Using Social Cognitive Constructs to Predict Preoperative Exercise before Total Joint Replacement

by

Bonnie Fiala
BSc, University of Victoria, 2006

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Supervisory Committee

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Abstract

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Objective: The purpose of this study was to examine social cognitive constructs as predictors of preoperative exercise (PE) in a sample of individuals waiting for total joint replacement (TJR) surgery using the framework of Bandura's Social Cognitive Theory (SCT). **Methods:** Participants (N = 78) were individuals waiting for TJR at the two major urban centres on Vancouver Island, Canada who completed measures of the SCT (barrier self-efficacy, outcome expectancy, self regulation, task efficacy & sociocultural factors of pain, physical function and neighbourhood walking environment) framed for (PE). **Results:** Independent t-tests suggested no differences between type of surgery (hip versus knee), gender or age for PE ($p<.05$). Over half of the sample was considered inactive (55%) using a definition of physical activity as accumulating at least 30 minutes of exercise at a moderate or vigorous intensity at least 3 days per week in bouts of 10 minutes or more. Bivariate correlations relating to PE were significant ($p<.05$) between self regulation (SR) (.25), task efficacy for exercise (TEE) (.27) and pain (-.28). Hierarchical regression analysis revealed that SR (β=.17) and TEE (β=.20) explained 10% of the variance in PE behaviour, but were not significant predictors of PE independently. The addition of pain to the regression analysis added 4% of the explained variance, and remained the only significant predictor ($p<.05$) of Pe behaviour. **Conclusions:** SCT showed modest capability in predicting PE in this sample, suggesting further testing of theoretical models is warranted in this area. These findings highlight the influence of pain on exercise before TJR surgery, and support the importance of considering individual factors such as pain when designing targeted interventions to increase activity in this population.

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Dedication

This work is dedicated to all who provided support & encouragement throughout this process.

Special thanks to T.G. for his understanding & commitment.

Chapter 1

Introduction

Although the physical and psychological benefits of physical activity (PA) are well recognized, over half of Canadians over the age of 65 are not active enough to attain these health benefits (Canadian Fitness and Lifestyle Research Institute, 2002). Regular participation in physical activity for older adults has been recommended to minimize the physical changes associated with the process of aging and maintain and improve levels of mobility and function, as well as enhance psychological well-being (Lim and Taylor, 2005). The potential to increase the health and quality of life of older adults through physical activity therefore may serve as an important factor to support and prolong independent living in the aged, which may also impact both individual and community health care costs. As a result, the promotion of regular physical activity in older adults is a public health priority.

Osteoarthritis

Osteoarthritis (OA) is the most common form of arthritis among older adults, and is a condition that affects as many as 80% of adults over the age of 65 (Brandt, 2000). Currently, over 37% of adults with arthritis are estimated to be inactive (Hughes, Seymour, Campbell, Huber, Pollak, Sharma & Desai, 2006), which is a risk factor for multiple adverse outcomes that may lead to further decreases in physical function and independence.

Compared to people with other chronic conditions, those with arthritis tend to experience more pain, activity restrictions and long-term disability, are more likely to need help with daily activities, report worse self-rated health and more disrupted sleep and depression, and more frequently report contact with health care professionals (Public Health Agency of Canada, 2003; Rhodes & Blanchard, 2007). As a result, OA imposes a considerable economic burden on the health care system. Given that the Canadian population of adults over the age of 65 is expected to continue to increase, the public health problem of hip and knee OA is also predicted to rise (Brandt, 2000).

The aim of OA treatment is to control the symptoms such as pain, mobility problems and activity restrictions. Pharmacological (i.e. medication) and non-pharmacological (i.e. exercise) approaches have shown to be effective in slowing the progression and treating the symptoms of OA (Van Baar, Assendelft, Dekker, Oostendorp, & Bijlsma, 1999). Several programs have been developed that combine physical exercise and health education to emphasize the role of physical activity for people with arthritis pain, as well as address pain management and coping skills. Although these treatments are considered the first line treatment in management of OA, to date there is no cure for this disease.

Total Joint Replacement

Joint replacement surgery is considered an effective treatment when initial methods are no longer successful in managing the symptoms of OA (Walker-Bone Javaid, Arden & Cooper, 2000). Over the past decade, the demand for total hip and total knee replacement has increased substantially. In Canada, total knee replacement utilization typically exceeds total hip replacement rates, and an increased demand for total joint replacement continues to grow. In 2005, total knee replacement surgeries were the fastest-growing priority area surgery, with a 69% increase in the number of cases since 2001 (Canadian Orthopaedic Association, 2005), with over 40,000 total knee replacements and over 28,000 hip replacements reported across the country in 2005 (Canadian Institute for Health Information, 2008).

The majority of Canadians receiving a joint replacement are 65 years of age or older (CIHI, 2007), with approximately 89% of total knee replacements and 79% of hip replacements occurring in this population group (Canadian Orthopaedic Association, 2005; CIHI, 2002). Due to rising demographics, as well as increased rates of hip and knee replacements among 45 to 54 year olds over the last decade, joint replacement surgeries in Canada have the potential to significantly impact both health care costs and resource utilization.

Preoperative Preparation

Several studies testing the effectiveness of prehab programs have shown that increased physical function before orthopaedic surgery may positively affect postoperative outcomes (Brown et al., 2009; Fortin et al., 1999; Barbay, 2009; Ackerman & Bennell, 2004), although research in this are to date is limited. Overall findings of recent reviews examining preoperative exercise programs & postoperative outcomes following lower limb TJR emphasize that the evidence supporting prehabilitation is inconclusive (Barbay, 2009; Ackerman & Bennel, 2004). One reason for the variability in research findings is due to the lack of theory-guided approaches, which have been shown to be more effective in other behavioural interventions to increase physical activity behaviour, thus advocating the need to test theoretical models and the determinants relating to exercise behaviour in this area.

Traditional preoperative education programs, which typically involve a lecture-style education session lead by a team of health professionals may include both verbal and written instruction outlining preparation for total joint replacement & provide information about what to expect before and after surgery (Thomas, Burton, Withrow, and Adkisson, 2004). In addition, other areas of instruction for preoperative preparation may include topics such as physical activity (i.e. walking) and/or prescribed exercises before surgery, pain management, social support, home safety, equipment needs (i.e. walking aids) and nutrition. Following this, it is typically up to the individual as to how they specifically prepare for surgery and the extent to which they adhere to the recommended exercise regime.

Exercise Adherence

Client adherence to exercises prescribed by a physical therapist is very important to successful treatment outcomes (Brewer, 1999). Unfortunately, many clients struggle with adherence to exercise. Often the symptoms of OA such as joint pain and stiffness have a negative impact on physical activity levels for those waiting for total joint replacement. As a result, decreased levels of physical activity in this population group leads to further physical decline and deconditioning during the preoperative period before surgery.

According to the Arthritis Society and Canadian Orthopaedic Association, wait times for hip and knee replacement surgery in British Columbia was 11 and 18 months, respectively, in 2000-2001. More recently, joint replacement statistics for the Greater Victoria area confirmed over 1,100 individuals who were on a waiting list for total joint replacement in 2008 (COA, 2008), thus efficient and effective interventions to maximize preoperative preparation are desirable.

Based on current literature, efforts to improve exercise adherence in several treatment areas is warranted. Innovative and proactive interventions that enhance long-term exercise adherence may help reduce physical disability, improve long-term outcomes, and reduce healthcare costs. Several reviews of exercise adherence have been conducted in the general field of clinical rehabilitation (e.g., Brawley & Culos-Reed, 2000; Marks & Allegrante, 2005; Mihalko, Brenes, Farmer, Katula, Balkrishnan, & Bowen, 2004; Rhodes & Fiala, 2009), although little is known specifically in the area of preoperative exercise and adherence in relation to total joint replacement.

Social Cognitive Theory

With the growing recognition of the importance of physical activity for individuals with OA, testing theoretical models for their effectiveness in predicting exercise behaviour in this group appears prudent. Social cognition models have been used to predict a wide variety of health related behaviours and health outcomes in clinical and nonclinical samples (Armitage & Conner, 2000, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Hobbis & Sutton, 2005). Various models including the theory of planned behaviour and social cognitive theory have highlighted the significance of control & efficacy beliefs to the prediction of limitations in activity relating to chronic disease (Bonetti & Johnston, 2008; Johnston, Pollard, Johnston, Kinmonth, & Mant, 2004; M. Johnston et al., 1999; Kempen, Van Sonderen, & Ormel, 1999; Orbell et al., 2001; Rejeski et al., 2001).

Social cognitive theory (SCT) is one of the most predominant theoretical models used in physical activity interventions (Marcus, Forsyth, Stone, Dubbert, McKenzie, Dunn, & Blair, 2000). Key determinants of SCT include self-efficacy, outcome expectancies, self regulation and sociocultural factors (Bandura, 1986).

According to Bandura (1986), the extent of individual effort and the length of persistence towards a given activity are greatly influenced by levels of self-efficacy and outcome expectancies and thus play a major role in determining the performance of desired behaviours. Indeed, recent work in the area of physical activity and older adults has shown that more determined efforts towards PA are associated with higher levels of perceived self- efficacy and outcome expectations (Hughes et al, 2006). Perceptions of personal capabilities & expected outcomes related to PA, as well as the factors that influence them, may therefore function as important cognitive processes that influence activity behaviours of patients with arthritis (Focht, Rejeski, Ambrosius, Katula, & Messier, 2005). Indeed, recent studies examining the determinants of physical performance in people with OA have shown that self efficacy has a strong correlational and predictive role with activity behaviour (Maly, Costigan & Olney, 2006, 2005; Harrison, 2004).

Despite its prevalence in health behaviour research, most studies using a SCT framework focus on the central constructs of self-efficacy and outcome expectations, and few studies incorporate a comprehensive analysis all of the SCT constructs to predict behaviour.

In the context of TJR, several studies using a SCT model have examined the relation between self efficacy and postoperative outcomes (Engel, Hamilton, Potter & Zautra, 2004; Dohnke, Knauper & Muller-Fahrnow, 2005; Kurlowicz, 1998; Moon & Backer, 2000; Orbell, Johnston, Rowley, Davey & Espley, 2001), although few have examined social cognitive predictors of preoperative exercise behaviour.

Identifying potential predictors of physical activity for individuals with OA, including efficacy beliefs, self regulation & outcome expectancies, as well as personal & environmental factors related to arthritis, could therefore serve as possible areas to consider when designing interventions before total joint replacement.

Walking Environment

A central focus of ecologic models is the role of the physical environment, recognizing that people's behaviours within their environment are shaped by social and organizational influences. In this respect, individual differences in physical activity within environmental contexts is highlighted, as physical activity can be promoted or encouraged within some environments, while made more difficult or restricted in others (Humpel, Owen, and Leslie, 2002)

Among older adults, walking is the most commonly reported type of physical activity, as it is recognized as an excellent type of activity that is easily accessible, inexpensive, and does not require equipment or instruction (Dawson, Hillsdon, Boller, and Foster, 2007). Importantly, there is also evidence that walking is associated with higher adherence than more vigorous activities (e.g., Lamb, Bartlett, Ashley, & Bird, 2002; Parkkari, Natri, Kannus, Manttari, Laukkanen, Haapasalo, Nenonen, Pasanen, Pedda, and Vuori, 2000).

The neighbourhood environment and its accessibility to safe and enjoyable locations for walking are important factors when investigating the environment-behaviour relationship in older adults, as these may be influential in the decision making process of seniors to be physically active. As walking behaviour in older adults may be influenced differently by individual perceptions regarding various built-environment, social-cognitive, and health-related influences, it is important to consider the impact of these factors when developing physical activity interventions for older adults.

The purpose of this study is to incorporate the perceived walking environment, physical function and pain into a social cognitive framework (barrier efficacy, task efficacy, outcome expectations, and self regulation) to predict preoperative exercise (PE) for individuals waiting for total joint replacement. Based on prior research, it is hypothesized that pain and the perceived environment, most notably neighbourhood aesthetics, proximity to services, and the presence of hills will be correlates of PE but mediated through self regulation, barrier & task self efficacy towards exercise with barrier efficacy being the main predictor. Further, based on prior work, outcome expectancies are not expected to be a major predictor of PE (Oetker-Black, Hart, Hoffman, and Geary, 1992), though it is hypothesized that self regulation will mediate the barrier self efficacy-behaviour relationship.

Research Questions & Hypotheses'

Pilot Study

The following research questions will be addressed in this study:

1. Using a SCT framework, what are the main barriers & facilitators to PE behaviour before total joint replacement?

Hypothesis:

The main barriers to PE would be related to pain, physical function & neighborhood characteristics & the main facilitators to PE would be related to social support.

Main Study

The following research questions will be addressed in this study:

1. How effective are the constructs of the Social Cognitive Theory (barrier efficacy, task efficacy, outcome expectations, and self regulation) to predict PE (seven day recall) behaviour among individuals waiting for total joint replacement surgery?

Hypothesis:

Barrier, task-efficacy and self regulation will have direct effects on preoperative PE behaviour, with barrier self-efficacy as the dominant predictor.

2. Does self regulation mediate the relationship between self-efficacy (barrier efficacy and/or task efficacy) and PE?

<u>Hypothesis:</u>

Self-regulation will mediate the relationship between self-efficacy and PE.

3. What is the relationship between the constructs of SCT, pain & physical function, perceived walking environment and PE for people waiting for total joint replacement?

<u>Hypothesis:</u>

Individuals with higher levels of self-efficacy and self regulation towards exercise, as well as lower perceived pain & higher perceived physical function and access to safe and pleasurable locations to exercise will be more physically active.

4. Does pain and perceived walking environment moderate the relationship between self-efficacy towards PE?

<u>Hypothesis:</u>

Pain and perceived walking environment will moderate the relationship between self-efficacy and PE.

Assumptions

1. Participants within the study are a representative sample.
2. Participants will provide accurate self-reported data.

Limitations

1. Questionnaire responses to behaviour rating scales are based on the subjective judgment of the participants.
2. Self-reported exercise behaviour may be biased.
3. Due to recruitment from two sites, the results of the study cannot be generalized to other populations.

Delimitations

1. Adults attending the Joint Replacement Clinic-South Island (JRC-SI) in Victoria, and Nanaimo Regional General Hospital (NRGH) in Nanaimo, British Columbia.
2. Adults who are currently on a waiting list for primary, unilateral total joint replacement.
3. Adults who are alert and oriented to person, place, and time, and are able to read and speak English.
4. Individuals will be excluded if they are undergoing revision arthroplasties, are unable to sign the informed consent form.

Operational Definitions

1. Exercise: Any activity that requires physical exertion when performed at a moderate intensity, on 3 or more days per week, accumulating at least 30 minutes each day in bouts as short as 10 minutes. This definition was based on the American Geriatrics Society's guidelines for adults with OA (2001).

2. Social Cognitive Theory constructs (Bandura, 1986)

    a. Barrier Self Efficacy: The confidence in one's ability to perform a task in the face of barriers.

    b. Task Self Efficacy: The confidence in one's ability to perform specific tasks related to an activity.

    c. Outcome Expectations: The perceived consequences or benefits of performing a task.

    d. Self Regulation: The personal regulation of goal-directed behavior or performance.

4. Walking Environment: The perceived accessibility, proximity, safety and enjoyment of one's environment for walking.

Chapter Two

Literature Review

The following review of literature has been divided into two main sections. The first section will describe the importance of health professionals in the promotion of physical activity and research examining the effectiveness of current approaches for the management of OA and adherence to prescribed exercise, and its relation to preoperative activity before total joint replacement surgery. This will be followed by a description of the Social Cognitive model and its multi-level influence on behaviour, in particular, the emphasis on environmental influences on exercise and walking behaviour in older adults. To highlight this area of research, the subsequent section will discuss the role of barrier & task self-efficacy, outcome expectations and self regulation in relation to both personal and social and environmental contexts of physical activity participation.

Health Professionals and Behaviour Change

Health professionals are considered to play a central role in the promotion of health and increasing awareness about the benefits of physical activity. Due to the frequent contact healthcare providers have with a large and diverse range of individuals, exercise prescription within a primary care setting is regarded as an essential means to promote physical activity in the general population. As health professionals are regarded as a credible source for health advice and guidance to safe and effective treatment, they are likely to be influential in the cycle of behaviour change (Dugdill, Graham, & McNair, 2005).

In the area of exercise prescription and promotion, physical therapists advocate physical activity and exercise by providing key elements of effective behavioural change interventions including personalizing treatment, providing feedback and assessing progress to suit individual needs. As healthcare providers, therapists thus have the potential to play a unique and valuable role in motivating and assisting individuals to adopt healthy behaviour changes, including promoting physical activity and exercise.

Exercise as Treatment for OA

Exercise therapy is considered to be in important non-pharmacological approach to treatment for chronic diseases such as OA, with the goal to reduce pain and disability (Marks & Allegrante, 2005). According to Van Baar and colleges (1999), evidence of the favourable impact of exercise therapy in individuals with OA of the hip or knee supports a small to moderate effect on pain reduction, and a moderate to great effect in relation to personal assessments of the beneficial aspects of exercise therapy. Supervised intervention programs that emphasize personalized tailoring of treatment by health professionals have been shown to be more effective in promoting efficacy towards exercise and self-management, thus providing individuals with increased confidence for future health behaviours (FitzGerald & Oatis, 2004).

In relation to joint replacement surgery, studies have shown that individuals with higher levels of preoperative physical function tend to have greater activity levels following surgery (e.g., Ostendorf, Buskens, van Stel, Schrijvers, Marting, Dhert &

Verbout, 2004; Montin, Leino-Kilpi, Suominen, and Lepisto, 2008). According to Montin and colleagues (2008), the main predictors of postoperative function and quality of life following total joint replacement surgery include preoperative function, preoperative pain and social support. Designing and implementing exercise programs that are designed to enhance preoperative strength and physical function therefore serves as an important determinant of postoperative success.

Prescription of exercise is an important skill of physical therapists that highlights the three major dimensions of physiotherapy practice: treatment of disorders of movement, knowledge of exercise prescription and dosages, and clinical reasoning skills to ensure that exercises are optimal for the individual (Bassett, 2003). Adherence to prescribed exercise is considered an important component to achieve positive outcomes in physiotherapy. The success of many therapy programs is dependent upon the commitment of the individual to the prescribed treatment, as well as the maintenance of therapeutic regimens over a period of time.

Adherence to Prescribed Exercise

Similar to other areas of health care, physical therapy is affected by the problem of poor adherence. Estimates suggest exercise adherence rates for clinic-based rehabilitation are variable, as research has shown rates to be as low as 40% in knee surgery patients (e.g., Daily, Brewer, & Van Raalte, 1995) and as high as 95% in a community based hydrotherapy program for individuals with osteoarthritis (e.g., Lin, Davey, & Cochrane, 2004), whereas non-adherence for home-based environments in a sample of students ranging from elite to recreational sport involvement have been shown to also get as low as 54-60% (e.g., Taylor & May, 1996). Although some participants in supervised exercise programs may continue to adhere to prescribed exercise after facility-based rehabilitation is complete, it has been suggested that many individuals demonstrate poor long-term adherence to prescribed exercise once outside a supervised exercise setting (Bassett, 2003).

Clearly, poor adherence to prescribed exercise in both clinical and home-based environments is an important issue not only to individuals, but also to healthcare providers. Based on current literature, efforts to enhance exercise adherence in several treatment areas is warranted. Innovative and individualized interventions to improve long-term exercise adherence may help reduce physical disability, improve long-term outcomes and quality of life.

An understanding of the foundations for behavioural action is considered an important task in order to produce effective behavioural interventions (Baranowski, Anderson, & Carmack, 1998). That is, in order to change behaviour, we need to know why certain clients adhere to an exercise prescription while others do not.

Social Cognitive Theory

Social Cognitive Theory (SCT) is perhaps one of the most widely used models exploring health-related activities, which attempts to predict and explain behaviours using key concepts of self-efficacy expectations, outcome expectations and self-regulation. According to Albert Bandura (1986), the central roles of SCT in relation to human functioning include cognitive, vicarious, self-regulatory and self-reflective processes in human adaptation and change, which result from the interaction of three main factors: personal, environmental, and behavioural. Personal factors are considered to arise within an individual, and include constructs such as self-efficacy and self-regulation. Environmental factors consist of characteristics of situations which occur outside an individual, and can include both social and ecological conditions. The final set of factors involves the behaviours performed by an individual. Bandura (1986) defines the interaction between these three factors as *reciprocal determinism*, or the idea that behaviour is controlled or determined by the individual through cognitive processes, and by the environment through external social stimulus events (see Figure 1).

In the causal structure of SCT, beliefs of personal efficacy play an important regulative role in one’s perceived capabilities to produce effects, and are dependent upon which aspects of behaviour one seeks to control (Bandura, 1998) (see Figure 2). Efficacy beliefs also regulate motivation by influencing goals people set for themselves, the strength of commitment to them and the expected outcomes from their efforts.

According to Bandura (1998), beliefs in personal efficacy can be developed by four main sources of influence: past successful or “mastery” performance, persuasion, vicarious experience, and physiological feedback (see Figure 3). The most effective way of creating a sense of efficacy is through mastery experiences, where successes build a strong belief in one’s capability to organize and execute a task (Maly, 2006). The second way of creating and strengthening efficacy beliefs is through the vicarious experiences provided by social models, or seeing people similar to oneself succeed, thus raising the observers’ beliefs that they may also possess the capabilities to succeed (Bandura, 1998). Social persuasion is the third way of increasing efficacy beliefs, and although this mode is considered to be less effective to strengthen self-efficacious beliefs, it is the mode most commonly used in health promotion (Rhodes, Fiala & Conner, 2009).

Perceptions of self-efficacy and outcome expectations play a major role in determining behaviour performance, the extent of individual effort, and the length of persistence towards a given activity (Resnick, 2004). Higher levels of perceived self-efficacy and outcome expectations in older adults have been related to more intense and determined efforts towards desired behaviours such as physical activity (Hughes et al, 2006).

Self-Efficacy

Self-efficacy (SE) is the foundation of social cognitive theory (Bandura, 1997), which can be defined as the level of perceived confidence that a person holds for a given behaviour when considering action (Bandura, 2004). The construct represents the degree of personal mastery that an individual perceives over the enactment of a specific behaviour which includes the physical task itself (sometimes referred to as task efficacy) and the organization and regulation of enactment (sometimes considered barrier, or coping and scheduling efficacy). In a recent review by Rhodes, Fiala & Conner,2009, several studies support the predictive utility of self-efficacy, although the size of effect for self-efficacy and adherence is variable (i.e. Levy, Polman, & Clough, 2008; Sluijs, Kok, & Van der Zee, 1993). Overall, the results of several studies provide support for the importance of self-efficacy as a correlate of adherence to physical therapy exercises.

As the enhancement of self-efficacy in individuals with OA is an important factor for participation and adherence to health programs, interventions that focus on exercise and education of OA treatment have been shown to relate to more effective treatment outcomes and increased self-efficacy (e.g. Yip, Sit, Fung, Wong, Chong, Chung, & Ng, 2007; Hughes, Seymour, Campbell, Huber, Pollak, Sharma, & Desai,2006; Focht, Rejeski, Ambrosius, Katula, & Messier, 2005; Keefe, Blumenthal, Baucom, Affleck, Waugh, Caldwell, Beaupre, Kashikar-Zuck, Wright, Egert, & Lefebvre, 2004; Hopman-Rock and Westhoff, 2000).

Bandura (2004) suggests that mastery experiences and social observation are the two most powerful techniques to alter behaviour via self-efficacy, with informational persuasion and other self-perception techniques falling-in as secondary interventions. Education-based techniques are very common and intended to increase outcome expectations. The concept of self-efficacy within Social Cognitive Theory emphasizes aspects such as vicarious experience through peer education (Hopman-Rock & Westhoff, 2000) and verbal persuasion by both written and verbal information. Examples of behavioural strategies used to enhance task-efficacy and scheduling-efficacy include goal setting and individualized exercise planning (Hughes et al., 2006; Focht et al., 2005; Hopman-Rock & Westhoff, 2000).

Self-efficacy is at the heart of Social Cognitive Theory, which suggests that people’s performance is better predicted by their beliefs about their capabilities than by their actual capabilities. Consistent with this theory, self-efficacy explains a large portion of the variance in performance of physical activities like walking in people with knee OA (Harrison, 2004). A study by Maly and colleagues (2007) examined whether self-efficacy mediated the effect of age, psychosocial, impairment, and mechanical factors on walking performance, where self-efficacy fully mediated the effect of age and impairments on walking performance of a six minute walk test. These findings highlight the importance of a psychosocial variable, self-efficacy, on walking performance in people with knee OA.

Behavioural science has been developed both to understand physical activity and exercise as a behaviour and to provide the conceptual foundation for the design of activity promoting programs (Marks et al., 2005). Overall, current literature supports a moderate to large effect for interventions that include an exercise and educational component on improvements in arthritis self-efficacy (Yip et al., 2007; Keefe et al., 2004), self-efficacy for exercise (Hughes et al., 2006), self-efficacy for mobility and stair climbing (Focht et al., 2005) and overall self-efficacy scores (Hopman-Rock & Westhoff, 2000). The intervention content difference among studies may be that some employed a heavier emphasis on behavioural strategies such as goal setting, social support and addressing barriers to exercise such as lack of time (Hughes et al., 2006; Keefe et al., 2004; Focht et al., 2005).

Several exercise interventions have been developed for older adults that emphasize the importance of engaging in physical activity to enhance physical function and manage the symptoms of OA (Hughes et al., 2006). Programs that combine instruction in multiple components of physical activity with education and problem solving for adopting and maintaining changes in behaviour are essential to fostering self-efficacy in older adults (Focht et al., 2005). Because self-efficacy is potentially modifiable, approaches that focus on enhancing self-efficacy may provide improvements in chronic disease outcomes and offer health specialists more effective means to promote healthy lifestyle changes.

Perceptions of personal abilities are important to consider in relation to PA behaviour and physical function in patients with arthritis (Focht, et al., 2005). For example, in a study by Rejeski and colleagues (1996), self-efficacy beliefs and knee pain were found to be independent predictors of activity restriction among older adults with knee OA. In related work, Rejeski and colleagues (1998) demonstrated that exercise therapy significantly impacted improvements in self efficacy for the performance of functional tasks. Taken collectively, these findings support the notion that performance-related self-efficacy beliefs and perceptions of relevant physical symptoms, such as pain, are possible determinants of the functional beliefs accompanying exercise participation for individuals with OA.

Outcome Expectations

Outcome expectations (OE) represent the expected consequences and experience of performing a specific behaviour (Bandura, 1998). Actions are considered to be regulated through normative influences of two processes: social sanctions and self-sanctions. These processes are thought to be shaped by social norms that influence behaviour by the expected social consequences they create (Bandura, 1998). Behaviour that satisfies social norms gain positive social reactions, whereas socially unacceptable behaviour brings social disapproval. When considering exercise, these include the assumption that people will perform behaviours that have positive expected experiences and outcomes and avoid behaviours whereby the experience is judged to be negative. Within the area of physiotherapy and prescribed exercise, the utility of outcome expectations have generally shown null results (Rhodes & Fiala, 2009), which suggests that outcome expectations are a small potential determinant of exercise adherence for exercise regimes prescribed by a therapist. In contrast, attitude towards exercise (overall outcome evaluation), perceived susceptibility to negative consequences of not exercising, and perceived severity of the outcome were all correlated with adherence to exercise measures in a study of 70 patients receiving therapy for various injuries (Levy, Polman, & Clough, 2008).

Self Regulation

Within SCT, self-efficacy and outcome expectations are believed to influence behaviour directly and through the development and use of self regulatory behaviours (Anderson, Winett, and Wojcik, 2007) (see Figure 2). According to Bandura (2005), self-management is important when considering changing health habits, and requires both motivational and self-regulatory skills. Self-regulation (SR) is thought to occur in several different ways, including self-monitoring, reinforcements, goal setting, and preparation to reach or avoid expectations of a given behaviour (Umstattd, Wilcox, Saunders, Watkins, and Dowda, 2008). Efficacy beliefs influence self regulation, as stronger perceived self-efficacy lead to higher goals that people set and a greater commitment to them.

Walking Environment

In line with Bandura's notion of *reciprocal determinism,* which emphasizes the interaction between social and environmental influences on behaviour, an additional area when considering motivation towards physical activity for individuals with OA before total joint replacement may include the influence of the neighbourhood environment on walking.

Ecological models of health behaviours have recently emerged to explain a wide range of influences on both individual and community-level behaviours related to exercise (Dawson, Hillsdon, Boller, and Foster, 2007). Inherent in the ecological model of behaviour is that objective features of an environment and individual factors are equally important when considering the role of the physical environment on effecting behaviour change in physical activity (Cunningham & Michael, 2004). Ecological models of health behaviour value both physical and sociocultural determinants within an individual's environment to explain the interaction of people on multiple levels of their behaviour (King, Brach, Belle, Killingsworth, Fenton, Kriska, 2003).

An increasing body of research in public health and urban planning has related individual participation in physical activity with environmental factors such as access to services, land-use mix, residential density, neighbourhood aesthetics, and the quality of footpaths, safety, and traffic (King, et al., 2003). Neighbourhood characteristics that provide opportunities for being physically active have been shown to increase levels of physical activity in several populations (Sugiyama and Thompson, 2007). Efforts to promote health using this model focus on the interactions between the various environments and how social systems are maintained within them.

Specific features of the environment such as proximity to facilities and services and sidewalk quality have been related to physical activity, although aspects of significant importance can differ between individuals and groups (Sugiyama and Thompson, 2007). A number of studies have highlighted the importance of older peoples' perceptions regarding various built-environment, social-cognitive, and health-related influences on their walking behaviour and general physical activity levels (e.g. Booth, Owen, Bauman, Clavisi, and Leslie, 2000; Ball, Bauman, Leslie, and Owen, 2001; Fisher, Li, Michael, and Cleveland, 2004; Li, Fisher and Brownson, 2005). In a study by Brownson and colleagues (2001), neighbourhood characteristics, including the presence of sidewalks, enjoyable scenery, heavy traffic, and hills, were positively associated with physical activity among a sample of over 1800 adults, where up to one third of individuals who had used environmental supports reported an increase in physical activity.

Defining aspects that influence individual choices to participate in physical activity in relation to one's surroundings can involve both subjective and objective measures of the built environment. Objective measures comprise physical features in one's neighbourhood, such as the physical presence of sidewalks, facilities and walking trails. Subjective measures, on the other hand, may describe individual perceptions about the physical attributes of one's surroundings such as sidewalk quality or neighbourhood safety, which may influence the perceived ability to be physically active.

The impact of both objective and subjective measures, therefore serve as potential determinants in the everyday choices people make when planning to be physically active, both in leisure-time activity and activity through day to day tasks. Both objective and perceived neighbourhood walkability, proximity to services, and access to safe locations to walk, can provide incentive for older adults to be physically active, as well as foster social interaction in the community (Michael, Green, and Farquhar, 2006).

As walking is the most commonly reported type of physical activity among older adults and is associated with higher adherence than more vigorous activities (Lamb, et al., 2002; Parkkari, et al., 2000), examining potential determinants for walking behaviour among individuals waiting for TJR may serve as potential areas to consider for targeted intervention strategies to promote preoperative PA.

Related Research

Client adherence to exercises prescribed by a physical therapist is important to successful treatment outcomes (Rhodes & Fiala, 2009). Unfortunately, many clients struggle with adherence and thus efficient and effective motivational interventions are desirable. Several studies provide evidence for the importance of self-efficacy in exercise adherence to physical therapy, and show that employing cognitive-behavioural approaches to interventions can increase self-efficacy levels in older adults. Among individuals with OA, high self-efficacy levels have been shown to predict better attendance and participation in health interventions, as well as adherence to health recommendations (Gyurcsik, Estabrooks & Frahm-Templar, 2003; Marks et al., 2005). Strategies to enhance self-efficacy therefore may enable individuals with chronic diseases such as OA to successfully undertake and continue prescribed exercise regimes that are considered essential for maintaining physical function and mental well-being.

In reviewing the literature, no studies were found that examined relationships among barrier & task self-efficacy, outcome expectancy, self regulation and preoperative PA behaviours in an orthopaedic population. Findings from numerous studies have shown positive relationships between higher self-efficacy and positive behavioural changes, for example, among persons with problems associated with weight control, contraception, exercise, alcohol abuse and smoking (Strecher, McEvoy, Becker, and Rosenstock, 1986).

Four studies have been reported that examined relationships between self-efficacy and postoperative functioning in surgical populations. Allen and associates (1990) examined relationships among self efficacy, physical functioning, and social and leisure functioning in 125 men after coronary artery bypass graft. Findings indicated that self-efficacy was significantly and positively related to physical functioning, as well as social and leisure functioning after surgery, accounting for 20% to 24% of the variance, respectively.

Findings from Oetker-Black and colleagues (1992) indicated that higher preoperative scores for self-efficacy were significantly related to postoperative ambulation in a sample of 68 female cholecystectomy patients. Higher scores on the outcome expectancy scale were not significantly related to postoperative ambulation, and the percent of explained variance was small, ranging from 4% to 7%.

Brown and Conn (1995) examined relationships among self-efficacy, outcome expectancy, and walking activity among 55 patients who had undergone coronary artery bypass graft. Findings indicated that patients who had high self-efficacy beliefs at pre-discharge and at 4 weeks post-discharge walked greater distances at 3 months postoperatively than did subjects with low levels of self-efficacy. In addition, patients who had high levels of outcome expectancy before being discharged walked greater distances 3 months after discharge than patients who had low levels of outcome expectancy. Self-efficacy at 4 weeks after discharge was found to be a better predictor of walking distance 3 months postoperatively than outcome expectancy.

In the context of orthopaedic populations, a study by Moon and colleagues (2000) found that self-efficacy was the sole predictor of postoperative leg exercises and ambulation among a sample of 50 individuals recovering from total hip or knee replacement, although the variance accounted for ranged from 8% to 33%. A study by Engel et al. (2004) found that on average, 10% of the variance in postoperative WOMAC & SF-36 scores was explained by preoperative coping self-efficacy in a group of individuals having total knee replacement surgery. Preoperative self-efficacy was also examined by Dohnke & colleagues (2005) before total hip arthroplasty, & results of this study revealed that efficacy at admission & the change from admission to discharge was a significant predictor of physical function. Two studies evaluated self-efficacy both pre & postoperatively in total knee and hip arthroplasty patients. Orbell et al. (2001) determined the effect of self-efficacy and goal importance on disability preoperatively and 3 & 9 months postoperatively, where preoperative efficacy explained 6% of the variance in 9-month disability. A related study by van den Akker-Scheek and colleagues (2007) examined the contributions of preoperative and postoperative self-efficacy for hip or knee arthroplasty patients and found postoperative self-efficacy was the better predictor of long-term outcome after surgery in regards to both self reported & performance based physical function & mental health evaluations (WOMAC, SF-36 & walking speed).

In summary, few studies have examined relationships among self-efficacy, outcome expectancy and postoperative behaviours in surgical populations. Findings of these studies indicate that self-efficacy was a better predictor of postoperative behaviours than outcome expectancy. This review provides evidence for the importance of self-efficacy for exercise adoption and adherence, and suggests that other variables, such as self-efficacy, self regulation, & environmental influences may be important to consider when attempting to explain physical activity behaviours in individuals waiting for total joint replacement surgery.

No studies were found that examined relationships among self-efficacy, outcome expectancy, self regulation and performance of preoperative exercise behaviours in an orthopaedic population. Therefore, this study will be designed to determine the following: Do barrier & task self-efficacy, outcome expectancy and self regulation predict preoperative exercise among individuals waiting for total joint replacement surgery?

Chapter Three

Methodology

Purpose

Pilot Study

This pilot study was conducted to inform the main study, to ensure the instruments used for measurement, which were based on previously validated measures in related research, were appropriate for individuals waiting for total joint replacement.

Main Study

The purpose of this study is to incorporate the perceived walking environment, physical function and pain into a social cognitive framework (self efficacy, outcome expectations, and self regulation) to predict preoperative exercise & walking behaviour for individuals waiting for total joint replacement.

Participants

Pilot Study

A purposive sample of 11 individuals waiting for total joint replacement surgery (hip or knee) with ages ranging from 60-75 years participated in the semi-structured interviews. The selected participants were invited to participate following a preoperative education session at the JRC-SI in Victoria, B.C.

Main Study

This study included a sample of 130 adults with medically diagnosed osteoarthritis of the hip or knee, attending the JRC-SI & NRGH. Eligible participants were included based on the following criteria: (1) on a waiting list for primary total joint replacement surgery; (2) alert and oriented to person, place, and time (3) able to read and speak English. Individuals were excluded if they are undergoing revision arthroplasties, or unable to sign the informed consent form.

Power analysis (GPower, 2.0) using data from related studies documents that a sample of 128 participants is required to detect a medium effect (power = .80, 2-tailed test with p = .05) (Cohen, 1988).

Location

The JRC-SI & NRGH are programs funded by the Vancouver Island Health Authority (VIHA) that provide support & education for clients during the pre-operative, inter-operative, and post-operative phases of having a hip/knee replacement.

Ethical Approval

This study was evaluated by the Joint UVic & VIHA Ethics Approval for Human Participant Research process to ensure that the recruitment, data collection, storage & dissemination are conducted in an appropriate and ethical manner.

Procedure

Pilot Study

In order to be consistent with SCT (Bandura, 1989), 11 individuals waiting for TJR (5 women, 6 men) were recruited from the JRC-SI to participate in semi-structured interviews either in person or over the phone in order to generate exercise barriers & facilitators that were specific to a TJR population. Open ended questions asked participants to discuss the factors that influence their confidence, most common barriers to preoperative exercise, ways to overcome exercise barriers, perceived positive and negative impact of PA, PA goals, aspects of their neighbourhood environment that facilitate or are barriers to PA, and ways they felt supported to be active before TJR. Individuals attending a preoperative education session at the JRC-SI were invited to participate in the study. Before the session, the primary researcher gave a brief oral presentation to provide information about the study and invite interested individuals to participate in a 15-20 minute interview which were conducted at the JRC-SI or over the telephone. With the cooperation of the JRC staff, an interview schedule was agreed on, and after written informed consent was obtained and anonymity and confidentiality were assured, the preoperative interviews were conducted.

Main Study

Participants were invited to participate in the study during a preoperative education session at the clinic. The primary researcher gave a brief presentation to provide information and invite individuals to participate. Interested individuals were given a consent form, physical activity questionnaire, & return envelope (see Appendix). For purposes of this study, the items included in the physical activity questionnaire were identified through a previously conducted pilot study (Study 1) to verify that the instruments used reflected specific aspects for which the research was intended. After providing written and informed consent, the participants were asked to complete a physical activity questionnaire and return it by mail to the principal investigator with the envelope provided.

Instrumentation

Pilot Study

Semi-structured interview guidelines included general open-ended questions that allowed participants to elaborate on their views regarding preoperative exercise and activity in the areas of self-efficacy; outcome expectations, self regulation, and walking environment (see Appendix A). Questions regarding general demographics and current activity levels were also included (see Appendix A).

Main Study

<u>Self-Efficacy Expectations</u>. The Self-Efficacy for Exercise Scale (SEE) (Resnick & Jenkins, 2000) is a 9-item measure which focuses on self-efficacy expectations related to the ability to continue to exercise in the face of barriers (see Appendix B). Response options will range from 0 to 10, with 0 being not confident and 10 being very confident. Prior use of this measure with older adults provides a high degree of internal consistency (Cronbach alpha = .92).

<u>Task Efficacy.</u> The four item task self-efficacy scale, which was developed for a prior study (Rogers, Shah, Dunnington, Greive, Shanmughan, Dawson, & Courneya, 2005),

asked participants to rate their confidence in the ability to exercise and walk for specific durations, frequencies and intensities (see Appendix B). Confidence (i.e., self-efficacy) for both scales was rated on a scale from 0 to 10 at 1.0 intervals as suggested by Bandura (1977). More general headings were provided as guides (i.e., not confident, 0–4 to very confident, 7–10).

Outcome Expectations. The Outcome Expectations for Exercise Scale (OEE) (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000; Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2001) specifically focuses on the perceived consequences of exercise for older adults (see Appendix B). The OEE consists of nine statements about the benefits of exercising. The subject is asked to rate his agreement with each statement from 1 (Strongly Disagree) to 5 (Strongly Agree). Internal reliability of the scale is good (Cronbach alpha = .89).

Self Regulation. The Revised Self Management Scale for Physical Activity (Petosa, 1993) is a 13-item instrument to assess the degree to which self-regulation strategies are used to support exercise adoption and adherence (Cronbach alpha = .92) (see Appendix B).

Pain, Stiffness & Physical Function. The Western Ontario McMaster (WOMAC) is a validated instrument designed specifically for the assessment of lower extremity pain and function in osteoarthritis (OA) of the knee or hip. This measurement is designed to detect changes in health status and physical function in patients with osteoarthritis of the hip and/or knee, and consists of 24 questions using a 5-point Likert scale (5 pain, 2 stiffness and 17 physical function) with high internal consistency (Cronbach alpha= .95). Because the main goals of TJR are to decrease pain and improve function, only the pain

(5 items) and physical function (17 items) of the WOAMC were profiled. (see Appendix B).

Walking Environment. The Neighbourhood Environment Walkability Scale - Abbreviated is a 54 item questionnaire used to assess environmental factors for walking in one's neighbourhood (see Appendix B). This instrument has been shown to be reliable in adult populations (Alexander, Bergman, Hagstromer, and Sjostrom, 2006). For brevity purposes, a revised version (14 items) of this instrument was used.

Exercise. A modified version of the Leisure Score Index (LSI) from the Godin Leisure Time Exercise Questionnaire (GLTEQ) was used to assess exercise behaviour (see Appendix B). The GLTEQ is considered one of the most reliable measures of self-reported exercise and it is easy to administer and brief. The GLTEQ assesses average frequency and duration of exercise at three levels of intensity: mild (minimal effort, no perspiration), moderate (not exhausting, light perspiration), and strenuous (heart beats rapidly, sweating). We did not use the mild minutes for our calculations, but included the category in the questionnaire to ensure that participants did not report mild exercise minutes in the moderate intensity category. Our interest in only moderate and vigorous exercise minutes is based on public health recommendations that suggest that moderate-to-vigorous intensity activity is required to obtain health benefits. An independent evaluation of the GLTEQ reported its reliability and validity to compare favourably to nine other self-report measures of exercise based on test-retest scores and fitness indices.

Design

Pilot Study

This qualitative study was meant to inform a second study (main study), and sought to identify areas of self-efficacy, outcome expectations, and environmental influences in relation to preoperative exercise and physical activity for people waiting for total joint replacement surgery. Semi-structured interviews were conducted with individuals waiting for total joint replacement, which took place either at the JRC-SI or over the telephone.

Main Study

Using a social cognitive model this study employed a cross-sectional, correlational design to examine the ability of the SCT to predict walking behaviour in the preoperative phase before TJR surgery. Assessment occurred approximately 1-3 months before surgery. This study also examined the relationships between barrier & task self-efficacy, outcome expectations, self regulation, walking environment, and perceived pain & physical function and preoperative physical activity behaviour in a group of individuals waiting for TJR surgery.

Analysis Plan

Pilot Study

All interviews were recorded and transcribed for content analysis through thematic coding techniques to confirm general analytical categories. Data were entered as text and coded using NVIVO Software for Qualitative Research. Text data was carefully read and systematically analyzed to identify recurrent patterns and themes related to physical activity before total joint replacement surgery. A code tree was developed and specific preoperative physical activity codes were created and assigned to appropriate sections of text for retrieval. A code tree lists the codes that are used to identify themes in texts and for coding the texts for the presence or absence of the identified themes (Patton, 2002). Specifically, information collected from interview questions related to self-efficacy, outcome expectations, and self-regulation towards preoperative physical activity and perceived neighbourhood environment were identified as the main areas relating to preoperative physical activity levels. Data were then be analyzed through statistical methods for categorical data (frequency counts, chi-square) using SPSS statistical software (version 15.0). A *p*-value lower than 0.05 was considered statistically significant.

Main Study

Descriptive statistics and bivariate correlations for all SCT constructs (barrier & task self-efficacy, self regulation and outcome expectations), perceived walking environment, physical function and pain, and physical activity behaviour were evaluated. A hierarchical regression model was used to examine the independent effects of the SCT variables, perceived walking environment, pain and physical function to predict preoperative physical activity behaviour. Each predictive factor was entered into the hierarchical regression model in the following order: 1) self regulation 2) outcome expectations and sociocultural factors (perceived walking environment, pain and physical function), and 3) barrier & task self-efficacy. Subsequent regression analyses were conducted to predict self regulation, outcome expectations and sociocultural factors (see Figure 2). To predict self regulation, the order of predictive factors entered into the regression model was: 1) outcome expectations, 2) sociocultural factors (perceived walking environment, pain and physical function), and 3) self-efficacy. Self-efficacy was entered to predict outcome expectations, as well as to predict sociocultural factors (see Figure 2). To test for moderation and interaction between variables, a stepwise regression was then implemented as a data reduction strategy to improve power. Step-wise regression was implemented only in the hierarchical level of interaction effects included in the model. Thus, to predict exercise behaviour the SCT variables were entered into the regression equation first using forced entry. Walking environment, pain and physical function were entered second using forced entry, and interaction terms were then allowed to enter into the regression equation using step-wise entry. A similar step wise regression analysis was conducted to predict self regulation, where self-efficacy, outcome expectations, perceived walking environment, pain and physical function was entered into the regression equation using forced entry, followed by interaction terms using step-wise entry. All data analyses was performed using SPSS statistical software, version 15.0. A *p*-value lower than 0.05 was considered statistically significant.

Data Analysis

Main Study

All statistical analyses were conducted using SPSS 18.0 for Windows. An alpha level of .05 was used to determine statistical significance for all procedures. Three effect size measures were used in the analysis. Correlational analyses used Pearson's *r,* with effect size magnitudes of .10 for a small, .30 for medium, and .50 as a large effect (Cohen, 1992). For the regression analyses, (f^2) R^2 and β were used, where Cohen (1992) states magnitudes of .02 for a small, .15 for a medium, and .35 for a large effect for R^2; and effect size magnitudes of .10 for a small, .30 for medium, and .50 as a large effect for β.

Data Cleaning

Before conducting the analysis, data were assessed and cleaned. Data were checked manually for key punch mistakes, as well as using frequency plots and spot checking data entry. Following this, the internal consistency of the social cognitive variables was determined. Cronbach's alpha was high for all variables, with .896 for barrier efficacy for exercise (BE), .784 for task efficacy for exercise (TEE), .905 for task efficacy for walking (TEW), .910 for outcome expectations (OEE), and .819 for self regulation (SR). Internal consistency was also determined for all sociocultural factor variables, including the Western Ontario & McMaster Universities Index for Osteoarthritis (WOMAC-pain & WOMAC-physical function subscales), and the Neighbourhood Environment Walkability Scale – Abbreviated (NEWS-A). Internal consistency was high for all variables (. 712, .889, .704, respectively).

Normality of each variable was determined by using a Z-score distribution to identify possible outliers and skewness. An initial investigation for outliers was conducted using frequency plots of Z-score values of each variable, followed by a screening for skewed variables using the skewness statistic. Using Z-score values, variables with values greater than 3.29 and/or a skewness statistic greater than 1.96 were considered problematic (Field, 2005).

All aggregated social cognitive (barrier efficacy for exercise, BE; task efficacy for exercise, TEE; task efficacy for walking, TEW; outcome expectations, OEE & self regulation, SR) and sociocultural factor (WOMAC, NEWS-A) variables were within acceptable range (i.e. Z scores below 3.29, and skewness statistic below 1.96) and were considered to be normally distributed.

The same method was followed for the physical activity variables where Z-score values above 3.29 for outliers and 1.96 for skewness were identified. Of the aggregated PA variables (Godin moderate & vigorous exercise frequency & walking moderate and vigorous frequency), exercise frequency was within acceptable range (i.e. Z score below 3.29, and skewness statistic below 1.96) and was considered to be normally distributed. Walking frequency, however, was positively skewed (2.047), which lead to an investigation into the presence of outliers. Using box plots, two outliers were identified and curbed such that the scores were brought in to equal the highest value within the normal range (Field, 2005), which resulted in a skewness statistic of 1.448.

Descriptive Statistics

Descriptive statistics were performed to obtain participant characteristics for age, gender, height & weight, ethnicity, education, marital status, occupation status, & annual household income. In order to determine if there were significant differences in physical activity behaviour between surgery type (hip vs knee), pre-existing health conditions and demographics, descriptive statistics were assessed using an independent t-test.

Descriptive statistics and correlations between preoperative physical activity behaviour and the SCT constructs were analyzed, followed by multiple hierarchical regression analyses based on the tenets of SCT (Bandura, 1986).

Prediction of Physical Activity and Walking Behaviour

Because the SCT is a mediation-based model and one of the research questions concerned the potential additional variance contributions of sociocultural factors (i.e. pain, physical function and neighbourhood walking environment), we employed the suggestions of Baron & Kenny (1986). Specifically, only variables that correlated with the principle DV (physical activity and walking behaviour) were carried forward in the path model. Due to a limited sample size, and therefore lack of statistical power, this was performed (1) to improve power, (2) to reduce inevitable multicollinearity that would arise from regression PA and walking behaviour on many possible constructs, and (3) because associations with PA and walking behaviour is the critical focus of this research. That is, associations of constructs that do not relate to behaviour do meet the mediation assumption (Baron & Kenny, 1986) and would ultimately be spurious to behaviour change initiatives (Sutton, 2002).

The first regression analyses involved the prediction of physical activity and walking behaviour and the second involved the prediction of self regulation and task efficacy.

To test the effectiveness of the SCT model to predict preoperative physical activity, a series of regression analyses were conducted using only the significant bivariate correlates of PA behaviour. Thus, only those SCT variables that significantly correlated with PA to at least the $p < .10$ level were entered into the regression equation (Barron & Kenny, 1986). The significant correlates of PA behaviour, including self regulation and task efficacy for exercise were entered into the regression in Block 1 using forced entry, followed by pain in Block 2 using forced entry.

A similar procedure was used to explain self regulation and task efficacy; however, barrier efficacy, outcome expectancy, pain, physical function, access, sidewalk condition, neighbourhood surroundings and neighbourhood safety were all entered together at Step 1 using forced entry.

Hierarchical regression was used to examine the independent relationships of the SCT constructs and sociocultural factors (perceived pain, physical function and neighbourhood walking environment) with exercise & walking behaviour. The blocks of variables were entered into the model, in the order listed above, to examine the change in explained variance of exercise and walking behaviour, while controlling for the SCT variables (Cohen, Cohen, West & Aiken, 2003). Hierarchical regression permits a researcher to choose the order in which independent variables or groups of independent variables are entered into a regression analysis, allowing for entry order to reflect the removal of confounding variables and specification of theoretical relevance or causal priority (Cohen, Cohen, West & Aiken, 2003). Specifically, hierarchical regression allows for evaluation of the R^2, partial regression and correlation coefficients for individual or groups of independent variables into a regression analysis in a pre-determined sequence (Cohen, Cohen, West & Aiken, 2003). Hypothesis testing is more appropriately accomplished with forced entry (hierarchical model), especially when specific correlations between variables are already well known. Individual regression coefficients relate to DV variance that is uniquely accounted for by each IV.

For the prediction of walking behaviour, significant correlates (task efficacy for walking) were entered in Block 1 of the regression using forced entry, followed by physical function in Block 2. A similar procedure was used for task efficacy for walking; however, barrier efficacy, outcome expectancy, pain, physical function, access, sidewalk condition, neighbourhood surroundings and neighbourhood safety were all entered together at Step 1 using forced entry.

Mediation analyses

To test for mediation, regression coefficients were determined between the following: (1) the mediator (pain, physical function, access, walkability, surroundings, safety) on the independent variable (IV) (SCT constructs; BE, TEE, TEW, OEE, SR); (2) the dependent variable (DV) (PA or walking behaviour) on the IV; and (3) the DV on both the IV and on the mediator. These three regression equations provide the tests of the associations of the meditational model (Baron & Kenny, 1986).

Moderation analyses

As part of our exploratory analysis, we also investigated the role of sociocultural factors (i.e. pain, physical function and neighbourhood walking environment) as moderators of the PA/walking and social cognitive relationship. Thus, a moderated regression analysis using mean centered values was conducted (Cohen & Cohen, 1983). This was achieved using forced entry of the linear effects variables followed by stepwise entry of any interaction terms in a subsequent block. For all analyses, we set the *p* level at 0.01 to protect against type 1 experimentwise error, due to the exploratory nature of these analyses.

To analyze all possible combinations of the above, 2 separate regressions were conducted. To account for the redundancy of shared variance, all sociocultural variables were analyzed simultaneously. Given the numerous multiple interaction effects, it was deemed necessary to use a data reduction strategy to improve power. Stepwise regression was therefore used at the entry of the interaction terms. Specifically, in the first regression analysis, SCT variables were entered into the regression first using forced entry, neighbourhood walking environment (NEWS-A; access, walking environment, surroundings & safety) were entered into the equation second using forced entry, and the interaction terms (SR x access, SR x walking environment, SR x surroundings, SR x safety, BE x access, BE x walking environment, BE x surroundings, BE x safety, OEE x access, OEE x walking environment, OEE x surroundings, OEE x safety, TEE x access, TEE x walking environment, TEE x surroundings, TEE x safety) were then allowed to enter into the regression equation using stepwise entry. A similar approach was followed for the second regression, where SCT variables were entered into the regression first using forced entry, pain & physical function (WOMAC) variables were entered into the equation second using forced entry, and the interaction terms (SR x pain, SR x physical function, BE x pain, BE x physical function, OEE x pain, OEE x physical function, TEE x pain, TEE x physical function) were then allowed to enter into the regression equation using stepwise entry. Though broad hypotheses have been generated for the study, the analysis of environment, pain & physical function interactions is still an exploratory phase. Stepwise regression allows for all interaction terms to be considered for entry into the regression equation and is an appropriate technique for exploratory analysis (Cohen & Cohen, 1983).

Interaction effects

Finally, interpretation of significant interaction effects used Aiken & West's (1991) suggested procedure of slope analysis, using ModGraph (Jose, 2004) for graphed interaction. Regression slopes within the SCT model for significant interaction effects across neighbourhood environment (NEWS-A), pain & physical function (WOMAC) levels of low (NEWS-A: strongly disagree, disagree; WOMAC: none, slight), and high (NEWS-A: agree, strongly agree; WOMAC: severe, extreme) were used for interpretation.

Chapter Four

Results

Pilot Study

Responses were independently coded by the primary researcher and a research assistant. Congruence was 100% on these beliefs when the two codings were merged. All beliefs were reflected in the measures for the questionnaire used in the main study to predict preoperative PA and walking behaviour before TJR.

Responses generated from the interviews included exercise barriers (pain/arthritis related, safety, time, stairs & financial), ways to overcome barriers (activity, psychological/mental strategies, medication, & communication strategies), positive outcome expectancies of PA (health, psychological, routine, confidence, better recovery after surgery, & weight loss), and negative outcome expectancies (pain & time) (see Table 1). Neighbourhood environment characteristics identified as facilitators were proximity & aesthetics, whereas barriers were hills, sidewalk condition and stairs. The most commonly reported support for PA included family/friends, being independently active, financial support, & dog ownership (see Table 1).

Main Study

Sociodemographic and Physical Activity Characteristics

Although the exact number of individuals attending the JRC-SI and NRGH who were eligible to participate (i.e. were not waiting for primary joint replacement or did not have osteoarthritis) is not available, seventy-eight of the 211 preoperative education attendees who were approached agreed to participate. The mean age of the sample was 69 years (9.11), the majority were female (67%), married (68%) & retired (73%). The average wait time until surgery was 3 months (1.11), and a greater proportion were waiting for total knee replacement (53%). The most commonly reported chronic health conditions included high blood pressure (49%), high cholesterol (35%) and diabetes (18%). Additional demographic, health and physical activity profiles can be found in Table 2.

Results of the independent t-test test showed no differences ($p > .05$) in preoperative physical activity behaviour between surgery type (hip vs knee) and were therefore analyzed together. Further analyses showed that individuals who were considered normal weight (WHO, 1995) (BMI of less than 25, n= 12), $t(74)=2.046$, $p=.044$; of European decent (n=27), $t(65)=1.990$, $p=.05$; previously diagnosed with cancer (n= 13), $t(76)=-2.032$, $p=.05$; and not married (never married, divorced or widowed, n=25), $t(76)=-2.271$, $p=.026$; were significantly less physically active than those considered overweight or obese (WHO, 1995) (BMI of above 25), Caucasian, with no history of cancer, or were married.

Based on the 78 participants enrolled, 35 individuals (45%) were considered active (those who engaged in moderate or vigorous physical activity at least 3 days per week, accumulating at least 30 minutes per day in bouts of 10 minutes or more; mean MVPA frequency=8.03, SD=3.19), whereas the majority (n=43, 55%) of participants exercised less than 3 days per week at a moderate or vigorous intensity (average frequency of MVPA= .744, SD 1.16). Less than 30% of the participants reported that they attended a supervised exercise program lead by a health professional or trained instructor (n=22).

Correlates of Preoperative Physical Activity and Walking Behaviour

Pearson correlation coefficients for the associations between SCT constructs are shown in Table 4. As illustrated, self regulation, task efficacy for exercise and pain were significantly correlated with physical activity at .25 ($p < .05$), .27 ($p < .05$), and -.28 ($p < .01$), respectively. Task efficacy for exercise, task efficacy for walking and physical function was significantly correlated with moderate and vigorous walking frequency at .30 ($p < .01$), .52 ($p < .01$), and -.23($p < .05$), respectively.

Upon further analysis of belief level variables related to both physical activity and walking behaviour, significant correlations were found in variables related to task efficacy, self regulation, and pain (see Table 8). Specifically, positive correlations were found for those who felt they could exercise at an intensity hard enough to increase heart rate (HR) and breathing for 15 minutes (PA=.29, walking=.33), and prioritized their exercise to get it done before other behaviours (PA=.29, walking=.24). Negative associations with physical activity and walking were found for individuals with higher pain when walking on flat surfaces (PA=-.27, walking=-.29).

In relation to physical activity alone, variables related to barrier efficacy, task efficacy, self regulation and pain were identified (see Table 8). Positive correlations were found for individuals who were more confident in their ability to exercise despite the presence of pain (.24), were confident they could exercise on 3 or more days per week at a moderate intensity (.27), who received emotional support from a significant other

(.31), worked out at an exercise facility (.34), and made exercise part of their normal routine (.23). Negative associations with physical activity were found for those who had more pain at night/in bed (-.27).

Correlates associated solely to regular walking behaviour included those related task efficacy and physical function (see Table 8). Specifically, positive associations were found for those with higher confidence to climb 3 flights of stairs without stopping (.41), walk at a leisurely pace for 10 minutes without stopping (.32), walk at a brisk pace for 10 minutes without stopping (.54), and walk for 15 minutes at a level hard enough to cause a large increase in HR and breathing (.57). Negative associations with walking were found for those who had more difficulty ascending & descending stairs and bending to floor (-.29, -.36 &-.25, respectively) (see Table 8).

Prediction of Preoperative Physical Activity & Walking Behaviour

Hierarchical regression analyses were conducted to determine whether the significant correlational SCT constructs were useful for predicting preoperative PA and walking behaviour. Results revealed that self regulation and task efficacy for exercise explained 10% of the variance in physical activity behaviour, $F(2,75)=4.021$, $p < .05$, although neither were significant predictors independently (see Table 5). The addition of WOMAC-Pain ($\beta= -.24$, $p < .05$) to the second block contributed to an additional 5% of the variance in PA behaviour, $F_{change}(1,74)=4.014$, $p < .05$. Furthermore, barrier efficacy ($\beta= .44$, $p<.01$) and outcome expectations ($\beta= .23$, $p < .01$) explained 53% of the variance of task efficacy for exercise, $F(8, 68)= 9.591$, $p < .01$ (see Figure 4).

A second regression analyses was conducted to determine whether the significant correlational SCT constructs were useful for predicting preoperative walking behaviour (see Table 6). Results revealed that task efficacy for walking (β= .52, $p < .001$) explained 27% of the variance in walking behaviour, $F(1,76)=13.848$ ($p < .001$). Furthermore outcome expectations (β= .25, $p < .05$) explained 27% of the variance of task efficacy for walking, $F(8, 68)= 3.091$ ($p < .01$) (see Figure 5).

Mediation Analysis

As a result of the significance of task efficacy for walking on walking behaviour, we examined whether this covariance could be accounted for by physical function. Physical function was the only variable to be viable for this test because it was the only sociocultural factor that was significantly correlated with walking behaviour. The results of this regression are presented in Figure 6 (see Appendix) showing that task efficacy for walking was not mediated by physical function. Sobel test confirmed these findings and showed that the decrease in beta coefficients were not significant (Sobel, 1990).

Moderation Analysis

For the moderator analyses of preoperative PA-SCT relations with pain, physical function and neighbourhood environment (access, walking environment, surroundings, safety), no interaction terms entered into the regression equation in the third block ($p>.05$). One sociocultural factor of the SCT was identified that explained 8% of the variance in walking behaviour. Specifically, physical function ($F_{change}(1,65)=9.480$, $p <.01$) moderated the effect of self efficacy on walking behaviour (see Figure 7).

Discussion

Evidence indicates that increased functional capacity before orthopaedic surgery may positively affect postoperative outcomes (Brown et al., 2009; Fortin et al., 1999), although research testing the effectiveness of prehab programs to date is limited (Barbay, 2009; Ackerman & Bennell, 2004). Indeed, recent reviews of the impact of preoperative exercise programs on postoperative outcomes following lower limb TJR have found only 8 studies between 1993-2008 (Barbay, 2009; Ackerman & Bennel, 2004). Overall findings of these reviews emphasize that the evidence supporting prehabilitation is inconclusive, and research to date is limited due to various design flaws, including small sample sizes, selection bias, and variation in outcome measures used.

One reason for this variability may be from the lack of theoretically based strategies, which have been shown to be effective in other health behaviour change interventions aimed to increase exercise levels (Baranowski et al., 1998; Sallis, 2001). Interventions targeting PA promotion in various chronic disease populations typically focus on the challenges of daily living that are considered to be distinct to certain diseases that may therefore pose unique barriers to PA participation. Experimental studies using theoretically based methods for targeted strategies to promote PA in special population groups have shown support for the use of theoretical approaches for increasing PA participation among special groups (Lorig, Ritter, Laurent, & Fries, 2004; Lorig, Ritter, & Plant, 2005; Kirk et al 2004). For example, Kirk and colleagues (2004) examined the impact of a counselling intervention aimed to increase PA using a transtheoretical framework in a sample of individuals with diabetes. Results of the 12 month trial found that a tailored approach (two, 30 minute counselling sessions based on TTM at baseline and 6 months) was more effective at increasing PA participation compared to receiving standard information.

Additional randomized trials have also found support for the positive impact of exercise behaviour on functional & physical wellbeing and quality of life for individuals with cancer (Courneya, Friedenreich, Sela, et al., 2003) and congestive heart failure (CHF) (Belardinelli, Georgious, Cianci, & Purcaro, 1999). Overall findings from these studies reveal greater improvements in those who exercise when comparing exercise vs. non-exercise control conditions, further highlighting the positive influence of PA on performance in activities related to daily tasks, as well the importance of PA as a means to improve overall health & wellbeing for those with chronic disease. Research examining the antecedents of PA and differences between diseased and non-diseased populations in studies of physical activity to date, however, are limited and have shown mixed results (Rhodes & Blanchard, 2007; Plotnikoff, Brez, & Brunet, 2003; Prapavessis, Maddison, Ruygrok, Bassett, Harper & Gillanders, 2005; Nelson, 1991).

Theoretically based correlational & predictive research in areas such as cardiac rehabilitation (Plotnikoff & Higginbotham, 1998; Johnston, Pollard, Kinmonth, & Mant, 2004), diabetes (Plotnikoff, Brez, & Hotz, 2000; Delahanty, Conroy & Nathan, 2006) and cancer (Courneya & Friedenriech, 1999; Courneya, Keats & Turner, 2000), have identified various correlates related to PA participation, suggesting that tailoring of PA interventions for special populations may be appropriate to address specific areas for chronic disease, although there is considerable variability in this area among PA correlates. For example, Delahanty, Conroy & Nathan (2006) identified specific predictors of PA such as gender, exercise self-efficacy, and activity level in persons with overweight and impaired glucose tolerance (IGT) following a diabetes prevention lifestyle intervention program aimed to increase PA behaviours. The study also highlighted psychological correlates such as depression & anxiety as potential areas for intervention programs designed specifically for individuals with diabetes, overweight and IGT. In addition, a study examining motivation & exercise behaviour in 37 bone marrow transplant patients by Courneya and colleagues (2000) found that although intention and PBC were significant predictors of cycle ergometry, over half of participants reported zero exercise behavior and the authors further suggested that the prediction of exercise could be improved by taking into account relevant medical complications specific to cancer patients that may influence participation.

Given the connection between PA and certain chronic diseases, there is growing need to focus on theory-based studies and interventions for special population groups. Clearly, further examination in both experimental and correlational work is needed in this area in order to increase PA participation. Due to the increasing incidence of chronic disease in Canada, research to identify more effective strategies for health promotion will be an important area to consider in order to address the potential impact of decreasing PA levels in individuals with chronic health conditions.

This study advances the literature on preoperative exercise and walking behaviour for individuals waiting for TJR by applying a belief-based SCT model to identify potentially important environmental, belief & OA specific targets for intervention. To our knowledge, this is also one of the first studies to test all constructs of the SCT model, including barrier & task self efficacy, self regulation, outcome expectations & sociocultural factors (pain, physical function & neighbourhood environment) in the physical activity domain (Plotnikoff, Lippke, Courneya & Birkett, 2008). Prior research with SCT and physical activity for individuals with OA had not focused specifically on the preoperative phase before TJR surgery or had not used a comprehensive model (i.e. using all SCT constructs) to predict behaviour.

Prediction of Preoperative Physical Activity

Our purpose in this study was to determine the effectiveness of the SCT in predicting preoperative PA and walking behaviour in a group of individuals waiting for TJR. Findings of this study revealed that the SCT showed modest capability in predicting preoperative PA while controlling for pain, physical function and neighbourhood walking environment. Our first hypothesis of the direct effect of barrier efficacy (BE), task efficacy (TE) and self regulation (SR) on PA was partially supported by the SCT model, as a small portion of PA behaviour was explained by SR & TE (10%), although neither was significant independently. According to Baronowski and colleagues (1998), support for intervention work should be substantiated through the ability of a theoretical model to account for at least 30% of the explained variance in order to be considered effective in predicting PA behaviour. Using this guideline, an R^2 value of .10 would be considered low; therefore, the SCT was not an appropriate model for predicting preoperative PA and walking before TJR in this study. The large amount of unexplained variance demonstrates that physical activity is a complex behaviour for individuals waiting for TJR, and additional variables may reveal important relationships.

As the results from this study do not support the SCT as a viable model to predict PA behaviour for this group, findings suggest further examination of the role of variables specific to individuals waiting for TJR & their influence on PA behaviour, efficacy levels, self regulation & outcome expectancies. Broadening the SCT model to look outside the main constructs (SE, OE, & SR) to include variables such as those related to mental health, pain management, personality and past experience, for example, may be efficacious for future studies to predict preoperative PA behaviour.

In addition, looking more closely within the SCT constructs to identify & examine variables which are more specific to preoperative PA behaviour for individuals waiting for TJR may also increase the potential to explain behaviour. Although the results of the preceding pilot work validated the items used in the main study, additional variables that reflect more detailed characteristics associated with OA pain and disease management may be needed in order to identify key areas related to preoperative PA.

Another area to consider may also be the potential for measurement error, as value judgments towards PA may be more variable for people with chronic disease in comparison to the general populace. Fluctuations in disease symptoms, treatments & medications and the resulting influence on behaviour may be reflected differently from day to day, or even hour to hour for special population groups, thus proximal affective states may not be as stable when attempting to predict behaviour.

Our findings differ from other studies in which barrier self efficacy, self regulation and outcome expectations have demonstrated independent significance in predicting regular exercise behaviour in younger populations (Petosa, et al, 2003; Winters et al., 2003). Most theoretically based studies with older adults focus on self efficacy or partial SCT models (Baranowski, 1990). Although findings from related work indicate that using partial models with SE as the main predictor of may be more effective in predicting behaviour, using this approach would not appear to be useful for individuals waiting for TJR, as SE failed to be significantly related at a correlational level. Indeed, Bandura (2004) suggests that behaviour is changed not only via self efficacy, but also through a combination of motivational & self regulatory strategies, further suggesting additional mechanisms for influencing behaviour should be considered.

From a conceptual level, SCT identifies self regulation as a determinant of behaviour and a key component upon which behavioural enactment occurs (Bandura, 2004). In fact, a recent review of PA interventions identified self regulation as the most common strategy used to promote increased PA behaviour in adults (Rhodes & Pfaeffli, in press). In line with the theoretical foundations of SCT, self-regulation functions as a central component of causal processes, and not only acts to mediate the effects of external influences of behaviour, but provides the basis for purposeful action (Bandura, 1991).

According to Bandura (1991), human behaviour is regulated by forethought, and through this people are motivated to guide their actions in a proactive manner. Further, as people form beliefs about their abilities, they anticipate likely consequences of future actions, subsequently set goals for themselves, and plan courses of action that are likely to produce desired outcomes (Bandura, 1991).

Although self regulation did not independently predict PA in this study, our findings suggest that self regulation & task efficacy play a key role within the SCT framework when considering preoperative exercise. This implies that motivation for preoperative PA may be influenced by the level of individual confidence towards the performance of specific exercise activities, as well as the extent to which strategies to support the regular participation in those activities are used.

Explanations for why self regulation was a significant predictor of PA in this study are supported in related research with older adults. For example, in a study of 98 seniors (>60 years), Umstattd & Hallam (2007) examined whether self efficacy, self-regulation and outcome expectancy predicted exercise behaviour, where self-regulation was the only variable independently associated with regular exercise. A related study by Hallam & Petosa (2004) found that SR was the only SCT variable to mediate exercise behaviour in an intervention examining the ability of a program to affect change in SCT variables and exercise in middle-aged adults. Both of these studies highlight the importance of self-regulation in predicting exercise or exercise change, and the lesser importance of outcome expectancy when both self efficacy and self regulation are accounted for in a multivariate model (Umstattd, 2007).

As conceptualized in social cognitive theory, outcome expectations are an individual's belief that performing a behaviour will yield specific consequences (Bandura, 1986). As expected, outcome expectancy was not a significant predictor of exercise before TJR in this study. One potential reason for the insignificant effect of outcome expectations on exercise behaviour can be explained via the framework of SCT; according to which outcome expectancy is theorized to be strongly related to self-efficacy beliefs (Bandura, 1997). As a result, if self-efficacy does not predict exercise behaviour, as observed in our results, then theoretically, it would seem likely that outcome expectations would not predict behaviour either.

Due to the frequent promotion of the benefits of health behaviours in popular media, it is also possible that beliefs towards these benefits have become commonly accepted amongst the general populace, but may not necessarily be related to one's actual level of PA participation. Our unsupported results of outcome expectancy are consistent with related studies (Rovniak et al., 2002; Brown & Conn, 1995; Conn, 1998), and is also consistent with Bandura's (1986) suggestion that self-efficacy is a stronger predictor of behaviour.

It was interesting to find outcome expectancy was the sole predictor of self regulation in this study, suggesting that the degree to which an individual uses self regulatory strategies for PA behaviours is influenced by the perceived outcomes towards PA participation. That is, those with higher or more positive expectancies of partaking in PA may be more inclined to utilize strategies such as goal setting & prioritizing to facilitate their behaviour.

According to Bandura (1991), human functioning is regulated by the interplay of self-generated and external sources of influence, therefore if expected outcomes of a behaviour are positive, motivation towards employing techniques to support these outcomes would also be expected, and vice versa. Although self efficacy has also been shown to be an important precursor to self regulation (Anderson et al., 2006), findings from this study were not supportive. Thus, the use of self regulatory strategies for PA in older adults waiting for TJR may have less to do with perceived confidence in one's ability to perform PA behaviour but instead with the expected outcomes associated with the behaviour.

Interestingly, we found the only efficacy variable related to exercise behaviour was task efficacy, whereas barrier self efficacy was not. Explanations why barrier efficacy was not a significant predictor of PA in this study may be due to the fact that the symptoms of various chronic diseases such as OA might influence the decision-making processes towards PA at an individual level, regardless of external barriers to behaviour. Considering the possible impact of unique barriers to physical activity among special population groups (i.e. pain), it stands to reason that one's level of PA engagement could be influenced by perceived confidence towards the actual performance of specific tasks related to an activity, and less with having confidence to overcome barriers to activity such as bad weather or time constraints.

Notably, these results demonstrate the importance of using separate measures of self efficacy, as task efficacy was a better predictor of PA behaviour than barrier efficacy for this group. This finding has also been found in related studies with special populations (Rogers et al., 2005; Blanchard et al., 2002, 2007), suggesting that task performance is an important aspect of self efficacy to be considered in future studies and interventions for individual's waiting for TJR. As many health promotion materials focus on the potential benefits of exercise & how to overcome barriers to being physically active, these findings suggest that materials and programs aimed to increase PA for individuals waiting for TJR should redirect their emphasis. For this population, a stronger emphasis on enhancing task efficacy could result in important PA behaviour changes.

As outlined by SCT, improving personal efficacy is dependent on exposure to several sources: (a) performance accomplishments, (b) vicarious experience, (c) social persuasion, and (d) physiological states (Bandura, 1998). According to Bandura (1998), performance accomplishments & vicarious experience are more successful modes to improve levels of personal efficacy.

Research has shown that past & present accomplishments, or mastery experiences, are the most reliable and effective source of efficacy information because they provide a direct demonstration of the individual's current level of skill (Bandura, 1998). To increase the likelihood of achieving early success with PA, it may be therefore beneficial to promote PA at an easily mastered intensity & frequency to begin with, then slowly progress the activity to the desired level over time.

From a practical perspective, interventions for enhancing task efficacy towards increased levels of PA before total joint replacement should therefore provide an opportunity for individuals to experience improvement in their perceived ability to perform PA safely & successfully, thus building confidence to promote further participation. For example, a program to increase PA could be specifically tailored to begin at a duration (i.e. 5 minutes), intensity (i.e. low/moderate), and/or frequency (i.e.

two bouts per week) that a participant felt confident to complete within their physical capability, then slowly progress each week by either by increasing the duration (i.e. increase from 5 minutes to 6 minutes), intensity (i.e. increase from low to moderate intensity by increasing the pace or difficulty of exercise) or frequency (i.e. increase from 2 to 3 bouts per week) once confident to safely do so. An approach such as this would allow individuals to experience the benefit of repeated, incremental performance accomplishments in order to build confidence.

Observing the successful behaviour of others delivers information about task demand, or vicarious experiences, is also considered to be a powerful efficacy enhancing strategy (Bandura, 1998). This is especially effective when individuals can observe the success of someone they perceive as being of equal ability to themselves, as this increases a sense of personal connection & desire to emulate that success. For example, increasing vicarious experiences in an exercise program could be achieved through peer teaching, as this would demonstrate an attainable level of achievement among participants of similar ability, as well as increasing personal connections through sharing individual experience & knowledge.

As our findings support the importance of task efficacy, using strategies to improve personal efficacy for specific activities within individual capabilities, rather than focusing on how to overcome barriers may be beneficial for this group. In other words, tailoring programs to peoples' abilities & focusing on what people can do instead of what they are unable to do may be advantageous in order to promote activity before TJR.

Pain

Our secondary analysis (block 2) for PA involved the addition of pain into the regression equation to predict behaviour. Interestingly, once added, pain became the sole predictor of PA, although the amount of explained variance still remained low (14%). Because neither self regulation nor task efficacy were independent predictors of PA, potential mediation analyses of pain on the relationship between self regulation, task efficacy and PA were not appropriate (Baron & Kenny, 1986).

Possible reasons why pain could not be accounted for by the SCT model to predict behaviour in this study can be explained through the SCT theoretical framework. As shown in Figure 1, facilitators & impediments to behaviour are theorized to be influenced by self efficacy and exert their effect on behavioural outcomes via self regulation (Bandura, 1998). Using this model, pain, as an impediment to behaviour, is not hypothesized to have a direct effect on PA behaviour, but rather influences the extent to which individuals use self regulatory strategies to promote PA behaviour. This view assumes that one's level of pain dictates the degree to which strategies such as goal setting and prioritizing to promote PA participation are utilized. Findings from this study, however, conversely suggest the possibility of an independent effect of pain on efficacy beliefs and behaviour, and support the notion that pain directly impacts PA participation levels before TJR.

Due to the finding that pain remained a significant predictor of preoperative PA suggests that our results may, in fact, challenge the SCT structural model used in this study (Figure 2). Based on our findings, pain may in fact have a direct influence on behaviour, or may do so by influencing efficacy beliefs or outcome expectancies. Further, considering pain as a bodily state and potential antecedent to behaviour, as outlined by Bandura (1986), self-efficacy may serve as a potential mediator for the relationship between pain and preoperative PA. Taking this into consideration, future studies should look at sources of efficacy specific to individuals waiting for TJR, as these may reflect a more comprehensive model for predicting behaviour.

The significance of pain in this study is in line with related research that has evaluated its impact on physical function for individuals with OA. For example, longitudinal study of 184 community-dwelling seniors by Machado and colleagues (2008), found the severity of physical (pain, stiffness and fatigue) & psychological (depressive) symptoms of OA was associated with greater restrictions in everyday activities. In a related study (Focht et al,. 2005), self efficacy and pain were identified as partial mediators of the beneficial effect of an exercise & weight loss intervention aimed to improve mobility in a group of older adults with knee OA. Given that the majority of individuals waiting for TJR are at the end stages of the OA disease progression, the challenge of being physically active in the face of debilitating pain and discomfort would certainly be a difficult task. Thus, our findings supporting the impact of pain on physical activity and walking behaviour are understandable.

Based on these results, programs aimed to promote preoperative PA for individuals waiting for TJR may be more effective if they incorporate & foster the use of self regulatory & pain management skills to address of the symptoms related to OA and

TJR. From a practical perspective, facilitating collaborative relationships & partnerships within existing programs and consulting with health professionals who deal with chronic disease management to integrate community services may be prudent. From a theoretical standpoint these results highlight the impact of variables specific to individuals waiting for TJR, such as pain, and their effect on the causal pathways of behaviour using a SCT model. In addition, our findings further suggest that testing additional theoretical models that include pain to examine preoperative PA before TJR is warranted.

Prediction of Preoperative Walking

Walking is considered to be an ideal physical activity for patients with OA because it is a low-impact activity that is tolerated well by those whose overall health status may be compromised (Allegrante, 1993). A recent review of the efficacy of walking and strengthening programs have shown that both have demonstrated improvements in functional status without increasing pain symptoms or medication use for individuals with OA (Roddy et al., 2005).

In a six month recall of past PA, walking was the highest reported form of PA in this study, with almost a third of participants (29%) reporting walking as their primary form of activity (see Table 1). In line with other research supporting the prevalence of walking among older adults (CFLRI, 2003), these findings support our secondary analysis to examine walking behavior before TJR. For the prediction of preoperative walking, task efficacy was the sole predictor and explained 26% of the variance in behavior. Similar to findings by Maly & colleagues (2007), efficacy directed towards specific tasks related to walking (i.e. “I can walk at a brisk pace for 10 minutes without stopping”) predicted walking behaviour. This finding provides additional support for the importance of task efficacy for preoperative PA and further highlights the concept that exercise, including walking, is greatly influenced by efficacy beliefs towards the performance of specific tasks for individuals waiting for TJR. Further analyses for potential mediation of physical function on task efficacy for the prediction of walking behaviour, however, were not significant.

From a practical point of view, this is an important consideration when designing interventions to promote physical activity participation for older adults waiting for TJR. As already discussed, the focus of most information attempting to increase PA emphasizes the health benefits of being physically active & how to overcome barriers to exercise. Our findings, however, suggest that strategies to improve interventions for people waiting for TJR could be attained by targeting confidence levels towards specific tasks associated with the desired exercise behaviour.

Mediation Analyses

Due to the unsupported independent effect of barrier efficacy on PA, our second hypothesis of self regulation mediating the relationship between BE and PA behavior was not supported. As noted above, this finding is contrary to related research predicting behaviour in young adults (Rovniak et al,. 2002), again, suggesting that factors other than barrier efficacy towards exercise play an important role in predicting PA participation in this group.

Moderation of Self Efficacy by Physical Function

Our final hypotheses examining potential moderation of pain, physical function and walking environment on the SCT and PA relationship was partially supported in this study. Our findings in this area were, for the most part, invariant to moderators, as we found that access, walkability, surroundings, safety and pain were not significant moderators of the SCT/PA and walking relationship. A significant interaction was found, however, between barrier efficacy and physical function in relation to walking behaviour. Our results showed that individuals who were more confident in their ability to be active in the face of barriers and walked more had less difficulty in performing daily tasks in comparison to those with less confidence in their ability to be active despite certain barriers (see Figure 4). As highlighted with these results, it may be prudent to consider how the symptoms of OA impact how individuals' function in activities of daily living, as this may also reflect their confidence towards & participation in PA before surgery.

Neighbourhood Environment

Research on the influence of environmental factors on physical activity has grown significantly in the past decade, and continues to be an area of debate in many population groups. Factors within the environment such as access to services, land-use mix, residential density, neighbourhood aesthetics, quality of footpaths, safety, and traffic has related individual participation in physical activity (King, Brach, Belle, Killingsworth, Fenton, Kriska, 2003).

Although recent studies examining the associations between neighbourhood characteristics and activity patterns in older adults support a relationship between the built environment and PA, our findings did not support a significant association between perceived neighbourhood walkability and preoperative PA or walking behaviour before TJR. These results further support the notion that PA is a complex behaviour for individuals waiting for TJR, and suggest that PA participation before TJR may influenced to a greater extent by internal factors such as pain, and to a lesser extent by environmental or barrier related factors.

According to Bandura (1999), some aspects of the physical and social environment may influence individuals whether they like it or not, but features of the environment may not function as an influence until they are triggered by the appropriate behaviour. An example that is relevant for individuals waiting for TJR would be whether the absence or presence of hills in one's neighbourhood has an impact on walking behaviour. In theory, this would seem a logical question to ask, assuming that the individual's normal activity patterns & level of ability enable them to be active in their neighbourhood. But what if, for instance, the person didn't walk in their neighbourhood (i.e. went to another location such as a mall or park), or wasn't physically able to walk more than 50 meters without experiencing unbearable pain? In this case, would seem that the absence or presence of hills in the neighbourhood may be irrelevant in relation to its impact on walking behaviour.

These findings are contrary to related work by Rhodes and colleagues (2006) examining the moderation of environmental characteristics on walking behavior among adults using a TPB framework. Results of this study found that recreation land-use mix moderated the intention-behaviour relationship for walking behaviour, as this relationship was greater for those with closer perceived access to recreation facilities.

As our findings did not reveal any significant neighbourhood environment and social cognitive relationships for preoperative PA before TJR, it may be important to target individual as well as environmental factors, and consider designing programs suited to address variables such as perceived pain & physical function when deigning effective strategies to promote PA before TJR.

Physical Activity and Walking Correlates

As noted above, self regulation, task efficacy for exercise and pain were the only SCT constructs significantly correlated with preoperative PA behaviour; whereas task efficacy for exercise & walking, and physical function were associated specifically with preoperative walking. These findings differ from other studies that have used the SCT to predict behaviour in older adults where barrier efficacy and outcome expectancies were significant correlates with exercise (Umstattd, 2007; Umstattd, 2006; Resnick & Nigg, 2003). At the belief level, our analysis of significant correlates of PA revealed that variables related to task efficacy, self regulation, and pain were associated with physical activity and walking behaviour. Specifically, a positive relationship between increased levels of confidence towards exercising at a moderate intensity for 15 minutes, and using prioritizing strategies for exercise behaviours was associated with preoperative PA and walking; whereas higher pain scores for walking on flat surfaces was negatively associated with physical activity and walking behaviour (see Table 9). These findings are useful for future research & health care professionals designing potential interventions to increase preoperative activity, and suggest that targeting these areas may be effective for promoting exercise behaviour for those waiting for TJR.

Implications for further Research

Analysis of belief-level targets for preoperative physical activity and walking in this study suggest that a focus on promoting the use of self regulatory strategies and increasing task efficacy, and addressing pain & physical function limitations would be prudent. By contrast, focusing solely on increasing barrier self efficacy for PA may result in limited behaviour change. Further research to examine how these findings can be used to design strategies in these specific areas to enhance performance and planning in relation to preoperative physical activity initiatives for individuals waiting for joint replacement is warranted.

Limitations

Although the present study offers important insights in the prediction of physical activity behaviour before total joint replacement, several limitations should be considered when interpreting the findings and planning future research. First, because we used a convenience sample rather than randomly selecting participants, generalizability of the results is limited. A second limitation of this study is that causal relationships between the outcome and explanatory variables cannot be determined because of the cross-sectional research design. Third, a self-report measure, although shown to be reliable and valid in other studies, was used rather than objective measurement. Recall bias is a potential limitation of self-reported exercise as an estimation of activity. Future studies should incorporate an objective measure of exercise to verify the accuracy of any self-report measures used. Also, the questionnaire battery used in this study was substantial in length (e.g. approx 100 items), which could lead to participant fatigue, especially in an older adult population.

Additional areas specific to this population that were not taken into consideration in this study include variables such as the depression, anxiety & coping strategies in relation to PE behaviour before TJR. As related studies support these areas as potential determinants of behaviour, including these variables for future research may provide additional information to predict & explain preoperative exercise for individuals with OA.

Conclusion

To our knowledge, this study was the first to attempt an integration of the social cognitive, pain, physical function and perceived neighbourhood environment to predict PE and walking behaviour in individuals waiting for total joint replacement surgery. The results of this study provide important preliminary evidence to support the importance of considering individual factors when attempting to predict PE behaviours in this population. Findings from this study suggest significant differences in barrier efficacy, task efficacy, outcome expectancy and self regulatory values for older adults waiting for TJR in comparison to other populations. Multivariate analyses suggest, however, that after controlling for all SCT constructs, neighbourhood environment, pain, and physical function, task efficacy and self regulation were the only SCT constructs related to regular PE and walking behaviour. Our results compliment prior work in this domain, further supporting the premise that unique barriers and circumstances are present due to specific symptoms of chronic diseases such as OA. Thus, considering these aspects in order to increase the effectiveness of tailored interventions to promote PE in this group is advocated. Further research needs to (a) be prospective, include a larger sample, and use random sampling to increase generalizability; (b) use objective measures for PE; and (c) test other theoretical models for their effectiveness to predict PE.

Given the paucity of research, assessing the impact of the variables included in this study to explain exercise behaviour in individuals waiting for TJR and the exploratory nature of this study, it is difficult to conclude specifically why barrier efficacy and outcome expectancy values were insignificant in the multivariate model predicting preoperative exercise. It is possible that further research examining relationship of additional variables would better predict exercise behaviour.

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Appendix

APPENDIX A: Belief Elicitation Interview Questions

SELF-EFFICACY

1. Are you confident in your ability to participate in physical activity before surgery?
2. Describe the factors that influence your confidence in participating in physical activity and/or an exercise program before total joint replacement.
3. Describe the most common barriers to physical activity and exercise you have experienced over the past year.
4. How do you think you can overcome the barriers you experience to preoperative exercise and physical activity?

OUTCOME EXPECTATIONS

1. In what ways do you feel physical activity will have a positive impact before surgery?
2. In what ways do you feel physical activity will have a negative impact before surgery?
3. Have you set any goals for physical activity before surgery?
4. What are they? (physical activity goals)

SOCIAL ECOLOGICAL

1. What aspects of your neighborhood help you to be physically active?
2. What aspects of your neighborhood are barriers to your activity levels?
3. What aspects of physical activity do you enjoy?
4. In what ways to you feel supported to participate in physical activity?

PHYSICAL ACTIVITY

Godin Leisure-Time Exercise Questionnaire

1. During a typical 7-Day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number).

Times Per Week

a) STRENUOUS EXERCISE
(HEART BEATS RAPIDLY) ____________
(e.g., running, jogging, hockey, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE ____________
(NOT EXHAUSTING)
(e.g., fast walking, baseball, tennis, easy bicycling, badminton, easy swimming, dancing)

c) MILD EXERCISE ____________
(MINIMAL EFFORT)
(e.g., yoga, bowling, horseshoes, golf, easy walking)

DEMOGRAPHICS

1. What is your age?
2. What is your current marital status? (single, married/commonlaw)
3. What is your current annual family income? (20,000 or less, 20-60,000, 60,000 to 100,00, over 100,00)
4. What joint are you having total replacement surgery for?

APPENDIX B: Preoperative Physical Activity Questionnaire

University
of Victoria

Preoperative Physical Activity Questionnaire
Bonnie Fiala, BSc, MA Candidate, University of Victoria

Instructions:

In this survey, we are going to ask you a series of questions about your beliefs and attitudes towards regular exercise before total joint replacement surgery, different strategies to facilitate physical activity behavior, the impact of osteoarthritis on physical function, as well as your current physical activity levels and neighborhood environment. There are no right or wrong answers and all we ask is that you provide responses that are as honest and accurate as possible. The questionnaire should take about 15-20 minutes for you to complete. All responses are completely confidential and will never be used in any way that could link them to you. If you have any questions, please feel free to contact me at the below address.

If you have any questions about completing the questionnaire, please call **Bonnie Fiala (250) 661-4002** or email **fialab@uvic.ca**.

Behavioural
Medicine
Laboratory
UVic

For this questionnaire, exercise is defined as any activity that requires physical exertion when performed at a moderate intensity, on 3 or more days per week, accumulating at least 30 minutes each day in bouts as short as 10 minutes**. Please consider this definition when answering the following questions.**

Part A: Self-Efficacy for Exercise

For this first set of questions, please think about how you feel about your ability to continue to exercise in the face of barriers.

If you really wanted to, how confident are you that you could exercise if:	**Not Confident**									**Very Confident**
The weather was bothering you	1	2	3	4	5	6	7	8	9	10
You did not have access to a fitness/recreation facility	1	2	3	4	5	6	7	8	9	10
You felt pain when exercising	1	2	3	4	5	6	7	8	9	10
You had to exercise alone	1	2	3	4	5	6	7	8	9	10
You felt unsafe	1	2	3	4	5	6	7	8	9	10
You were too busy with other activities	1	2	3	4	5	6	7	8	9	10
You felt you didn't have sufficient knowledge to exercise correctly	1	2	3	4	5	6	7	8	9	10
You felt depressed	1	2	3	4	5	6	7	8	9	10

Part B: Task Efficacy for Exercise

For the next set of questions, please think about your confidence to perform the activities described.

Please rate your confidence in performing the following activities:	**Not Confident**									**Very Confident**
I can exercise on 3 or more days per week at a moderate intensity	1	2	3	4	5	6	7	8	9	10
I can accumulate at least 30 minutes of exercise on the days that I exercise	1	2	3	4	5	6	7	8	9	10

I can climb three flights of stairs without stopping	1	2	3	4	5	6	7	8	9	10
I can exercise for 15 minutes at a level hard enough to cause a large increase in heart rate and breathing	1	2	3	4	5	6	7	8	9	10

Part C: Task Efficacy for Walking

For this set of questions, please think about your confidence to perform the activities described.

Please rate your confidence in performing the following activities:	**Not Confident**									**Very Confident**
I can walk at a leisurely pace for 10 minutes without stopping	1	2	3	4	5	6	7	8	9	10
I can walk at a brisk pace for 10 minutes without stopping	1	2	3	4	5	6	7	8	9	10
I can walk for 15 minutes at a level hard enough to cause a large increase in heart rate and breathing	1	2	3	4	5	6	7	8	9	10

Part D: Self-Management

Please rate the items which best characterize the strategies used when exercising over the past 2 weeks.	**Never** **0**	**Infrequently** **1**	**Most of the time** **2**	**Always** **3**
Self-Monitoring ***Maintaining records of your exercise behaviour***				
I mentally noted my exercise behaviour	0	1	2	3
I wrote down notes about my exercise behaviour on a log, diary, or chart	0	1	2	3
Goal Setting ***Establishing measureable goals and objectives to promote compliance to an exercise program***				
I set exercise goals	0	1	2	3
I set both long term and short term goals for my exercise program	0	1	2	3

<u>Behavioural Cues</u> ***Placement of reminders to prompt exercise behaviour***				
I left exercise equipment out to remind me to exercise	0	1	2	3
I use prompts to remind myself to exercise	0	1	2	3
<u>Social Support</u> ***Asking for or receiving support from significant others to assist your exercise program***				
I exercised with a significant other	0	1	2	3
I received emotional support from a significant other for my exercise behaviour	0	1	2	3
<u>Environmental Aids</u> ***Using active manipulation of one's environment or resources to support exercise behaviour***				
I used home exercise equipment	0	1	2	3
I worked out at an exercise facility	0	1	2	3
<u>Education</u> ***Obtaining information to provide motivation to achieve exercise objectives***				
I obtained exercise information to facilitate my exercise behaviour	0	1	2	3
I obtained an exercise prescription from a health professional	0	1	2	3
<u>Modelling</u> ***Asking others for exercise advice or demonstration of exercise behaviour***				
I asked a peer for advice or demonstration of exercise behaviour	0	1	2	3
I asked a health professional for advice or demonstration of exercise behaviour	0	1	2	3

Part D: Self-Management, continued

Please rate the items which best characterize the strategies used when exercising <u>over the past 2 weeks.</u>	**Never** **0**	**Infrequently** **1**	**Most of the time** **2**	**Always** **3**
<u>Reinforcement</u> ***Establishing rewards depending upon attainment of exercise objectives***				
I rewarded myself for my exercise behaviour	0	1	2	3
I prioritized my exercise so that I could get it done before other behaviours	0	1	2	3

<u>Compatible Habits</u> ***Use of other enjoyable activities which can be done in unison with exercise***				
I listened to music while I exercised	0	1	2	3
I watched television while I exercised	0	1	2	3
I socialized with others while I exercised	0	1	2	3
<u>Time Management</u> ***Scheduling specific time periods to exercise***				
I made my exercise behaviour part of my normal routine	0	1	2	3
I wrote down specific time periods for my exercise behaviour	0	1	2	3
<u>Relapse Prevention</u> ***Systematic planning to address perceived barriers to exercise program***				
I thought about ways to overcome barriers to my exercise behaviour	0	1	2	3
<u>Behavioural Contracting</u> ***The use of a formal or informal agreement with yourself or others to promote adherence to exercise***				

I set an agreement to exercise with myself or others	0	1	2	3

Part E: Outcome Expectations for Exercise

For these next questions, please rate the following outcomes you perceive when you participate in physical exercise.					
Exercise…	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Makes me feel better physically	1	2	3	4	5
Makes my mood better in general	1	2	3	4	5
Helps me feel less tired	1	2	3	4	5
Helps to decrease my stress	1	2	3	4	5
Makes my muscles stronger	1	2	3	4	5
Is an activity I enjoy doing	1	2	3	4	5
Gives me a sense of personal accomplishment	1	2	3	4	5
Makes me more alert mentally	1	2	3	4	5
Improves my endurance in performing my daily activities	1	2	3	4	5
Helps to strengthen my bones	1	2	3	4	5

Part F: The Western Ontario and McMaster Universities Index of Osteoarthritis (WOMAC)

For these next questions, please think about how osteoarthritis of your knee or hip impacts daily activities.					
How much pain do you have during the following activities?	**None**	**Slight**	**Moderate**	**Severe**	**Extreme**
Walking on a flat surface	0	1	2	3	4
Going up or down stairs	0	1	2	3	4
At night or while in bed	0	1	2	3	4

Sitting or lying	0	1	2	3	4
Standing upright	0	1	2	3	4

Part F: WOMAC, continued

What degree of difficulty do you have with the following activities?	None	Slight	Moderate	Severe	Extreme
Descending stairs	0	1	2	3	4
Ascending stairs	0	1	2	3	4
Rising from sitting	0	1	2	3	4
Standing	0	1	2	3	4
Bending to floor	0	1	2	3	4
Walking on flat	0	1	2	3	4
Getting in or out of car	0	1	2	3	4
Going shopping	0	1	2	3	4
Putting on socks	0	1	2	3	4
Rising from bed	0	1	2	3	4
Taking off socks	0	1	2	3	4
Lying in bed	0	1	2	3	4
Sitting	0	1	2	3	4
Getting on or off toilet	0	1	2	3	4
Getting in/out of bath	0	1	2	3	4
Heavy domestic duties	0	1	2	3	4
Light domestic duties	0	1	2	3	4

Part G: Neighbourhood Environment Walkability Scale-Abbreviated (NEWS-A)

Please circle the answer that best applies to you and your neighbourhood. Both local and within walking distance mean ***within a 10-15 minute walk*** *from your home.*

Access to Services	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
Stores are within easy walking distance of my home	1	2	3	4
Parking is difficult in local shopping areas	1	2	3	4
There are many places to go within easy walking distance from my home	1	2	3	4
It is easy to walk to a bus stop from my home	1	2	3	4
The streets in my neighbourhood are hilly, making my neighbourhood difficult to walk in	1	2	3	4
There are many barriers to walking in my local area that make it hard to get from place to place (e.g. freeways, rivers)	1	2	3	4
Places for walking	**Strongly Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**
There are sidewalks on most streets in my neighbourhood	1	2	3	4
Sidewalks are separated from traffic in my neighbourhood by parked cars and/or a grass strip	1	2	3	4
Neighbourhood surroundings	**Strongly Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**
There are many interesting things to look at while walking in my neighbourhood	1	2	3	4
There are many attractive natural sights in my neighbourhood (such as landscaping, views)	1	2	3	4
Neighbourhood safety	**Strongly Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**
The amount of traffic along the street I live on makes it difficult or unpleasant to walk in my neighbourhood	1	2	3	4
There are crosswalks and pedestrian signals to help walkers cross busy streets in my	1	2	3	4

neighbourhood				
The crime rate in my neighbourhood makes it unsafe to go on walks	1	2	3	4
The condition of the sidewalks makes it unsafe to walk in my neighbourhood	1	2	3	4

Part H: Preoperative Walking

During a typical **7-Day period (one week)**, how many times on the average do you walk for **more than 10 minutes** during your free time?
(Write on each line the appropriate number)

Walking Intensity	**Times Per Week**	**Average Duration (minutes)**
Vigorous Walking Fast pace, steep incline -heart beats rapidly, breathing heavily	____.	____.
Moderate Walking Brisk pace, rolling hills -not exhausting	____.	____.
Mild Walking Slow or leisurely pace -minimal effort	____.	____.

During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular walking **long enough to work up a sweat**
(heart beats rapidly)?

□Often □Sometimes □Never/Rarely

Part I: Godin Leisure-Time Exercise Questionnaire

During a typical **7-Day period (a week)**, how many times on the average do you do the following kinds of exercise for **more than 10 minutes** during your free time (write on each line the appropriate number).

Activity	Times Per Week
Strenuous Exercise -heart beats rapidly (e.g., running, jogging, vigorous swimming, vigorous long distance bicycling)	____________.
Moderate Exercise -not exhausting (e.g., fast walking, easy swimming, tennis, easy bicycling, dancing)	____________.
Mild Exercise -minimal effort (e.g., easy walking yoga, bowling, golf,)	____________.

During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)?

□Often □Sometimes □Never/Rarely

Do you attend an exercise program that is **supervised by a health professional or trained instructor?** □Yes □No

Recent Physical Activity Recall:

Please describe the physical activities that you have participated in **over the past 6 months**, as well as **how often** you would normally participate in them: (E.g. swimming for 30 minutes, 3 days per week for 2 months)

____

____

____

Part J: Demographic Information

Age:_______ Gender: □Male □ Female

Height:_______(please specify □cm □inches) Weight:________(please specify □kg □lbs)

Ethnicity:____________________

For the questions below, please place a check beside the answer that best describes you:

What is the highest level of education you have completed?

□8th Grade or less □Vocational School or some College

□Some High School □College Degree

□High School Diploma □Professional or Graduate Degree

What is your current marital status?

□Never married

□Married/Common Law

□Separated/Divorced/Widowed

What is your current job situation (please check the one that fits you best)

□Homemaker □Paid Part-time Employment

□Retired □Paid Full-time Employment

□Temporarily Unemployed

What is your annual household income?

□$20,000 or less □$20,001 to $60,000

□ $60,001 to $100,000 □More than $100,001

Part K: Health Information

Please check the appropriate answer	Yes	No
Do you currently smoke cigarettes? If yes, how many do you usually smoke per day? __________		
Have you ever smoked?		
Has a close blood relative (e.g. parent, brother, sister) ever had heart disease (e.g. heart attack, stroke, angina) before the age of 60?		

Part K: Health Information, continued

Has a doctor or nurse ever told you that you have/had the following:

(Please check all that apply)

□Angina □High Blood Pressure □Other (please specify below)

□Heart Attack □Cancer _________________

□Stroke □Diabetes (please specify below)

□High Blood Cholesterol □Type I □Type II □Gestational

In general, compared to other persons your age, how would you rate your health?

□Poor □Very Good

□Fair □Excellent

□Good

What joint are you having total joint replacement for?

□Total Hip Replacement

□Total Knee Replacement

When is your surgery date? _________________________

Do you currently use a walking aid (i.e. cane, walker, etc.)

If yes, please specify:___________________________

Please provide your contact information in the event that clarification is needed for the above questions.

Name:**____**

Address:**_____________________________________**

____

Email or Telephone:**__________________________**

University of Victoria

THANK-YOU!

YOUR PARTICIPATION IS GREATLY APPRECIATED

Behavioural Medicine Laboratory UVic

APPENDIX C: Tables

Table 1. Pilot Study Belief Elicitation of Preoperative Physical Activity

			Frequency	% Listed
Self Efficacy	**Confidence**	Yes	10	91
		No	1	9
		Past Activity	1	9
		Current Activity	5	45
		Physical Condition	3	27
	Barriers	Pain/Arthritis Related	9	82
		Safety	2	18
		Time	2	18
		Stairs	2	18
		Financial	1	9
	Overcome Barriers	Activity	7	64
		Psychological	5	45
		Medication	2	18
		Communication	1	9
Outcome Expectations				
	Positive	Health	7	64
		Psychological	5	45
		Routine	1	9
		Confidence	1	9
		Recovery	1	9
		Weight Loss	1	9
	Negative	Pain	6	55
		None	6	55
		Time	1	9
Self Regulation	**Goals**		5	45
Social Ecological		Hills/Sidewalks (barriers)	6	55
		Proximity	5	45
		Aesthetics	1	9
		Barriers – None	1	9
		Barriers – Stairs	2	18
		Enjoy- Yes	9	82
		Enjoy- No	2	18
	Support	Family/Friends	7	64
		Independent	4	36
		None	2	18
		Financial	1	9
		Dog	1	9

*Note: N = 11.

Table 2. Demographic, Health & Physical Activity Profiles

	Study 1 (N=11)		Study 2 (N=78)	
Characteristic	n	%	n	%
Age mean (SD)	63 (3.9) range 55-68		69 (9.11) range 49-90 years	
Female	5	45%	52	67%
Ethnicity*				
Caucasian			40	51%
Married/common-law	8	73%	53	68%
Completed University*			33	42%
Retired			57	73%
Annual family income				
>$60,001	2	18%	18	23%
$20,001 to $60,000			39	50%
< $20,000			8	10%
Total Hip Replacement	4	36%	37	47%
Total Knee Replacement	7	64%	41	53%
Surgery Wait Time (months) mean (SD)			3 (1.11) range 1-6 months	
Recruitment location				
JRC (Victoria)	11	100%	57	73%
NRGH (Nanaimo)			21	27%
Health profile*				
Smokers			2	3%
High blood cholesterol			27	35%
High blood pressure			38	49%
Past heart attack			5	6%
Stroke			2	3%
Diabetes			14	18%
Activity Profile				
Active (at least 3 times/week of MVPA)	8	73%	35	45%
Inactive (less than 3 times/week of MVPA)	3	3%	43	55%
> 3 days/week MV walking*			21	27%
< 3 days/week MV waking*			57	73%

*Main Study only

Table 2 Continued

	Study 1 (N=11)		Study 2 (N=78)	
Characteristic	n	%	n	%
Past Physical activity (6 month recall)*				
Walking			40	29%
Water Exercise or Swimming			26	19%
Resistance Training or Home Exercise Program			24	18%
Gardening, Yard work or Household Chores			16	12%
Cycling or Stationary Bike			12	9%
Other			18	13%
Do you attend an exercise program supervised by a health professional or trained instructor? (yes)			22	28%
Use of Mobility Aids				
Cane			35	45%
Cane and/or Walker			6	8%
Nordic Poles			5	6%
None			33	42%

*Main Study only

Table 3. Correlations between Sociodemographic Information and Physical Activity
(Main Study)

	1	2	3	4	5	6	7	8	9	Mean	(SD)
1. Physical Activity	-	.36**	-.03	.06	.33**	.27*	.7	.10	.13	2.49	(2.76)
2. Walking Frequency		-	-.01	.10	-.16	-.19	.01	.00	.20	1.53	(2.45)
3. Age			-	-.05	-.41**	-.36**	-.27*	-.18	.03	68.68	(9.11)
4. Height (ft)				-	.18	-.29*	.24*	.19	-.05	5.48	(.346)
5. Weight (lbs)					-	.84**	.17	-.09	-.12	182.82	(41.06)
6. BMI (lbs/inches^2)						-	.04	-.11	-.10	29.94	(6.54)
7. Education (1=8th grade or less, 6=professional/graduate degree)							-	.17	-.11	4.28	(1.25)
8. Income (1=< $20,000, 4= > $100,001)								-	-.19	2.22	(.739)
9. Overall Health (1= poor, 5= excellent)									-	3.31	(.726)

* p < .05, ** p < .01, N= 78

Table 4. Correlations between Social Cognitive Constructs, Sociocultural Factors, Physical Activity & Walking Behaviour

	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean (SD)
1. Physical Activity	-	.36**	.25*	.09	.14	.27*	.14	-.28*	-.13	-.07	.02	-.11	.14	2.49 (2.76)
2. Walking Frequency		-	.19	.18	.17	.30**	.52**	-.18	-.23*	-.10	.13	-.03	.04	1.53 (2.45)
3. Self Regulation			-	.35**	.25*	.41**	.01	-.01	.01	-.12	.10	.01	.05	1.16 (.448)
4. Outcome Expectations				-	.36**	.42**	.35**	-.05	-.24*	-.02	.13	.15	.03	4.27 (.606)
5. Barrier Efficacy					-	.64**	.37**	-.31**	-.28*	-.16	.02	.31**	.00	6.50 (1.77)
6. Task Efficacy for Exercise						-	.57**	-.41**	-.41**	-.05	.00	.32**	.10	6.57 (1.99)
7. Task Efficacy for Walking							-	-.26*	-.32**	.11	.07	.26*	.03	5.81 (2.76)
8. WOMAC-Pain								-	.68**	.02	-.03	-.09	-.11	2.03 (.601)
9. WOMAC-Function									-	.27*	.08	-.23*	.23*	1.93 (.591)
10. NEWS-Access										-	.32**	.10	.31**	2.65 (.646)
11. NEWS-Walking											-	.15	.11	2.44 (1.17)
12. NEWS-Surroundings												-	.23*	3.26 (.746)
13. NEWS-Safety													-	3.17 (.534)

* p < .05, ** p < .01, N= 78

Table 5. Summary of Preoperative Physical Activity Behaviour using Hierarchical Regression Analysis

	R^2	R^2_{change}	F_{change}	df	β	B	Sig.	SE
Physical Activity Behavior								
Block 1	.097	.097	4.021*	2, 75			.022	
Self Regulation					.17	1.053	.159	.741
Task Efficacy for Exercise					.20	.276	.101	.166
Block 2	.143	.046	4.014*	1, 74			.049	
Self Regulation					.22	1.339	.075	.740
Task Efficacy for Exercise					.08	.112	.540	.183
WOMAC-Pain					-.24*	-1.108	.049	.553
Self Regulation	.195	.195	2.063	8, 68			.052	.579
Barrier Efficacy					.17	.043	.195	.033
Outcome Expectations					.32**	.236	.011	.091
WOMAC-Pain					-.02	-.014	.908	.118
WOMAC-Physical Function					.13	.101	.413	.123
NEWS-Access					-.16	-.107	.181	.079
NEWS-Sidewalk Condition					.10	.037	.413	.045
NEWS-Neighborhood Surroundings					-.09	-.055	.458	.073
NEWS-Neighborhood Safety					.11	.092	.348	.097
Task Efficacy for Exercise	.530	.530	9.591**	8, 68			.000	
Barrier Efficacy					.44**	.494	.000	.111
Outcome Expectations					.23**	.764	.016	.309
WOMAC-Pain					-.23	-.746	.068	.403
WOMAC-Physical Function					-.04	-.122	.772	.419
NEWS-Access					-.03	-.077	.777	.270
NEWS-Sidewalk Condition					-.05	-.092	.556	.155
NEWS-Neighborhood Surroundings					.12	.308	.222	.250
NEWS-Neighborhood Safety					.05	.188	.572	.331

Note. df = degrees of freedom; β = standardized regression coefficients

* $p < .05$, ** $p < .01$, N=78

Table 6. Summary of Preoperative Walking Behaviour using Hierarchical Regression Analysis

	R^2	R^2_{change}	F_{change}	df	β	B	Sig.	SE
Walking Behaviour								
Block 1	.270	.270	28.062**	1, 76			.000	
Task Efficacy for Walking					.52**	.460	.000	.087
Block 2	.255	.005	.485	1, 75			.488	
Task Efficacy for Walking					.50**	.440	.000	.092
WOMAC-Function					-.07	-.299	.488	.429
Task Efficacy for Walking	.272	.272	3.174**	8, 68			.004	
Barrier Efficacy					.21	.323	.091	.188
Outcome Expectations					.23*	1.045	.050	.524
WOMAC-Pain					-.12	-.540	.431	.681
WOMAC-Physical Function					-.10	-.462	.517	.709
NEWS-Access					.13	.538	.243	.457
NEWS-Sidewalk Condition					-.00	-.007	.980	.262
NEWS-Neighbourhood Surroundings					.13	.472	.270	.424
NEWS-Neighbourhood Safety					-.07	-.340	.546	.561

Note. df = degrees of freedom; β = standardized regression coefficients

* $p < .05$, ** $p < .01$, N=78

Table 7. Western Ontario & McMaster University Osteoarthritis Index & Neighbourhood Environment Moderators of the SCT when predicting Preoperative Walking Behaviour before Total Joint Replacement Surgery

		R^2	R^2_{change}	F_{change}	df	B_3	$β_1$	$β_2$	$β_3$	sig	SE_3
Walking Frequency (moderate to vigorous)											
Block 1		.315	.315	8.296**	4, 72					.000	
	Self Regulation					1.333	.24*	.21	.24*		.562
	Outcome Expectations					-.302	-.08	-.12	-.08		.452
	Barrier Efficacy					-.161	-.09	-.06	-.12		.156
	Task Efficacy for Walking					.580	.58**	.61**	.64**		.097
Block 2		.398	.082	1.505	6, 66					.190	
	Pain					.319		.09	.08		.537
	Physical Function					-.626		-.20	-.15		.564
	Access					-.633		-.19	-.17		.366
	Walking					.292		.18	.14		.208
	Surroundings					-.526		-.22*	-.16		.342
	Safety					.280		.08	.06		.444
Block 3	(stepwise) all interaction terms	.475	.077	9.480**	1, 65					.003	
	SEE X Physical Function					-.664			-.29**		.216

Note. df = degrees of freedom; β = standardized regression coefficients
* $p < .05$, ** $p < .01$; N=78

Table 8. Belief Level Constructs Significantly Correlated with Physical Activity and Walking Behaviour

Construct	PA	Walking	Mean (SD)
Barrier Efficacy (0= not confident, 10=very confident)			
Confidence to exercise if you felt pain	.24*	.13	5.91 (2.040)
Task Efficacy (1= not confident, 10=very confident)			
I can exercise on 3 or more days per week at a moderate intensity	.27*	.07	7.94 (2.218)
I can exercise for 15 minutes at a level hard enough to cause a large increase in HR and breathing	.29*	.33**	5.83 (2.718)
I can climb 3 flights of stairs without stopping	.11	.41**	4.37 (3.142)
I can walk at a leisurely pace for 10 minutes without stopping	.14	.32**	7.45 (2.983)
I can walk at a brisk pace for 10 minutes without stopping	.15	.54**	5.51 (3.182)
I can walk for 15 minutes at a level hard enough to cause a large increase in HR and breathing	.10	.57**	4.47 (2.864)
Self Regulation (0=never, 3= always)			
I received emotional support from a significant other for my exercise behaviour	.31**	.05	1.38 (1.131)
I worked out at an exercise facility	.34**	-.01	1.14 (1.224)
I prioritized my exercise so that I could get it done before other behaviours	.29**	.24*	1.62 (.943)
I made my exercise part of my normal routine	.23*	.11	2.09 (.914)
Pain (0=none, 4=extreme)			
Pain while walking on a flat surface	-.27*	-.29**	2.09 (.648)
Pain at night or while in bed	-.27*	-.10	1.86 (1.050)
Physical Function (0=none, 4=extreme)			
Degree of difficulty descending stairs	-.15	-.36**	2.365 (.821)
Degree of difficulty ascending stairs	-.19	-.29*	2.494 (.839)
Degree of difficulty bending to floor	-.17	-.25*	2.205 (1.152)

Pearson Correlations,*p<.05, ** p<.01

APPENDIX D: Figures

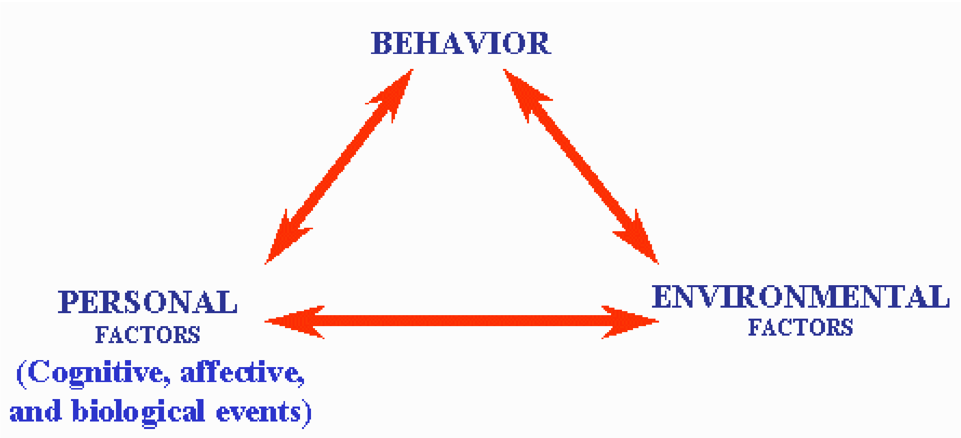

Figure 1. Social Cognitive Theory: Conceptual Model (Pajares, 2002)

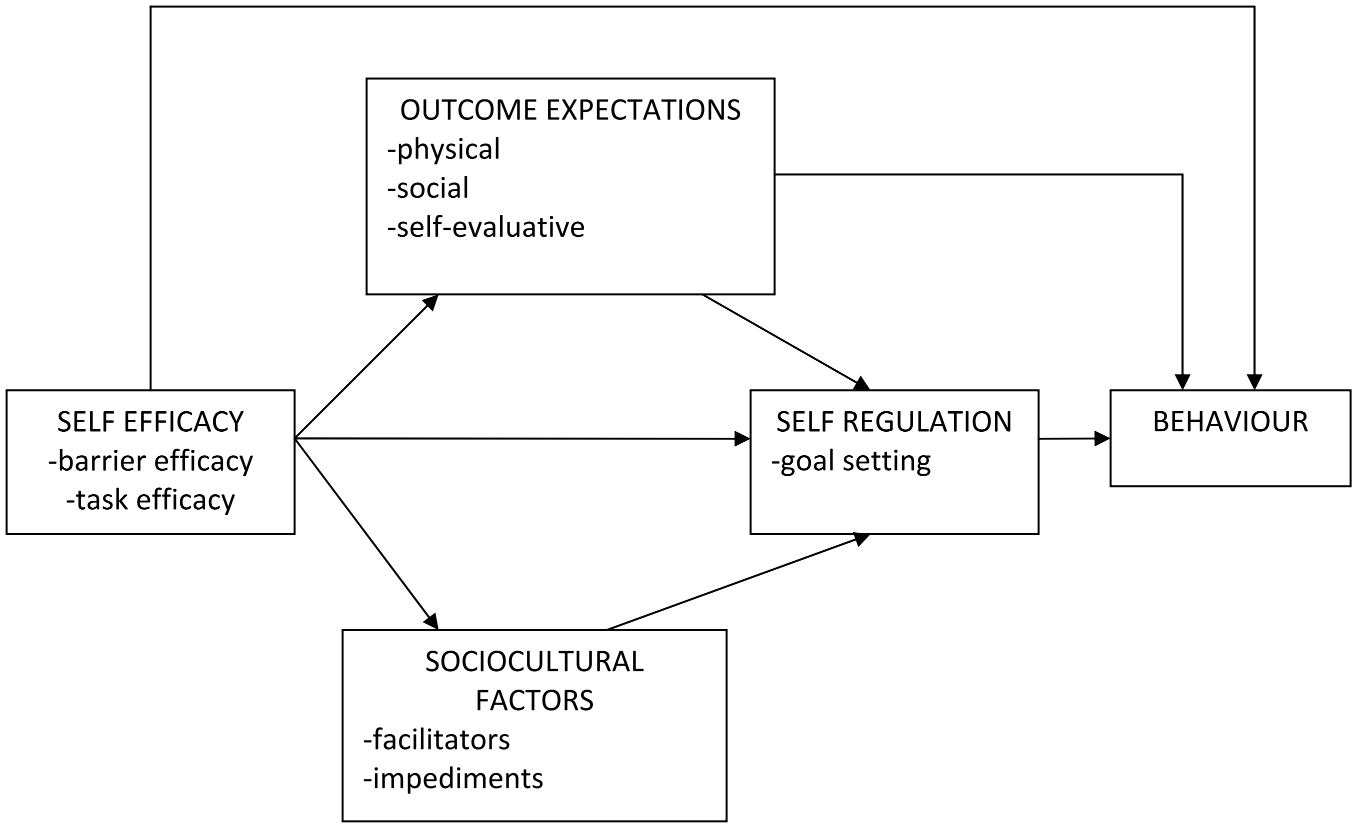

Figure 2. Structural paths of influence wherein perceived self-efficacy affects health habits both directly and through its impact on goals, outcome expectations, and perception of sociostructural facilitators and impediments to health-promoting behaviour (Bandura, 2004).

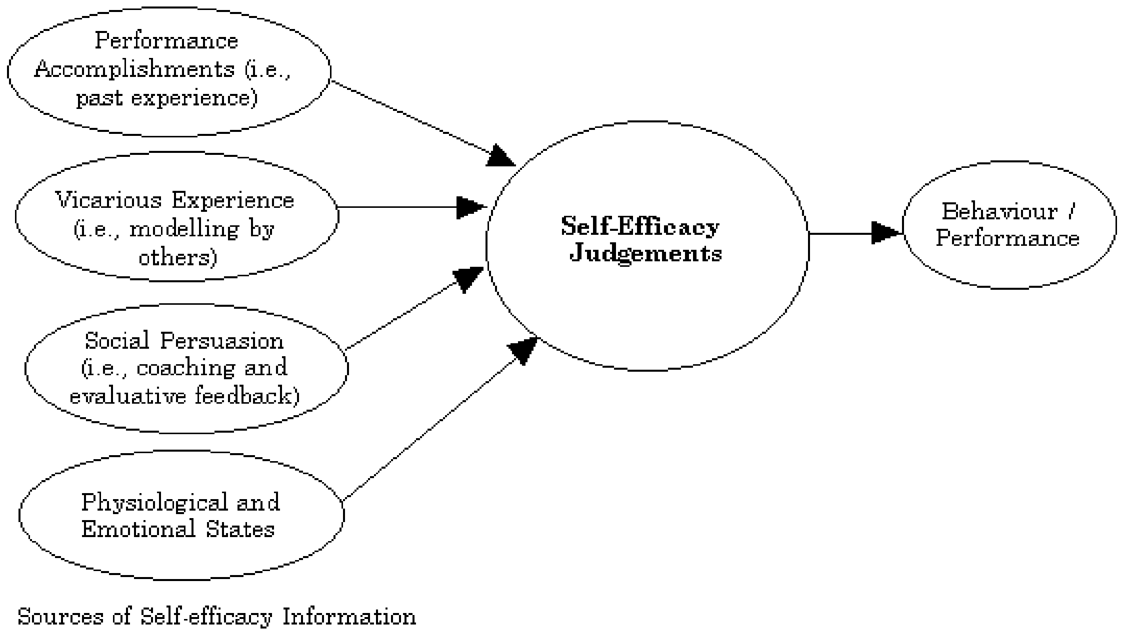

Figure 3. Self Efficacy Theory (Staples, Hulland, and Higgins, 1998).

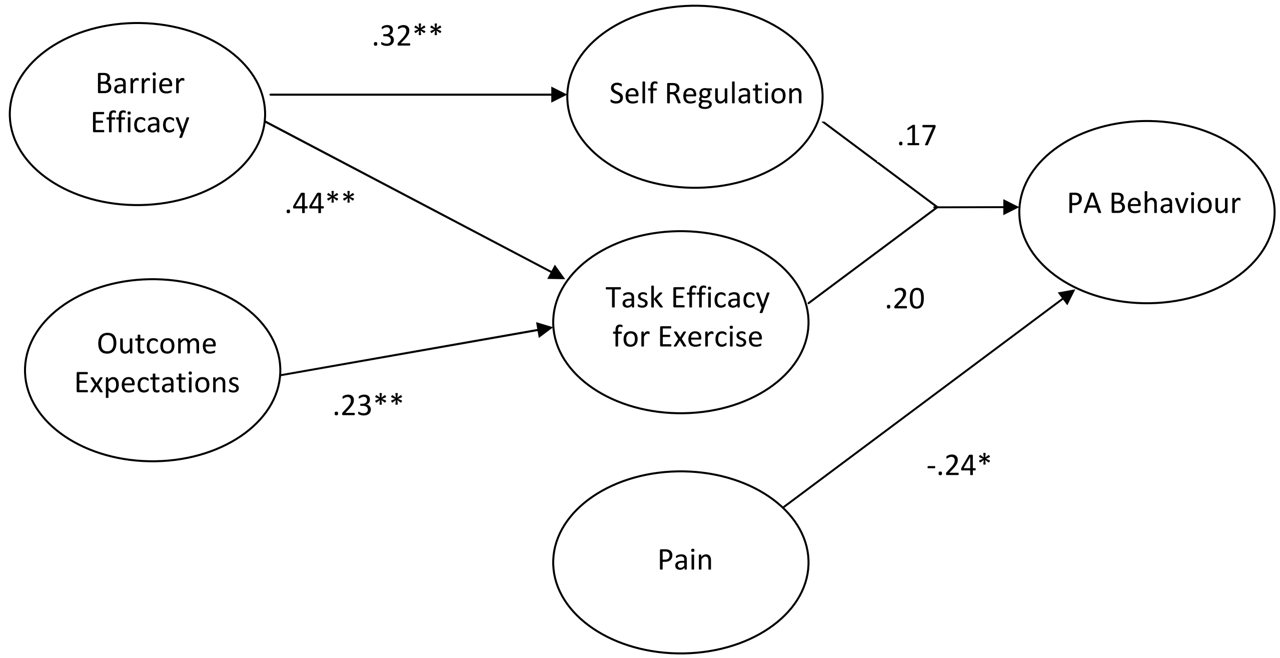

Figure 4. Integration of the Social Cognitive Theory and Preoperative Physical Activity for Individuals waiting for Total Joint Replacement. Coefficients are standardized; * p < .05, **p < .01

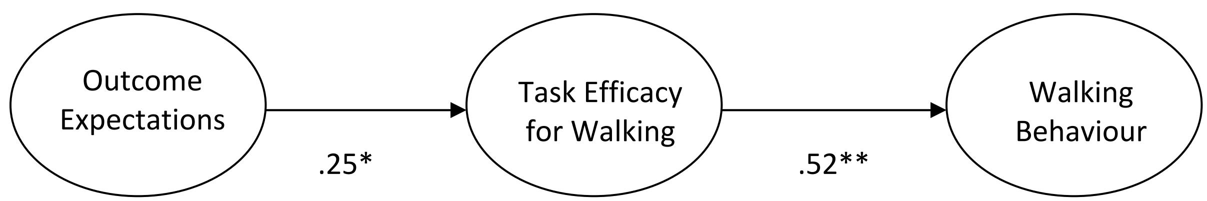

Figure 5. Integration of the Social Cognitive Theory and Preoperative Walking for Individuals waiting for Total Joint Replacement. Coefficients are standardized; * p < .05, **p < .01

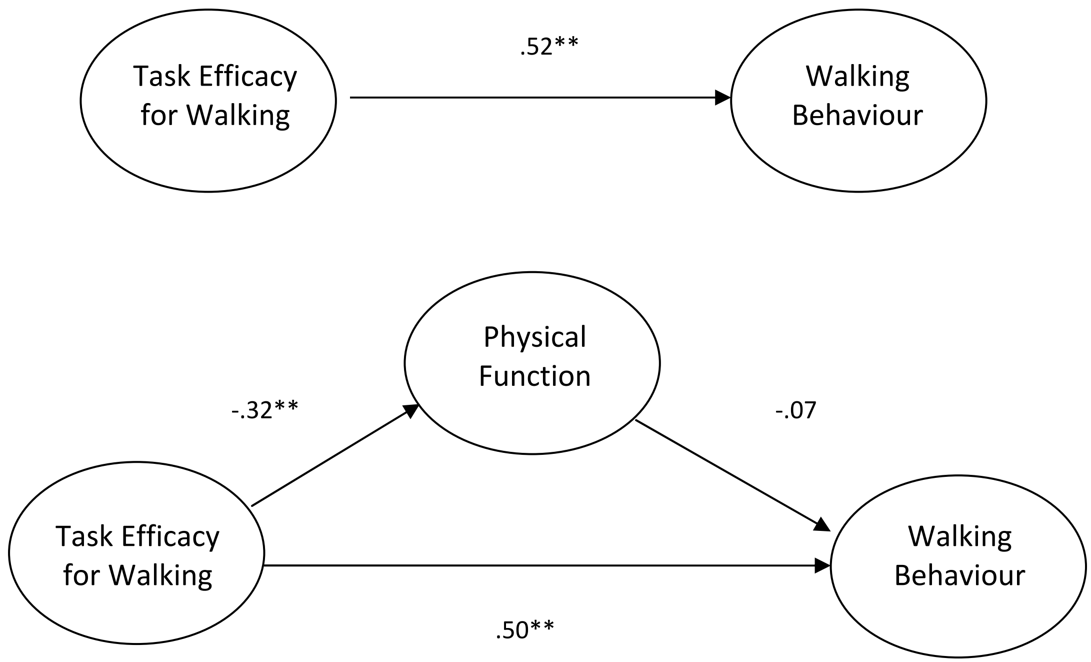

Figure 6. Path Model of Task Efficacy for Walking, Physical Function and Walking Behaviour. Coefficients are standardized; **$p < .01$

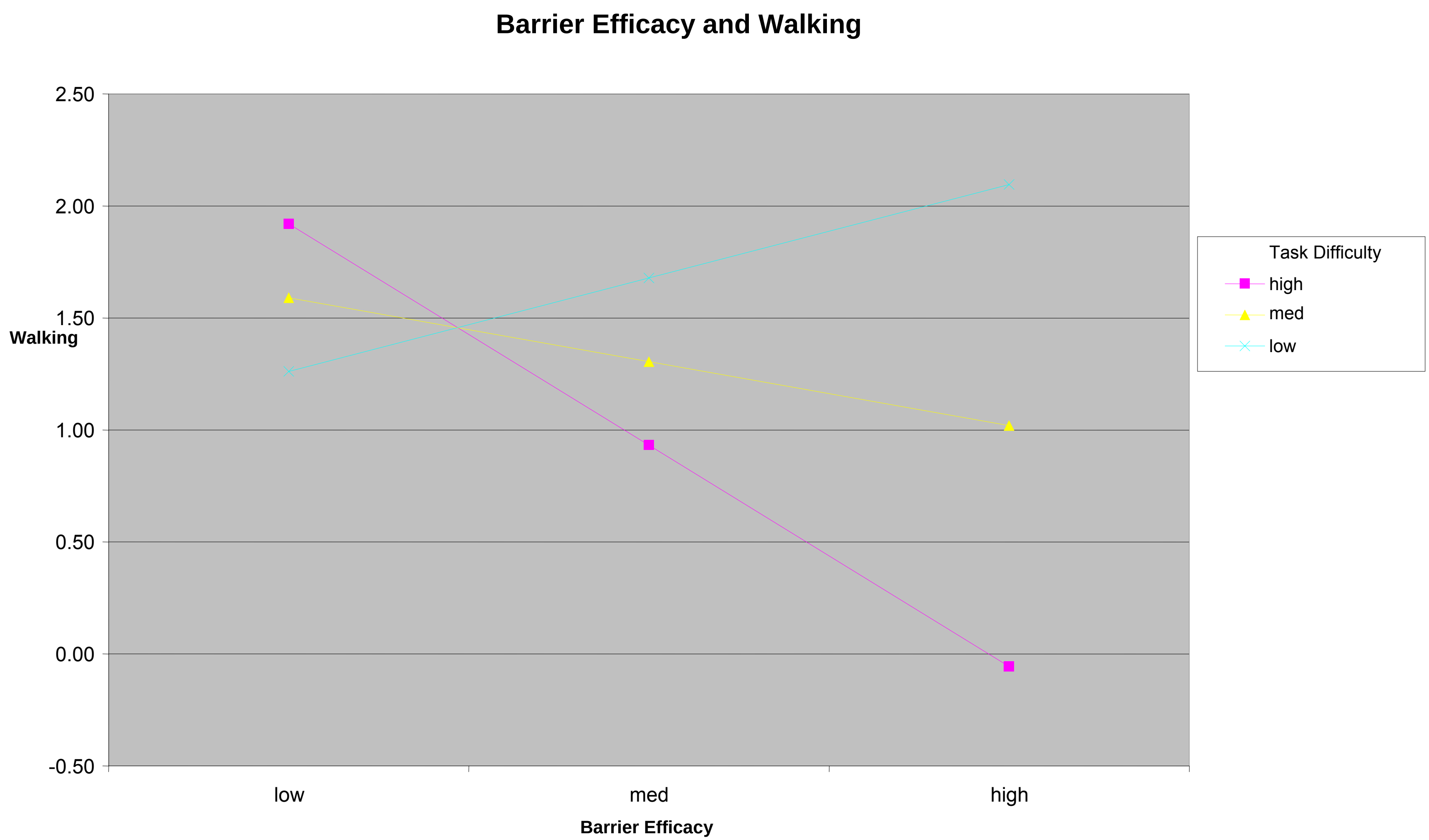

Figure 7. Barrier Efficacy as a function of Physical Function and Walking Behaviour for Individuals waiting for Total Joint Replacement.

APPENDIX E: Notice of Research Study (Pilot Study)

University of Victoria

Behavioural Medicine Laboratory UVic

Barriers to Physical Activity and Preoperative Exercise before Total Joint Replacement

You are being invited to take part in a study titled "Barriers to Physical Activity and Preoperative Exercise before Total Joint Replacement". We are inviting any adults attending the Joint Replacement Clinic-South Island (JRC-SI) who are currently waiting for total joint replacement surgery. This study has been reviewed by the Joint UVic/VIHA Research Ethics Sub-committee and has met the rigorous requirements for ethical approval.

Preoperative physical function is an important factor which has been shown to contribute to positive postoperative outcomes following joint replacement surgery. Although the benefits of physical activity and exercise are well known, over one third of adults over the age of 65 are not active enough to achieve these benefits. Many individuals with osteoarthritis (OA) struggle with adherence to exercise programs, thus effective interventions are desirable. We hope that through this study we will learn more about the factors influencing physical activity behaviour among individuals such as you.

Purpose of this Project

In this study, we will be examining the perceived barriers and facilitators to physical activity and preoperative exercise for individuals who are currently on a waiting list for total joint replacement surgery. The interview questions will help identify barriers to preoperative physical activity and exercise, as well as assess physical activity levels before total joint replacement surgery and general demographics, which may help foster ideas for future preoperative program development.

An understanding of the factors that influence physical activity behavior in older adults is critical to developing effective intervention strategies that will address the problem of physical inactivity in this population, and in doing so, improve the health status and quality of life of the older adult, while having a significant impact on healthcare expenditures.

This study will inform a second study in a masters program of research which will be based on the Social Cognitive and Social Ecological Theory to examine self-efficacy, outcome expectations, and environmental influences on adherence to physical activity and exercise before total joint replacement.

What do I have to do to participate?

It is actually quite simple. We ask you to sign this consent form and complete a personal interview. The entire interview will take approximately 15-30 minutes of your time. You may refuse to answer any questions in the interview.

Inconvenience, Risks and Benefits:

There are no known risks for your participation in this research other than the time needed to complete the interview. Although there will not be a direct benefit to participating in this study, the potential benefits of your participation in this research include providing much needed information on the effectiveness of preoperative preparation for total joint replacement surgery. This information will be helpful to us when designing future programs to engage individuals in physical activity before surgery. As well, if requested, you can obtain feedback of the results of this study. The results of the study will be presented at scholarly meetings and published as an article in an academic journal.

Compensation

As compensation for your time you will receive a $10 gift certificate from Thrifty Foods. This compensation is not to serve as an inducement to participate in this study but rather a social compensation to support your involvement in this study.

Anonymity and Confidentiality

The interviews will not be anonymous since they will be conducted either in person or over the phone by the principal researcher. We can assure you that your confidentiality will be completely protected in this instance and only the research team will have access to your contact information. Upon receiving any information from you, you will be provided a number which you will be referred to throughout the study. In terms of protecting the confidentiality of your data, the data file and completed questionnaires will be kept in a locked and secure environment on the University of Victoria campus at all times. Only the investigators will have access to the data and all results will be interpreted and displayed as group data and no individual cases will be identified. The original questionnaires will be shredded after 5 years.

Do I have to participate?

No, your participation in this study is completely voluntary and you have the right to withdraw at any time without consequence. We hope you can spare a few minutes of your time to help with this important research endeavour!

If you have any questions or concern about this study please do not hesitate to contact either Bonnie Fiala (Primary Investigator) or Dr. Ryan Rhodes (Supervisor) at the numbers below. In addition you may verify the ethical approval of this study, or raise any concerns you may have by contacting the Associate Vice-President, Research at the University of Victoria by email ethics@uvic.ca, or by phone, 250-472-4545.

Your signature below indicates that you understand the above conditions of the participation in this study, and that you have had the opportunity to have your questions answered by the researchers.

____________________ ______________________ ___________________

Name of Participant Signature Date

__________________________ _______________________

Phone Number Email

****** Please sign and return one copy of this form and keep one copy for yourself ******

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APPENDIX F: Notice of Research Study (Main Study)

"USING SOCIAL COGNITIVE CONSTRUCTS TO PREDICT PREOPERATIVE PHYSICAL ACTIVITY BEFORE TOTAL JOINT REPLACEMENT"

You are being asked to take part in a study titled "Using Social Cognitive Constructs to Predict Preoperative Physical Activity before Total Joint Replacement". We are inviting any adults waiting for total joint replacement who have at least 4-6 weeks before their surgery date. This study has been reviewed by the Joint UVic/VIHA Research Ethics Sub-committee and has met the rigorous requirements for ethical approval.

Preoperative physical function is an important factor which has been shown to contribute to positive postoperative outcomes following joint replacement surgery. Although the benefits of physical activity and exercise are well known, over one third of adults over the age of 65 are not active enough to achieve these benefits. Many individuals with osteoarthritis (OA) struggle with adherence to exercise programs, thus effective interventions are desirable. We hope that through this study we will learn more about the factors influencing physical activity behaviour among individuals such as you.

Purpose of this Project

This is a project for a Graduate Thesis in the area of Exercise Psychology at the University of Victoria, in Victoria, B.C. The purpose of this study is to incorporate the perceived walking environment, physical function and pain into a social cognitive framework (self efficacy, outcome expectations, and self regulation) to predict preoperative walking behaviour and adherence to a prescribed walking program for individuals waiting for total joint replacement.

What do I have to do to participate?

It is actually quite simple. **1)** First we ask you to sign this consent form and complete the enclosed questionnaire. The entire questionnaire will take you approximately 20-30 minutes of your time. You may refuse to answer any questions in the questionnaire. **2)** We then ask that you wear the enclosed pedometer and complete the pedometer log sheet each day for one full week. **3)** Then mail the completed consent form, questionnaire, pedometer log sheet and the pedometer back to us using the self-addressed stamped envelope provided to you. **4)** Approximately 1-2 weeks before your surgery, we will mail you a second questionnaire and ask you to wear the pedometer for another week. After receipt of your completed follow-up questionnaire and pedometer, there will be no further questionnaires or contact associated with this study. We will provide self-addressed, stamped envelopes for your convenience for all the questionnaires and clear instructions will be provided on the front of the questionnaires.

Inconvenience, Risks and Benefits:
There are no known risks for your participation in this research other than the time needed to complete the questionnaires. The potential benefits of your participation in this research include providing much needed information on the factors influencing preoperative physical activity before total joint replacement surgery. This information will be helpful to us when designing future promotional materials to engage individuals in physical activity. As well, if requested, you can obtain feedback of the results of this study. The results of the study will be presented at scholarly meetings and published as an article in an academic journal.

Anonymity and Confidentiality
The questionnaires will not be anonymous since your name and contact information will be required on the last page of the questionnaire. This information is required so that we can mail you the physical activity information package and the second questionnaire and pedometer. We can assure you that your confidentiality will be completely protected in this instance and only the research team will have access to your contact information. Upon receiving any information from you, you will be provided a number which you will be referred to throughout the study. In terms of protecting the confidentiality of your data, the data file and completed questionnaires will be kept in a locked and secure environment on the University of Victoria campus at all times. Only the investigators will have access to the data and all results will be interpreted and displayed as group data and no individual cases will be identified. The original questionnaires will be shredded after 5 years. If you decide that you would like to withdraw from the study, you will be asked if the data collected up to that point can be used. If you agree, the data will be included in the final analysis; if you decline the data will be destroyed immediately.

Do I have to participate?
No, your participation in this study is completely voluntary and you have the right to withdraw at any time without consequence. Declining to participate in this study or withdrawing part way through will not, in any way, influence the care individuals receive from the Joint Replacement Clinic.

We hope you can spare a few minutes of your time to help with this important research endeavour!

If you have any questions or concern about this study please do not hesitate to contact either Bonnie Fiala (Primary Investigator) or Dr. Ryan Rhodes (Associate Professor) at the numbers below. In addition you may verify the ethical approval of this study, or raise any concerns you may have by contacting the Associate Vice-President, Research at the University of Victoria by email ethics@uvic.ca, or by phone, 250-472-4545, or VIHA Research & Academic Development by email at: marilyn.fuller@viha.ca or by phone, 250-370-8620.

Your signature below indicates that you understand the above conditions of the participation in this study, and that you have had the opportunity to have your questions answered by the researchers.

____________________	____________________	____________________
Name of Participant	Signature	Date
____________________	____________________	
Phone Number	Email	

****** Please sign and return one copy of this form along with your completed questionnaire and keep one copy for yourself ******

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