., & Weber, B. 2000. Assessing the risk of breast cancer. *The New England Journal of Medicine*, 342(564), 2000-571. doi: 10.1056/NEJM200002243420807
- Ashing-Giwa, K. T., Padilla, G., Tejero, J., Kraemer, J., Wright, K., Coscarelli, A.,... Hills, D. (2004). Understanding the breast cancer experience of women: A

- qualitative study of African American, Asian American, Latina, and Caucasian cancer survivors. *Psycho-Oncology*, 12(6), 408-28. doi: 10.1002/pon.750
- Awick, A. E., Phillips, M. S., Lloyd, R. G., & McAuley, E. (2016). Physical activity, self-efficacy and self-esteem in breast cancer survivors: A Panel Model. *Psycho-oncology*, doi: 10.1002/pon.4180
- Bardwell, A. W., & Ancoli-Israel, S. (2008). Breast cancer and fatigue. *Sleep Medicine Clinics*, 3(1), 61-71. doi: 10.1016/j.jsmc.2007.10.011
- Barnes, M. P., & Schoenborn, A. C. (2012). Trends in adults receiving a recommendation for exercise or other physical activity from a physician or other health professional. Centre for Disease Control. *NCHS Data Brief*, 86. Retrieved from: <http://www.cdc.gov/nchs/data/databriefs/db86.pdf>
- Bassett, D. R., & John, D. (2010). Use of pedometers and accelerometers in clinical populations: validity and reliability issues. *Physical therapy reviews*, 15(3), 135-142. doi: <http://dx.doi.org/10.1179/1743288X10Y.0000000004>
- Battaglini, L. C., Mills, C. R., Phillips, L. B., Lee, T. J., Story, E. C., Nascimento, G. B. M., & Hackney, C. A. (2014). Twenty-five years of research on the effects of exercise training in breast cancer survivors: A systematic review of the literature. *World Journal of Clinical Oncology*, 5(2), 177-90. doi: 10.5306/wjco.v%*i*2.177
- Bianchini, F., Kaaks, R., & Vainio, H. (2002). Weight control and physical activity in cancer prevention. *Obesity reviews*, 3(1), 5-8. doi: 10.1046/j.1467-789X.2002.00046.x
- Biro, F. M., Huang, B., Wasserman, H., & Pinney, S. (2016). Pubertal growth, IGF1, and windows of susceptibility. *Journal of Pediatric & Adolescent Gynaecology*, 29(2), 190. doi: <http://dx.doi.org/10.1016/j.jpag.2016.01.005>

- Branstrom, R., Petersson, L. M., Saboonchi, F., Wennman-Larsen, A., & Alexanderson, K. (2015). Physical activity following a breast cancer diagnosis: Implications for self-rated health and cancer-related symptoms. *European Journal of Oncology Nursing*, 19(6), 680-85. doi: 10.1016/j.ejon.2015.04.008
- Brintzenhofe-Szoc, M. K., Levin, T. T., Li, Y., Kissane, W. D., & Zabora, R. J. (2009). Mixed anxiety/depression symptoms in a large cancer cohort: Prevalence by cancer type. *Psychosomatics*, 50(4), 383-91. doi: 10.1176/appi.psy.50.4.383
- Bouchard, C., & Shephard, R. J. (1994). *Physical activity, fitness and health: the model and key concepts*. Champaign, IL: Human Kinetics
- Bower, E. J., Ganz, A. P., Desmond, A. K., Rowland, H. J., Meyrowitz, E. B., & Belin, R. T. (2000). Fatigue in breast cancer survivors: Occurrence, correlates, and impact on quality of life. *Journal of Clinical Oncology*, 18(4), 743-53. doi: 10.1200/JCO.2000.18.4.743
- Bower, J., Patricia, G., Desmond, A. K., Bernaards, C., Rowland, H. J., Meyerowitz, E. B., & Belin, R. T. (2006). Fatigue in long-term breast carcinoma survivors. *Cancer*, 106(4), 751-58. doi:10.1002/cncr.21671
- Boquiren, M. V., Esplen, J. M., Wong, J., Toner, B., Warner, E., & Malik, N. (2016). Sexual functioning in breast cancer survivors experiencing body image disturbance. *Psychooncology*, 25(1), 66-76. doi: 10.1002/pon.3819
- Brawley, L. R., Culos-Reed, S. N., Angove, J., & Hoffman-Goetz, L. (2003). Understanding the barriers to physical activity for cancer patients: Review and recommendations. *Journal of Psychosocial Oncology*, 20(4), 1-21. doi:http://dx.doi.org/10.1300/J077v20n04_01

- Brown, J., Byers, T., Doyle C., Courmeya, K. S., Denmark-Wahnefried, W.,...Sawyer, K. A. (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), 268-91. doi: 10.3322/canjclin.53.5.268
- Brunet, J., Taran, S., Burke, S., & Sabiston, M. C. (2013). A qualitative exploration of barriers and motivators to physical activity participation in women treated for breast cancer. *Disability and Rehabilitation*, 25(24), 2038-45. doi: 0.3109/09638288
- Burgess, C., Cornelius, V., Love, S., Graham, J., Richards, M., & Ramirez, A. (2005). Depression and anxiety in women with early breast cancer: Five year observational cohort study. *British Medical Journal*, 330(7493). doi:10.1136/bmj.38343.670868.D3
- Canadian Breast Cancer Foundation. (2016). Staging and grading breast cancer. Retrieved on 29/12/2016 from <http://www.cbcbf.org/central/AboutBreastCancerMain/Diagnosis/Pages/StagingGrading.aspx>
- Canadian Cancer Society. (2015). Canadian Cancer statistics special topic: Predictions of the future burden of cancer in Canada. Retrieved 28/04/2016 from: <https://www.cancer.ca/~media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2015-EN.pdf>
- Canadian Cancer Society. (2016). Screening for breast cancer. Retrieved on 05/08/2016 from <http://www.cancer.ca/en/prevention-and-screening/early-detection-and-screening/screening/screening-for-breast-cancer/?region=bc>

Canadian Cancer Society. (2017). Canadian Cancer Statistics. Special topic: Pancreatic Cancer. Retrieved on 18/06/2017 from:

<http://www.cancer.ca/~media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2017-EN.pdf?la=en>

Canadian Society for Exercise Physiology (CSEP), 2012 *The Canadian Physical Activity Guidelines*, retrieved on 04/01/2017 from

http://www.csep.ca/cmfiles/guidelines/csep_guidelines_handbook.pdf

Ceela, D., Peterman, A., Passik, S., Jacobsen, P., & Breitbart, W. (1998). Progress toward guidelines for the management of fatigue. *Oncology*, 12(11A), 369-77. doi: 10028520

Chen, L. H., Zhou, Q, M., Tian, W., Meng, X, K., & He, F. H. (2016). Effect of age on breast cancer patient prognoses: A population-based study using the SEER 18 database, *PLoS One*, 11(10). doi: 10.1371/journal.pone.0165409

Cleeland, C. S., Zhao, F., Chang, V. T., Sloan, J. A., O'Mara, A. M., Gilman, P. B., ... Fisch, J. M. (2013). The symptom burden of cancer: Evidence for a core set of cancer-related and treatment-related symptoms from the eastern cooperative oncology group symptom outcomes and practice patterns study. *Cancer*, 119(24), 4333–40. doi: 10.1002/cncr.28376

Chachaj, A., Malyszczak, K., Pyszel, K., Lukas, J., Tarkowski, R., Pudielko, M., Andrezejak, R., & Szuba, A. (2009). Physical and psychological impairments of women with upperlimb lymphedema following breast cancer treatment. *Psycho-Oncology*, 19(3), 299-305. doi: 10.1002/pon.1573.

- Cox, D. G., Dostal, L., Hunter, D. J., Le Marchand, L., Hoover, R., Ziegler, R. G., ... & Boutron-Rualt, M. C. (2011). N-acetyltransferase 2 polymorphisms, tobacco smoking, and breast cancer risk in the breast and prostate cancer cohort consortium. *American journal of epidemiology*, 174 (11), 1316-1322. doi: 10.1093/aje/kwr257
- 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 Behavioural Medicine*, 24(4), 257-268.
- Courneya, K. S., & Hellsten, L. M. (1998). Personality correlates of exercise behaviour, motives, barriers, and preferences: An application of the five-factor model. *Personal and Individual Differences*, 24(5), 625-633.
- Culos- Reed, S. N., Carlson, L. E., Daroux, L. M., & Hatley- Aldous, S. (2006). A pilot study of yoga for breast cancer survivors: physical and psychological benefits. *Psycho- Oncology*, 15(10), 891-897. doi: 10.1002/pon.1021
- Daley, J. A., Bowden, J. S, Rea, W. D., Billingham, L., & Carmicheal, R. A. (2008). What advice are oncologists and surgeons in the United Kingdom giving to breast cancer patients about physical activity? *British Medical Journal*, 5(46) doi: 10.1186/1479-5868-5-46
- Daley, J. A., Crank, H., Saxton, M. J., Mutrie, N., Coleman, R., & Roalfe, A. (2007). Randomized trial of exercise therapy in women treated for breast cancer. *Journal of Clinical Oncology*, 25(13), 1713-21. doi: 10.1200/JCO.2006.09.5083

- Dam, M. K., Hvidtfeldt, U. A., Tjønneland, A., Overvad, K., Grønbæk, M., & Tolstrup, J. S. (2016). Five year change in alcohol intake and risk of breast cancer and coronary heart disease among postmenopausal women: prospective cohort study. *British Medical Journal* , 35. doi: <https://doi.org/10.1136/bmj.i2314>
- Davies, C., Pan, H., Godwin, J., Gray, R., Arrigada, R., Raina, V., ... Khaled, H. (2013). Long-term effects of continuing adjuvant tamoxifen to 10 years versus stopping at 5 years after diagnosis of oestrogen receptor-positive breast cancer: ATLAS, a randomized trial. *The Lancet*, 381(9869), 9-15. doi:10.1016/S0140-6736(12)61963-1
- Demark-Wahnefried, W., Peterson, B., McBride, C., Lipkus, I., & Clipp, E. (2000). Current health behaviors and readiness to pursue life-style changes among men and women diagnosed with early stage prostate and breast carcinomas. *Cancer*, 88(3), 674-684.
- Demark-Wahnefried, T., Rogers, q. L., Alfano, M. C., Thomson, A. C., Courneya, S. K., Meyerhardt, A. J...Ligibel, A. J. (2015). Practical clinical interventions for diet, physical activity, and weight control in cancer survivors. *A Cancer Journal for Clinicians*, 65(3), 167-89.
- Desantis, E. C., Lin, C. C., Mariotto, B. A., Siegel, R., Stein, D. K., Kramer, L. J.,...Jeml, A. (2014). Cancer treatment and survivorship statistics, 2014. *A Cancer Journal for Clinicians*, 64(4), 252-71.
- Dunn, L. S., Dunn, M., Buursma, P. M., Clark, A. J., Vander Berg, L., Hollo, A. D., & Tintle, L. N. (2016). Home and hospitalized-based cardiac rehabilitation exercise. *Western Journal of Nursing Research*, 39(2), 214-233

- Elley, C. R., Harkness, K. N., Arroll, B., & Robinson, E. (2003). Effectiveness of counselling patients on physical activity in general practice: cluster randomised controlled trial.
- Ellison, L. F., & Gibbson, L. (2006). Survival from cancer: Up-to-date predictions using period analysis. *Health Reports*, 17(2): 19–30. Retrieved on 20/12/2016 from: <http://www.statcan.gc.ca/pub/82-003-x/2005002/article/9193-eng.pdf>
- Epplein, M., Zheng, Y., Zheng, W., Chen, Z., Gu, K., Penson, D., ... & Shu, X. O. (2010). Quality of life 8after breast cancer diagnosis and survival. *Journal of Clinical Oncology*, 29(4), 406-412.
- Erikson, D. K., Patterson, R. E., Natarajan, L., Lindsay, P. S., Heath, D., & Caan, J. B. (2012). Weight change and risk of incident diabetes after breast cancer. *Cancer Research*, 72(3), 24-33. DOI: 10.1158/0008-5472.SABCS12-P2-11-09
- Fagerlind, H., Kettis, A., Glimelius, B., & Ring, L. (2013). Barriers against psychosocial communication: Oncologists perceptions. *Journal of Clinical Oncology*, 31(30), 3815-22.
- Falk Dahl, A. C., Reinertsen, V. K., Nesvold, L. I. Fossa, D. S., & Dahl, A. A. (2010). A study of body image in long-term breast cancer survivors. *Cancer*, 116(15), 3549-57. doi: 10.1002/cncr.25251
- Ferlay, J., Soerjomataram, I., Ervik, M., Dikshit, R., Eser, S., Mathers, C., ...Bray, F. (2012). Cancer Incidence and Mortality Worldwide: IARC cancerbase. *World Health Organization*, retrieved on 05/08/2016 from <http://globocan.iarc.fr/Pages/references.aspx>

- Fillmore, M. C., & Kuperwasser, C. (2008). Human breast cancer cell lines contain stem-like cells that self-renew, give rise to phenotypically diverse progeny and survive chemotherapy. *BioMed Central*, 10(25).
- Fobair, P., Stewart, L. S., Chang, S., D'Onofrio, C., Banks, P. J., & Bloom, R. J. (2013). Body image and sexual problems in young women with breast cancer. *Psychology*, 15(7), 279-294.
- Forsythe, P. L., Alfano, M. C., George, M. S., McTiernan, A., Baumgartner, B. K., Bernstein, L., & Ballard-Barbas, R. (2012). Pain in long-term breast cancer survivors: The role of body mass index, physical activity, and sedentary behaviour. *Breast Cancer Research and Treatment*, 137(2), 617-30.
- Freedman, J. R., Aziz, N., Albanes, D., Hartman, T., Danforth, D., Hill, S., ... Yanovski, A. J. (2004). Weight and body composition changes during and after adjuvant chemotherapy in women with breast cancer. *The Journal of Clinical Endocrinology and Metabolism*, 89(5), 2248-53.
- Feigelson, H. S., Jonas, C. R., Teras, L. R., Thun, M. J., & Calle, E. E. (2004). Weight gain, body mass index, hormone replacement therapy, and postmenopausal breast cancer in a large prospective study. *Cancer Epidemiology and Prevention Biomarkers*, 13(2), 220-224.
- Friedenreich, C. M. (2010). Physical activity and breast cancer: Review of the epidemiologic evidence and biologic mechanisms. In *Clinical Cancer Prevention* (pp. 125-139). Springer: Berlin Heidelberg.
- Frisch, R. E., Wyshak, G., Albright, N. L., Albright, T. E., Schiff, I., Jones, K. P., ... & Marguglio, M. (1985). Lower prevalence of breast cancer and cancers of the

- reproductive system among former college athletes compared to non-athletes. *British Journal of Cancer*, 52(6), 885.
- Fu, J. B., & Morishita, S. (2017). The future of rehabilitation in oncology. *Future Oncol*, 13(7), 585-587. doi:10.2217/fon-2016-0540
- Gärtner, R., Jensen, M. B., Nielsen, J., Ewertz, M., Kroman, N., & Kehlet, H. (2009). Prevalence of and factors associated with persistent pain following breast cancer surgery. *Journal of the American Medical Association*, 302(18), 1985-1992. doi:10.1001/jama.2009.1568
- Gaudet, M. M., Gapstur, M. S., Sun, J., Diver, W. R., Hannan, M. L., & Thun, J. M. (2013). Active smoking and breast cancer risk: Original cohort data and meta-analysis. *Journal of the National Cancer Institute*, 105(8), 515-525.
- Glasgow, R., Eakin, G. E., Fisher, B. E., Bacak, J. S., & Brownson, C. R. (2001). Physician Advice and support for physical activity: Results from a national survey. *American Journal of Preventative Medicine*, 21(3), 189-95.
- Gold, M., Dunn B. L., Phoenix, B., Paul, M. S., Hamolsky, D., Levine, D. J., Miaskowski, C. (2016). Co-occurrence of anxiety and depressive symptoms following breast cancer surgery and its impact on quality of life. *European Journal of Oncology Nursing*, 20(1), 97-105. DOI: 10.1016/j.ejon.2015.06.003
- Goodwin, P. Esplen, J. M., Butler, K., Winocur, J., Pritchard, K., Brazel, S., Gao, J., & Miller, A. (1998). A Multidisciplinary weight management in locoregional breast cancer: results of a phase II study. *Breast Cancer Restorative Treatment*, 48(1), 53-64.
- Gotay, C. 2013. Trends in Cancer Research Funding in Canada (PowerPoint slides). Retrieved from on 08/09/2016 from:

- https://cancerprevent.ca/sites/cancerprevent.ca/files/documents/Gotay%2CCarolyn-TrendsCancerResearchFunds_2013.pdf
- Gupta, B. P., & Kuperwasser, C. (2004). Disease models of breast cancer. *Drug Discovery Today: Disease Models*, 1(1), 9-16.
- Grady, D., Rubin, S. M., Petitti, D. B., Fox, C. S., Black, D., Ettinger, B., ... & Cummings, S. R. (1992). Hormone therapy to prevent disease and prolong life in postmenopausal women. *Annals of internal medicine*, 117(12), 1016-1037.
- Grandes, G., Sanchez, A., Sanchez-Pinilla, R. O., Torcal, J., Montoya, I., Lizarraga, K., & Serra, J. (2009). Effectiveness of physical activity advice and prescription by physicians in routine primary care: a cluster randomized trial. *Archives of internal medicine*, 169(7), 694-701.
- Grassi, L., Rossi, E., Sabato, S., Cruciani, G., & Zambelli, M. (2004). Diagnostic criteria for psychosomatic research and psychosocial variables in breast cancer patients. *Psychosomatics*, 45(3), 483-491. DOI: 10.1176/appi.psy.45.6.48
- Hamajima, N., Hirose, K., & Kung'u, A. (2002). Alcohol, tobacco and breast cancer--collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. *British Journal of Cancer*, 87(1), 1234-1245.
- Hauer, K. E., Carney, P. A., Chang, A., & Satterfield, J. (2012). Behavior change counseling curricula for medical trainees: a systematic review. *Acad Med*, 87(7), 956-968. doi:10.1097/ACM.0b013e31825837be
- Hayes, C. S., Janda, M., Cornish, B., Battistutta, D., & Newman, B. (2008). Lymphedema after breast cancer: Incidence, risk factors, and effect on upper body function. *American Society of Clinical Oncology*, 26(21), 3536-42.

- Hiza, H. A., Pratt, C., Mardis, A. L., & Anand, R. (2001). Body mass index and health. *Family economics and nutrition review*, 13(2), 52. doi: N/A
- Hecht, S. S. (2002). Tobacco smoke carcinogens and breast cancer. *Environmental and molecular mutagenesis*, 39(2- 3), 119-126. doi: 10.1002/em.1007
- Heisey, R., & Carrol, C. J. 2016. Identification and management of women with a family history of breast cancer: Practical guide for clinicians. *Canadian Family Physician*, 62(10), 799-803.
- Hewitt, M., Greenfield, S., & Stovall, E. (2006). *From cancer patient to cancer survivor: Lost in transition*. Washington, DC: The National Academies Press.
- Hoeger, W., Hoeger, S., Locke, M., & Lauzon, L. (2006). *Principles and labs for fitness and wellness*. 1st ed. Toronto: Wadsworth/Nelson.
- Hojan K., Milecki, P., Molinska-Glura, M., Roszak, A., & Leszczynski. (2013). Effect of physical activity on bone strength and body composition in breast cancer premenopausal women during endocrine therapy. *European Journal of Physical and Rehabilitation Medicine*, 49(3), 331-39.
- Holmes, M. D., Chen, W. Y., Feskanich, D., Kroenke, C. H., & Colditz, G. A. (2005). Physical activity and survival after breast cancer diagnosis. *Jama*, 293(20), 2479-2486.
- Holtz, A. K., Kokotilo, J. K., Fitzgerald, E. B., & Frank, E. (2013). Exercise behaviour and attitudes among fourth-year medical students at the University of British Columbia. *Canadaian Family Physician*, 59(1), 26-32.
- Howlader, N., Chen, V. W., Ries, L. A., Loch, M. M., Lee, R., DeSantis, C., ... & Cronin, K. A. (2014). Overview of breast cancer collaborative stage data items—their

- definitions, quality, usage, and clinical implications: A review of SEER data for 2004- 2010. *Cancer*, 120(S23), 3771-3780.
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), 1277-1288.
- Hurria, A., Wong, L., Villaluna, D., Bhatia, S., Chung, T. C., Mortimer, J., Hurvitz, S., & Naeim, A. (2008). Role of age and health in treatment recommendations for older adults with breast cancer. The perspectives of oncologists and primary care providers. *Journal of Clinical Oncology*, 26(33), 5386-5392.
- Ibrahim, E. M., & Al-Homaidh, A. (2011). Physical activity and survival after breast cancer diagnosis: Meta-analysis of published studies. *Medical Oncology*, 28(3), 4066-73.
- Innerd, P., Catt, M., Collerton, J., Davies, K., Trenell, M., Kirkwood, B. L. T., & Jagger, C. (2015). A comparison of subjective and objective measures of physical activity from the Newcastle 85+ study. *Age and Ageing*, 44(4), 691-69.
- Irwin, M. L., Wilder Smith, A., McTiernan, A., Ballard-Barbash, R., Cronin, K., Gilliland, d. F., Baumgartner, N. R., Baumgartner, B. K., & Bernstein L. (2008). Influence of Pre- and Postdiagnosis Physical Activity on Mortality in Breast Cancer Survivors: The Health, Eating, Activity, and Lifestyle Study. *Journal of Clinical Oncology*, 26(24), 3958-3964.
- Irwin, M. L., McTiernan, A., Bernstein, L., Gilliland, F. D., Baumgartner, R., Baumgartner, K., & Ballard-Barbash, R. (2004). Physical activity levels among breast cancer survivors. *Medicine and Science in Sport and Exercise*, 36(9), 1484-1491.

- Irwin, L. M., Crumley, D., McTiernan, A., Bernstein, L., Baumgartner, R., Gilliland, F.,...
& Ballard, A. (2003). Physical activity levels before and after a diagnosis of breast carcinoma. *Cancer*, 97(7),1746-57.
- Jimmy, G., & Martin, W. B. (2005). Implementation and effectiveness of a primary care based physical activity counselling scheme. *Patient Education and Counseling*, 56(3), 323-331. doi: 10.1016/j.pec.2004.03.006
- Jones, L. S., Hadjistavropoulos, D. H., & Gullickson, K. (2013). Understanding health anxiety following breast cancer diagnosis. *Journal of Psychology, Health & Medicine*, 19(5), 525-35. doi: <http://dx.doi.org/10.1080/13548506.2013.845300>
- Jones, L. W., & Courneya, K. S. (2002a). Exercise counseling and programming preferences of cancer survivors. *Cancer Practice*, 10(4), 208-215.
- Jones, L. W., & Courneya, K. S. (2002b). Exercise discussions during cancer treatment consultations. *Cancer Practice*, 10(2), 66-74.
- Jones, L. W., Courneya, K. S., Fairey, A. S., & Mackey, J. R. (2004a). Effects of an oncologist's recommendation to exercise on self-reported exercise behavior in newly diagnosed breast cancer survivors: a single-blind, randomized controlled trial. *Annals of Behavioral Medicine*, 28(2), 105-113.
doi:10.1207/s15324796abm2802_5
- Jones, L. W., Courneya, K. S., Fairey, A. S., & Mackey, J. R. (2005a). Does the theory of planned behavior mediate the effects of an oncologist's recommendation to exercise in newly diagnosed breast cancer survivors? Results from a randomized controlled trial. *Health Psychol*, 24(2), 189-197. doi:10.1037/0278-6133.24.2.189
- Jones, L. W., Courneya, K. S., Peddle, C., & Mackey, J. R. (2005). Oncologists' opinions towards recommending exercise to patients with cancer: a Canadian

- national survey. *Support Care Cancer*, 13(11), 929-937. doi:10.1007/s00520-005-0805-8
- Jones, L. W., Sinclair, R. C., Rhodes, R. E., & Courneya, K. S. (2004b). Promoting exercise behaviour: an integration of persuasion theories and the theory of planned behaviour. *Br J Health Psychol*, 9(Pt 4), 505-521.
doi:10.1348/1359107042304605
- Karantonis, D. M., Narayanan, M. R., Mathie, M., Lovell, N. H., & Celler, B. G. (2006). Implementation of a real-time human movement classifier using a triaxial accelerometer for ambulatory monitoring, *IEEE transactions on information technology in biomedicine*, 10(1), 156-167.
- Karim, S. M., Baeshen, W., Neamatullah, S. N., & Bin, B. (2015) Oral contraceptives, abortion and breast cancer risk: A case control study in Saudi Arabia. *Asian Pacific Organization for Cancer Prevention*, 16(9), 3957-60.
- Karvinen, H. K., DuBose, D. K., Carney, B., & Allison, R. R. (2010). Promotion of physical activity among oncologists in the United States. *The Journal of Supportive Oncology*, 8(1), 35-41.
- Karvinen, H. K., McGourty, S., Parent, T., & Walker, R. P. (2012). Physical activity promotion among oncology nurses. *Cancer Nursing*, 35(3).
doi:10.1097/NCC.0b013e31822d9081
- Knobf, M. T. (2006). The influence of endocrine effects of adjuvant therapy on quality of life outcomes in younger breast cancer survivors. *The Oncologist*, 11(2), 96-110.
doi:10.1634/theoncologist.11-2-96

- Kobayashi, S., Sugiura, H., Ando, Y., Shiraki, N., Yanagi, T., Yamashita, H., & Toyama, T. (2012). Reproductive history and breast cancer risk. *Breast Cancer*, 19(4), 302-08. doi: 10.1007/s12282-012-038
- Krogh-Madsen, R., Thyfault P. J., Brohold, C., Mortensen, H. O. Olsen, H. R., Mounier, R., Plomgaard, P., van Hall, G., Booth, W. F., & Pedersen, K. B. (2010). A 2-wk reduction of ambulatory activity attenuates peripheral insulin sensitivity. *Journal of Applied Physiology*, 108(5). doi: 10.1152/jappphysiol.00977.2009
- Lee, I.-M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Impact of physical inactivity on the world's major non-communicable diseases. *Lancet*, 380(9838), 219–229.
- Lee, D. H., Kim, J. Y., Lee, M. K., Lee, C., Min, J. H., Jeong, D. H., . . . Jeon, J. Y. (2013). Effects of a 12-week home-based exercise program on the level of physical activity, insulin, and cytokines in colorectal cancer survivors: a pilot study. *Support Care Cancer*, 21(9), 2537-2545. doi:10.1007/s00520-013-1822-7
- Lillberg, K., Verkasalo, K. P., Kaprio, J., Teppo, L., Helenius, H., & Koskenvuo, M. (2003). Stressful life events and risk of breast cancer in 10808 women: A cohort study. *American Journal of Epidemiology*, 157(5), 415-23. doi: 10.1093/aje/kwg00
- Livingston, P. M., Craike, M. J., Salmon, J., Courneya, K. S., Gaskin, C. J., Fraser, S. F., . . . Group, E. U.-O. C. (2015). Effects of a clinician referral and exercise program for men who have completed active treatment for prostate cancer: A multicenter cluster randomized controlled trial (ENGAGE). *Cancer*, 121(15), 2646-2654. doi:10.1002/cncr.29385

- Lyden, K., Kozey, S. L., Staudenmeyer, J. W., & Freedson, P. S. (2011). A comprehensive evaluation of commonly used accelerometer energy expenditure and MET prediction equations. *European journal of applied physiology*, 111(2), 187-201. doi: 10.1007/s00421-010-1639-8
- Lobelo F, Duperly J, Frank E (2009). Physical activity habits of doctors and medical students influence their counselling practices. *British Journal of Sports Medicine*, 43(2), 89-92.
- Lobelo F, Stoutenberg, M, Hutber, A. (2014). The Exercise is Medicine Global Health Initiative: a 2014 update. *British Journal Sports Medicine*, 48(22), 1627-1633.
- Longman, A. J., Braden, C. J., & Mishel, M. H. (1999). Side-effects burden, psychological adjustment, and life quality in women with breast cancer: Pattern of association over time. *Oncology Nursing Forum*, 26(5), 909-15.
- Luo, J., Margolis, K. L., Wactawski-Wende, J., Horn, K., Messina, C., Stefanick, M. L., ... & Rohan, T. E. (2011). Association of active and passive smoking with risk of breast cancer among postmenopausal women: a prospective cohort study. *British medical journal*, 342. Doi: <https://doi.org/10.1136/bmj.d101>
- Ma, X., & Yu, H. (2006). Global burden of cancer. *Yale Journal of Biology and Medicine*. 79(4), 85-94.
- Male, A. D., Fergus, D. K., & Cullen, K. (2016). Sexual identity after breast cancer: Sexuality, body image, and relationship repercussions. *Journal of Supportive and Palliative Care*, 10(1), 66-74. doi: 10.1097/SPC.000000000000001
- Malik, A., Jeyaraj, P. A., Shankar, A., Rath, G. K., Mukopadhyay, S., Kamal, V. K. (2015). Passive smoking and breast cancer- a suspicious link. *Asian Pacific Journal of Cancer Prevention*, 16(14), 5715-9

- Marshall, A. L., Miller, Y. D., Burton, N. W., & Brown, W. J. (2010). Measuring total and domain-specific sitting: a study of reliability and validity. *Medicine and Science in Sports and Exercise*, 42(6), 1094-1102. doi: 10.1249/MSS.0b013e3181c5ec18
- Makari-Judson, G., Judson, H. C., Mertens, C. W. (2007). Longitudinal patterns of weight gain after breast cancer diagnosis: observations beyond the first year. *Breast Cancer Journal*, 13(3), 258-265. DOI: 10.1111/j.1524-4741.2007.00419.x
- Makari-Judson, G., Braun, B., Jerry, D. J., Mertens, C. W. (2014). Weight gain following breast cancer diagnosis: Implication and proposed mechanisms. *World Journal of Clinical Oncology*, 5(3), 272-82.
- McInnis, A. J., & Knobf, M. T. (2001). Weight gain and quality of life in women treated with adjuvant chemotherapy for early stage breast cancer. *Oncology Nursing Forum*, 28(4), 675.
- McNeely, M. L., Campbell, K. L., Rowe, B. H., Klassen, T. P., Mackey, J. R., Courneya, K. S. (2006). Effects of exercise on breast cancer patients and survivors: A systematic review and meta-analysis. *Canadian Medical Association Journal*, 175(1), 34-41.
- McPherson, K., Steel, C. M., & Dixon, M. J. (2000). Breast cancer-epidemiology, risk factors, and genetics. *British Medical Association*, 9(321), 624-8.
- Mendes, R., Sousa, N., & Barata, J. L. (2011). [Physical activity and public health: recommendations for exercise prescription]. *Acta Med Port*, 24(6), 1025-1030.
- Merriam-Webster. (2016). Histology. Retrieved on 15/05/2017 from <https://www.merriam-webster.com/dictionary/histology>
- Merriam-Webster. (2016). Prognosis. Retrieved on 15/05/2017 from <https://www.merriam-webster.com/dictionary/prognosis>

- Mock, V., Frangakis, C., Davidson, N. E., Ropka, M. E., Pickett, M., Poniatowski, B., Stewart, K. J., Cameron, L., Zawacki, K., Podewils, L. J., Cohen, G., & McCorkle, R. (2005). Exercise manages fatigue during breast cancer treatment: A randomized controlled trial. *Psycho-Oncology*, 14 (6), 464–477.
- Montazeri, A., Vahdaninia, M., Harirchi, I., Ebrahimi, M., Khaleghi, F., & Jarvandi, S. (2008). Quality of life in patients with breast cancer before and after diagnosis: an eighteen months follow-up study. *BMC cancer*, 8(1), 330.
- Morimoto, M. L., White, E., Chen, Z., Chelbowski, T. R., Hays, J., Kuller, L.,...McTiernan, A. (2002). Obesity, body size, and risk of postmenopausal breast cancer: the Women's Health Initiative (United States). *Cancer Causes and Control*, 13(8), 741-51.
- Mustian, M. K., Katula, A. K., & Hongwei, Z. (2006). Influence of tai chi chuan on functional capacity among breast cancer survivors. *Supportive Oncology*, 4(3), 139-145.
- Mutrie, N., Campbell, M. A., Whyte, F., McConnachie, A., Emslie, C., Lee, L., Kearney, N., Walker, A., & Ritchie, D. (2007). Benefits of supervised group exercise programme for women being treated for early stage breast cancer: Pragmatic randomised controlled trial. *British Medical Journal*, 334(1), 1-7.
- Nadler, M., Bainbridge, D., Tomasone, J., Cheifetz, O., Juergens, R. A., & Sussman, J. (2017). Oncology care provider perspectives on exercise promotion in people with cancer: an examination of knowledge, practices, barriers, and facilitators. *Support Care Cancer*. doi:10.1007/s00520-017-3640-9

National Institute of Mental Health. (2016).What is Prevalence? Retrieved on 15/05/2017 from

<https://www.nimh.nih.gov/health/statistics/prevalence/index.shtml>

National Heart, Lungs, and Blood Institute. (2016). Cardiac Rehab. Retrieved on

21/05/2017 from <https://www.nhlbi.nih.gov/health/health-topics/topics/rehab>

Neuhouser, M. L., Aragaki, A. K., Prentice, R. L., Manson, J. E., Chlebowski, R., Carty, C. L., ... & Urrutia, R. P. (2015). Overweight, obesity, and postmenopausal invasive breast cancer risk: a secondary analysis of the women's health initiative randomized clinical trials. *Journal of the American Medical Association*, 1(5), 611-621.

Nyrop, K. A., Deal, A. M., Williams, G. R., Guerard, E. J., Pergolotti, M., & Muss, H. B. (2016). Physical activity communication between oncology providers and patients with early-stage breast, colon, or prostate cancer. *Cancer*, 122(3), 470-476. doi:10.1002/cncr.29786

Olson, E. A., Mullen, S. P., Rogers, L. Q., Courneya, K. S., Verhulst, S., & McAuley, E. (2014). Meeting physical activity guidelines in rural breast cancer survivors. *American Journal of Health Behaviour*, 38(6), 890-899.

Owen, J. A., Punt, J., Stranford, A. S., Jones, P. P., & Kuby, J. (2013). Kuby immunology (pp.501-23). New York: W.H. Freeman.

Park, J. H., Oh, M., Yoon, Y. J., Lee, C. W., Jones, L. W., Kim, S. I., . . . Jeon, J. Y. (2015). Characteristics of attitude and recommendation of oncologists toward exercise in South Korea: a cross sectional survey study. *BMC Cancer*, 15, 249. doi:10.1186/s12885-015-1250-9

- Patel, A., Schofield, G. M., Kolt, G. S., & Keogh, W. L. J. (2011). General practitioners' views and experiences of counselling for physical activity through the New Zealand green prescription program. *British Medical Journal Family Practice*, 12(1), 119.
- Peters, T. M., Schatzkin, A., Gierach, G. L., Moore, S. C., Lacey, J. V., Wareham, N. J., ... & Leitzmann, M. F. (2009). Physical activity and postmenopausal breast cancer risk in the NIH-AARP diet and health study. *Cancer Epidemiology and Prevention Biomarkers*, 18(1), 289-296.
- Pickett, M., Mock, V., Ropka, M. E., Cameron, L., Coleman, M., & Podewils, L. (2002). Adherence to moderate-intensity exercise during breast cancer therapy. *Cancer Pract*, 10(6), 284-292.
- Pijpe, A., Manders, P., Brohet, R. M., Collée, J. M., Verhoef, S., Vasen, H. F., ... & Aalfs, C. M. (2010). Physical activity and the risk of breast cancer in BRCA1/2 mutation carriers. *Breast cancer research and treatment*, 120(1), 235-244.
- Pinto, B. M., Lynn, H., Marcus, B. H., DePue, J., & Goldstein, M. G. (2001). Physician-based activity counseling: intervention effects on mediators of motivational readiness for physical activity. *Ann Behav Med*, 23(1), 2-10.
doi:10.1207/S15324796ABM2301_2
- Pharoah, P. D., Day, E. N., Duffy, S., Easton, F. D., & Ponder, A. J. B. (1997). Family history and the risk of breast cancer: A systematic review and meta-analysis. *International Journal of Cancer*, 71(5), 800-809.
- Philip, E. J., Coups, E. J., Feinstein, M. B., Park, B. J., Wilson, D. J., & Ostroff, J. S. (2014). Physical activity preferences of early-stage lung cancer survivors. *Supportive Care in Cancer*, 22(2), 495-502.

- Phillips, S. M., & McAuley, E. (2015). Associations between self-reported post-diagnosis physical activity changes, body weight changes, and psychosocial well-being in breast cancer survivors. *Supportive Care in Cancer*, 23(1), 159-167.
- Preston, L. D., Mattson, A. Holmberg, E., Shore, R., Hildreth, G. N., & Boice, D. J. (2002). Radiation effects on breast cancer risk: A pooled analysis of eight cohorts. *Official Journal of the Radiation Research Society*, 158(2), 220-35
- Pronk, A., Ji, B. T., Shu, X. O., Chow, W. H., Xue, S., Yang, G., ... & Matthews, C. E. (2011). Physical activity and breast cancer risk in Chinese women. *British journal of cancer*, 105(9), 1443-1450.
- Reyes-Gibby, C. C., Anderson, O. K., Morrow, K. P., Shete, S., & Hassan, S. (2012). Depressive symptoms and health related quality of life in breast cancer survivors. *Journal of Women's Health*, 21(3), 311-18. doi:10.1089/jwh.2011.2852
- Reynolds, P. (2013). Smoking and Breast Cancer. *Journal of Mammary Gland Biology and Neoplasia*, 18(1), 15-23.
- Robb, C., Haley, W. E., Balducci, L., Extermann, M., Perkins, E. A., Small, B. J., & Mortimer, J. (2007). Impact of breast cancer survivorship on quality of life in older women. *Critical reviews in oncology and hematology*, 62(1), 84-91.
- Rock, L. C., Doyle C., Demark-Wahnefried, W., Meyerhardt, J., Courneya, S. K., Schwartz, L. A,... & Gansler, T. (2012). Nutrition and physical activity guidelines for cancer survivors. *A Cancer Journal for Clinicians*, 62(4), 242-274.
- Rogers, Q. L., Courneya, S. K., Anton, M. P., Verhulst, S., Vicari, K. S., Robbs, S. R., & McAuley, E. (2016). Effects of a multicomponent physical activity behaviour change intervention on fatigue, anxiety, and depressive symptomatology in

- breast cancer survivors: Randomized trial. *Psycho-Oncology*, 159(2). doi: 10.1002/pon.4254
- Royak-Schaler, R., Passmore S. R., Gadalla, S., Hoy, M. K., Zhan, M.,...Hutchison, A. P. (2008). Exploring patient-physician communication in breast cancer care for African American women primary treatment. *Oncology Nursing Forum*, 35(5), 836-43.
- Schmidt, E. M., Wiskemann, J., Schneeweiss, A., Ulrich, M. C., & Steindorft, K. (2015). Effects of resistance exercise on fatigue and quality of life breast cancer patients undergoing adjuvant chemotherapy: A randomized controlled trial. *International Journal of Cancer*. 137(2), 471-80.
- Schmitz, K. H., Courneya, K. S., Matthews, C. (2010) American College of Sports Medicine routable on exercise guidelines for cancer survivors. *Medical Science Sports Exercise*, 42(1), 1409-26.
- Segal, R., Evans, W., Johnson, D., Smith, J., Colletta, S. P., Corsini, L., & Reid, R. (1999). Oncology Rehabilitation Program at the Ottawa Regional Cancer Centre: program description. *Canadian Medical Association Journal*, 161(3), 282-285.
- Segar, M. L., Katch, V. L., Roth, R. S., Garcia, A. W., Portner, T. I., Glickman, S. G., . . . Wilkins, E. G. (1998). The effect of aerobic exercise on self-esteem and depressive and anxiety symptoms among breast cancer survivors. *Oncology Nursing Forum*, 25(1), 107-113.
- Shield d. K., Soerjomataram, I., & Rehm, J. (2016). Alcohol use and breast cancer: A critical review. *Alcoholism Clinical and Experimental Research*, 40(6), 1166-81.
- Stan, D., Loprinzi, C. L., Ruddy, K. J. (2013). Breast cancer survivorship issues. *Hematology Oncology Clinics of North America*. 27(4), 805–827.

- Statistics Canada. (2013). Directly measured physical activity if adults, 2012, and 2013. Retrieved from: <http://www.statcan.gc.ca/pub/82-625-x/2015001/article/14135-eng.htm>
- Statistics Canada. (2015). Smoking, 2014. Retrieved on 10/06/2016 from <http://www.statcan.gc.ca/pub/82-625-x/2015001/article/14190-eng.htm>
- Taghian, R. N., Miller, L. C., Jammallo, S. L., O'Toole, J., & Skolny, N. M. (2014). Lymphedema following breast cancer treatment and impact on quality of life: A review. *Critical Reviews in Oncology/Hematology*, 92(3), 227-34.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2(1), 53-55. doi: 10.5116/ijme.4dfb.8dfd
- Teo, I., Novy, M. D., Chang, W. D., Cox, G. M., & Fingeret, C. (2014). Examining pain, body image, and depressive symptoms in patients with lymphedema secondary to breast cancer. *Psycho-Oncology*, 24(11), 1377-1383. doi: 10.1002/pon.3745
- Thornton, S. J., Fremont, P., Khan, K., Poirier, P., Fowles, J., Wells, D. G., Frankovich, J. R. (2016). Physical activity prescription: A critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by Canadian Academy of Sport and Exercise Medicine. *British Medical Journal*, 50(18), 1109-1114.
- Torre, L., Bray, F., Siegel, L. R., Ferlay, J., Lortet-Tieulent, J., & Ahmedin, J. (2015). Global cancer statistics, 2012. *A Cancer Journal for Clinicians*, 65(2), 87-108
- Travier, N., Velthuis, J. M., Steins N. C., van den Buijjs, B., Monninkhof, M. E., Backx, F.,... & May, M. A. (2015). Effects of an 18-week exercise programme started early during breast cancer treatment: A randomised controlled trial. *BioMedCentral*, 13(121), 1-11.

- Vallance, J. K., 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(17), 2352-2359. doi:10.1200/JCO.2006.07.9988
- Vallance, K. J., Wylie, M., & MacDonald, R. (2008). Medical students' self-perceived competence and prescription of patient-centered physical activity. *Preventative Medicine*, 48(2), 164-66.
- Velthuis, M. J., May, A. M., Koppejan-Rensenbrink, R. A., Gijzen, B. C., van Breda, E., de Wit, G. A., . . . Peeters, P. H. (2010). Physical Activity during Cancer Treatment (PACT) Study: design of a randomised clinical trial. *BMC Cancer*, 10(2), 272. doi:10.1186/1471-2407-10-272
- Ventura, E. E., Ganz, A. P., Bower, E. J., Abascal, L., Peterson, L., Stanton, L. A., & Crespi, M. C. (2015). Barriers to physical activity and healthy eating in young breast cancer survivors: modifiable risk factors and associations with body mass index. *Breast Cancer Research and Treatment*, 142(2), 423-333. DOI: 10.1007/s10549-013-2749
- Warburton, E. R., Nicol, W. C., & Bredin, S. D. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, 174(6), 801-09.
- Weiss, J. R., Moysich, K. B., & Swede, H. (2005). Epidemiology of male breast cancer. *Cancer Epidemiology and Prevention Biomarkers*, 14(1), 20-26.
- Winters-Stone KM, Dobek, J., Nail, L., Bennett, A. J., Michael, C. L., Naik, A., & Schwartz, A. (2011). Strength training stops bone loss and builds muscle in postmenopausal breast cancer survivors: A randomized controlled trial. *Breast Cancer and Research Treatment*, 127(2), 447-456.

- Wurz, A., St-Aubin, A., & Brunet, J. (2015). Breast cancer survivors' barriers and motives for participating in a group-based physical activity program offered in the community. *Support Care Cancer*, 23(8), 2407-16. doi: 10.1007/s00520-014-2596-2
- Yarnall, K. S., Pollak, K. I., Ostbye, T., Krause, K. M., & Michener, J. L. (2003). Primary care: is there enough time for prevention? *Am J Public Health*, 93(4), 635-641.
- Young-McCaughan, S., & Sexton, D. L. (1991). A retrospective investigation of the relationship between aerobic exercise and quality of life in women with breast cancer. *Oncology Nursing Forum*, 18(4), 751-757.
- Zon, R. T., Goss, E., Vogel, V. G., Chlebowski, R. T., Jatoi, I., Robson, M. E., . . . American Society of Clinical, O. (2009). American Society of Clinical Oncology policy statement: the role of the oncologist in cancer prevention and risk assessment. *Journal of Clinical Oncology*, 27(6), 986-993.
doi:10.1200/JCO.2008.16.3691

APPENDICES

Appendix A: Consent Form

Consent Form

Title: If THEY build it, will THEY act? Novel approaches to increasing physical activity among breast cancer survivors

Lead Investigators:

Dr. Cristina Caperchione, School of Health and Exercise Sciences, University of British Columbia, Kelowna 250 807 9679

Dr. Catherine Sabiston, Faculty of Kinesiology and Physical Education, University of Toronto, Toronto 416 555 1234

Co-Investigators:

Dr. Joan Bottorff, Inst. For Healthy Living and Chronic Disease Prevention, University of British Columbia, Kelowna 250 807 8627

Dr. Kristin Campbell, Department of Physical Therapy, University of British Columbia, Vancouver 604 827 4704

Dr. Neil Eves, School of Health and Exercise Sciences, University of British Columbia, Kelowna 250 807 9676

Dr. Carolyn Gotay, School of Population and Public Health, University of British Columbia, Vancouver 604 827 4022

Tanya Pullen, School of Health and Exercise Sciences 778-835-0191

Kayla Fitzpatrick, School of Health and Exercise Sciences 250-878-1329

Collaborator:

Dr. Susan Ellard, Medical Oncologist, BC Cancer Agency, Kelowna

Funding

This study is funded by the Canadian Cancer Society Research Institute.

Purpose of the study

The purpose of this research study is to evaluate an innovative health promotion program, The ACTION Grant Program, aimed at increasing physical activity in female breast cancer survivors throughout the Okanagan Region. The ACTION Grant Program will include 2 components; 1) the submission, evaluation and awarding of a microgrant of up to \$2000, and 2) the potential distribution of an additional monetary incentive of \$500.

Eligibility

You are being invited to voluntarily take part in this study because you are a female breast cancer survivor residing in the Okanagan Region of British Columbia who is part of a community group that has been successful in receiving a microgrant awarded by the ACTION Grant Program.

Study Procedures

As a participant of this research project you will be asked to submit a proposal that your

group has created and allow it to be reviewed by a grant review committee consisting of researchers and community liaisons invested in breast cancer survivorships. You will be expected to work with your group to create the proposal, which could take between 3-6 hours. You will also be asked to complete three assessment periods (initial start of the microgrants program, then again at 6 months and 12 months). These assessment sessions will be held at UBC, at a time that is convenient to you. These assessment periods will last up to 1.5 hours. At these assessment periods, you will be asked to complete a series of eight brief questionnaires about your; motivations to be physically active, physical activity behaviours, social relatedness and questions concerning breast cancer survivorship as well as a general demographic survey (e.g., age, education, marital status). During these times you will also be given an accelerometer and instructions on how to use the accelerometer. Accelerometers are a device for measuring your daily physical activity. It is a small, non-invasive device which is worn around your chest. You will be asked to wear this accelerometer for 7 consecutive days during all waking hours. You will also be asked to return the accelerometers to the research team after these 7 days. Return instructions and pre-paid postage will be provided to you when you receive your accelerometer. At the 12 month assessment period you will also be asked commit a further 1 hour of your time (1.5+1=2.5 hours) to participate in a focus group with your group members. All focus groups will be audio recorded with your consent. In these focus groups we hope to hear about your experiences with breast cancer, survivorship, and physical activity. You will also be asked to share your thoughts, opinions and perceptions about the ACTION Grant Program and provide general comments about how you think the ACTION Grant Program could be improved. Refreshments and healthy snacks will be provided during these focus group sessions. Lastly, you will be asked to provide a brief overview of your group and a group picture that will be uploaded onto the project website with your consent.

Potential Risks and Benefits

The ACTION Grant Program and data collection procedures involve no foreseeable risks or harm to you. However, you will be asked to work towards meeting the minimum recommended Canadian Physical Activity Guidelines (150minutes per week in bouts of 10 minutes or more) and depending on your initial activity levels, you will be encouraged to safely increase your physical activity levels throughout the project. Becoming physically active and progressively increasing your physical activity may potentially include some risk of injury, such as common muscle soreness or strains associated with being physically active. To limit any concerns you may have regarding these minor injuries, information about reducing this risk of injury, such as education about stretching and starting off slowly and building up your physical activity levels is detailed on the project's website. Furthermore, speaking about experiences of breast cancer or survivorship may cause some emotional discomfort. In the case of any emotional discomfort that you may experience, contact information for local resources that can provide appropriate support, such as the Kelowna Thrives Breast Cancer Support Group, will be provided. Although no benefits can be guaranteed, potential benefits that may occur include; improvements in overall physical and mental health as a result of increasing your physical activity levels, improved understandings about the benefits of physical activity and other healthy lifestyle behaviours (i.e., healthy eating, stress management), increased social interaction and support, and opportunities to 'voice'

your opinion about health promotion programs specifically designed for breast cancer survivors.

Confidentiality

Your confidentiality will be respected at all times. Only research team members and research staff will have access to data collected in this study. All documents will only be identified by a code number and kept in a locked filing cabinet and/or secure password protected system. Participants will not be identified by name in any reports or materials associated with this research. Paper copies and electronic audio files will be kept for 7 years. All participants taking part in the focus group discussions will sign the confidentiality agreement at the bottom of this consent form; however, we cannot control what the other participants do with the information discussed. Findings from the study may be shared through conference presentations, articles for publication, and other media outlets. This study forms part of Kayla Fitzpatrick's and Tanya Pullen's Masters thesis, which will be published; therefore, will be publically available on the internet via cIRcle. An electronic or print copy of the research report will be available to you on request.

Contact for information about the study

If you have any questions or would like additional information, please contact Dr. Cristina Caperchione at 250-807-9679, or Dr. Catherine Sabiston at 416-555-1234.

Contact for concerns about the rights of research participants

If you have any concerns about your treatment or rights as a research participant and/or your experiences while participating in this study you may contact the Research Participant Complaint Line in the UBC Office of Research Services at 1-877-822-8598 or the UBC Okanagan Research Services Office at 250-807-8832. It is also possible to contact the Research Participant Complaint Line by email (RSIL@ors.ubc.ca).

Consent

Your participation is entirely voluntary. You may refuse to participate or withdraw at any time without penalty or consequence. If you choose to participate and then decide to withdraw at a later time, you have the right to request the withdrawal of your information collected during the study. This request will be respected to the extent possible.

By signing this consent form, you are agreeing to participate in all study protocols, in audio recorded focus groups, to having your group proposal reviewed by the grant review committee and to having your group profile and group picture uploaded to the project website. By signing this consent form you are acknowledging that you have received a signed copy of the consent form for your records. By signing this consent form, you do not waive any of your legal rights.

Consent

I have read and understood the information on this consent form and voluntarily consent to participate in this study. I have had a chance to ask questions about the study and my involvement in it and have received a copy of the consent form.

Participant's Name (please print)

Participant's Signature

Date

Confidentiality Agreement

I agree to respect the confidentiality of all program participants. This means I will not discuss participants' personal information with anyone outside of this program.

Participant's Name (please print)

Participant's Signature

Date

Contact for Future Studies

Would you like to be contacted in the future about other studies?

☐ Yes, I would like to receive information about future studies on women's health and physical activity.

☐ No, I would not like to receive information about future studies.

Participant's Name (please print)

Participant's Signature

Date

Appendix B: Accelerometer Information

ACCELEROMETER INSTRUCTIONS

Q: What is an accelerometer?

A: An accelerometer is a movement monitor that captures how much movement you do and how intense that movement is. It is like a pedometer but captures different kinds of activity.

Q: Why do I have to wear it?

A: We ask that you wear an accelerometer so that we have an idea of how much physical activity you do, and whether being part of Project Move changes this at all. We will share the results with you so you can see your activity patterns!

How do I use an accelerometer?

Make sure to put the accelerometer around your waist **as soon as you wake up** so that all of your movement in the day is measured. At this time, please fill out the given **Accelerometer Time Log** every morning.

Attach the accelerometer to your waist using the elastic belt and align it on your right hip directly above your knee. You can wear it either over or under your clothing.

Make sure your accelerometer remains upright and close to your body (The top of the accelerometer is marked by the round clasp)

Do not wear the accelerometer in the water – this includes showering, bathing, swimming etc. – since it is not waterproof. You can wear it during your usual activities and workouts as it can handle sweat and is water resistant.

After wearing the accelerometer for 7 consecutive days, please store it in a safe place and put it in the envelope given to you until a member of the research team returns to pick it up. These monitors are very expensive so please take care of them!!

Thank you so much for taking part in this study. Enjoy!

Appendix C: Accelerometer Log Sheet

Accelerometer Time Log

Please record the start time (time you put accelerometer on) and the stop time (time you took accelerometer off) for each day that you wear the device. This should be done for 7 days in a row. If you forget to wear the accelerometer on one of the days, please write “----” or “I forgot” in the space. If you have any questions, please contact the Project MOVE team at 250-807-9907 or t.pullen@alumni.ubc.ca or kayla.fitzpatrick@alumni.ubc.ca

Accelerometer number _____

	Date (dd/mm/yy)	Start Time (hh:mm)	Stop Time (hh:mm)	Is this a regular routine day? If no, were you MORE or LESS active than usual?
Day 1		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐
Day 2		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐
Day 3		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐
Day 4		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐
Day 5		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐
Day 6		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐
Day 7		☐ AM ☐ PM	☐ AM ☐ PM	YES ☐ NO ☐ I was more active ☐ I was less active ☐

Appendix D: Demographics Questionnaire

BACKGROUND & DEMOGRAPHICS

The following information provides background information and will only be asked of you once. Please report as accurately as possible

Date (day/month/year): _____

Personal Information

1. Identification number (provided by researcher): _____
2. What is your date of birth (day/month /year) _____
3. People living in Canada come from many different cultural and racial backgrounds.

Are you (check all that apply):

- ☐... White?
- ☐... Aboriginal (Metis, First Nation, Inuit/Inuuk)
- ☐... Asian (specify)?
- ☐... South Asian (e.g., East Indian, Pakistani, Sri Lankan)?
- ☐... Black?
- ☐... Other – Specify

4. What is your highest level of education? (Please check one)
 - ☐ Some high school or less
 - ☐ High school diploma
 - ☐ Some post-secondary without diploma or degree
 - ☐ College or technical diploma or certificate (CEGEP, vocational, trade)
 - ☐ University degree

☐ Other (please specify): _____

5. What is your marital status?

☐ Married or living with a life partner

☐ Living alone

☐ Widowed

6. What is your main activity (check one):

☐ Full time work

☐ Part time work

☐ Caring for family/managing household

☐ Unemployed

☐ Recovering from illness/on disability

☐ Retired

☐ Other _____

Appendix E: Breast Cancer Information Questionnaire

BREAST CANCER INFORMATION

1. What was the date of your most recent diagnosis for breast cancer? _____

What stage of breast cancer were you diagnosed with?

- ☐ Stage 0
- ☐ Stage I
- ☐ Stage II
- ☐ Stage III
- ☐ Stage IV

2. Indicate which medical treatments you have received for breast cancer and the date of the last treatment, if applicable

Treatment	Received?	Date of last surgery/treatment (day/month/year)
Lymph or axillary node dissection	☐ Yes ☐ No	_____
Lumpectomy	☐ Yes ☐ No	_____
Single Mastectomy	☐ Yes ☐ No	_____
Double Mastectomy	☐ Yes ☐ No	_____
Reconstructive surgery	☐ Yes ☐ No	_____

Chemotherapy	☐ Yes ☐ No	_____
Radiotherapy	☐ Yes ☐ No	_____
Hormonal therapy	☐ Yes ☐ No	_____
Other Specify:		_____

3. What is your height, in feet and inches? _____ ft, _____ in.

4. What is your current weight in _____ kgs. **OR** _____ lbs.

5. Are you:

☐ Pre-menopausal

☐ Going through menopause

☐ Post-menopausal

Appendix F: Oncology Provider Physical Activity Communication Questionnaire (OPPAC)

PHYSICAL ACTIVITY COMMUNICATION

Please indicate whether the care you received from your oncology provider (oncologist, surgeon, oncology nurse, radiotherapist) included any of the following:

My oncology provider ...	Yes	No
Asked me about my physical activity routines		
Assessed my fitness (e.g., as part of a physical exam or fitness test)		
Referred me to other exercise professionals (e.g., exercise physiologist, physiotherapist, exercise specialist)		
Discussed the physical health benefits associated with being physically active (e.g., reduced tiredness and pain, weight control, increased strength)		
Discussed the mental health benefits associated with being physically active (e.g., reduced anxiety and depression, improved social interaction)		
Discussed ways to overcome potential barriers to being physically active during and after my cancer treatment		
Recommended that I begin a physical activity program		
Recommended that I participate in at least 150 minutes of moderate or 75 minutes of vigorous physical activity per week		
Recommended that I reduce the time I spend sitting		
Provided me with instructions for a physical activity program		
Recommended that I visit a community fitness centre (e.g., GoodLife, local pool)		
Gave me physical activity booklets or handouts		
Recommended that I use a physical activity website or web-based exercise/fitness app		
Recommended that I use a physical activity monitoring tool (e.g., Fitbit, pedometer, step counter)		

Recommended that I join a local walking or sport related group (e.g., dragon boating)		
---	--	--

Please rate the importance of the following action by your oncology provider to you, where **1 is not important** and **5 is very important**.

	Not important				Very Important
Asks me about my physical activity routines	1	2	3	4	5
Assesses my fitness (e.g., as part of a physical exam or with a fitness test)	1	2	3	4	5
Refers me to other exercise professionals (e.g., exercise physiologist, physiotherapist, exercise specialist)	1	2	3	4	5
Discusses the physical health benefits associated with being physically active (e.g., reduced tiredness and pain, weight control, increased strength)	1	2	3	4	5
Discusses the mental health benefits associated with being physically active (e.g., reduced anxiety & depression, improved social support and social interaction)	1	2	3	4	5
Discusses ways to overcome potential barriers to being physically active during and after my cancer treatment that I may experience	1	2	3	4	5
Provides me with verbal instructions for a physical activity program	1	2	3	4	5
Provides me with written instructions for a physical activity program	1	2	3	4	5

Please indicate your level of agreement with each of the following statements, where **1** is strongly disagree and **5** is strongly agree.

	Strongly Disagree				Strongly Agree
My oncology provider is knowledgeable about physical activity.	1	2	3	4	5
I am satisfied with the overall quality of physical activity information my oncology provider has provided me.	1	2	3	4	5
The physical activity information provided to me by my oncology provider has been useful.	1	2	3	4	5
Physical activity counselling from my oncology provider has an impact on activity levels.	1	2	3	4	5

When do you think your oncology provider should discuss physical activity with you? (check all that apply)?
☐ I do not believe that my oncologist should discuss physical activity with me ☐ Before my treatments ☐ During my treatments ☐ After my treatments ☐ At every opportunity ☐ Other, please specify _____

****If you have never discussed physical activity with your oncology provider, please go to question 2****

1. Thinking back to your interactions with your oncology provider regarding physical activity:

a) What was most helpful?

b) What was least helpful?

2. What suggestions do you have for oncology providers related to providing advice and support regarding physical activity to women who have been diagnosed with breast cancer?

Thank you for completing this questionnaire! If you have any questions or concerns, please do not hesitate to contact Kayla @ kayla.fitzpatrick@alumni.ubc.ca

