WALKING DETERMINANTS AND INTERMITTENT CLAUDICATION

PREDICTING WALKING INTENTIONS AND BEHAVIOUR AMONG INDIVIDUALS WITH INTERMITTENT CLAUDICATION: THE ROLE OF PAIN WITHIN THE THEORY OF PLANNED BEHAVIOUR

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Abstract

This study aimed to improve understanding of walking exercise among individuals with intermittent claudication. Using a prospective design, Ajzen's (1985, 1991) theory of planned behaviour was applied to examine psychosocial determinants of walking exercise. In addition, measures of barrier self-efficacy were explored as determinants of behaviour and perceived pain intensity was examined as a moderator of the intention-behaviour relationship. Ninety-four participants (n = 33 female) completed baseline measures of attitudes, subjective norms, perceived behavioural control, and intentions to engage in walking exercise. Additional measures of pain-related barrier self-efficacy and barrier self-efficacy regarding walking exercise were obtained and the Borg CR10 Pain Scale (Borg, 1998) was used to assess perceived pain intensity during walking. Participants were contacted weekly by telephone over four consecutive weeks and asked to recall their walking exercise and associated perceived pain intensity for the preceding seven-day period. Attitudes, subjective norms and perceived behavioural control contributed significantly to a multiple regression model predicting 67% of the variance in walking intentions. Intentions and perceived behavioural control explained 34% of the variance in walking exercise; however, pain-related barrier self-efficacy and barrier self-efficacy did not explain additional variance in behaviour and perceived pain intensity failed to moderate the intention-behaviour relationship. Findings support the theory of planned behaviour for predicting walking intentions and exercise among individuals with intermittent claudication, and suggest that pain cognitions as measured in this study do not play a role in determining walking.

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One of the greatest pains to human nature is the pain of a new idea.
-Walter Bagehot

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Intermittent Claudication: Epidemiology

Atherosclerosis is an age-related disease characterized by the narrowing and hardening of arteries and subsequent impaired blood flow to various areas of tissue throughout the body. In the case where blood flow to the coronary arteries is reduced, an individual could experience angina or suffer a heart attack. In instances where the arterial system feeding cerebral tissue is diminished the outcome could be a transient ischemic attack or stroke. When atherosclerosis develops in the peripheral arteries which supply blood to the muscle tissue of the lower limbs it is called peripheral arterial disease (PAD), and often produces a debilitating symptom of ischemic pain or discomfort termed intermittent claudication.

Prevalence of PAD and intermittent claudication. PAD afflicts approximately 3.9% and 3.3% of men and women aged 40 and above, respectively (Murabito et al., 2002). When adjusted for age, however, the prevalence of PAD increases to nearly 19% in individuals of at least 70 years (Criqui, Denenberg, Langer, & Fronek, 1997). The prevalence of PAD does not vary by gender, but women indicate greater impairment in walking ability and physical function than men who are diseased (Collins, Suarez-Almazor, Bush, & Peterson, 2006; McDermott et al., 2003). Among both men and women with PAD, the presence of atherosclerotic disease in the cardiovascular system is increased such that the occurrence of a heart attack or stroke is two or three times more frequent in comparison to those without PAD (Criqui et al., 1997). In comparison to individuals with asymptomatic PAD, the risk of cardiovascular morbidity and mortality is heightened among those who experience intermittent claudication (Criqui et al., 1997). This symptom is an early manifestation of PAD of the lower extremities and can signify the presence of systematic atherosclerosis. Intermittent claudication is present among at least 10% of community-dwelling individuals with PAD and up to approximately 33% of those identified from vascular laboratories (Criqui, et al., 1996; Murabito et al., 2002).

Clinical indicators and symptomology. Intermittent claudication is identified by reported walking impairment in addition to the clinical presence of PAD. In turn, PAD is indicated by a reduced ankle-brachial index (ABI), which represents the ratio of systolic blood pressure at the ankle (measured at either the posterior tibial or anterior fibular arteries) to that of the highest brachial artery. When blood pressure at the ankle is sufficiently impaired, typically to a pressure between 60 and 90 percent of brachial flow pressure (Criqui, Fronek, Klauber, Barrett-Connor, & Gabriel, 1985), intermittent claudication will occur.

Intermittent claudication is experienced during walking activity when reduced blood flow to the lower limbs does not meet the metabolic demands of working muscle. This imbalance generates a sensation of ischemic pain or discomfort in the leg muscles that causes the individual to slow down or stop walking. During a period of rest, when the demands of the muscle are reduced and sufficient blood flow to the muscle is resumed, the discomfort subsides within a few minutes enabling the individual to proceed with walking. Along a walk, individuals with intermittent claudication typically follow a pattern involving bouts of activity interspersed by short rest breaks, which last several minutes until the pain has subsided.

Impact on walking ability. Individuals with intermittent claudication have shown greater declines over time in their ability to walk specific distances and speeds in comparison with people who do not have PAD (McDermott et al., 2001; McDermott et al., 2006). They have also reported decreases in overall physical activity and function in comparison with age-matched controls (Hiatt, Regensteiner, Hargarten, Wolfel, & Brass, 1994). In one study, Gardner, Montgomery and Killewich (2004) examined physical activity behaviour among 43 elderly men with intermittent claudication. Participants in that study reported a 31% decline in overall activity levels over a period of 18 months. Assessment of walking ability revealed a 22% decrease in the distance walked before the onset of claudication pain and a 9% decline in the total distance walked during a 6-minute walk test. These effects were evident despite no change in disease severity represented by ABI measures.

Impact on physical function and activity. Impaired physical function among individuals with intermittent claudication bears implications for pursuing and engaging in activities beyond just walking. In a qualitative examination of patients with PAD, Treat-Jacobson et al. (2002) found poor walking ability compromised participants' ability to participate in various activities including physical tasks at home or work as well as recreational pursuits. Consistent with those patient reports, findings from a cross-sectional study which examined physical function and activity among PAD patients indicate accelerometer derived physical activity level was associated with overall lower-extremity function represented by walking velocity, chair raises, and standing balance (McDermott et al., 2002). Using the same tasks to assess physical function, participants in a study by Gardner et al. (2004) showed a 12% decline in their overall performance after 18 months. Over the same period in that study, the number of participants who reported ambulatory unsteadiness and stumbling increased by 15%.

Impact on health-related quality of life. In addition to functional limitations associated with PAD, there is also a decline in overall health related quality of life. Pell (1995) compared age and sex adjusted quality of life in 201 individuals with intermittent claudication to population normal values using the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) which is a general quality of life scale assessing both physical and social aspects of health-related life satisfaction (Stewart, Hays, & Ware, 1988). This study revealed people with intermittent claudication had lower scores on all aspects of quality of life measured by the SF-36 compared to age and sex adjusted norms. It is important to note that the presence of comorbidities among individuals with PAD makes it difficult to attribute lower ratings of quality of life to this condition alone. For instance, using the World Health Organization Quality of Life Assessment Instrument-100 as a measure, Breek et al. (2002) found that the degree of reported walking impairment due to intermittent claudication was associated only with physical aspects of quality of life pertaining to participants' level of independence. In addition, findings from that study indicated that lower-limb joint symptoms and the presence of hypertension were also predictive of lower scores on quality of life. In a different study that measured walking impairment objectively using a 6-minute walk test, Bauman and Arthur (1997) found that walk test results were associated with physical domains of quality of life measured by the SF-36 including physical function, physical role functioning, and bodily pain. In addition, overall scores for physical components of quality of life were lower than the general population norms.

Although the findings discussed above indicate that PAD impacts primarily those aspects of quality of life pertaining to physical health and function, other qualitative studies provide evidence for a broad bearing of intermittent claudication on life satisfaction. In those studies, individuals with intermittent claudication have expressed feelings of powerlessness, inadequacy and isolation attributable to their symptoms and a sense that their self-perception and ego is compromised because of their limitations (Gibson & Kenrick, 1998; Treat-Jacobson et al., 2002). Hallin, Bergqvist, Fugl-Meyer and Holmberg (2002) assessed quality of life among a sample of 80 individuals with PAD using semi-structured interviews in addition to the SF-36 survey. Their results indicated that generic measures of health related quality-of life may not adequately assess facets of life satisfaction that are affected by PAD. Areas identified by participants that may be unique to PAD included concerns about the impact on family members, sexual functioning, future complications, and social functioning due to both physical and psychological impairment (Hallin et al., 2002). Several disease-specific measures of quality of life have been developed and validated for use among individuals with PAD, and some have shown improved sensitivity to disease parameters in comparison to generic measures (Mehta, Venkata Subramaniam, Chetter, & McCollum, 2005), alluding to the unique impact of intermittent claudication on various social and physical domains of health related quality of life.

The research described above suggests that the effects of intermittent claudication on those afflicted are broad, and include limitations in mobility, daily physical function, as well as satisfaction and quality of life affecting both physical and social domains. While future research should aim to gain a more comprehensive understanding of the impact of these limitations, effective management of this debilitating symptom is a priority for clinicians, therapists and for those afflicted with PAD.

Conservative Treatment of PAD and Intermittent Claudication

The profound impact of intermittent claudication on physical function and quality of life as well as the associated risk for cardiovascular morbidity and mortality is considered in the treatment goals for PAD (Kugler & Rudofsky, 2003). Primarily, disease management aims to halt the progression of atherosclerosis by modifying risk factors (i.e., hypertension, hypercholesterolemia, diabetes, and smoking) and to improve blood flow to and function of the lower limbs. In most instances a conservative approach to treatment including lifestyle modification (i.e., physical activity and smoking cessation) and pharmacological intervention is prescribed, while invasive procedures (e.g., percutaneous transluminal angioplasty and surgical revascularisation) are reserved for instances in which function is sufficiently compromised and/or disease has progressed such that it is limb-threatening. A principal component included in the conservative management of PAD and intermittent claudication, and often prescribed in addition to invasive treatment, is walking exercise (Stewart, Hiatt, Regensteiner & Hirsch, 2002).

Benefits associated with walking exercise. Although walking with pain creates an exceptional challenge for individuals with intermittent claudication, the benefits of this form of exercise for the treatment of PAD are widely documented and it is commonly prescribed as a treatment modality. Walking exercise is a means for improving the cardiovascular risk factor profile of PAD patients while achieving gains in walking and functional ability (Izquierdo-Porrera, Gardner, Powell, & Katzel, 2000). A handful of studies have examined the association between cardiovascular function and walking exercise among individuals with PAD who experience intermittent claudication. Although one study failed to identify an association between self-reported exercise patterns and cardiovascular function among community dwelling individuals with PAD (Oka, Altman, Giacomini, Szuba, & Cooke, 2004), participation in a structured treadmill walking rehabilitation program has demonstrated improvements in cholesterol and systolic blood pressure among this population (Izquierdo-Porrera et al., 2000). Furthermore, extensive evidence exists for the benefits of regular exercise for cardiovascular risk factors among individuals without PAD (Albright et al., 2000; Pescatello et al., 2004; Reaven, McPhillips, Barrett-Connor, & Criqui, 1990).

In contrast, there is a large body of research providing evidence for the benefits of exercise training for walking ability and physical function among individuals with symptomatic PAD. Walking exercise has been shown to increase the distance that individuals with intermittent claudication can walk before the onset of pain as well as the maximum distance achieved before a resting break is necessary. In a meta-analytical review including 21 studies examining walking exercise for PAD, Gardner and Poehlman (1995) found the distance participants could walk before the onset of claudication pain increased 179% from a mean of 125.9m (*SD*=57.3) to 351.2m (*SD*=188.7). Maximal walking distance increased 122% from a mean of 325.8m (*SD*=148.1) to 723.3m (*SD*=591.5). Results of a second meta-analysis including ten randomized clinical trials showed consistent findings with gains in walking distance of 28% to 210% from baseline measures (Brandisma et al., 1998). A more recent review by Leng, Fowler, and Ernst (2000) found similar results, with an overall improvement in walking distance of 150% (range = 74% to 230%) following exercise training. According to those authors, the gains achieved through walking exceeded the benefits of angioplasty and did not differ significantly from surgical treatment.

Exercise-related gains in walking ability have been associated with increases in daily physical activity and improvements in overall ambulatory function, including stair climbing (Gardner et al., 2000; Gardner et al., 2001) enabling individuals with PAD to become more functionally independent. In addition to enhanced physical function, there is some evidence for associated improvements in health-related quality of life with walking rehabilitation (e.g., Gardner, Montgomery, Flinn, & Katzel, 2005; Tsai et al., 2002). Still, many exercise trials have not produced gains in quality of life (e.g., Gardner et al., 2001; Savage et al., 2001), and could be limited by the use of generic measures such as the SF-36. There is accumulating evidence that disease-specific measures are more sensitive to changes in quality of life following intervention (Cheetham et al., 2004; Mehta et al., 2005), alluding to the effectiveness of exercise training on aspects of health-related quality of life most pertinent to individuals with PAD. However, more studies are needed to determine the efficacy of walking exercise for improving psychological well-being among individuals with intermittent claudication (Regensteiner, 2004).

Recommendations for walking exercise. Guidelines for walking exercise are based on studies examining the outcomes of participation in structured treadmill walking programs. Gardner and Poehlman (1995) conducted a meta-analysis to identify components of exercise rehabilitation programs that were most effective in improving walking ability among individuals with intermittent claudication. That study showed that the greatest improvement in walking ability occurred when the duration of walking was at least 30 minutes, when the frequency of walking sessions was a minimum of 3 days per week, and when the program lasted 6 months or more. Current recommendations for supervised walking rehabilitation prescribe a minimum of 35 minutes of walking on 3 to 5 days of the week with progressive increases in walking duration up to 50 minutes (Falcone et al., 2003; Hirsch et al., 2006; Stewart et al., 2002). The intensity of walking should elicit claudication of moderate severity within approximately 3 to 5 minutes, at which point the individual should stop and take a resting break until the pain subsides before continuing walking (Hirsch et al., 2006).

Supervised versus home-based walking exercise. Given that most research on exercise and intermittent claudication has involved participants enrolled in treadmill rehabilitation programs, some researchers have asserted this environment provides the optimal setting for initiating a walking regimen (e.g., Hirsch et al., 2006). In a supervised setting, trained personnel can modify walking intensity by changing treadmill speed and grade while monitoring participant symptoms to ensure safety. However, because access to and availability of structured rehabilitation programs for this population is often scarce (Stewart & Lamont, 2001), self-directed walking is a frequently prescribed exercise treatment modality for individuals with PAD. Studies examining the outcome of this type of exercise have shown encouraging findings, indicating slowed decline in physical function and even gains in walking ability can be achieved through self-directed, home-based walking exercise (McDermott et al., 2006; Savage et al., 2001; Wullink, Stoffers & Kuipers, 2001). Furthermore, although structured treadmill walking programs yield the greatest improvements in walking ability and physical function (Bendermacher, Willigendael, Teijink, Prins, 2006; Regensteiner, Meyer, Krupski, Cranford, & Hiatt, 1997; Wullink et al., 2001), the long term-outcome of such programs is similar to home-based walking (Savage et al., 2001), and improvements following discharge from a supervised program are only maintained with continued, self-directed walking exercise (Menard et al., 2004). Unfortunately, it appears that long-term compliance to walking exercise is an exceptional challenge among this population. Indeed, one study found that only about one-third of PAD patients adhered to a home-based walking program (de la Haye, Diehm, & Blume, 1992) and activity levels have been shown to decline without treatment (Gardner et al., 2004). Furthermore, despite a comprehensive review of the literature on home-based walking-exercise interventions among individuals with PAD, Buck and Ciccone (2004) were unable to present conclusive evidence for specific components of interventions which may improve adherence to exercise.

Exercise and Activity among Individuals with Intermittent Claudication

Are people with intermittent claudication walking enough? Recommendations for walking exercise based on outcomes of participation in treadmill walking programs prescribe a minimum of 35 minutes of walking on at least 3 days of the week with progressive increases in walking duration up to 50 minutes (Falcone et al., 2003; Hirsch et al., 2006; Stewart et al., 2002), although improvements in claudication symptoms have been associated with as little as 30 minutes of walking on 3 or more days (Gardner & Poehlman, 1995). Few studies have reported on rates of walking exercise among individuals with intermittent claudication. The information that is currently available indicates that this population is not sufficiently active to accrue the benefits of walking.

Sieminski et al. (1997) monitored physical activity over two consecutive days among 43 adults with PAD using a pedometer in a study exploring the reliability and validity of two physical activity questionnaires. In this investigation, the average number of steps taken across both days was 9113 (*SD* = 5607) indicating participants were "somewhat active" based on guidelines for healthy adults (Tudor-Locke & Bassett, 2004). Indeed, this step count approximates recommended standards of 10,000 steps per day for active living. However, this study did not identify participants as symptomatic PAD patients; therefore, the findings cannot be generalized to those individuals who experience intermittent claudication. In a recent investigation of PAD patients of whom 81% were symptomatic, McDermott et al. (2006) found the majority of participants reported engaging in walking on fewer than three days per week. Specifically, among those who experienced leg pain while walking, 44.7% of participants reported little or no walking, 19.1% reported walking on one or two days per week, and 36.2% met the recommended frequency of at least three days. Another study, which assessed self-reported walking activity among individuals with intermittent claudication, found participants achieved 30 or more minutes of walking on fewer than 3 days per week

(*M*=2.46 days, *SD*=2.72) (Galea & Bray, in press). In that sample, less than half of participants (47.5%) were meeting guidelines for walking exercise for individuals with PAD. Although there is limited research quantifying walking activity among this population, the available evidence indicates that the majority of individuals with intermittent claudication are not achieving the recommended walking frequency and duration.

Are people with intermittent claudication physically active? Information on overall physical activity levels among this population is not as limited as data on walking in particular and provides an indication of the broad impact of intermittent claudication on exercise and physical activity participation. For example, several studies using doubly labelled water found individuals with intermittent claudication are sedentary, with physical activity accounting for as little as 16% to 22% of their total daily energy expenditure (Gardner et al., 1999; Gardner et al., 1998; Otis, Brown, Womack, Fonong, & Gardner, 2000). In a study of 43 community dwelling men with intermittent claudication, physical activity expenditure was only 159 kilocalories per day (*SD* = 151) at baseline and declined significantly to only 110 kilocalories (*SD* = 137) after 18 months (Gardner et al., 2004). McDermott et al. (2002) compared physical activity between PAD patients (including asymptomatic and symptomatic participants) and individuals without PAD using accelerometers over 7 days. Results indicated physical activity levels were significantly lower among individuals with PAD (*M* = 783.8 units, *SD* = 426.2) in comparison to those without (*M* = 1109.0 units, *SD* = 640.1). In summary, reports of physical activity levels indicate individuals with PAD and intermittent claudication are not just refraining from walking exercise, but are generally inactive and engage in less daily activity than individuals who are not affected.

Understanding Theoretical Determinants of Walking

Understanding factors that determine exercise initiation and maintenance is important for increasing participation rates among individuals with intermittent claudication. In particular, knowledge of theory-based psychosocial variables associated with physical activity should be applied in the design, implementation, and evaluation of exercise interventions (Buckworth, 2000). According to Baranowski, Anderson and Carmack (1998) interventions are of limited use without the objective of targeting underlying processes of behaviour change. Social cognitive models (e.g., social cognitive theory, Bandura, 1986; health belief model, Rosenstock, 1974; theories of reasoned action, Ajzen & Fishbein, 1980; and planned behaviour, Ajzen, 1985, 1991) have been applied extensively to identify and examine psychosocial correlates and determinants of physical activity and exercise (Sallis & Owen, 1999). Among these, Ajzen's (1985, 1991) theory of planned behaviour has been widely supported as a useful framework for explaining a number of health behaviours, including exercise, among various populations (Bauman, Sallis, Dzewaltowski & Owen, 2002).

Basic tenets of the theory of planned behaviour. The theory of planned behaviour is an extension of Ajzen and Fishbein's (1980) theory of reasoned action, and advances the tenets of the original model by accounting for behaviour which is not completely within an individual's volitional control. Forming the basis of both theories is the notion that individuals undergo a reasoned thought process when considering an action, and that this process is a reflection of underlying, salient beliefs. Consistent with an expectancy-value model, beliefs are a product of anticipated outcomes of performing the behaviour and the value placed on that particular outcome. The theory of planned behaviour (Ajzen, 1985; 1991) posits that behavioural, normative, and also control beliefs each contribute to the formation of attitudes (i.e., the positive or negative evaluation of the outcome of performing the behaviour), subjective norms (i.e., the perceived social pressure to engage in the behaviour), and perceived behavioural control (i.e., the perceived ease or difficulty for performing the behaviour), respectively. According to the theory's basic tenets, attitudes, subjective norms, and perceived behavioural control each contribute to the formation of a behavioural intention which, in turn, acts as a proximal determinant of the behaviour in question. In instances where a person's volition is compromised (e.g., when extra-personal barriers or unforeseen obstacles inhibit the performance of a behaviour), perceived behavioural control also acts as a direct determinant of behaviour and gains in predictive importance, relative to intention, as the extent of volitional control over the behaviour decreases.

Evidence for the utility of the theory of planned behaviour. To date, five meta-analytical reviews examining applications of the theory of planned behaviour provide evidence for the ability of Ajzen's (1985, 1991) model to explain intentions and various behavioural outcomes (Armitage & Conner, 2001; Blue, 1995; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997). Among these reviews, three reported on studies examining physical activity behaviour in particular (Godin & Kok, 1996; Hagger et al., 2002; Hausenblas et al., 1997). Most recently, Hagger et al. (2002) carried out a meta-analysis including 72 studies demonstrating the viability of the theory of planned behaviour within the context of physical activity. Specifically, 44.5% of the variance in intentions was explained, with attitudes and perceived behavioural control each contributing significantly to the model (β=.40 and β=.33, p<.01, respectively) and with a relatively weak but significant proportion of the variance in behaviour explained by subjective norms (β = .05, p<.01). With regard to behaviour, intention (β=.43, p<.01) and perceived behavioural control (β=.15, p<.01) together accounted for 24.4% of the variance in physical activity.

The Theory of Planned Behaviour and Intermittent Claudication

Findings from a preliminary investigation. The theory of planned behaviour has been applied in a single study examining exercise among individuals with intermittent claudication (Galea & Bray, in press). In that study, participants completed baseline measures of theory of planned behaviour constructs regarding walking for at least 30 minutes on 3 or more days in an upcoming week. One week later, walking behaviour was recalled during a telephone interview. Findings showed 67% of the variance in intentions was accounted for with significant unique contributions by attitudes (β = .40, p<.01) and perceived behavioural control (β = .39, p<.01). In addition, the variance in walking intentions explained by subjective norms approached significance (β = .18, p=.06). In contrast to these findings supporting the theory of planned behaviour, there was no association between intentions and walking exercise after one week and only 8% of the variance in walking exercise was accounted for by perceived behavioural control (β =.45,

$p<.05$). The amount of variance in behaviour explained in this study was approximately one-third of that shown in the meta-analysis by Hagger et al. (2002).

Explaining previous findings: Does the theory apply? While the findings of Galea and Bray (in press) provide novel and essential insights into determinants of walking for people with intermittent claudication, interpretation of these results requires both careful scrutiny of the methods used in that study and a comprehensive review of comparative literature. In doing so, possible shortcomings of the theoretical framework in its application to that investigation become evident.

One consideration raised by the absence of an association between intentions and behaviour in the study by Galea and Bray (in press) is the theory of planned behaviour is not applicable for examining walking exercise among individuals with intermittent claudication. For example, distinctions pertaining to the symptomology of PAD or among individuals afflicted with intermittent claudication could make them subject to motivational determinants of exercise that differ from theoretical variables known to influence activity among the general population. However, given that the study by Galea and Bray (in press) was a preliminary application of the theory of planned behaviour among individuals with intermittent claudication and in light of extensive support for this framework within the general literature on physical activity (Godin & Kok, 1996; Hagger et al., 2002; Hausenblas et al., 1997), it may be hasty to discount the viability of Ajzen's (1985, 1991) theory for its applicability to this population. Indeed, although it explained very little about exercise behaviour, this framework was able to predict a substantial proportion ($R^2_{\text{adjusted}}= .67$; Galea & Bray, in press) of the variance in intentions, providing important information regarding motivational determinants of walking among individuals with intermittent claudication. Moreover, positive findings emanate from studies examining the theory of planned behaviour among various special populations including individuals who are comparable to those with PAD. Specifically, the tenets of the theory of planned behaviour have been supported in research examining older adults in various stages of readiness for physical activity (Courneya, 1995), as well as individuals with coronary heart disease (Blanchard et al., 2003; Blanchard, Courneya, Rodgers, Daub & Knapik, 2002; Godin, Valois, Jobin, & Ross, 1991).

While some studies have shown support for the theory of planned behaviour, others have revealed shortcomings in the utility of the theory of planned behaviour for determining physical activity. Consequently, it is necessary to remain cognizant of possible limitations of this theory's use and to interpret findings from studies using this theory among special populations with caution. For example, in an examination of exercise motivation among patients with congenital heart disease, Prapavessis et al., (2005) found attitudes, subjective norms, and perceived behavioural control explained 69% of the variance in intentions to exercise, but only 11% of the variance in exercise behaviour was accounted for by intention and perceived behavioural control. Akin to the findings reported by Galea and Bray (in press), only perceived behavioural control, and not intention, contributed significantly to the variance in exercise behaviour explained in that study.

Explaining previous findings: Could pain play a role? For the most part, the theory of planned behaviour has received extensive support in the literature on physical activity behaviour. Considering its general utility, the most compelling factor which may contribute to the findings of the study by Galea and Bray (in press) is the unique symptom of exercise-induced pain experienced by individuals with PAD. Indeed, other theory of planned behaviour studies examining physical activity among individuals who experience pain including chronic low back pain (Trafimow & Trafimow, 1998), fibromyalgia (Culos-Reed & Brawley, 2003) and pain associated with spinal cord injury (Latimer, 2004; Latimer & Martin Ginis, 2005; Latimer, Martin Ginis, & Craven, 2004) present mixed findings which are discussed below. The upcoming portion of this literature review provides evidence for the role of pain as a determinant of regular physical activity which, when accounted for, may provide a more comprehensive understanding of physical activity among individuals who experience pain during exercise – including those with intermittent claudication.

The Theory of Planned Behaviour and Exercise among Individuals with Pain

In addition to the findings presented by Galea and Bray (in press), studies examining other populations which experience pain or discomfort associated with physical activity have presented limitations in the ability to predict exercise intentions and behaviour using the theory of planned behaviour. For example, in a study examining intentions to follow exercise prescriptions for low back pain, Trafimow and Trafimow (1998) obtained direct measures of attitudes, subjective norms, and two distinct types of perceived behavioural control among 23 patients. The only variables associated with intentions were the two measures of perceived control, which were operationalized as perceived ability (i.e., how much control one has over performing the exercise) and perceived difficulty (i.e., the perceived ease or difficulty for performing the exercise) for performing the prescribed activities. Combined, these measures predicted 68% of the variance in intention, (β= .49 and .44, *ps* <*.01* for perceived ability and perceived difficulty, respectively), a substantial proportion in comparison to the general literature. However, lacking a significant contribution of attitudes and subjective norms, this study failed to support the basic tenets of the theory of planned behaviour for predicting intentions. In addition, exercise behaviour was not assessed, providing an incomplete depiction of planned exercise behaviour.

Culos-Reed and Brawley (2003) reported similar findings when they examined physical activity among individuals with fibromyalgia. In that study, attitudes and subjective norms were not associated with activity intentions. Although theory of planned behaviour variables were examined, that investigation was couched within a social cognitive theory framework (Bandura, 1986) and did not test the basic tenets of the theory of planned behaviour.

Studies examining physical activity intentions and behaviour among individuals with spinal cord injury also provide evidence for the questionable utility of the theory of planned behaviour. In a preliminary study by Latimer et al., (2004), intentions did not predict behaviour. Perceived behavioural control alone emerged as a significant predictor of intentions and behaviour among 70 men and women with tetraplegia, accounting for 30% and 6% of the variance in each, respectively. Similar to the findings among low back pain patients (Trafimow & Trafimow, 1998) and individuals with fibromyalgia

(Culos-Reed & Brawley 2003), attitudes and subjective norms did not predict intentions among individuals with spinal cord injury.

A subsequent study by Latimer and Martin Ginis (2005) applied the theory of planned behaviour, this time to a sample of 104 individuals with both complete and incomplete spinal cord injury. In this study, a measure of leisure time physical activity previously validated for use among individuals with spinal cord injury (Martin Ginis, Latimer, Hicks, & Craven, 2005) was administered. This study supported the tenets of the theory of planned behaviour for predicting intentions by accounting for 60% of the variance, which is a substantial proportion in comparison to the general literature (Hagger et al., 2002). In contrast to previous findings, only intentions emerged as a significant predictor of behaviour, accounting for 16% of the variance in leisure time physical activity.

Collectively, findings from theory of planned behaviour studies examining physical activity among individuals who experience pain reveal inconsistent findings and limitations regarding the utility of this framework. When adequate methods and measures are used, motivational variables have been able to account for a considerably large proportion of the variance in intentions (e.g., Galea & Bray, in press; Latimer & Martin Ginis, 2005); however, there remains a gap in our understanding of physical activity when this behaviour is coupled with pain.

The Present Study: Advancements from Previous Literature

The present study aimed to advance our understanding of walking exercise among individuals with intermittent claudication. Specifically, this study sought to improve upon the behavioural measure of walking exercise and to investigate the role of variables pertaining to claudication pain.

Improving the measure of behaviour. A possible limitation of the study by Galea and Bray (in press) was the measurement used for the outcome variable, walking behaviour. In that study, walking activity was represented by a recall of activity spanning one week using the Physical Activity Scale for the Elderly (PASE; Washburn, Smith, Jette, & Janney, 1993). The use of a self-report recall measure of behaviour over one-week may not have provided a representative reflection of participants' typical exercise regimen. Dishman, Washburn, and Schoeller (2001) have argued that a longer recall period improves the likelihood of capturing a person's true habits, particularly when patterns of physical activity are not routine. The flipside of this argument is that memory limitations could compromise the accuracy of reported behaviour when extended periods of recall are examined (Sallis & Saelens, 2000). However, this potential problem can be addressed by breaking down the full measurement period into smaller epochs of repeated measures. This strategy of physical activity measurement was used in the present study where weekly recall interviews allowed a four-week span of activity to be examined without compromising accuracy.

Given that very little is known about the activity patterns of individuals with intermittent claudication, and in light of evidence for the utility of the theory of planned behaviour for predicting physical activity over time (Armitage, 2005; Randall & Wolff, 1994; Hausenblas et al., 1997), using a longer window of measurement than one week may provide a more accurate indication of walking behaviour among this population in addition to providing information pertaining to the strength of claudicants' intentions to determine behaviour over time. As such, the present study aimed to assess walking behaviour over four consecutive weeks.

In addition to reporting activity over a longer time period, participants in the present study were asked to log the frequency and duration of their walking activity using a four-week calendar. Although an activity log could serve as a motivating tool (i.e., increasing participants' awareness of their activity and altering their typical walking exercise), it is also a means for improving the validity and accuracy of reported activity (Dishman et al., 2001). Furthermore, in a study comparing reports of activity with and without an activity log, Timperio, Salmon, Rosenberg, and Bull (2004) found that the use of an activity log did not influence the validity of the physical activity measure. Accordingly, the use of a walking calendar in an attempt to maximize the accuracy of recalled behaviour was considered advantageous.

Assessing self-efficacy regarding salient barriers. While the variables comprising the theory of planned behaviour have been shown to predict physical activity, it is possible that other variables play an important role in determining walking among individuals with intermittent claudication. To date, both qualitative and empirical findings point to perceptions of control playing a role in disease management, including walking exercise (Galea & Bray, in press; Treat-Jacobson et al., 2002). According to Ajzen (1988) perceived behavioural control, or the perceived ease or difficulty of performing a behaviour, takes into account the availability of resources and opportunities and incorporates beliefs about potential obstacles. In addition to this, and in line with the theory of planned behaviour framework, information concerning beliefs about variables which facilitate or impede efforts to engage in regular exercise is important for understanding exercise intention, but also plays a role in determining behaviour directly. While many common barriers (e.g., injury, lack of motivation and energy, lack of time) and facilitators (e.g., pleasure, social support) for exercise have been identified, it is also important to elicit factors that are most salient among individuals with special needs (Symons Downs & Hausenblas, 2005).

In a preliminary phase of this research project, focus groups were conducted inviting insights from 15 men and women with intermittent claudication regarding perceived barriers and facilitators for engaging in walking activity (Galea, Bray & Martin Ginis, 2006). Findings from that research provided evidence that individuals with intermittent claudication face challenges to regular activity as a consequence of their symptomology which distinguish them from similar populations who do not experience intermittent claudication. For example, frequently identified barriers included environmental barriers such as stairs and graded paths, the need for frequent resting breaks, and uncertainty pertaining to the benefits of walking for their condition. Facilitators for walking included social support in the form of walking companionship and an understanding from others of their need to take prolonged rest breaks, availability of a supervised exercise program, and availability of rest places or accessible walking routes.

While perceived behavioural control takes into account the availability of resources and opportunities and incorporates beliefs about potential obstacles (Ajzen, 1988), Bandura's (1977) concept of self-efficacy explicitly accounts for such impediments by representing the confidence one has to perform a behaviour in the face of a particular barrier (McAuley & Blissmer, 2002). A measure of self efficacy for walking in the context of salient, pain-related barriers (i.e., those elicited from the study by Galea et al., 2006) were therefore examined in an attempt to capture a greater proportion of the variance in behaviour explained by the direct measures of intention and perceived behavioural control used in the previous study (Galea & Bray, in press). In addition to the population-specific barriers examined, items from a scale developed to measure exercise barrier efficacy particular to individuals in phase II cardiac rehabilitation were also included (Blanchard et al., 2002). These additional items were selected because they were also identified by focus group participants who have intermittent claudication (Galea et al., 2006).

Pain as a moderator of the intention-behaviour relationship. As discussed earlier, there is accumulating evidence suggesting that the theory of planned behaviour may not capture nearly as much of the variance in behaviour when individuals experience pain during exercise. Among the possible explanations for these findings is that exercise-induced pain or discomfort may not be taken into account when reporting exercise intentions in the absence of painful stimuli (e.g., during questionnaire completion), but could thwart subsequent efforts to engage in activity. Along these lines, research has shown evidence for an inverse relationship between ratings of pain intensity and activity level (e.g., Jensen & Karoly, 1991; Kop et al., 2005; Vuillemin et al., 2005). For example, Kop et al. (2005) administered continued assessments of accelerometer-derived activity level and real-time reports of symptom ratings among men and women with fibromyalgia over a five-day period. Pain severity was associated with lower concurrent and subsequent activity levels, whereas previous activity levels did not predict reported pain.

These findings suggest that pain severity could moderate the relationship between intention and physical activity behaviour such that individuals who report greater pain may be less likely to engage in physical activity despite strong intentions to do so. Accordingly, the present study examined perceived pain severity as a moderator of the relationship between intention and walking exercise among individuals with intermittent claudication.

Study Purpose

The overarching objective of this study was to advance understanding of determinants of walking exercise among individuals with intermittent claudication using the theory of planned behaviour (Ajzen, 1985, 1991) as a framework. Guided by the outcome of a preliminary investigation of walking exercise among this population (Galea & Bray, in press), the present study used a more extensive measure of walking behaviour and examined the role of perceived pain-intensity as well as self-efficacy to cope with barriers to walking as determinants of walking. Specifically, this study aimed to a) test the basic tenets of the theory of planned behaviour by examining attitudes, subjective norms, and perceived behavioural control as determinants of walking intentions and reported behaviour; b) examine whether measures of pain-related self-efficacy and barrier self-efficacy contributed to the prediction of walking behaviour beyond the effects of intention and perceived behavioural control; and c) explore the role of perceived pain intensity as a moderator of the relationship between walking intentions and subsequent behaviour.

Study Hypotheses

In accordance with the basic tenets of the theory of planned behaviour and based on research involving physical activity (Godin & Kok, 1996; Hagger et al., 2002; Hausenblas et al., 1997) and walking exercise among individuals with intermittent claudication (Galea & Bray, in press), five hypotheses were generated for this study:

1. It was hypothesized that attitudes, subjective norms and perceived behavioural control would be positively associated with and predict intentions to engage in walking exercise.
2. Intention and perceived behavioural control were expected to be positively associated with and predict walking exercise.
3. It was expected that intention would mediate the relationships between walking exercise and attitudes, subjective norms, and perceived behavioural control.
4. Pain-related barrier self-efficacy and barrier self-efficacy were hypothesized to account for additional variance in walking behaviour beyond that explained by intention and perceived behavioural control.
5. It was expected that perceived pain intensity would moderate the relationship between intention and behaviour such that the relationship would be stronger among individuals who reported less intense pain while walking in comparison to those who reported higher perceived pain intensity.

Method

Participants

Participants included individuals who were previously diagnosed with peripheral arterial disease (PAD) and who experienced intermittent claudication associated with their condition. Adult men and women who were patients of the Windsor Vascular Laboratory and who had an ankle-brachial index less than or equal to .90 (Dormandy, Rutherford; TASC Working Group, 2000) at the time of the study were recruited for participation using posters and flyers promoting the investigation. A total of 127 individuals volunteered to participate in this study. Among those who expressed interest in participating, 21 individuals were excluded because they (a) responded negatively to the Edinburgh Claudication Questionnaire (Leng & Fowkes, 1992) which is a six-item tool used to identify intermittent claudication (10 volunteers); (b) reported other conditions which limited their walking beyond intermittent claudication (e.g., arthritis, sciatica, orthopedic pain) (7 volunteers); or (c) did not complete baseline assessment in full (4 volunteers). Of the remaining 106 participants who completed baseline assessment, five individuals voluntarily withdrew from the study, six individuals could not be contacted for each of the four weekly telephone interviews, and a single multivariate outlier was removed from the data set. The resultant sample included 94 participants who completed the entire study protocol.

Demographic characteristics of study participants are summarized in Tables 1 and 2 (see Appendix A). Participants included 61 men and 33 women, with a mean age of 70.1 years (*SD* = 9.0 years). Most were married (64.9%), of white ethnicity (94.7%), and had completed some or all high school requirements (67%). The majority of participants identified themselves as previous smokers (56.5%) and nearly a third (31.9%) were enrolled in a treadmill walking program during their participation in this study. Just over one third of the sample experienced claudication bilaterally (37.2%) and most participants had been symptomatic for at least 2 years (62.8%). Only 14.9% reported taking medication to treat their claudication pain. The average ABI for this sample was .69 and represents moderate disease severity (Dormandy, Rutherford; TASC Working Group, 2000).

Measures

Theory of planned behaviour questionnaire. Theory of planned behaviour variables were measured using a 23-item questionnaire which assessed participants' attitudes, subjective norms, perceived behavioural control, and intentions regarding walking exercise (see Appendix B). These measures were used in a previous study of the theory planned behaviour and exercise among individuals with intermittent claudication (Galea & Bray, in press). Face validity of the item content and estimated internal consistency of the scales derived from that study and from previous pilot work suggested this was an adequate measure to use in the present investigation. Walking exercise was operationally defined as the accumulation of at least 30 minutes of walking on 3 or more days per week in the upcoming 4 weeks. This definition is based on evidence for a minimum frequency and duration of walking associated with beneficial outcomes (Gardner & Poehlman, 1995). Scores for items representing each scale were summed and their average was used for statistical analyses.

Attitudes. Direct measures of attitudes towards walking exercise were obtained using nine items which were preceded by the statement: "During the next 4 weeks, for me to walk for at least 30 minutes on 3 or more days per week would be…" and which were presented on 7-point evaluative semantic differential scales with the following anchors: (*wise-foolish, unpleasant-pleasant, easy-difficult, good-bad, enjoyable-unenjoyable, boring-interesting, stressful-relaxing, beneficial-harmful, and useless-useful).* Scores for items 1, 3, 4, 5, and 8 were reversed yielding a composite scale with higher scores representing more positive attitudes. Reliability analysis yielded an adequate Cronbach's alpha for this scale ($\alpha = .82$) indicating sufficient internal consistency (Tabachnick & Fidell, 2001).

Subjective norms. Subjective norms were measured using four items rated on 7-point Likert scales ranging from 1(completely disagree) to 7(completely agree). Each item measured respondents' perceptions of how others appraise their engaging in walking activity in the upcoming four weeks. One global item asked participants about important others (i.e., "Most people who are important to me think that I should walk for at least 30 minutes on 3 or more days in the upcoming four weeks"), whereas the remaining three items targeted salient normative referents (i.e., spouse/significant other, medical practitioner, closest friend or family member) identified in previous elicitation studies on exercise behaviour (Symons Downs & Hausenblas, 2005). Adequate internal consistency was obtained for this scale ($\alpha = .71$; Tabachnick & Fidell, 2001)

Perceived behavioural control. Perceived behavioural control was measured using six items, each rated on a 7-point Likert scale. Item wording and scale anchors were as follows: (1) "During the next 4 weeks, it is mostly up to me whether or not I walk for at least 30 minutes on 3 or more days per week." (*1 = completely disagree – 7 = completely agree*), (2) "If it were entirely up to me, I am confident that I would be able to walk for at least 30 minutes on 3 or more days per week in the next 4 weeks." (*1 = completely disagree – 7 = completely agree*), (3) During the next 4 weeks, how much personal control do you believe you have over whether or not you walk for at least 30 minutes on 3 or more days per week?" (*1 = complete control – 7 = absolutely no control*), (4) "During the next 4 weeks, how much do you feel that whether you walk for at least 30 minutes on 3 or more days per week is beyond your control?" (*1 = completely beyond my control – 7 = completely within my control*), (5) During the next 4 weeks, how confident are you that you will be able to walk for at least 30 minutes on 3 or more days per week?" (*1 = completely unsure –7 = completely sure*), (6) During the next 4 weeks, to what extent do you see yourself as being capable of walking for at least 30 minutes on 3 or more days per week? (*1 = extremely capable – 7 = extremely incapable*). Items 3 and 6 were reverse-scored to yield a composite measure with higher scores representing greater perceived control. Internal consistency for this scale was sufficient ($\alpha = .82$; Tabachnick & Fidell, 2001).

Intentions. Four questions were used to measure respondents' intentions to engage in walking behaviour. The wording of the individual items was: (1) "During the next 4 weeks, I will walk for at least 30 minutes on 3 or more days per week," (2) During the next 4 weeks, my goal is to walk for at least 30 minutes on 3 or more days per week," and (3) During the next 4 weeks, I intend to walk for at least 30 minutes on 3 or more days per week." The first three items were assessed using a 7-point Likert scale anchored by 1 = *completely agree* and 7 = *completely disagree.* The fourth item: "Do you plan to walk for at least 30 minutes on 3 or more days in the upcoming four weeks?" was measured on a 7-point scale ranging from 1 = *definitely not* to 7 = *definitely yes.* The Cronbach's alpha for this scale represents adequate internal consistency (α = .92; Tabachnick & Fidell, 2001).

Pain-related barrier self-efficacy. Four items measured respondents' self-efficacy for engaging in walking in the face of salient, pain-related barriers which included a) having no place to take a rest break along a walk; b) encountering a hill or stairs along a walk; c) having no companion or partner to walk with; and d) experiencing leg pain or discomfort during a walk. Items were preceded by the statement, "During the next 4 weeks, how confident are you that you can accumulate 30 minutes of walking on three or more days per week..." and were measured on an 11 point scale ranging from 0 = *not at all confident* to 10 = *completely confident.* Cronbach's alpha for this scale was sufficient (α = .88; Tabachnick & Fidell, 2001).

Barrier self-efficacy. Seven items drawn from a scale developed by Blanchard et al., (2002) were used to assess participants' self-efficacy for overcoming exercise barriers. Barriers represented in the scale item content were those commonly identified among older adults with cardiovascular disease and thus were considered applicable to participants with peripheral arterial disease. Participants were asked to rate their self-efficacy using an 11-point scale ranging from 0= "*not at all confident*" to 10 = "*completely confident*" in response to the statement, "During the next 4 weeks, how confident are you that you can accumulate 30 minutes of walking on 3 or more days per week…" Preliminary data screening revealed a pattern for missing values pertaining to four items on the barrier self-efficacy scale. Each of these items produced a large proportion of missing scores, ranging from 15% to 29%. In addition, participants completing the baseline questionnaire conveyed difficulty in responding to these items and sometimes circled a score of zero while also indicating on the questionnaire that the items were not applicable to them. As a result, the four items were removed from the scale representing barrier self-efficacy for walking. The remaining scale included three items which assessed participants' confidence to walk when facing the following barriers: a) having too much work to do; b) having no time; c) when the weather is bad. Alpha reliability for this three-item scale was sufficient ($\alpha = .76$; Tabachnick & Fidell, 2001).

Perceived pain intensity. The Borg CR10 Scale for Pain (Borg, 1998) was used to assess participants' average perceived pain intensity during walking over the previous week. This scale allows pain ratings to be made along an accelerated growth function (Price, 1988) ranging from 0 = *"nothing at all"* to 10 = *"maximal."* Perceived pain intensity measured at baseline asked participants to recall the average intensity of pain they experienced in their legs during walking over the previous week and served as an orientation to the measure, which was to be used during telephone interviews.

A separate score representing perceived pain intensity over the four-week period following baseline assessment was obtained during weekly telephone interviews. Participants were asked to report their average perceived pain intensity during walking over the previous week using the Borg CR10 Scale for Pain (Borg, 1998). The four weekly scores were summed and their average was used for statistical analyses. Internal consistency of the 4 pain scores obtained over the month was good ($\alpha = .88$), indicating high reliability of scores indicating pain intensity experienced while walking. In previous studies, the Borg CR10 Scale has shown adequate test-retest reliability (Harms-Ringdahl et al., 1986) and has been validated against Visual Analog Scales for pain ratings (Neely & Borg, 1995). This scale was sensitive to changes in pain tolerance during walking among individuals with peripheral arterial disease following 24 weeks of aerobic exercise training (Zwierska et al., 2005).

Walking exercise. Walking exercise was assessed using a series of one-week recall measures obtained by telephone interview over four consecutive weeks following baseline assessment. A weekly recall was obtained, instead of a one month recall in order to optimize the accuracy of reported behaviour which can be compromised as the recall duration increases (Dishman et al., 2001). The walking subscale of the PASE (Washburn, et al., 1993) was used as a guiding framework for the walking measure, but was adapted and expanded from the original version for the purposes of this study. Specifically, the original PASE walking subscale includes two questions addressing the frequency and duration of walking activity carried out during the previous week "for any reason". These items were modified in the present study to obtain information on walking carried out during the previous week "for the purpose of exercise." A third question was added to assess the average number of minutes spent engaged in walking exercise in order to gain a more detailed account of walking behaviour. A score representing average weekly walking frequency was computed for each participant by summing the number of days per week on which at least 30 minutes of walking was achieved and averaging those scores over the four week period. Internal consistency of the average weekly walking frequency scores was good ($\alpha = .94$).

Procedure

This was a prospective study with five points of data collection. Individuals who volunteered and were eligible to participate were asked to provide informed consent before participating in the study. At baseline, participants completed a questionnaire measuring demographic variables, the theory of planned behaviour constructs (i.e., attitudes, subjective norms, perceived behavioural control, and intentions), pain-related barrier self-efficacy, barrier self-efficacy, and perceived claudication pain intensity experienced during the previous week. Upon completing the questionnaire package, participants were presented with and instructed in the use of a four-week calendar on which they were asked to record their walking exercise and leg pain during walking in the upcoming four weeks (see Appendix C). One week after baseline assessment, participants received their first follow-up phone call and were asked to refer to their calendar in reporting their walking exercise and perceived pain intensity over the previous week. In instances when participants did not have their calendar on hand or had not used their calendar, they were prompted to recall their walking and associated perceived pain intensity day by day for the seven-day period. Subsequent assessments of walking behaviour and perceived pain intensity were obtained by telephone interview at two, three, and four weeks following baseline questionnaire completion. At the end of the week-four phone call, participants were debriefed and thanked for their participation, and any questions they had pertaining to the investigation were answered by the investigator.

Preliminary Analysis

Data Screening

Data were screened for univariate and multivariate outliers and for missing values based on guidelines provided by Tabachnick and Fidell (2001). A single multivariate outlier with scores greater than 3 standard deviations from the sample mean was identified and data provided by this participant were removed from subsequent analyses. In this case, the participant had scores which were greater than one standard deviation below the mean for all predictor variables (attitudes, subjective norms, perceived behavioural control, and intentions) but reported walking for at least 30 minutes on an average of 6 days per week over four weeks.

Most participants completed the baseline questionnaire in full (69.1%). Patterns of missing data were flagged by items missing greater than 5% of scores (Tabachnick & Fidell, 2001). Only a single item, missing 21.3% of scores, met this criterion. This item asked participants to rate their subjective norms using their spouse or significant other as a referent. Participants were asked to leave this item blank when it was not applicable to them, explaining the large proportion of missing scores. Missing scores for this item and other baseline questionnaire responses were replaced using Person Mean Substitution at the item level (Downey & King, 1998; King, Fogg, & Downey, 1998). Using this procedure, scores for missing data were computed as the mean of responses for the other scale items that were answered by a particular person.

Testing Assumptions of Regression

Frequency histograms, residual scatter plots, and normal probability plots were examined in order to ensure normality of distributions, linearity of relationships between variables, and homoscedasticity of the data for each linear regression analysis. Values representing skewness and kurtosis of distributions ranged between -2 and +2, corroborating graphical evidence for normality. Covariance matrices and collinearity statistics were used to identify multicollinearity between independent variables. Multicollinearity was approached in several cases; however, none of the bivariate correlations exceeded the maximum tolerance (r = .90; Tabachnick & Fidell, 2001) and tolerance statistics and variance inflation factors did not indicate variable redundancy.

Results

Treatment of Covariates

Bivariate correlations between demographic variables and the primary outcome variables (i.e., intention and behaviour) were examined to identify potential covariates. Laterality of symptoms (i.e., unilateral or bilateral leg pain) was significantly associated with the outcome variable intention (r = -.35, p <.01). No other demographic variables were correlated with intention or walking behaviour. Given the large number of demographic variables examined and the possibility that alpha levels were inflated by repeated analyses, this item was not included in the regression predicting intention.

Descriptive Findings

Means and standard deviations for the primary variables of interest are included in Table 3. Overall, participants reported generally positive attitudes, subjective norms, perceptions of control and intentions regarding walking exercise. However, on average the frequency of walking for at least 30 minutes was less than three days ($M = 2.76$, $SD = 2.24$). Mean scores for pain-related barrier self-efficacy and barrier self-efficacy were slightly above the conceptual midpoint of the 11 point scale suggesting participants held somewhat positive self-efficacy beliefs pertaining to coping with barriers to walking. The mean score of 3.31 for perceived pain intensity represents perceptions of pain intensity which fall between the descriptors "moderate" (score 3) and "somewhat severe" (score 4).

Correlational Findings

Examination of the correlation matrix (Table 3) revealed significant bivariate correlations in the positive direction between the various predictor and outcome variables defined by the theory of planned behaviour. In addition, pain-related and barrier self-efficacy scores were significantly correlated with walking behaviour in the positive direction as anticipated. Perceived pain intensity was associated only with pain-related barrier self-efficacy ($r = -.23$, $p < .05$). Among the demographic variables, past behaviour (defined as the reported number of days on which participants walked for at least 30 minutes in the week preceding baseline testing) was significantly associated with both intention ($r = .24$, $p < .05$) and walking behaviour ($r = .52$, $p < .01$).

Table 3

Descriptive Statistics and Bivariate Correlations between Theory of Planned Behaviour Variables, Pain-related Barrier Self-efficacy, Barrier Self-efficacy, Perceived Pain Intensity, and Walking Exercise

Variable	2	3	4	5	6	7	8	*M*	*SD*
1. Attitude	.45**	.67**	.63**	.63**	.43**	-.14	.40**	5.50	0.95
2. SN	-	.60**	.68**	.45**	.38**	.06	.37**	5.76	1.34
3. PBC	-	-	.77**	.68**	.49**	-.18	.55**	5.22	1.28
4. Intention	-	-	-	.69**	.55**	.04	.56**	5.55	1.61
5. Pain-related BE	-	-	-	-	.61**	-.23*	.44**	5.68	2.68
6. BE	-	-	-	-	-	-.02	.46**	5.86	2.58
7. Perceived pain	-	-	-	-	-	-	.01	3.31	1.68
8. Walking Ex								2.76	2.24

Note. SN = subjective norm, PBC = perceived behavioural control, BE = barrier self-efficacy, $*p < .05$, $**p < .01$

Tests of Theory and Primary Hypotheses

Hypothesis 1. Attitudes, subjective norms and perceived behavioural control will predict intentions to engage in walking exercise.

A hierarchical linear regression was conducted to test the basic tenets of the theory of planned behaviour for predicting intention. Intention was regressed onto attitudes and subjective norms (Step 1), and perceived behavioural control (Step 2) (Table 4). Overall, the model was significant, $F(3, 90) = 64.67$, $p < .001$, and accounted for 67% of the variance in intentions. Together, attitudes and subjective norms accounted for 58% of the variance in intentions, $F(2, 91) = 65.01, p < .01$. Perceived behavioural control explained an additional 9% of the variance, F change$(1, 90) = 26.94, p < .001$. In the overall model, the beta weights of the three predictor variables were significant, ranging from least to greatest in magnitude beginning with attitudes ($\beta = .17, p < .05$), subjective norms ($\beta = .33, p < .01$), then perceived behavioural control ($\beta = .46, p < .01$).

Table 4

Hierarchical Linear Regression Models Testing the Basic Tenets of the Theory of Planned Behaviour for Predicting Intentions.

Variable	R^2adj	R^2	β	t
Step 1				
Attitude	.58**	.59**	.40	5.32**
Subjective norm			.50	6.59**
Step 2				
Attitude	.67**	.09**	.17	2.15*
Subjective norm			.33	4.37**
Perceived behavioural control			.46	5.19**

*p <.05, **p <.01

Hypothesis 2. Intentions and perceived behavioural control will predict behaviour.

To examine the determinants of behaviour, walking exercise was regressed onto intention (Step 1) and perceived behavioural control (Step 2) (Table 5). Overall the model was significant, $F(2, 91) = 24.45, p < .001$ and accounted for 34% of the variance in walking exercise. Intention explained 31% of the variance in behaviour, $F(1, 92) = 42.08$,

$p < .001$ and perceived behavioural control accounted for an additional 3% of the variance, $F(2, 91) = 4.98$, $p < .05$. The beta weights for intention ($\beta = .33$, $p < .05$) and perceived behavioural control ($\beta = .30$, $p < .05$) indicated both variables were significant predictors of walking exercise.

Table 5

Hierarchical Linear Regression Models Testing the Basic Tenets of the Theory of Planned Behaviour for Predicting Behaviour

Variable	R^2adj	R^2	β	*t*
Step 1				
Intention	.31**	.31**	.56	6.49**
Step 2				
Intention	.34**	.03*	.33	2.51*
Perceived behavioural control			.30	2.23*

*p <.05, **p <.01

Hypothesis 3. Intention will mediate the relationships between walking exercise and attitudes, subjective norms, and perceived behavioural control.

Analyses were conducted in order to test the mediating framework of the theory of planned behaviour. Specifically, a series of hierarchical linear regression analyses were used to test for mediation by intention of the relationships between attitudes and behaviour, subjective norms and behaviour and perceived behavioural control and behaviour (Table 6). The procedures used adhered to recommendations by Baron and

Kenny (1986) for testing for mediation using regression, which required that the four conditions in Figure 1 (i.e., Paths A, B, C, and D) be met for each predictor variable (i.e., attitudes, subjective norms, perceived behavioural control). Perfect mediation occurred if the effect of the predictor variable on the outcome variable (i.e., walking behaviour) was not significant when controlling for the mediator (i.e., intention). Partial mediation occurred if the predictor variable had an effect on the outcome variable that was significantly reduced when controlling for the mediator. Regression analyses testing hypotheses 1 and 2 provide support for Path A (i.e., attitudes, subjective norms and perceived behavioural control each predicted intention) and Path B (i.e., intention predicted walking exercise) satisfying the first two conditions for testing for mediation in the case of each of the three predictor variables. Table 6 includes the linear models testing the final two conditions of mediation (Paths C and D) for each of the predictor variables. Separate linear regression analyses predicting walking exercise conducted for each of the three independent variables provides support for Path C in each case. Examination of the regression models for path D indicates that intention mediated the relationships between attitudes and walking exercise ($R^2 = .00, p = .47$) and between subjective norms and walking exercise ($R^2 = .00, p = .86$). With intention held constant, the effect of perceived behavioural control on walking exercise was reduced but remained significant, indicating that intention was a partial mediator of this relationship.

To examine the extent to which intention partially mediated the relationship between perceived behavioural control and walking exercise, the significance of the difference between the beta weight of perceived behavioural control for paths C and D was estimated by dividing the product term of the unstandardized regression coefficients for paths A (beta = .97) and B (beta = .78) by a standard error term (Baron & Kenny, 1986; Frazier, Tix, & Barron, 2004; Kenny, Kashy, & Bolger, 1998). This computation yields a *z* score of the mediated effect, which if it is greater than 1.96 indicates the effect is significant at the .05 level. Accordingly, a *z* score equal to 5.66 was derived from this calculation for the mediating effect of intention indicating this variable was significant ($p < .01$) in partially mediating the relationship between perceived behavioural control and walking exercise. The proportion of the total effect of perceived behavioural control on walking exercise that was mediated by intention was calculated by dividing the product term of the unstandardized regression coefficients for paths A and B by the unstandardized regression coefficient for Path C (beta = .96) (Shrout & Bolger, 2002), yielding a score of .781. Accordingly, approximately 78% of the total effect of perceived behavioural control on behaviour was mediated by intention.

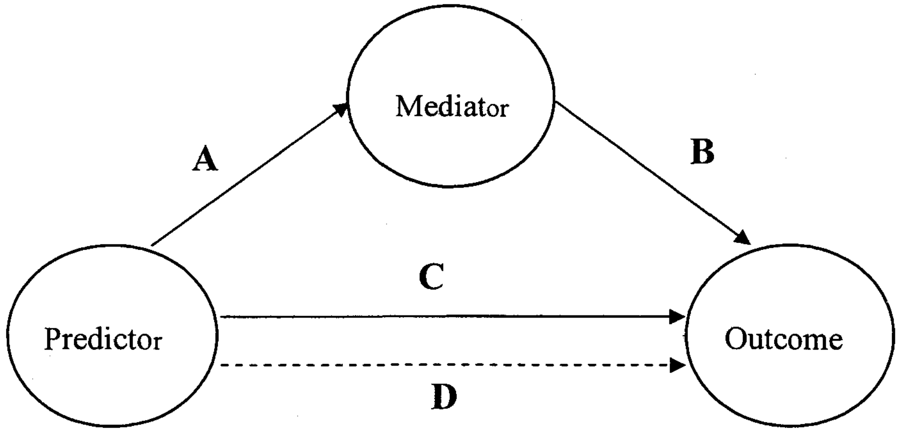

Figure 1. Conceptual model used for mediational analyses.

Table 6

Hierarchical Linear Regression Models Examining Intentions as a Mediator of the relationships between Attitudes, Subjective Norms, and Perceived Behavioural Control with Walking Exercise

Variables	$R^2 adj$	R^2	β	t
Path C				
Attitude	.15**		.40	4.18**
Subjective norm	.13**		.37	3.80**
Perceived behavioural control	.30**		.55	6.34**
Path D[a]				
Intention	.31**	.31**	.51	4.59**
Attitude	.30**	.00	.08	.73
Intention	.31**	.31**	.58	4.87**
Subjective norm	.30**	.00	-.02	-.18
Intention	.31**	.31**	.33	2.51*
Perceived behavioural control	.34**	.03*	.30	2.23*

*p <.05, **p <.01, [a] Models controlling for intention

Hypothesis 4. Pain-related barrier self-efficacy and barrier self-efficacy will account for additional variance in walking exercise beyond that explained by intention and perceived behavioural control.

To test the third hypothesis, pain-related barrier self-efficacy and barrier self-efficacy were entered into a hierarchical linear regression predicting walking behaviour after controlling for intention and perceived behavioural control (Table 7). Pain related barrier self-efficacy and barrier self-efficacy did not explain additional variance in walking behaviour (*F* change(2, 89) = 2.16, $p = .12$). However, the independent contribution of barrier self-efficacy was significant with a beta weight of .23 ($p < .05$). The beta weight for pain-related barrier self-efficacy was not significant (β = -.09, $p = .50$).

Table 7

Hierarchical Linear Regression Models Predicting Walking Exercise including Pain-related Barrier Self-efficacy and Barrier Self-efficacy

Variable	R^2adj	R^2	*β*	*t*
Step 1				
Intention	.34**	.35**	.33	2.51*
Perceived behavioural control			.30	2.23*
Step 2				
Intention	.35**	.03	.28	1.93
Perceived behavioural control			.29	2.10*
Pain-related barrier self-efficacy			-.09	-.67
Barrier self-efficacy			.23	2.08*

*p <.05, **p <.01

To explore the unique contributions of each variable to the prediction of walking exercise, squared semi-partial correlations were computed (Table 8). Combined, the unique contributions of the four predictors accounted for approximately 8% of the variance in behaviour indicating a substantial proportion of the explained variance in behaviour was shared.

Table 8

Squared Semi-partial Correlations of Variables Predicting Walking Exercise

	R^2adj	*F-ratio*	β	*t*	sr^2
Model	.35	13.61**			
Perceived behavioural control			.29	2.10*	.02
Intention			.28	1.92	.03
Pain-related barrier efficacy			-.09	-.67	<.01
Barrier self-efficacy			.23	2.08*	.03

* p <.05, ** p <.01

Hypothesis 5. Perceived pain intensity will moderate the relationship between intention and behaviour such that the intention-behaviour relationship will be positive and stronger among individuals who report less intense pain while walking.

A hierarchical multiple linear regression was conducted in order to test for the hypothesized moderating effect of perceived pain intensity on the intention–walking exercise relationship. Prior to testing the third hypothesis, data were treated in accordance with recommendations for testing for moderation effects using multiple regression (Frazier et al., 2004). Scores for the predictor variable (i.e., intention) and moderator variable (i.e., average perceived pain intensity over weeks one through four) were centered (i.e., put into deviation units) by subtracting their sample means in order to avoid problems of multicollinearity with the interaction term. Next, an interaction term was computed by multiplying the centered scores for each of the independent variables.

To test for moderation, a hierarchical linear regression including two steps for predicting walking behaviour was conducted (Table 9). In the first step, the centered variables representing intention and averaged perceived pain intensity were entered as a block producing a significant model which explained 30% of the variance in walking behaviour ($F(2, 91) = 20.81$, $p < .001$). In the second step, the product term was entered into the regression equation while controlling for the predictor and moderator variables. The addition of this variable did not explain variance in behaviour beyond the contributions of intention and perceived pain intensity (Fchange$(1, 90) = .001$, $p = .97$), indicating the absence of a moderating effect of perceived pain intensity on the intention-behaviour relationship.

Table 9

Hierarchical Linear Regression Models Examining Average Perceived Pain Intensity Over Weeks One through Four as a Moderator of the Intention-Behaviour Relationship

Variable	R^2adj	R^2	β	*t*
Step 1				
Intention[a]	.30**	.31**	.56	6.45**
Average perceived pain intensity[a]			-.01	-.12
Step 2				
Intention[a]	.29**	.00	.56	6.28**
Average perceived pain intensity[a]			-.01	-.13
Intention[a] x average perceived pain intensity[a]			-.00	-.04

*$p < .05$, **$p < .01$, [a] Centered scores

Discussion

The purpose of this study was to advance our understanding of determinants of walking exercise among individuals with intermittent claudication. Guided by mixed findings of a preliminary study on walking exercise among this population (Galea & Bray, in press) and by the broader literature on psychosocial determinants of exercise, this study applied Ajzen's (1985, 1991) theory of planned behaviour to examine psychosocial determinants of physical activity. The investigation also attempted to elaborate on the basic tenets of this theory by exploring social cognitive (Bandura, 1986) and pain-related variables for exercise using Ajzen's (1985, 1991) framework. Overall, findings supported the basic tenets of the theory of planned behaviour for examining walking exercise among individuals with intermittent claudication but failed to provide substantive evidence for the utility of self-efficacy constructs and perceived pain intensity as factors that contribute further to our understanding of this behaviour.

The Basic Tenets of the Theory of Planned Behaviour

This study represents a second attempt to examine theory-based psychosocial determinants of walking exercise among individuals with intermittent claudication, and provides corroborating evidence for the utility of the theory of planned behaviour (Ajzen, 1985, 1991) for predicting intentions to walk. Indeed, findings of the previous examination by Galea and Bray (in press) and the present study are remarkable in their consistency with attitudes, subjective norms, and perceived behavioural control accounting for 67% of the variance in walking intentions in both studies. What differs between the two studies is the relative contribution of each independent variable to the prediction of intentions. Previous findings pointed to significant contributions by attitudes ($\beta = .40, p < .01$) and perceived behavioural control ($\beta = .39, p < .01$), but not subjective norms ($\beta = .18, p = .06$) (Galea & Bray, in press). In the present investigation, the beta weights of the three predictors were significant, with the greatest variance in intentions explained by perceived behavioural control ($\beta = .46, p < .01$), followed by subjective norms ($\beta = .33, p < .01$), and attitudes ($\beta = .17, p < .05$).

The finding that attitude was the weakest predictor of intentions is surprising, and stands in contrast to consistent evidence in the general physical activity literature for its predictive strength (Hagger et al., 2002). A strong bivariate correlation (Pearson $r = .63$, $p < .01$) between these two variables indicates that attitude does play an important role in the formation of intentions. Given that correlations among the predictor variables were high, attitudes may have been outperformed by subjective norms and perceived behavioural control, in this case, simply because of conceptual and statistical overlap among the variables. Ajzen (1991) has pointed out that the relative importance of the theory of planned behaviour variables can vary depending on the context, population, or the behavioural outcome. However, he also notes that these variables are influenced by many common background factors (e.g., past experience, mood state, education level, cultural norms) and, as a result, are often highly associated (Ajzen & Fishbein, 2005).

Among the determinants of walking intentions, perceived behavioural control emerged as a strong contributor, with a substantial beta weight in comparison to the general literature (Hagger et al., 2002). Taking into consideration the functional limitations of PAD and the challenge of walking with intermittent claudication, it is not surprising that perceptions of control play an important role in predicting intentions to walk. Individuals with PAD are susceptible to factors which influence walking beyond the general population of older adults (Galea, Bray, & Martin Ginis, 2006) and which could have a bearing on the perceived ease or difficulty for engaging in this form of exercise. For example, an individual who lives in a hilly neighbourhood or who relies on a partner for support during a walk may indicate he or she is less likely to walk than a person who has access to a treadmill, or someone who has developed strategies for coping with the onset of pain during a walk.

The strong predictive power of subjective norms in the present study is evidence that this variable plays an important role in predicting walking intentions among individuals with intermittent claudication. In a meta-analysis of theory of planned behaviour studies on physical activity, Hagger et al. (2002) found subjective norms tended to be the weakest predictor, accounting for only a small proportion of the variance in intentions ($\beta = .05, p < .05$). In comparison, the beta weights for subjective norms in both the present study ($\beta = .33, p < .01$) and the study by Galea and Bray (in press) ($\beta = .18, p = .06$) are substantial and suggest an important bearing of this variable in determining walking exercise for people with intermittent claudication.

One factor that may account for the superior performance of subjective norms is the use of a measure targeting specific referents. Unlike many studies which have employed single-item measures of subjective norms reflecting a global source of normative influence on intentions, both the present investigation and the study by Galea and Bray (in press) included a four-item scale prompting information pertaining to referents identified as having a salient normative influence on physical activity cognitions (Galea, et al., 2006; Symons Downs & Hausenblas, 2005). Three of these items targeted specific individuals (i.e., spouse/significant other, medical practitioner, closest friend or family member) and only the fourth used a global referent (i.e., important others). When considered in concert, findings from both studies support the use of a multiple item measure targeting relevant normative referents and provide data strongly linking subjective norms to intentions to exercise among individuals with intermittent claudication.

Another finding of the present study that stands out is the 34% variance explained in behaviour by intention and perceived behavioural control. These findings are consistent with the broader literature on the theory of planned behaviour and physical activity (Godin & Kok, 1996; Hagger et al., 2002; Hausenblas et al., 1997). However, the magnitude of this effect is in stark contrast to the results of a previous study by Galea and Bray (in press), in which only 8% of the variance in walking exercise was explained. Although the inconsistencies in the two sets of findings may be due to sampling error, there are at least two factors, pertaining to the methodology used, which may have contributed to the increased variance explained in the present study. First, a definition of walking exercise was read to participants prior to filling out the baseline questionnaire, and again at each subsequent measurement time point. This definition made clear that for the purposes of the research study walking exercise does not include walking that is accumulated throughout the day, (e.g., while running errands, doing yard work, etc.), but that it represents only walking done for the purpose of exercise. This procedure was not undertaken in the earlier study by Galea and Bray (in press). Providing a clear definition of walking exercise may have helped ensure participants were reporting intentions about walking exercise that were closely correspondent with the behavioural outcome.

A second measure taken, which may have contributed to the improved prediction of behaviour, was the use of a take-home calendar. This calendar enabled participants to log their walking exercise and perceived claudication pain intensity. Participants were asked to use their calendar as an aide when reporting their activity and pain during telephone interviews, in an effort to improve the reliability of reported data. Physical activity reported using exercise logs has been validated against self-report recall and objective measures (Taylor et al., 1984; Timperio et al., 2004). Combined with a recall measure of activity, the use of an exercise log may have improved the accuracy of reported walking exercise in the present study by providing a memory prompt for participants during telephone interviews.

The Mediating Role of Intention

As a supplementary analysis testing the theory of planned behaviour framework, intention was examined as a mediator of the relationships between each of the three motivational variables (i.e., attitudes, subjective norms, and perceived behavioural control) and behaviour using hierarchical linear regression models. Overall the results provided evidence that the relationship between attitudes and walking exercise and between subjective norms and walking exercise were fully mediated by intentions.

Partial mediation of the relationship between perceived behavioural control and behaviour by intentions indicates that perceived behavioural control has both an indirect and a direct effect on walking exercise among individuals with intermittent claudication. These findings are entirely consistent with the proposed roles of perceived behavioural control and intentions in the theory of planned behaviour. Since perceived behavioural control serves as a proxy measure of actual control (Ajzen, 1985), these findings suggest walking exercise is not under complete volitional control and is subject to obstacles and impediments that could make walking difficult to engage in. Factors which impede walking could include barriers such as weather constraints, having no place to take a resting break along a walk, or finding there is too much work to do on a particular day (Galea et al., 2006). These obstacles can be overcome only to the degree that perceived behavioural control reflects actual control over performing the behaviour. Collectively these findings offer support for the mediating framework of the theory of planned behaviour.

Self-efficacy Constructs as Determinants of Walking Exercise

The present study also aimed to enhance our understanding of walking determinants investigating additional variables which were hypothesized to improve the prediction of behaviour. Namely, measures of pain-related barrier self-efficacy and barrier self-efficacy for walking exercise were explored as determinants of behaviour beyond intentions and perceived behavioural control. Results of hierarchical regression analyses indicated that the addition of these variables did not account for a significant proportion of additional variance in behaviour (R^2 change = .03, p = .12). While the results of that analysis in one way forgoes further examination of these variables, this evidence is not sufficient to discount a prominent role for pain-related barrier self-efficacy and barrier self-efficacy for predicting walking exercise among individuals with intermittent claudication. For example, examination of bivariate correlations indicates substantial associations between these variables and walking exercise (Pearson $r = .44$ and .46, for pain-related barrier self-efficacy and barrier self-efficacy, respectively), and a hierarchical linear regression predicting behaviour presented a significant beta weight for barrier self-efficacy ($\beta = .23, p < .05$). Furthermore, examination of semi-partial correlations indicated substantial overlap between variables. It is therefore possible that the effect of self-efficacy on behaviour may have been shrouded by common associations with intentions and perceived behavioural control. Rhodes and Courneya (2003a, 2003b) provide evidence using structural equation modeling and confirmatory factor analyses for conceptual redundancy between measures of self-efficacy and intentions regarding exercise, arguing that both constructs comprise an aspect of motivation. In addition, their findings indicate that measures of self-efficacy, which fail to hold motivation as a positive constant, do not fit in a model with measures of intention and control and could affect the predictive ability of other theoretical variables (Rhodes & Courneya, 2003b; Rhodes & Courneya, 2004). While these two studies examined task self-efficacy, or self-efficacy for engaging in exercise, this interpretation could apply to other self-efficacy constructs, including barrier self-efficacy.

With regard to the argument presented by Rhodes and Courneya (2003b), measures of pain-related barrier self-efficacy and barrier self-efficacy used in the present study could have incorporated aspects of motivation that are taken into account at an earlier stage of the reasoned action process. For instance, these cognitions may be influential when formulating intentions and when considering perceptions of control. Indeed, according to Ajzen (1988), perceived behavioural control takes into account potential obstacles and impediments, and is comprised of cognitions pertaining to efficacy beliefs (Rhodes & Courneya, 2003b). Given perceived control can influence behaviour both indirectly through intention and as a direct determinant, it is possible that the effect of barrier self-efficacy measures on behaviour was affected by intention in a similar manner. For instance, barrier self-efficacy might only be relevant for those individuals who intend to exercise, and who have experience doing so, enabling persistence in the face of impending obstacles. Others may hold efficacious cognitions regarding those same barriers, despite low intentions to exercise, and as a result need not act on their beliefs, in which case intentions would predict behaviour while barrier self-efficacy would not.

The pattern of results in Tables 3 and 7, representing bivariate correlations and a hierarchical linear regression predicting behaviour support an interpretation that intention could mediate the relationship between walking behaviour and barrier self-efficacy as well as pain-related barrier self-efficacy. Resolving the conceptual muddle regarding barrier self-efficacy and its role as a determinant of walking exercise among individuals with intermittent claudication may have required a restructuring of the items on the questionnaire to control for motivation. This would have provided a measure consistent with Ajzen's (2002) conceptualization of self-efficacy as a component of perceived behavioural control which is distinct from behavioural intentions, and which acts as a direct determinant of behaviour.

Does Pain Moderate the Intention-Behaviour Relationship?

In an additional effort to improve our understanding of walking behaviour, this study explored the role of perceived pain intensity as a moderator of the relationship between intentions and behaviour. The hypothesis that this relationship would be weaker among those participants who reported higher perceived pain intensity during walking was not supported. This hypothesis was based on the idea that individuals may have underestimated the influence of pain severity on their ability to accumulate 30 minutes or more of walking on at least 3 days per week when reporting their intentions in the absence of painful stimuli.

The absence of an effect may have been due to difficulties in detecting moderator effects. In a bleak illustration of the limitations of testing for moderation in field research, McClelland and Judd (1993) point to a number of factors that may result in the support of a null hypothesis. Among these, the present study may have been limited in its power by at least two conditions. First this study tested an ordinal interaction with an anticipated "fan shaped" plot. That is, only high scores on perceived pain intensity were anticipated to affect the intention-behaviour relationship. According to McClelland and Judd (1993), it is easiest to detect a cross-over interaction where a relationship is affected by extreme scores on either end of a moderating variable (i.e., high and low pain intensity). A second limitation of the present examination involves the distribution of scores for perceived pain intensity. A normal distribution, with the majority of scores falling along the mid-range of the scale (M = 3.31, SD = 1.68), may have reduced the efficiency of the model to detect a moderating effect. When testing for moderation, it is ideal to have the scores of a moderating variable fall at the extremes, and even better, to have extreme scores for both variables used to compute the product term coincide with one another. Neither of these conditions was met in the present study.

Despite the discouraging findings of the investigation into the role of pain for predicting behaviour among individuals with intermittent claudication, the 34% variance in behaviour accounted for in this study remains a modest proportion and warrants continued investigation of both additional determinants of behaviour and potential moderators of the relationship between behaviour and its predictors, including pain-related variables.

Other Possible Avenues for Exploring Pain

An important consideration to be made with regards to the role of pain as a determinant of exercise is whether it could precede intentions in the theory of planned behaviour model. Indeed, it is plausible that considerations about pain become relevant at an early level of reasoned action as beliefs that contribute to the formation of attitudes and perceptions of control. For instance, behavioural beliefs reflect the likely consequences of performing a behaviour and could include beliefs about potential positive changes in symptomology arising from regular walking exercise, but also beliefs about the painful experience of engaging in regular walking exercise. With this in mind, it is possible that individuals with intermittent claudication could hold a positive instrumental evaluation of walking exercise, but maintain a relatively low affective attitude. Along these lines, Rhodes and Courneya (2003b) provide evidence for a conceptual distinction between the two subcomponents of attitudes. In their study only the affective component of attitudes predicted exercise intentions among a sample of individuals who had survived cancer, warranting further research on underlying behavioural beliefs among this population and other populations with special needs pertaining to exercise.

Perceptions of control, which are shaped by beliefs about the presence or absence of factors that make the behaviour in mind more easy or difficult (Ajzen, 1991), could also incorporate beliefs regarding pain. Galea et al. (2006) provide qualitative evidence for a number of pain-related factors that act as barriers and facilitators for regular walking exercise among individuals with intermittent claudication. Some of these factors include the presence or absence of a resting place, the anticipation of walking up stairs or along an incline, and the ability to employ cognitive coping strategies while walking through pain. Additional research eliciting control as well as behavioural beliefs about walking could indicate whether and how considerations about intermittent claudication pain factor into the earliest stages of the reasoned action process.

Is Pain Associated with Walking Exercise?

In addition to results testing the hypothesized role of perceived pain severity, a noteworthy finding of the present study is the lack of an association between perceived pain intensity and walking behaviour. This finding stands out in comparison to previous research suggesting that pain severity is limiting factor of exercise participation (Jensen & Karoly, 1991; Kop et al., 2005; Vuillemin et al., 2005). Consistent with that line of research, a negative association between perceived pain intensity and walking was expected such that individuals who reported higher perceived pain would engage in less walking. However, alternative patterns of the pain-behaviour relationship are also possible. That is, because claudication pain is exercise induced, individuals who reported low perceived pain but did little walking may have reported low pain simply *because* they did not walk. Similarly, individuals who reported higher scores on perceived pain intensity and who engaged in walking exercise may have experienced more pain because they walked more. These patterns would suggest a positive association between perceived pain intensity and walking exercise. Clearly there is scope for future work examining the relationship between pain and walking among individuals with intermitted claudication.

The Status of Walking Exercise

In addition to results of tests of the primary hypothesis, descriptive information drawn from this study provides a noteworthy account of walking behaviour among individuals with intermittent claudication. A breakdown of reported walking exercise in terms of frequency and duration indicates that on average, participants in this study walked on most days of the week (M = 3.94, SD = 2.14), and for just over half an hour per occasion (M = 30.41, SD = 15.54). While these data suggest participants achieved a level of walking activity that could reduce their rate of functional decline (McDermott, et al., 2006), more than half of the participants in the study (57.4%) did not accumulate a minimum of 30 minutes of walking on at least 3 days per week over the four week period. These findings are comparable to other reports of activity levels among people with intermittent claudication. For example, only 35.3% of individuals with symptomatic PAD who participated in a study by McDermott et al. (2006) reported walking at least 3 times per week at baseline. Galea and Bray (in press) also found a minority (47.5%) of individuals with intermittent claudication achieved the recommended 30 minutes of walking on at least 3 days per week.

Strengths of the Present Study

The present study provides support for Ajzen's (1985, 1991) theory of planned behaviour by presenting evidence for its utility in predicting exercise intentions and behaviour consistent with the broader literature on physical activity (Godin & Kok, 1996; Hagger et al., 2002; Hausenblas et al., 1997). In turn, these findings indicate it is an appropriate framework for examining exercise determinants among individuals with intermittent claudication. Although findings are not entirely consistent with a preliminary investigation applying Ajzen's (1985, 1991) framework to this population, the present study provides convincing evidence grounded in an improved methodology. First, in a meta-analytic review on the theory of planned behaviour, Armitage and Conner (2001) report a large proportion of studies examining physical activity used a cross-sectional design. Armitage (2005) argues that this methodology could inflate relationships which are measured contemporaneously, and encourages studies with lengthened time periods. The present study embraced these suggestions by incorporating a prospective design which was extended over a four week period. Additionally, repeated measures of walking exercise, accompanied by a calendar record of activity reduced the likelihood that primacy and recency effects associated with free recall (Armitage, 2005; Murdock, 1974) would compromise the validity of the data obtained.

This study was also strengthened by its attempt at theory integration. Specifically, it incorporated measures of self-efficacy, a concept drawn from Bandura's (1986) social cognitive theory within the theory of planned behaviour framework. Baranowski et al. (1998) emphasize the need for incorporating theoretical concepts and constructs when conducting basic research in order to gain a comprehensive understanding of physical activity behaviour. In addition, Weinstein and Rothman (2005) argue that theories pitted against one another in comparison tell little about their relative predictive utility, but that combining theoretical predictors enables researchers to maximize our understanding of health behaviour determinants while also identifying the elements of each theory which may have improved the model. In line with these suggestions, the present study did not limit its investigation to theory of planned behaviour determinants alone, but incorporated additional theoretical concepts to gain a better understanding of walking exercise among individuals with intermittent claudication.

Finally, this study looked beyond basic predictive relationships to examine perceived pain intensity as a potential moderator of the intention-behaviour relationship. Furthermore, it is the first study to incorporate a measure of pain as a determinant of exercise behaviour using the theory of planned behaviour as a framework. Research exploring potential moderators of the intention-behaviour relationship is accumulating (e.g., Cooke & Sheeran, 2004; Sniehotta, Scholz & Schwarzer, 2005) and should continue to accumulate given evidence that the theory of planned behaviour may be limited in its ability to predict behaviour (Armitage & Conner, 2001; Hagger et al., 2002).

A better understanding of moderators can contribute to the tailoring of interventions to specific subgroups of people (Bauman et al., 2002). The present study investigated moderation by a disease-related characteristic of the population under investigation and provides evidence that the intention-behaviour relationship does not vary between individuals with intermittent claudication based on their level of perceived pain intensity experienced while walking.

Practical Implications and Future Directions

The present study represents a basic application of theory, but provides compelling evidence for the contributions of several modifiable variables for determining walking exercise. Consequently, the findings may have practical implications for practitioners and clinicians. Ajzen and Fishbein (2005) identify a non-exhaustive list of background factors which could influence beliefs forming an individual's attitudes, subjective norms, and perceived behavioural control. Among these, experience, knowledge, and intervention are avenues whereby walking motivation could be strengthened. When interacting with individuals who have intermittent claudication, specialists should aim to target and affect positive changes in these variables. For instance, practitioners have an opportunity to inform visiting patients of the benefits of walking exercise for their condition, emphasizing the long-term medical and biological outcomes of regular activity as well as the implications of improved walking in other aspects of daily life. A qualitative study exploring motivating factors for walking exercise among individuals with PAD hypothesised a core role of physicians for intervening in the behaviour modification of PAD patients (Collins et al., 2006). This study identified positive interaction styles between physicians and their patients and the communication of specific information as important variables in increasing exercise motivation. Other research indicates that practitioners' interactions with their patients hold bearing for subsequent compliance to treatment regimens (Cameron, 1996; Sherbourne, Hayes, Ordway, DiMatteo, & Kravitz, 1992), and they have been identified as important referents for influencing subjective norms (Symons Downs & Hausenblas, 2005).

Evidence for modifiable theoretical determinants of exercise provides a blueprint for the development of more effective interventions, designed to target and measure variables known to influence activity. In turn, interventions provide a setting ideal for testing, evaluating, and advancing theory. The interdependence of theory and intervention is summarized by Rothman (2004) as an opportunity to specify critical assumptions underlying the protocol for interventions, and as a means to test theory in order to generate evidence for its accuracy and applicability.

There is ample evidence for the effectiveness of structured treadmill walking exercise programs for eliciting gains in the health status of individuals with intermittent claudication (e.g., Gardner et al., 2000; Izquierdo-Porrera et al., 2000; Leng et al., 2000). However, adherence to walking following enrolment in this type of intervention is not well-maintained, and any prior health gains are usually lost shortly after participation in the program ends (de la Haye et al., 1992; Menard et al., 2004; Savage et al., 2001). This study is among the first to provide theory-based evidence identifying variables which could aide in enhancing adherence to exercise during and following structured walking programs and which could facilitate self-directed walking for those without access to formal programming. Future structured treadmill walking interventions could be combined with strategies that target the formation of positive attitudes and perceived behavioural control, and which foster a network of encouraging social referents, in turn providing an opportunity for testing and refining theoretical determinants.

Given research on psychosocial determinants of physical activity among people with intermittent claudication has only just laid its groundwork, it is prudent to adhere to the recommendations of Baranowski et al. (1998) for improving the quality of research and intervention. Those authors express the need for a foundation of basic theory-based research comparing and integrating models for predicting physical activity. Another framework which holds promise for improving our understanding of determinants among this population, and which has not yet been investigated, is Bandura's (1986) social cognitive theory. This study presents an association between social cognitive variables, namely measures of barrier self-efficacy, with intentions and walking exercise. Research employing a more comprehensive array of social cognitive variables (Bandura, 1986) could indicate additional constructs that play an important role as determinants of walking exercise.

Limitations

While the study presents numerous strengths, there are also several limitations that must be accounted for when considering the findings. First, participants were recruited from a diagnostic and treatment clinic specializing in peripheral arterial disease and were under specialist care for their condition. In addition, the vast majority of the sample was either enrolled in a treadmill walking program at the time of the study (31.9%) or had previously participated in such a program (45.7%). These factors may be reflected in the finding that participants reported having generally positive attitudes, subjective norms, perceived behavioural control, and intentions regarding walking. Consequently, findings of this study must be interpreted with caution as they may not be generalizeable to all community-dwelling older adults with intermittent claudication.

A second consideration when interpreting the findings of the present study involves the measures used to assess barrier self-efficacy. Four items included on the pain-related barrier self-efficacy scale were drawn from focus groups involving individuals with intermittent claudication, and are pertinent to the present investigation. In contrast, the barrier self-efficacy scale was adapted from a scale developed for cardiac rehabilitation patients (Blanchard et al., 2002) and may not have captured many of the barriers pertaining to the specified frequency and duration of walking exercise in the present study. In addition, four of the seven items originally included in this scale were not analysed because of a substantial proportion of missing values suggesting the scale did not adequately represent barriers to walking which are most prominent among individuals with intermittent claudication. Careful construction of a scale including pain-related barriers but also more general barriers to walking exercise using information elicited directly from individuals afflicted by intermittent claudication could result in a more comprehensive measure of barrier self-efficacy while also shedding light onto potential obstacles to walking among this population.

A third limitation of this study, and one that is also pertaining to measurement, involves the use of the Borg CR10 Scale of Pain (Borg, 1998) to assess perceived pain intensity. This measure was considered suitable for the present study because it provides a brief, straightforward measure of perceived pain intensity. The experience of pain is a complex process, however, that can be represented on multiple dimensions. According to Melzack and Casey (1968), three major psychological dimensions of pain include sensory-discriminative, motivational-affective, and cognitive-evaluative components. Subjective pain intensity, as measured by the single-item Borg CR10 Scale of Pain (Borg, 1998) provides an indication of the latter of the three dimensions. It may be that walking behaviour among individuals with intermittent claudication is also influenced by sensory (e.g., temporal and spatial properties) and affective (e.g., tension, fear, and autonomic properties) qualities of the pain experience. The single-item measure of pain used in the present study captures only a fragment of participants' experience of pain. Exploration into exercise behaviour among individuals with claudication using more comprehensive measures of pain could provide a better indication of the role of pain in determining walking.

Interpretation of the findings should also be tempered considering the use of a walking log because it may have served as a motivational tool for participants (Dishman et al., 2001) with unknown influences on activity during the period of the study. The promotion of self-monitoring is at least one mechanism whereby the walking log may have influenced exercise behaviour. Self-monitoring involves the evaluation of one's behaviour in comparison with a particular standard (Bandura, 1997) and has been shown to predict physical activity by mediating the intention-behaviour relationship (Sniehotta, Nagy, Scholz, & Shwarzer, 2006; Sniehotta et al., 2005). Accordingly, walking exercise could have been facilitated by having a record of activity on hand along with a presumed standard of walking exercise in mind after completing baseline assessment. As a result, generalizability of the findings of this study may be limited to instances when individuals are motivated by self-monitoring.

Conclusion

The findings of the present study advanced our understanding of walking exercise among individuals with intermittent claudication, supporting the utility of the theory of planned behaviour for predicting physical activity among special populations. Associations were detected between pain-related barrier self-efficacy and barrier self-efficacy and walking exercise; however, more research including refined measures of self-efficacy variables is needed to better test their role in determining activity. Perceived pain intensity does not appear to moderate the relationship between intention and behaviour; however, examination into the role of various dimensions of pain as they contribute to the reasoned action process is warranted.

Findings of this study provide a foundation and direction for future research examining exercise among individuals with intermittent claudication, but also carry practical implications which could enhance strategies for increasing exercise participation. At this time, more research is needed in order to best guide the development and testing of such interventions. It is hoped that this study will raise awareness among health and exercise psychologists of the unique symptomology of peripheral arterial disease and that it will be succeeded by advanced research on psychosocial variables and exercise among individuals with intermittent claudication.

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Appendix A

Tables 1 and 2

Table 1

Means, Standard Deviations, and Ranges for Continuous Measures of Demographic Variables and Disease Characteristics.

	M	*SD*	Observed Range
Age	70.05	9.02	48-91
Ankle-Brachial Index	.69	.14	.32-.90

Table 2

Frequencies and Percentages of Categorical Measures for Demographic Variables and Disease Characteristics

	Frequency	Percent
Sex		
Female	33	35.1
Male	61	64.9
Ethnicity		
White	89	94.7
Chinese	1	1.1
Black	2	2.1
Arab	1	1.1
Other	1	1.1
Marital status		
Single, divorced, widowed, separated	33	35.1
Married	61	64.9

Education Level		
Elementary	37	39.4
Secondary	41	43.7
College/University	8	8.5
Post graduate	8	8.5
Smoking Status		
Never Smoked	8	8.5
Previous Smoker	52	55.3
Currently Smoking	32	34.0
Treadmill Exercise Program Participation		
No Experience	20	21.3
Past Participation	43	45.7
Currently Enrolled	30	31.9
Laterality of Disease		
Unilateral	59	62.8
Bilateral	35	37.2
Duration of Claudication Symptoms		
Less than 1 year	12	12.8
1 to 2 years	22	23.4
Greater than 2 years	59	62.8
Pharmacological Pain Treatment		
Yes	14	14.9
No	77	81.9

Appendix B

Baseline Questionnaire

This survey includes 6 pages and should take approximately 20 – 25 minutes to complete. Complete all questions to the best of your ability. Once you are finished, please place the survey in the envelope and return it to the researcher.

Thank you for your participation!

Age: ________

Gender (check one): Male Female

Are you currently (check one):
Married Separated Widowed Single Divorced Other

Ethnicity (check one):
White Chinese Black Filipino Latin American
Southeast Asian South Asian West Asian Arab
North American Indian, Métis, or Inuit Other

What is the highest education level you have achieved?
- some high school
- completed high school
- some university/college
- completed university/college
- some/completed graduate school

Smoking History (check the box that best applies to you):
- I am currently a cigarette smoker
- I used to smoke, but have NOT smoked a cigarette in the past 6 months
- I have never been a cigarette smoker

Exercise Experience (check the box that best applies to you):
- I am currently enrolled in a treadmill walking exercise program
- I have participated in a treadmill walking exercise program in the past
- I have never participated in a treadmill walking exercise program

The following questions refer to blockages in the arteries of your body, particularly your legs, and how that might affect your life. Please complete the following questions. There are no right or wrong answers. Mark the answer that best applies to you.

Blockages in the arteries affect different people in different ways. Some feel cramping or aching while others feel fatigue. Which leg (or buttock) causes you the most severe **discomfort, fatigue, pain, aching, or cramps** while you are walking?

Right leg (buttock) **Left** leg (buttock) **Both** are the same Neither

Approximately how long have you been experiencing this **discomfort, fatigue, pain, aching, or cramp**?

less than one year one to two years greater than two years

Are you on any medication which helps to treat or alleviate the **discomfort, fatigue, pain, aching, or cramp** that you experience in your legs during walking?

yes no

The questions in this survey relate to your thoughts and feelings about going walking for at least 30 minutes on 3 or more days in the next 4 weeks. Remember, we are interested in the walking that you do during your **free time** for the purpose of exercise. We are **NOT** interested in the walking that you accumulate while doing other activities throughout the day (for example, walking around the house, at work, or while shopping). Also, for the purposes of this survey, 30 minutes of walking **does not** include the time spent taking rest breaks due to pain or discomfort. Instead it represents only the total time spent **actually walking.**

For each question, **circle the number** that best represents how you feel.

For example:

1	2	3	4	(5)	6	7
completely disagree			neither agree nor disagree			completely agree

1.**During the next 4 weeks,** it is mostly up to me whether or not I walk for at least 30 minutes on 3 or more days per week.

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

2.Most people who are important to me think that I should walk for at least 30 minutes on 3 or more days per week **during the next 4 weeks.**

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

3.**During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be...

1	2	3	4	5	6	7
wise	somewhat wise		neither wise nor foolish	somewhat foolish		foolish

4.**During the next 4 weeks,** I will walk for at least 30 minutes on 3 or more days per week.

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

5.If it were entirely up to me, I am confident that I would be able to walk for at least 30 minutes on 3 or more days per week **during the next 4 weeks.**

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

6.**During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be...

1	2	3	4	5	6	7
unpleasant	somewhat unpleasant		neither unpleasant nor pleasant	somewhat pleasant		pleasant

7.My spouse/significant other approves of me walking for at least 30 minutes on 3 or more days per week **during the next 4 weeks.**

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

8.**During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days in the upcoming week would be...

1	2	3	4	5	6	7
extremely easy			neither easy nor difficult			extremely difficult

9.My goal **during the next 4 weeks** is to walk for 30 minutes on 3 or more days per week.

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

10.**During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be...

1	2	3	4	5	6	7
good	somewhat good		neither good nor bad	somewhat bad		bad

11.My medical practitioner thinks that I should walk for at least 30 minutes on 3 or more days per week **during the next 4 weeks.**

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

12. **During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be...

1	2	3	4	5	6	7
enjoyable			neither enjoyable nor unenjoyable			unenjoyable

13. My closest friend or family member (other than my spouse/significant other) approves of me walking for at least 30 minutes on 3 or more days per week **during the next 4 weeks.**

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

14. **During the next 4 weeks,** I intend to walk for at least 30 minutes on 3 or more days per week.

1	2	3	4	5	6	7
completely disagree			neither agree nor disagree			completely agree

15. **During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be...

1	2	3	4	5	6	7
boring	somewhat boring		neither boring nor interesting	somewhat interesting		interesting

16. **During the next 4 weeks,** how much personal control do you believe you have over whether or not you walk for at least 30 minutes on 3 or more days per week?

1	2	3	4	5	6	7
complete control						absolutely no control

17. **During the next 4 weeks,** how much do you feel that whether you walk for at least 30 minutes on 3 or more days per week is beyond your control?

1	2	3	4	5	6	7
completely beyond my control						completely within my control

18. **During the next 4 weeks,** do you plan to walk for at least 30 minutes on 3 or more days per week?

1	2	3	4	5	6	7
definitely not						definitely yes

19. **During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be…

1	2	3	4	5	6	7
stressful			neither stressful nor relaxing			relaxing

20. **During the next 4 weeks,** how confident are you that you will be able to walk for at least 30 minutes on 3 or more days per week?

1	2	3	4	5	6	7
completely unsure						completely sure

21. **During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be…

1	2	3	4	5	6	7
harmless			neither harmless nor beneficial			beneficial

22. **During the next 4 weeks,** to what extent do you see yourself as being capable of walking for at least 30 minutes on 3 or more days per week?

1	2	3	4	5	6	7
extremely capable						extremely incapable

23.**During the next 4 weeks,** for me to walk for at least 30 minutes on 3 or more days per week would be…

1	2	3	4	5	6	7
useless			neither useless nor useful			useful

Please rate how confident you are that you can do the following things at present. To indicate your answer circle **one** of the numbers on the scale under each item, remembering that
0 = ***not at all confident*** and **10 =** ***completely confident.***

During the next 4 weeks, how confident are you that you can accumulate 30 minutes of walking on three or more days per week…

1. if there is no convenient place (e.g. park bench, bus stop) to take a resting break along the way.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

2. if you might have to walk uphill or climb stairs along the way.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

3. if you do not have at least one companion or partner to walk with.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

4. if you experience pain or discomfort in you legs during the walk.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

5. when you experience side effects of your medications

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

6. if you experience angina or chest pains

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

7. if you experience health-related problems

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

8. if you have too much work to do

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

9. if you have no time

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

10. if you experience back pain

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

11. when the weather is bad

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

Many individuals like yourself experience pain or discomfort in their legs during a walk. Some people need to stop walking and take a seated or standing rest break to alleviate this pain or discomfort. Once the pain subsides they can continue walking. The following questions refer to times when you may need to stop and rest during a walk because of the pain or discomfort you experience in your legs.

Please rate how confident you are that you can do the following things at present.

I can accumulate 30 minute of walking on three or more days in the upcoming 4 weeks…

1. if I need to take ONE rest break during my walk.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

2. if I need to take TWO rest breaks during my walk.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

3. if I need to take THREE OR MORE rest breaks during my walk.

0	1	2	3	4	5	6	7	8	9	10
not at all confident					somewhat confident					completely confident

Think of the three worst experiences of pain you have *ever* had. If you use 10 on the following scale as the worst pain you have ever experienced or can think of, how would you rate the **average intensity** of pain or discomfort you experienced in your legs while walking over the past week?

Start by looking at the *verbal expressions* and then chose a *number*.
For example, if your pain was "Very slight," chose 1, if "Moderate," chose 3, and so on. You can also use half values (such as 1.5, 3.5 or decimals such as 0.4, 0.8, or 2.3).

0	Nothing at all
0.5	Just noticeable
1	Very slight
2	Slight
3	Moderate
4	Somewhat severe
5	Severe
6	
7	Very severe
8	
9	Very, very severe
10	Maximal

Average pain intensity score: _______

YOU HAVE COMPLETED THE SURVEY!

THANK YOU FOR YOUR PARTICIPATION!!

You will receive a telephone call from the researcher in one week. Please indicate the time of day that you are most often available to answer the phone. You may check more than one box.

8 AM – 10 AM	10 AM – NOON	NOON – 3 PM
3 PM – 6 PM	6 PM – 8 PM	OTHER (specify) _______

Please indicate the primary phone number at which you can be reached during this time:

(   ) ____ - _________

Is there a second phone number at which you can be reached?

(   ) ____ - _________

Please provide your name so that the researcher may contact you:

____

Appendix C

Take-Home Walking Calendar

WALKING LOG

ID# _____

Please use the following calendar to record:
1. The number of minutes you spent walking each day (this does not include the time you spent taking rest breaks)
2. The severity of pain you felt during your walk (using the pain intensity scale on the right)

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
WALK TIME: ______ mins PAIN: _____ Start Date:___	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____
WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____
WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____
WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____	WALK TIME: ______ mins PAIN: _____ End Date:___

Pain Intensity Scale

0	Nothing at all
0.5	Just noticeable
1	Very slight
2	Slight
3	Moderate
4	Somewhat severe
5	Severe
6	
7	Very severe
8	
9	Very, very severe
10	Maximal