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Self-efficacy and Mood in Phase II Cardiac Rehabilitation: Should We Consider Gender?

by

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Dedication

I would like to dedicate my dissertation to my parents, Jack and Linda, my three brothers, Rob, Mike and Scott, and my partner Michelle. What can I say? You were all there for me when I needed you most.

Abstract

The present dissertation examined gender differences on various psychosocial variables (e.g., task and barrier efficacy and mood) during phase II cardiac rehabilitation (CR) in a series of two studies. The purpose of study one was to determine whether barrier efficacy (i.e., confidence in one's ability to perform an elemental task under challenging conditions) mediated the gender / exercise adherence relationship in phase II CR. A questionnaire that contained 9 exercise barriers developed from a pilot study was administered to 98 phase II CR patients (50 males and 48 females). Preliminary analyses showed that men had significantly higher exercise adherence and barrier efficacy. Partial correlations demonstrated that barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. Specifically, men had significantly higher barrier efficacy, which in turn, was associated with higher exercise adherence during phase II CR compared to women.

Although study one offered novel information regarding gender differences in phase II CR from a barrier efficacy standpoint, the second study took more of an outcome approach to examining gender differences in phase II CR. The purpose of study two was to examine a) the influence of phase II CR on task and barrier efficacy and mood states in men and women, b) the relationship between task and barrier efficacy and post-phase II CR exercise adherence, and c) the reciprocal relationship between self-efficacy and mood. Patients (57 men and 24 women) completed a questionnaire that included task and barrier efficacy scales, and anxiety, depression, and vigor subscales from the POMS three to five weeks prior to phase II rehabilitation, immediately pre- and post-phase II CR, and 6 to 10 weeks post-rehabilitation (i.e., follow-up). Women had significantly larger

increases in task and barrier efficacy from pre- to post- phase II CR than men, however, men and women had a significant decline at follow-up. Both men and women had a similar decrease in anxiety and an increase in vigor during phase II CR, however, vigor significantly declined at follow-up. All changes in mood were significantly related to changes in task and barrier efficacy.

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Chapter One

General Introduction

Introduction

Coronary heart disease (CHD) remains the leading cause of death in the United States for men and women. Furthermore, 1.1 million new or recurrent coronary events were expected in the United States in the year 2000. Of these 1.1 million people, 55% were expected to be men while 45% were expected to be women (American Heart Association, 2000). Based on a national survey of phase II cardiac rehabilitation (CR) programs in the United States, 14.8% of the 1.1 million people hospitalized as a result of CHD were expected to participate in structured phase II CR. Of this 14.8%, 75 % of the patients were expected to be men while only 25% were expected to be women (Thomas et al., 1996). Moreover, once men and women enroll in a phase II CR program, it has been consistently shown that women have lower adherence rates and are more likely to drop out compared to men (Halm et al., 1999; Schuster, & Waldron, 1991; Oldridge, Ragowski, & Gottlieb, 1992; Ades et al., 1992). As a result of the small enrollment numbers and low adherence / high drop out rates of women to phase II CR, very little research has been conducted to examine a) theoretical variables (e.g., self-efficacy) which may help explain gender differences in adherence to phase II CR programs, and b) any potential gender differences in the outcomes (e.g., self-efficacy, anxiety, and depression) of phase II CR.

The present dissertation attempted to address both of these novel issues by conducting two studies. The first study attempted to explain gender differences in exercise adherence to phase II CR via barrier efficacy (i.e., confidence in one's ability to perform an elemental task *under challenging conditions* such as walking for 30 minutes when you are experiencing medication side effects). More specifically, it was tested to see if barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. It was hypothesized that men would have significantly higher barrier efficacy compared to women, which in turn, would be associated with significantly higher exercise adherence during phase II CR. The second study examined potential gender differences in the outcomes of phase II CR. In this study, it was examined whether phase II CR had a similar influence on task efficacy (i.e., confidence in one's ability to perform the elemental aspects of a task such as walking for 30 minutes), barrier efficacy, anxiety, depression, and vigor in men and women. It was hypothesized that women would experience larger changes in task and barrier efficacy during phase II CR compared to men, however, no gender differences were expected for the changes in mood. Furthermore, as previous studies in phase II CR have not offered theoretical explanations for mood changes associated with these programs, the bi-directional relationship between self-efficacy and mood (i.e., a change in one should influence a change in the other) proposed by social cognitive theory (Bandura, 1997) was tested to explain these mood changes. It was hypothesized that an increase in task and barrier efficacy would be associated with a decrease in anxiety and depression and an increase in vigor.

Goals and Benefits of Cardiac Rehabilitation

Before reviewing the self-efficacy and mood literature in CR, it is important to describe the general goals and benefits of CR in order to familiarize the reader with the process of recovery.

Cardiac rehabilitation programs have two primary foci: 1) promoting health behavior change; and 2) enhancing psychological well-being. Regular exercise is consistent with both of these objectives. Exercise speeds recovery and helps patients feel better, reduces their fears, and facilitates resumption of normal routines (Ewart & Fitzgerald, 1994).

Phase I CR occurs while patients are still in the hospital following the initial cardiac event. This program usually includes supervised ambulatory therapy. The staff-patient ratio is generally 1:1. ECG monitoring equipment must be available for determining appropriate exercise responses and an emergency team should be available on the premises. The goals of the inpatient exercise program are to provide medical surveillance of patients, to return patients to daily physical activities, to offset the deleterious physiological and psychological effects of bed rest and to prepare patients for the stages of CR that will follow (American Association of Cardiovascular Pulmonary Rehabilitation, 1995).

The phase II CR exercise program provides a continuation of the inpatient program and usually begins two to four weeks after hospital discharge. It is estimated that approximately 15% of phase I CR patients will attend structured phase II CR (Thomas et al., 1996). Structured phase II CR is usually administered on an outpatient basis in a hospital or other facility in which ECG monitoring, emergency support and direct professional supervision are available (American Association of Cardiovascular Pulmonary Rehabilitation, 1995). The goal of this phase is to develop adherence to safe, regular exercise as a life-long habit. Dietary education, as well as help in quitting smoking, moderating alcohol consumption, and coping with emotional stress are often included in phase II CR programs. The benefits of participating in these programs is suggested by a review that concluded that phase II CR programs achieve a reduction in cardiovascular mortality ranging from 29% to 50% (Dennollet, 1993).

Patients in phase III CR exercise programs usually have completed the inpatient hospital program and the outpatient hospital program, or may be referred without previous participation. Patients in this phase can either participate in a community-based program or they can exercise on their own. As a general rule, patients in phase III CR have clinically stable or decreasing angina, medically controlled arrhythmias during exercise, and a knowledge of symptoms, which are main goals of phase II CR. The goal of this phase is to ensure that patients have the required skills to self-regulate their exercise (American Association of Cardiovascular Pulmonary Rehabilitation, 1995).

Phase II CR at the Glenrose Hospital

The following paragraphs outline the specific procedure used at the Glenrose phase II CR program. This is done in order to provide the reader with a clear understanding of the context in which the dissertation studies were conducted.

On the first day of the rehabilitation program, patients participate in an orientation meeting that familiarizes them with the program and exercise in particular. Here, the patients are provided with explanations and examples of what exercise actually is and how it is beneficial in fighting heart disease. Once this is completed and any questions are addressed, the patients are taken to the exercise room to familiarize them with the equipment and the procedures/rules, which are followed in the room. After this, their first day is completed.

Before any exercise rehabilitation commences, all patients have a stress test done (see appendix A for the protocol). From the results of the stress test, the exercise specialist calculates the appropriate workload (i.e., MET) to achieve a desired target heart rate for the patients' exercise sessions. Initially, all patients are provided with a minimum of 4 weeks of supervised exercise. However, depending on the severity of their condition, some are required to exercise twice a week while others are required to exercise 3 times a week. Many patients will continue past the required four weeks (up to an additional 4 weeks) depending on their progress. The length of the patients' programs depend on numerous factors such as: a) whether or not they have clinically stable angina or angina is absent, b) whether or not they have medically controlled arrhythmias or arrhythmias are absent during exercise, c) whether or not they have appropriate increases in blood pressure during exercise, d) stable and/or controlled resting heart rate and blood pressure, and e) a knowledge of symptoms.

The exercise program itself involves using at least three modalities. It is set up so that patients exercise for at least 10 minutes on a treadmill, at least 10 minutes on an upper body arm machine, and at least 10 minutes on a bicycle. Before patients start exercising, they put on a heart monitor so the nurses can monitor their hearts while exercising to ensure that the patients are exercising at a safe level. The monitors are also used for another purpose. During the last minute on each modality, patients are asked to take a pulse count for ten seconds and call it out loud to the nurse at the monitors. He/she then checks to see how accurate the patient is at reading his/her pulse. The idea behind this is to teach the patients how to monitor their heart rates when they are exercising on their own to ensure a safe intensity.

Two weeks after the patients have begun the rehabilitation program, they are instructed to begin exercising at home. They are given a log book by the rehabilitation hospital in which they record the type of exercise they do, the length of time they do it, and the target heart range they were in. At this time, the patients are encouraged to exercise at least twice a week over and above their supervised exercise at the Glenrose.

Once patients graduate from their prescribed exercise sessions at the Glenrose (however long that may be), they have officially completed their phase II CR and have moved into phase III CR. Here, the patients are left alone until their phase III stress test that is approximately 6 to 10 weeks post phase II CR.

Gender Differences in Adherence to Phase II CR

Although it has been consistently shown that men and women exhibit similar increases in functional capacity after a phase II CR program (Oldridge, LaSalle, & Jones, 1980; Ades, et al., 1992; Lavie & Milani, 1995; Balady et al., 1996), this is only the case when they have similar exercise adherence rates to the program. In fact, studies have consistently shown that women participating in phase II CR programs have significantly higher dropout rates and lower adherence rates to the programs compared to men (O'Callaghan et al., 1984; Schuster, & Waldron, 1991; Ades et al., 1992, Oldridge, Ragowski, & Gottlieb, 1992; Halm et al., 1999). For example, Halm et al. (1999) found that women in their program had an adherence rate of 75% while men had an adherence rate of 88%. Furthermore, Schuster and Waldron (1991) found that only 5% of men dropped out of their phase II CR program compared to 14% of women. Various explanations have been offered for women's lower adherence rates such as women being less likely to drive a car and more likely to have a dependent spouse at home making adherence to a phase II CR program difficult (Ades et al., 1992). However, Emery (1995) has argued that it is essential to delineate social and psychological factors that may differentially influence the adherence patterns among men and women in phase II CR. The present study used self-efficacy theory as a framework to address potential psychological factors.

What is Self-efficacy?

Self-efficacy was originally defined as a specific type of expectancy concerned with one's beliefs in one's ability to perform a specific behavior or set of behaviors required to produce an outcome (Bandura, 1977). The definition of self-efficacy has been expanded, however, to refer to "people's beliefs about their capabilities to exercise control over events that affect their lives " (Bandura, 1989, p. 1175) and their beliefs in their capabilities to mobilize the motivation, cognitive resources, and courses of action needed to exercise control over task demands (Bandura, 1990). Thus, self-efficacy judgments are concerned "not with the skills one has but with judgments of what one can do with whatever one possesses" (Bandura, 1986, p. 391). However, Kirsch (1995) argues that efficacy judgments are also concerned with skill. He offers a distinction between task efficacy (i.e., confidence in one's ability to perform an elemental task or "Can I perform the behavior?") and barrier efficacy (i.e., confidence in one's ability to perform an elemental task *under challenging conditions* or “Can I prevent, manage, or control the potential aversive consequences of this behaviour?”).

The distinction between task efficacy and barrier efficacy closely resembles Bandura's (1986) distinction between perceived skills (such as performing a simple motor act) and perceived operative capability in the face of changing and unpredictable circumstances, including inconveniences and impediments, only the latter of which he defines as self-efficacy. Thus, Kirsch and Bandura seem to disagree primarily on whether the perceived ability at a motor task should be considered a type of self-efficacy, or whether to restrict the term self-efficacy to operative capability (Maddux, 1995). I would argue that task efficacy is a valid subcategory of self-efficacy to use in phase II CR. Maddux (1995) gave the example of being a tennis coach for Andre Agassi. He argued that being Agassi's tennis coach, he would be concerned with his self-efficacy for serving with speed and accuracy, hitting an overhead slam, and so on. In this way, Maddux (1995) argued that he would be detaching elemental acts (e.g., a serve) from a complex adaptation (e.g., winning a match) which would be beneficial since coaches are concerned with teaching specific elemental skills and increasing self-efficacy for those skills. The same could be argued for phase II CR. For example, in phase II CR, patients are taught to monitor their pulse or use the Rating of Perceived Exertion (RPE) scale (Borg, 1970) if they cannot monitor their pulse. The purpose of this elemental skill is to ensure that the patients can exercise at a target heart rate or RPE for a given duration (i.e., that they can exercise at an intensity that is safe and also provides the desired physiological benefits). Therefore, the phase II CR staff is concerned with the patients’ skills to evaluate the intensity of their exercise when they are on their own. If patients do not have the task-efficacy to perform these elemental skills, then it is difficult for the phase II CR staff to prescribe exercise (i.e., an intensity of exercise) and be confident that the patients are maintaining a safe intensity while they exercise. If this is the case, then it is potentially dangerous for the patients to exercise unsupervised, which is an end goal of phase II CR.

Task efficacy, gender, and exercise adherence in phase II CR

Task efficacy as a *predictor* variable. To date, the vast majority of research examining self-efficacy and exercise adherence has focused on what Kirsh (1995) has described as task efficacy. Indeed, task efficacy has been found to be a significant predictor of exercise adherence in the general exercise population (McAuley & Jacobson, 1991; McAuley, Lox, & Duncan, 1993; Desharnais, Bouillon, & Godin, 1986), however, the results are equivocal in a phase II CR context. There are only three studies that have examined task efficacy as a *predictor* of exercise adherence in phase II CR. Ewart et al. (1983) found that task efficacy (i.e., jogging efficacy) during phase II CR was positively correlated with cardiac patients' self-reported home physical activity levels while Jeng and Braun (1997) found that task efficacy (i.e., biking and walking efficacy) was not related to exercise adherence over a 12 week phase II CR program. When examining gender differences, a third study (Schuster & Waldron, 1991) found that men's task efficacy (physical ability self-efficacy) upon entry into a phase II CR program was significantly higher than women's. Furthermore, it was found that women with low self-efficacy had fewer days in attendance while men high in self-efficacy had fewer days in attendance. Thus, the relationship of task efficacy to exercise adherence in men and women is not well understood.

Task efficacy as an *outcome* variable. When studying task efficacy as an *outcome* variable, three studies have shown that task efficacy significantly increased from pre- to post-phase II CR (Schuster, Wright, & Tomich, 1995; Jeng & Braun, 1997; Foster et al., 1995). However, none of these studies compared gender differences in the changes in task efficacy over time. There is evidence to suggest, however, that men and women have similar increases in task efficacy (i.e., walking efficacy) from pre-bypass surgery to one week post-surgery that persisted up to 12 months post surgery (Carroll, 1995; Jenkins & Gortner, 1998). Nonetheless, men's task efficacy was significantly higher at all time points.

Unfortunately, there is no information regarding the change in task efficacy specifically associated with a structured phase II CR program directly comparing men and women. McAuley, Courneya, and Lettunich (1991), however, have found that women had a larger increase in task efficacy than men over a 20 week structured exercise program in the general population. Because phase II CR programs follow a similar structured exercise program format to that studied by McAuley et al. (1991), it is also important to examine the relationship between exercise adherence and the change in task efficacy in men and women separately in phase II CR, given that it is not clear whether the increases in task efficacy reported in the CR literature (Schuster, Wright, & Tomich, 1995; Jeng & Braun, 1997; Foster et al., 1995) are actually related to exercise adherence. Based on social cognitive theory (Bandura, 1997), one would hypothesize that the more male and female patients adhere to phase II CR and obtain valuable performance experiences that they interpret as being positive, the larger the increase should be in task efficacy. However, it is important to note that the size of the task efficacy change will be related to the task efficacy levels prior to starting phase II CR (i.e., patients with lower pre- phase II CR task efficacy have the potential to show larger increases in task efficacy throughout phase II CR compared to individuals starting with higher pre- phase II CR task efficacy).

Barrier efficacy, gender, and exercise adherence in phase II CR

Barrier efficacy as a *predictor* variable. Although there is evidence to suggest that men's task efficacy is higher compared to women's, there is no evidence to suggest that this higher task efficacy mediates the gender / exercise adherence relationship during phase II CR (i.e., one can not say that men have significantly higher task efficacy compared to women, which in turn, is associated with higher exercise adherence during phase II CR). Therefore, further research is needed to clarify this issue as Kirsch (1995) would suggest that patients with higher task efficacy should have higher exercise adherence during phase II CR as has been the case in the general exercise population (McAuley & Jacobson, 1991; McAuley, Lox, & Duncan, 1993). However, social cognitive theory (Bandura, 1997) also suggests that Bandura's (1997) concept of self-efficacy and Kirsch's (1995) concept of barrier efficacy may also be an efficacy-type mediator of the gender / exercise adherence relationship during phase II CR that needs to be considered. Indeed, Bandura (1986; 1989; 1997) suggests that individuals who are efficacious in their beliefs to cope with inherent situational difficulties will be more likely to persist in the face of adversity (e.g., overcoming exercise barriers) whereas inefficacious individuals will abandon or disengage from a behavior if they feel they cannot cope with situational difficulties (i.e., exercise barriers). Furthermore, studying barrier efficacy is particularly important from Kirsch's (1995) viewpoint because he would suggest that patients with low barrier efficacy would have poor exercise adherence during phase II CR even if they had high task efficacy (i.e., Kirsch (1995) suggests that barrier efficacy significantly influences task efficacy).

Several researchers have shown that barrier efficacy is a significant *predictor* of exercise adherence in cross-sectional (Sallis et al., 1988; Horne, 1994) and prospective (McAuley, 1993; Yordy & Lent, 1993; Sallis et al., 1992) designs in the general exercise population (i.e., higher barrier efficacy was associated with a higher frequency of exercise). However, there are no studies examining the mediating influence of barrier efficacy on the gender / exercise adherence relationship in a phase II CR setting. It may be that female CR patients have lower exercise adherence rates to phase II CR compared to men because their barrier efficacy is lower.

<u>Barrier efficacy as an *outcome* variable.</u> One study has examined barrier efficacy as an *outcome* variable in a phase II CR context. Here, Bock et al. (1997) found that barrier efficacy significantly increased from pre- to post- phase II CR. However, the authors did not attempt to demonstrate that the magnitude of change in barrier efficacy was related to exercise adherence during phase II CR. Furthermore, potential gender differences were not examined in this study. As this was the only study to examine barrier efficacy in a phase II CR context, gender differences need to be considered when

examining the *changes* in barrier efficacy throughout phase II CR. Moreover, Bock et al. (1997) did not attempt to explain why barrier efficacy increased from pre- to post phase II CR. Based on social cognitive theory (Bandura, 1997), one could hypothesize that patients who exercise more frequently during phase II CR would experience larger increases in barrier efficacy compared to patients who exercise less frequently. For example, if a patient has low efficacy for overcoming his/her fear of having angina/chest pain in order to exercise, social cognitive theory would suggest that the efficacy judgment for this barrier will increase each time the patient does not experience angina/chest pain when he/she exercises.

Categorical or dimensional mood?

In addition to risk reduction, rehabilitation programs should be recommended as much for their contributions to psychological well-being as for their medical benefits. Not only is improved psychological well-being an important health care goal in its own right, it is an important precondition for enabling patients to become actively involved in their own care (Ewart & Fitzgerald, 1994).

According to Ewart (1995), an important issue to address when studying psychological well-being in CR is what type of approach to studying mood should be used. A popular approach to date has been one of a categorical nature. Here, researchers try to identify basic moods and the conditions necessary to evoke the particular mood and the cognitive, behavioral, and physiological responses that usually accompany it. For example, "fear" may be distinguished from "sadness" by the fact that fear is triggered by the perception of threat or danger, and is accompanied by elevated heart rate and avoidance behavior, whereas sadness is a pattern of responses elicited by a perceived loss and characterized by hopelessness and passivity (Ewart, 1995).

The other major approach to understanding mood can be characterized as dimensional. Investigators pursuing this line of inquiry assume that the varied and seemingly endless number of mood-related words used in everyday speech refer, in fact, to but a few underlying dimensions of a mood-related experience (Watson, Clark, & Tellegen, 1988). They try to uncover these dimensions by applying factor-analytic and clustering methods to people's ratings of mood-related words in order to see which mood descriptors tend to covary across individuals. One prominent dimensional model is Watson, Clark, & Tellegen's (1988), which reduces human moods to two independent factors reflecting positive and negative affective experiences. In this model, positive affect describes the extent to which emotional experiences are characterized by feelings of energy, mental concentration, and pleasurable engagement. Negative affect describes the degree to which emotions are characterized by feelings of anger, nervousness, fear, and disgust.

Which of the two approaches to mood is more likely to advance our understanding of mood in phase II CR? According to Ewart (1995), it depends on what one wants to know. He argues that for investigators who wonder if specific physiological changes give rise to the pleasant moods many people associate with exercising, the dimensional approach such as the two factor model is appealing. For example, as Tuson and Sinyor (1993) put it, the Positive Affect and Negative Affect Scales (PANAS) can be administered repeatedly over the course of an exercise bout to determine if levels of positive or negative affect vary with changes in perceived exertion, heart rate, endorphins, or other suspected physiological mediators of affect variation.

A problem with using the dimensional approach is that the brevity and simplicity of the measures used are seriously offset by an insensitivity to important differences between mood types (Ewart, 1995). For example, if one is trying to evaluate an exercise training program designed to help patients return to normal activities after AMI, would it matter if the program succeeded in reducing patents' fears about becoming active, yet left many patients feeling frustrated or even angry at the manner in which the program was conducted? According to Ewart (1995), if one adheres strongly to a dimensional view of mood, the answer should be no. For example, feeling fear or frustration, according to this view, merely suggests negative mood. Differences between feeling fear or frustration are relatively unimportant if these words are only surface indicators of an underlying negative mood; what really matters to this approach of mood is the number of negative mood-related words endorsed-not their specific content. This view contrasts sharply with the perspectives of those who provide health care: whether a patient is afraid or angry can have important implications for diagnosis, prognosis, and overall quality of life (Ewart, 1995). Therefore, the categorical approach in this sense would be much more meaningful and pragmatic to use and be more applicable to phase II CR workers. It has the advantage of formulating precise conceptual models to guide training interventions that target specific mood disturbances (e.g., anxiety or depression).

Mood and self-efficacy in phase II CR

The majority of the literature in phase II CR has used the categorical approach to assessing mood. In doing so, the major moods that have been studied are anxiety, depression, and more recently, vigor (i.e., positive mood). When measuring these moods, the Profile of Mood States (POMS; McNair, Loor, & Droppleman, 1992), the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), and the Beck Depression Inventory (BDI; Beck & Steer, 1984) were the most popular instruments used. Numerous studies have shown that phase II CR significantly reduces anxiety and depression (Kugler, Seelbach, & Kruskemper, 1994; Milani, Lavie, & Cassidy, 1996; Yoshida et al., 1999; Lavie & Milani, 1997; Lavie & Milani, 1996; Lavie & Milani, 1997; Milani & Lavie, 1998) and increases vigor (Oldridge, et al., 1995; Engebretson et al., 1999) in both men and women. However, there is a dearth of information that attempts to explain these changes in mood. Understanding why mood changes occur during phase II CR is important because it will help phase II CR programs develop future psychosocial interventions that will maximize psychological benefits. This is particularly important from an anxiety and depression standpoint because they have both been linked to subsequent cardiac events (Frasure-Smith, Lesperance, & Talajic, 1995; Levine et al., 1996).

Recently, studies have begun to take a social cognitive approach to explain mood changes in cardiac populations (Perkins & Jenkins, 1998; Gortner & Jenkins, 1990). Social cognitive theory suggests that there is a bi-directional relationship between self-efficacy and mood such that a change in one may lead to a change in the other (Bandura, 1997). For example, in phase II CR, social cognitive theory would hypothesize that an increase in self-efficacy from pre- to post rehabilitation would have a negative correlation (i.e., relationship) with anxiety and depression. More specifically, one could argue that the increase in self-efficacy was responsible for the decrease in anxiety and depression and vice versa.

To date, there are no studies that have directly examined this bi-directional relationship in a phase II CR program. However, there is evidence to suggest that a) task efficacy (i.e., walking efficacy) is negatively correlated to total mood disturbance (i.e., the sum of the POMS subscales) two weeks after a coronary angioplasty (Perkins & Jenkins, 1998) and b) task efficacy (i.e., walking efficacy) is positively correlated to vigor at four, 12, and 24 weeks post bypass surgery (Gortner & Jenkins, 1990).

Although these studies provide initial insight on the task efficacy / mood relationship in a cardiac population, they did not directly test the bi-directional relationship between task efficacy and mood. Stewart, Kelemen, and Ewart (1994), however, have shown that a significant increase in task efficacy was associated with a significant decrease in anxiety and depression in mildly hypertensive men after a 10 week training program. However, the bi-directional relationship between vigor and task efficacy was not found. Therefore, it does appear that an increase in task efficacy is associated with a decrease in anxiety and depression experienced during an exercise program, but not an increase in vigor. Nonetheless, the bivariate (Perkins & Jenkins, 1998; Gornter & Jenkins, 1990) and bi-directional (Stewart et al., 1994) relationships between task efficacy and mood have not been demonstrated in a phase II CR context.

Certainly, it is very important to gain an understanding of the bi-directional relationship between task efficacy and mood during phase II CR. Obtaining this information will be particularly important for phase II CR programs. More specifically, if phase II CR programs can discover that moods (e.g., anxiety and depression) improve due to an increase in task efficacy, they will be able to develop future interventions based on a solid theoretical foundation that specifically aims at improving task efficacy. In doing so, these programs can be confident that the intervention to increase task efficacy will not only improve patients' exercise adherence (as previously suggested), but it will also improve their psychological well-being.

Social cognitive theory also suggests that there is a bi-directional relationship between barrier efficacy and mood. However, there is no information with respect to this in phase II CR. McAuley (1991), however, has shown that barrier efficacy mid-way through an exercise program was significantly related to positive mood in sedentary middle-aged participants. However, this study examined a bivariate relationship between barrier efficacy and mood and not a bi-directional relationship (i.e., the study did not demonstrate that an increase in barrier efficacy was associated with an increase in positive mood). Furthermore, the bivariate relationship was found between barrier efficacy and a positive mood state. Therefore, no information exists on a) the bivariate relationship between barrier efficacy and negative mood (e.g., anxiety and depression) and b) the bi-directional relationship between barrier efficacy and positive and negative mood in phase II CR. However, based on McAuley's (1991) initial finding in middle-aged adults and the tenets of social cognitive theory (Bandura, 1997), one could hypothesize that an increase in barrier efficacy would be associated with an increase in vigor and a decrease in anxiety and depression. For example, a common barrier for phase II CR patients beginning the program is the fear that they will experience a cardiac event during exercise. This fear is tightly coupled with the patients' anxiety levels. Based on social cognitive theory, one would hypothesize that each time the patients exercise and don't experience a cardiac event, their efficacy to overcome this barrier will increase resulting in a reduction in anxiety.

Purpose of the present dissertation

The present dissertation has several purposes that it attempted to address in two studies. More specifically, study one focused on explaining gender differences in exercise adherence during phase II CR from a barrier efficacy standpoint. Study two examined gender differences on the influence of phase II CR on various forms of self-efficacy (i.e., task and barrier) and mood and the hypothesized bi-directional relationship between self-efficacy and mood. Furthermore, these relationships were also examined during phase III CR (i.e., once the patients completed Glenrose program and were on their own for six to 10 weeks).

Study 1

Purpose 1. The purpose of study one was to determine whether barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. As previous literature has consistently found that men's exercise adherence rates are significantly higher compared to women in phase II CR (Ewart et al., 1983; Schuster & Waldron, 1991; Jenkins & Gortner, 1998), and the fact that performance experiences are the strongest determinant of self-efficacy, it was hypothesized that men would have significantly higher exercise adherence and barrier efficacy compared to women. Furthermore, it was hypothesized that barrier efficacy would mediate the gender / exercise adherence relationship (i.e., men would have significantly higher barrier efficacy during phase II CR, which in turn, would be associated with higher exercise adherence during phase II CR).

Study 2

Purpose 1. The first purpose of study two was to examine the time course changes of task and barrier efficacy, anxiety, depression, and vigor during and following phase II CR. It was hypothesized that all variables would significantly improve from pre- to post-phase II CR and these post rehabilitation levels would be maintained at follow-up (i.e., 6 to 10 weeks post-rehabilitation). Furthermore, based on McAuley et al.'s (1991) finding, it was hypothesized that the changes in task and barrier efficacy would be larger in women compared to men, however, no gender differences were expected for any of the mood state changes (Kugler et al., 1994; Engebretson et al., 1999).

Purpose 2. The second purpose of study two was to examine the relationships between a) the *changes* in task and barrier efficacy during phase II CR and exercise adherence, and b) task and barrier efficacy at the end of phase II CR and exercise adherence following completion of the program (i.e., from post-rehabilitation to follow-up). It was hypothesized that a) men and women with higher exercise adherence during phase II CR would experience larger changes in task and barrier efficacy, and b) task and barrier efficacy at the end of phase II CR would be significantly related to subsequent exercise adherence post-rehabilitation in men and women.

Purpose 3. The third purpose of study two was to examine the bi-directional relationship between task/barrier efficacy and mood (i.e., anxiety, depression, and vigor) during and following phase II CR. Based on the tenets of social cognitive theory, it was hypothesized that the changes in task and barrier efficacy during and following phase II CR would be significantly related to the changes in all three mood states in men and women.

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Appendix 1-A

Exercise Tolerance Test

The purpose of exercise tolerance testing is to evaluate the response of the heart and circulation to a controlled exercise test. Stress tests are usually performed on a bicycle or treadmill with increasing effort. Blood pressure, heart rate, and rhythms are monitored throughout the test while the patient communicates any symptoms and evaluates their own rate of perceived exertion on a Borg Scale rating from 6 - 20. Adding a zero to these figures roughly approximates the patient's heart rate.

There are basically three reasons for exercise testing:

1) To assess the physiological response of people with no known cardiovascular disease i.e., for those who wish to start on a program of regular exercise or for insurance purposes.
2) To diagnose an abnormal response to exercise thus indicating pulmonary or cardiovascular disease.
3) To evaluate the exercise capacity of a patient with known cardiovascular disease i.e., stable angina, after angioplasty, myocardial infarction, coronary artery bypass grafts or valve replacement.
4) To provide data for exercise prescription
5) To provide base data to allow for evaluation of change over time

<u>Preparation for ETT</u>

Prior to the exercise tolerance test, a physician conducts a physical examination and reviews the patient's history, medications and lab results including recent ECG, chest x-ray and blood tests. The patient is prepared with a routine 12 lead hook-up with the leg electrodes placed on the lower ribs for ease of exercise. Blood pressure and ECG are recorded immediately prior to starting exercise and at regular intervals throughout the test, while the ECG is continually monitored.

Termination of a symptom limited stress test should be considered when one or a combination of the following occur:

1) When the target heart rate has been reached (220 - age).
2) The patient develops symptoms:
   a. angina
   b. dizziness
   c. dyspnea
   d. leg claudication
   e. marked tiredness i.e., 20 on the Borg Scale
3) The patient develops ECG changes:
   a. ST segment depression greater than -2 mm.
   b. Frequent ectopics or other significant arrhythmias.
   c. Heart Block
   d. ST elevation
4) Fall in blood pressure.
5) Drop in heart rate.

Following the test, the patient rests in a supine position for five minutes to allow heart rate, blood pressure and ECG to return to resting values. After an additional 15 minutes of rest, the patient is allowed to leave the testing facility.

Contraindications to Stress Testing:

1) When acute myocardial infarction is suspected.
2) When there is an acute intercurrent illness.
3) When the patient is hypokalemic.
4) When the patient is hypo-hyperglycaemic.
5) When there is uncontrolled hypertension.
6) When there is evidence of tight aortic stenosis.
7) When a significant arrhythmia is present.
8) When there is no physician present.

Reference: Canadian Society of Cardiology Technologist Certification Manual.

Chapter Two

Study One

Does Barrier Efficacy Mediate the Gender / Exercise Adherence Relationship During Phase II Cardiac Rehabilitation?

Introduction

Coronary heart disease (CHD) remains the leading cause of death in the United States. In 1997, there were 466,101 deaths attributed to coronary heart disease. Of these deaths, 228,769 (51%) were women and 227,332 (49%) were men. This year, it is estimated that there will be 1.1 million new or recurrent coronary events in the United States. Of these 1.1 million people, 55% were expected to men while 45% were expected to be women (American Heart Association, 2000). Furthermore, of the 1.1 million people who will be hospitalized as a result of coronary heart disease, only 20% will participate in structured cardiac rehabilitation (CR) programs (Smith, 1989). Of these 20%, 80% of the patients will be men while only 20% will be women (Schuster & Waldron, 1991). As a result, very little research has been conducted to examine the differences between men and women in the outcomes of phase II CR (Schuster, Wright, & Tomich, 1995).

Gender Differences in Adherence Rates to Cardiac Rehabilitation

Although it has been consistently shown that men and women exhibit similar increases in functional capacity after a phase II CR program (Oldridge, LaSalle, & Jones, 1980; Ades, Waldmann, Polk, & Coflesky, 1992; Lavie & Milani, 1995), this is only the case when they have similar exercise adherence rates to the program. In fact, studies have consistently shown that women participating in CR programs have significantly higher dropout rates and lower adherence rates to the programs compared to men (O'Callaghan, Teo, O'Riordan, Webb, Dolphin, & Horgan, 1984; Schuster, & Waldron, 1991; Oldridge, Ragowski, & Gottlieb, 1992). Various explanations have been offered for women's lower adherence rates such as women being less likely to drive a car and more likely to have a dependent spouse at home making adherence to a CR program difficult (Ades et al., 1992).

Does Self-efficacy Mediate the Gender / Exercise Adherence Relationship?

To date, the vast majority of research examining self-efficacy and exercise adherence has focused on what Maddux (1995) has described as task efficacy (i.e., confidence in one's ability to perform the elemental aspects of a task such as walking for 30 minutes at a prescribed heart rate). Indeed, task efficacy has been found to be a significant predictor of exercise adherence in the general exercise population (McAuley & Jacobson, 1991; McAuley, Lox, & Duncan, 1993; Desharnais, Bouillon, & Godin, 1986), however, the results are equivocal in the CR context. For example, Ewart et al. (1983) found that task efficacy (i.e., jogging efficacy) during CR was positively correlated with cardiac patients' self-reported home physical activity levels, however, Jeng and Braun (1997) found that task efficacy (i.e., biking and walking efficacy) was not related to exercise adherence over a 12 week phase II CR program. When examining gender differences, Schuster and Waldron (1991) found that men's task efficacy (physical ability self-efficacy) upon entry into a CR program was significantly higher than women's. Furthermore, it was found that women with low self-efficacy had fewer days in attendance while men high in self-efficacy had fewer days in attendance. Finally, Jenkins and Gortner (1998) found that men's task efficacy (i.e., walking) was significantly higher compared to women's postoperatively (i.e., post-coronary bypass surgery) at one, two, three, six, and twelve months. Moreover, task efficacy was positively correlated with self-reported exercise behavior for men and women at all times.

Although the data consistently demonstrate that men's task efficacy is higher compared to women's, there is no evidence to suggest that this higher task efficacy mediates the gender / exercise adherence relationship during phase II CR. The present study offers an alternative explanation that barrier efficacy (i.e., confidence in one's ability to perform an elemental task *under challenging conditions*) may be a more important efficacy-type mediator of the gender / exercise adherence relationship during phase II CR. Indeed, Bandura (1986; 1989) suggests that individuals who are efficacious in their beliefs to cope with inherent situational difficulties will be more likely to persist in the face of adversity (e.g., overcoming exercise barriers) whereas inefficacious individuals will abandon or disengage from a behavior if they feel they cannot cope with situational difficulties (i.e., exercise barriers). Several researchers (Horne, 1994; Marcus et al, 1994; Armstrong et al., 1993; McAuley, 1993; Yordy & Lent, 1993; Garcia & King, 1991; Sallis et al., 1988) have, in fact, found a positive relationship between barrier efficacy and exercise behavior (i.e., higher barrier efficacy is associated with a higher frequency of exercise) in the general exercise population. However, there are no studies examining the mediating influence of barrier efficacy on the gender / exercise adherence relationship in a phase II CR setting. It may be that female CR patients have lower exercise adherence rates to phase II CR compared to men because their barrier efficacy is lower.

<u>Purpose of Present Study</u>

The purpose of the present study was to determine whether barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. As previous literature has consistently found that men's exercise adherence rates are significantly higher compared to women in a cardiac population (Ewart et al., 1983; Schuster & Waldron, 1991; Jenkins & Gortner, 1998), and that performance experiences are the strongest determinant of self-efficacy, it was hypothesized that men would have significantly higher exercise adherence and barrier efficacy compared to women. Furthermore, it was hypothesized that barrier efficacy would mediate the gender / exercise adherence relationship.

Method

Phase II Cardiac Rehabilitation and Glenrose Program

Phase II CR follows phase I CR which involves in-hospital education while the patient is in hospital due to his/her cardiac event. Phase II CR usually begins within 2 to 4 weeks post- hospital discharge (American Association of Cardiovascular Pulmonary Rehabilitation, 1995). The Glenrose phase II program follows the recommended guidelines for this phase of rehabilitation. More specifically, the program combines medically supervised exercise with nutrition and behavior modification education to reduce risk factors associated with coronary heart disease. The program duration ranges from 4 to 8 weeks depending on the severity of the patient's condition and their response. Exercise schedules vary from 1 to 3 times per week and last approximately 1 hour. The program duration and exercise frequency is determined on the basis of each patient's cardiac condition. Both can be altered on an ongoing basis depending on the patient's response to the rehabilitation. The exercise program details are determined by the physician, other medical staff, and the exercise specialists. The Glenrose program also includes weekly education classes on topics such as cardiac risk factors, sexual activity post-coronary event, stress management, and nutrition planning.

Pilot Study

In order to be consistent with self-efficacy theory (Bandura, 1989), eleven cardiac patients (7 men and 4 women) were recruited before their initial orientation meeting began at the Glenrose hospital. Those patients willing to participate were escorted to a private room where they were interviewed in order to generate exercise barriers that were specific to a phase II CR population. To increase the representativeness of our sample, patients (mean age = 62.63; SD=7.11) were recruited from the following three main categories: a) angina/angioplasty (1 man and 1 woman), bypass surgery (2 men and 1 woman), or myocardial infarction (4 men and 2 women). There were six exercise barriers generated from the interviews with the actual patients (i.e., fear of having a cardiac incident, medication side effects, angina/chest pain, health-related problems, too much work to do, and no time). The list of exercise barriers was then presented to the exercise specialists in the program because they regularly discuss the exercise prescriptions with all of their patients. The exercise specialists were able to generate three additional exercise barriers encountered in the Glenrose program (i.e., back pain, bad weather, and too expensive to exercise) which resulted in 9 exercise barriers specific to phase II CR. After generating the items from the pilot study, they were put into questionnaire format and administered to 10 patients (5 men and 5 women) to determine the face validity of the items and understanding of instructions. Based on feedback from the participants, small wording adjustments were made for the main study.

Main Study

Participants

All patients entering the Glenrose rehabilitation program were eligible to participate. Over the 6 month recruitment period, 135 patients were approached to participate in the study and 98 (50 males and 48 females) agreed to participate yielding a response rate of 72.5%. The most common reasons for refusal to participate were lack of interest and being non-English speaking.

To evaluate the representativeness of our sample, a comparison was made between the 37 individuals who were approached but did not complete our study with the 98 who did complete our study. Both groups were similar with respect to age, height, weight, number of exercise sessions attended at the Glenrose, gender, marital status, level of education, reason for CR, and smoking status. The two groups were also similar in reported levels of arthritis, asthma, high blood pressure, diabetes, gallbladder problems, thyroid problems, and high cholesterol. However, there was a significant difference in employment status distribution $\chi^2(4)=4.35$, $p= .03$ and stomach problems $\chi^2(1)=4.12$, $p=.04$. More specifically, participants were more likely to be retired (35.2%) and have stomach problems (16.9%) compared to non-participants (14.1% retired; 2.3% with stomach problems).

Measures

Barrier efficacy. The nine exercise barriers generated from the pilot study were put into questionnaire format for the present study. Each exercise barrier was preceded by the statement "How confident are you that you can exercise at some point during the day when…." Patients rated their confidence on a scale from 1(not at all confident) to 10 (very confident). The average of the nine exercise barriers was calculated and used as an indicator of overall barrier efficacy ($\alpha = .86$). Each barrier was also examined to determine its independent influence on exercise adherence.

Exercise Adherence During Rehabilitation. As the number of exercise sessions varied from 1 to 3 times per week, from 3 to 36 in total, and the weeks attended ranged from 1 to 8, an objective measure of the patients' exercise adherence during their phase II CR that was standardized was needed. Therefore, the percentage approach was used via the following formula: [# of exercise sessions attended / # exercise sessions prescribed at the start of the program] * 100. Patients' objective exercise attendance was verified by medical information recorded during each exercise session by the Glenrose staff. If a patient did not show up for his/her scheduled exercise session, he/she was marked absent for that day in the medical file.

Procedure

In their initial orientation meeting, all new CR patients were informed that a researcher would be approaching them to participate in a study. The patients were approached during their exercise sessions at the CR unit and were asked to complete a questionnaire relating to exercise barriers in CR. Those who agreed to participate completed an informed consent (see appendix A) and took home the barrier efficacy scale (see appendix B). All patients returned their questionnaire packages at their next scheduled exercise session (within 2 days). When patients returned their questionnaires, the researchers addressed any questions regarding the patients' understanding of a particular question. This was done to ensure the patients fully understood the questions. Once patients completed their last exercise session at the Glenrose, they were debriefed.

At this time, the debriefing entailed a conversation regarding the hypotheses of the study, any questions the patients had about the study in general, any questions the patients had regarding their own responses to the questionnaires, and the knowledge that the patients could get the results of the study at any time.

Results

Preliminary Analyses

With respect to gender differences within the sample, Table 1 shows no differences between gender with the exception of women (17.2%) having more thyroid problems than men (1.1%). Men and women were also similar in age F (1,89)=. 01, p>. 05 (men mean age = 60.67; women mean age = 60.42).

Table 2-1

Demographic characteristics of the sample

	Men N (%)	Women N (%)	χ^2	p
Marital Status	N=43	N=41		
Married / common law	36 (83.7)	25 (60.9)		
Divorced / separated	2 (4.6)	9 (21.9)	χ^2 (5)=8.91	ns
Single / widowed	5 (11.6)	7 (17.1)		
Education	N=48	N=42		
Grade 9 or less	6 (12.5)	5 (11.9)		
High school	17 (35.4)	13 (30.9)		
Post-secondary	3 (6.3)	5 (11.9)		
University	18 (37.5)	14 (33.3)	χ^2 (4)=1.34	ns
Technical	4 (8.3)	5 (11.9)		
Employment Status	N=48	N=44		
Retired	20 (41.6)	25 (56.8)		
Homemaker	- (0)	1 (2.3)		
Employed	27 (56.3)	18 (40.9)	χ^2 (3)=4.19	ns
Unemployed	1 (2.1)	- (0)		

	Men N (%)	Women N (%)	χ^2	p
Admitting Diagnosis	N=47	N=44		
Myocardial Infarction	24 (51.1)	23 (52.3)		
Angina	9 (19.1)	13 (29.5)		
Bypass surgery	9 (19.1)	1 (2.3)	$\chi^2(3)=7.39$	ns
Angioplasty	5 (10.6)	7 (14.3)		
Health-related Problems	N=50	N=48		
Arthritis	13 (26.0)	21 (43.7)	$\chi^2(1)=3.84$	ns
Asthma	4 (8.0)	10(20.8)	$\chi^2(1)=3.50$	ns
High blood pressure	22 (44.0)	23 (47.9)	$\chi^2(1)=0.26$	ns
Diabetes	14 (28.0)	10(20.8)	$\chi^2(1)=0.58$	ns
Stomach problems	7 (14.0)	15(31.3)	$\chi^2(1)=4.54$	ns
Gallbladder problems	3 (6.0)	10(20.8)	$\chi^2(1)=0.95$	ns
Thyroid problems	1 (2.0)	16 (33.3)	$\chi^2(1)=17.4$	<.01
High cholesterol	19 (38.0)	19 (39.6)	$\chi^2(1)=0.07$	ns
Smoking Status	N=48	N=45		
Currently smoke	4 (12.0)	5 (11.1)		
Never smoked	13 (27.1)	16 (35.6)	$\chi^2(2)=1.21$	ns
Quit	31 (64.6)	24 (53.3)		

Descriptives

Descriptives for overall barrier efficacy, each barrier efficacy item, and exercise adherence rates overall and by gender are presented in Table 2-3. As can be seen, men had a significantly higher exercise adherence rate during phase II CR $F(1,96)=7.22$, $p<.01$ (ES = .53) and significantly higher barrier efficacy $F(1,95) = 17.49$ $p<.01$ (ES = .79) compared to women. Gender differences were also examined for each barrier efficacy item. As evident from Table 2-3, men had significantly higher efficacy to exercise when a) they had a fear of having a cardiac incident, b) when they were experiencing back pain, c) when they were experiencing medication side effects, d) when they felt they didn't have time, e) when they experienced angina/chest pain earlier in the day, and f) when they felt it was too expensive to exercise.

Table 2-3

Means and (standard deviations) for barrier efficacy, individual barrier efficacy items, and exercise adherence overall and by gender

Efficacy For Barriers	Overall	Men	Women	df	F-value	p	*d*
Barrier Efficacy (Aggregate)	7.68 *1.69*	8.33 *1.16*	6.99 *1.91*	1,95	17.49	.01	.79
Fear of having a cardiac event	7.66 *2.13*	8.47 *1.82*	6.80 *2.13*	1,93	16.92	.01	.78
Back pain	7.77 *2.54*	8.61 *1.72*	6.67 *2.97*	1,93	15.33	.01	.76
Medication Side effects	7.97 *2.22*	8.57 *1.59*	7.32 *2.61*	1,93	7.99	.01	.56
Bad weather	7.78 *2.24*	8.34 *1.83*	7.19 *2.50*	1,95	6.74	.01	.51
Too much work to do	7.75 *2.43*	8.23 *1.86*	7.21 *2.86*	1,86	4.03	.04	.42
Don't have time	7.72 *2.08*	8.30 *1.63*	7.11 *2.34*	1,92	8.08	.01	.57
Had angina/chest pain	7.54 *2.53*	8.22 *2.38*	6.78 *2.48*	1,93	8.33	.01	.57
Experiencing health problems	7.76 *2.59*	7.97 *2.41*	7.53 *2.77*	1,91	.69	.41	.17
Too expensive to exercise	7.58 *2.12*	8.22 *1.78*	6.91 *2.26*	1,95	9.99	.01	.62
Exercise Adherence(%)	84.63 *14.49*	88.36 *11.48*	80.74 *16.28*	1,96	7.22	.01	.53

Note. $d = \frac{\bar{X}_{men} - \bar{X}_{women}}{SD_{pooled}}$

Test of the mediational hypothesis

Once the preliminary analyses were completed, the analyses for our primary purpose of the study, which was to determine whether barrier efficacy mediated the gender / exercise adherence relationship during phase II CR were conducted. This was done by modifying the Baron and Kenny (1986) procedure by using a series of zero-order and partial correlations. In order to establish mediation, three conditions must be met. The first step in testing mediation is to establish a significant relationship between the independent variable (i.e., gender) and the mediating variable (i.e., barrier efficacy). This was done via a zero-order correlation between gender and barrier efficacy. The second step is to establish a significant relationship between the independent variable (i.e., gender) and the dependent variable (i.e., exercise adherence). This was also done via a zero-order correlation. Finally, the third step in establishing mediation is to perform a partial correlation between the independent variable (i.e., gender) and the dependent variable (i.e., exercise adherence) while controlling for the mediating variable (i.e., barrier efficacy). This partial correlation should be non-significant. Mediation is established when the partial correlation removes the relationship between the independent (i.e., gender) and the dependent (i.e., exercise adherence) variable observed in the second step of the zero-order correlations. However, all three conditions must be met in order to establish barrier efficacy as a mediating variable.

The mediational hypothesis was supported for barrier efficacy and is reported in Table 2-4. The zero-order correlation between gender and exercise adherence was $r = -.26$, $p < .01$ (step one). The zero-order correlation between gender and barrier efficacy ($r = -.39$, $p < .01$) was also significant (step two). These correlations suggested that men had significantly higher barrier efficacy and exercise adherence compared to women, which is consistent with the preliminary analyses. Additionally, the partial correlation between gender and exercise adherence (step three) was non-significant ($r = -.08, p > .05$) when controlling for barrier efficacy. That is, the relation of gender to exercise adherence is removed when barrier efficacy is taken into account. Therefore, the mediational analyses suggest that men had significantly higher barrier efficacy compared to women, which in turn, was associated with a higher exercise adherence rate.

The mediational hypothesis were also tested separately for each barrier efficacy item. It was found that gender was significantly correlated to efficacy for overcoming a) fear of having a cardiac incident ($r = -.39, p < .001$), b) back pain ($r = -.38, p < .001$), c) medication side effects ($r = -.28, p < .01$), d) lack of time ($r = -.28, p < .01$), e) angina/chest pain ($r = -.29, p < .01$), and f) being too expensive to exercise ($r = -.31, p < .01$). However, gender was not significantly correlated to efficacy for overcoming a) bad weather ($r = -25, p \geq .05$), b) too much work to do ($r = -.21, p \geq .05$), and c) experiencing health problems ($r = -.09, p > .05$). As can be seen from Table 3, the partial correlations controlling for barrier efficacy showed that efficacy for overcoming a) fear of having a cardiac incident, b) back pain, c) medication side effects, d) lack of time, e) angina/chest pain, and f) being too expensive to exercise resulted in non-significant correlations. This indicates that barrier efficacy for overcoming these specific exercise barriers mediated the gender / exercise adherence relationship. More specifically, men were significantly more confident that they could exercise when experiencing these exercise barriers compared to women, and in turn, each was associated with higher exercise adherence during phase II CR.

Table 2-4.

Partial correlations between gender and exercise adherence after partialling out the effects of barrier efficacy and each barrier efficacy item

Efficacy For Barriers	Exercise Adherence (efficacy partialed)
Barrier Efficacy	-.08
Fear of having a cardiac incident	-.15
Back pain	-.09
Medication Side effects	-.15
Bad weather	-.17
Too much work to do	-.16
Don't have time	-.17
Had angina/chest pain	-.15
Experiencing health problems	-.22*
Too expensive to exercise	-.19

Note.*$p < .05$; The correlation between gender and exercise adherence was $r = -.26$, $p < .01$

Discussion

The purpose of the present study was to determine whether barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. In particular, it was hypothesized that men would have significantly higher barrier efficacy compared to women, which in turn, would be associated with a higher exercise adherence rate during phase II CR.

The present study found that men had a significantly higher exercise adherence rate to phase II CR compared to women which is consistent with previous literature (Oldridge, Ragowski, & Gottlieb, 1992; Schuster & Waldron, 1991). Although the adherence rates in the present study for men (88%) and women (80%) are higher than those reported in these studies, the data still indicate a significant gender difference in exercise adherence that needs to be explained. This will be particularly important for CR programs which have lower exercise adherence rates compared to the present study. It is known that functional gains in women are lower overall compared to men when their exercise adherence is lower (Ades et al., 1992; Lavie & Milani, 1995). Even though the present study's data may not coincide with this literature due to the higher exercise adherence rate, it is possible that other programs are not producing exercise adherence rates among women sufficient to achieve health outcomes comparable to men. Therefore, explaining gender differences in exercise adherence in this sample will nevertheless assist other phase II rehabilitation programs that encounter gender differences in exercise adherence.

Another important finding of the present study was that men had significantly higher efficacy compared to women. This was expected as previous literature in CR has shown that men have significantly higher task efficacy compared to women (Schuster & Waldron, 1991; Jenkins & Gortner, 1998). When looking at the individual barrier efficacy items, men were significantly more confident that they could exercise compared to women when experiencing a) a fear of having a cardiac incident, b) back pain, c) medication side effects, d) lack of time, e) angina/chest pain earlier in the day, and f) when they felt it was too expensive to exercise. This suggests that phase II CR programs may want to specifically address these six exercise barriers in women in the early stages of CR to increase women's confidence to overcome them as a possible strategy to increase their exercise adherence.

The major finding of the present study was that barrier efficacy mediated the gender / exercise adherence relationship. More specifically, it was found that men had significantly higher barrier efficacy, which in turn, was associated with higher exercise adherence during phase II CR. Furthermore, examination of the individual barrier efficacy items showed that efficacy for overcoming six of the nine barriers also mediated the gender / exercise adherence relationship. Back pain, lack of time, and exercise expense are barriers that are also present in the general population (McAuley & Mihalko, 1998) suggesting that they were not acquired after commencing the CR program, but may have been barriers prior to the cardiac event. However, fear of having a cardiac incident, medication side effects, and angina/chest pain are more likely to be barriers once a cardiac event has occurred and it appears that men are more confident in overcoming them compared to women. Therefore, the mediational analyses suggest that strengthening women's confidence in overcoming these specific exercise barriers may increase their adherence to phase II CR.

Specific behavioral interventions for increasing women's confidence to overcome these barriers in CR need to be developed. It is suggested that one takes a theoretical approach that would involve manipulating various determinants of barrier efficacy outlined by Bandura (1986). The four determinants are performance experiences, verbal persuasion, physiological arousal, and vicarious experiences. The strongest source of barrier efficacy is performance experience (Bandura, 1997). Therefore, helping a woman to complete an acute exercise bout while she has a fear of having a cardiac event would be expected to increase her barrier efficacy. Verbal persuasion could be provided by the rehabilitation staff by encouraging the female patients to overcome exercise barriers to get to the exercise program. From a physiological arousal perspective, educational interventions to help women correctly interpret different types of physical arousal may have a positive influence on their barrier efficacy. For example, some of the responses to exercise are similar to those associated with a cardiac event. Therefore, familiarizing the female patients with "healthy" physiological arousal may increase their confidence for overcoming this barrier. Finally, the rehabilitation staff could point out the progress that other female CR patients (with similar heart conditions and exercise barriers) had in overcoming their exercise barriers in order to attend their exercise sessions at the rehabilitation program. This would be using vicarious experience. All of these possibilities may provide fruitful avenues for future research as well as intervention development.

Limitations

Although the present study offers important insight regarding gender differences in phase II CR from a barrier efficacy standpoint, it does have limitations that need to be taken into consideration when interpreting the findings and planning future research. First, although the exercise barriers were generated through interview procedures with other cardiac patients, it is possible that more barriers may have surfaced if more cardiac patients were interviewed. Therefore, it is not known whether a saturation point was completely reached when generating the exercise barriers specific to phase II CR. Second, the patients sampled in the present study may not have previously experienced these particular exercise barriers and therefore may be subject to over- or underestimation of the efficacy judgment (DuCharme & Brawley, 1995). Second, although this study used a prospective design, it is well known that self-efficacy expectations increase due to various experiences (e.g., mastery experiences or vicarious experiences) incurred over time (e.g., see McAuley et al., 1991). It may be that efficacy to overcome certain barriers is more prevalent at different times throughout phase II CR. Furthermore, the rate at which barrier efficacy increases may differ between genders. Therefore, further research should assess barrier efficacy throughout phase II CR to a) examine the rate of change in barrier efficacy for men and women, and b) to determine whether the same barriers are having the same influence on exercise adherence throughout the phase II rehabilitation program for men and women. A third limitation of the present study is that the generalizability of these results may be limited in that they represent data from a single sample of patients enrolled in a hospital-based CR program. It is not clear whether the exercise barriers generated for our hospital-based rehabilitation program would be relevant to a home-based rehabilitation program. In fact, a study done by Schuster et al. (1995) demonstrated that men and women who participated in hospital-based CR had higher exercise adherence compared to a home-based program suggesting that patients attending hospital-based programs are more motivated to exercise. Therefore, it would be interesting to examine whether home-based and hospital-based CR patients a) have similar exercise barriers, and b) whether the patients' efficacy to overcome the barriers is similar in each context. In other words, it would be interesting to determine whether barrier efficacy mediated the relationship between hospital/home-based programs and exercise adherence.

Conclusion

Despite these limitations, the present data indicate that men have significantly higher barrier efficacy than women, which was associated with higher exercise adherence during phase II CR. Despite the fact that women who complete CR show the same improvements in functional status compared to men (Lavie & Milani, 1995; Brezinka & Kittel, 1995), this only occurs when they have exercise adherence rates similar to men. As women's exercise adherence rates have been found to be significantly lower compared to men, it has been suggested that special strategies be developed to prevent dropout and to increase adherence rates for those women who are particularly at risk of poor exercise adherence. The present study suggests to develop interventions that focus on building women's confidence to overcome specific exercise barriers as one possible avenue. As previously mentioned, one possible avenue to pursue in doing so is by manipulating the determinants of self-efficacy.

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Appendix 2-A

Cover Letter

Title of Project: Social Cognitive Theory in Cardiac Rehabilitation

Principal Investigators:
Chris Blanchard, M.A., University of Alberta, 492-7424
Dr. Wendy Rodgers, University of Alberta, 492-2677
Co-Investigators:
Bill Daub, Research Co-ordinator, Glenrose Hospital, 471-8206
Grant Knapik, Exercise Specialist, Glenrose Hospital, 471-8206

Dear Glenrose rehabilitation participant:

Exercise is an important part of improving overall health. The purpose of this survey is to find out why some people manage to exercise regularly following rehabilitation and why some people don't. In particular, we are interested in studying how confident you are to overcome obstacles that could prevent you from exercising. To save you time, Bill Daub and Grant Knapik will be providing the following information: age, sex, marital status, education level, employment status, height and weight, and type of cardiac event.

Participating in the study is not required by the Glenrose program. As well, if you choose not to participate, this will NOT affect your care at the Glenrose in any way. You will be asked to fill out a survey that takes about 10 minutes to complete. It will be done at the Glenrose hospital at a time which suits you. It is important to know that there are no right or wrong answers and you can refuse to answer any question. You can also refuse to participate or withdraw from the study at any time.

There are no known physical risks. However, there is a possibility that a question could make you feel uncomfortable or upset. If this occurs, the program has a social worker if you need to see one. The information you provide will be used to develop future projects and exercise choices for other cardiac patients, as well as to improve the present program.

All information collected by your survey will be held in confidence by Dr. Rodgers and Chris Blanchard. They will be the only ones who will have access to your data. Your data will be held in locked filing cabinets for seven years in a laboratory with limited access at the University of Alberta. Personal information will be removed and replaced with numerical codes as it is collected. No person's identity will be revealed in any reports in this project. If you have any questions about any aspect of this study, contact the Patient Concerns Office of the Capital Health Authority at 474-8892. This office has no connection with study investigators.

Informed Consent

Title: Social Cognitive Theory in Cardiac Rehabilitation

Principal Investigator(s):
Chris Blanchard, M.A., University of Alberta, 492-7424
Dr. Wendy Rodgers, University of Alberta, 492-2677

Co-Investigator(s):
Bill Daub, Research Co-ordinator, Glenrose Hospital, 471-8206
Grant Knapik, Exercise Specialist, Glenrose Hospital, 471-8206

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate or withdraw from the study at any time? You do not have to give a reason and it will not affect your care.	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to the information you provide?	Yes	No
Do you want the investigator(s) to inform your family doctor that you are participating in this research study? If so, please provide your doctor's name:	Yes	No

____

This study was explained to me by: ____________________________

I agree to take part in this study.

____________________	______________	____________
Signature of Research Participant	Date	Witness

____

Printed Name

Appendix 2-B

Barrier Efficacy Scale

Instructions: Below is a list of obstacles that could prevent you from exercising. In the **second column,** we ask you to rate on the scale from 1 to 10 of how confident you are that you can overcome each obstacle so you can exercise.

Things that may prevent you from exercising.	How confident are you that you can overcome the obstacle so you can exercise? 1 2 3 4 5 6 7 8 9 10 not confident very confident
fear of heart attack	1 2 3 4 5 6 7 8 9 10 not confident very confident
back pain	1 2 3 4 5 6 7 8 9 10 not confident very confident
medication side effects	1 2 3 4 5 6 7 8 9 10 not confident very confident
weather	1 2 3 4 5 6 7 8 9 10 not confident very confident
work	1 2 3 4 5 6 7 8 9 10 not confident very confident
time	1 2 3 4 5 6 7 8 9 10 not confident very confident
angina/chest pain	1 2 3 4 5 6 7 8 9 10 not confident very confident
no exercise equipment	1 2 3 4 5 6 7 8 9 10 not confident very confident
expensive to exercise	1 2 3 4 5 6 7 8 9 10 not confident very confident
health	1 2 3 4 5 6 7 8 9 10 not confident very confident

Chapter Three

Study Two

Self-efficacy and Mood in Phase II Cardiac Rehabilitation:

Should Gender Be Considered?

Introduction

Coronary heart disease (CHD) remains the leading cause of death in the United States for men and women. Furthermore, 1.1 million new or recurrent coronary events were expected in the United States in the year 2000. Of these 1.1 million people, 55% were expected to be men while 45% were expected to be women (American Heart Association, 2000). Based on a national survey of phase II cardiac rehabilitation (CR) programs in the United States, 14.8% of the 1.1 million people hospitalized as a result of CHD were expected to participate in structured phase II CR. Of this 14.8%, 75% of the patients were expected to be men while only 25% were expected to be women (Thomas et al., 1996). Moreover, once men and women enroll in a phase II CR program, it has been consistently shown that women have lower adherence rates and are more likely to drop out compared to men (Halm et al., 1999; Schuster, & Waldron, 1991; Oldridge, Ragowski, & Gottlieb, 1992; Ades et al., 1992). As a result of the small enrollment numbers, low adherence rates, and high drop out rates of women to phase II CR, there has been a dearth of research examining gender differences in various psychosocial outcomes resulting from these programs. Identifying any potential psychosocial differences (e.g., anxiety, depression, self-efficacy) between men and women resulting from these rehabilitation programs will provide invaluable information on which to base future program interventions that will a) optimize psychological benefits, and b) offer insights into gender differences in exercise adherence during and following phase II CR.

Self-efficacy and Phase II Cardiac Rehabilitation

To date, the majority of research examining the influence of phase II CR on self-efficacy has focused on what Maddux (1995) has described as task efficacy (i.e., confidence in one's ability to perform the elemental aspects of a task such as walking for 30 minutes). Two studies have examined task efficacy as a *predictor* of exercise adherence in phase II CR. One study found a significant relationship between task efficacy and exercise adherence (Ewart et al., 1983) while the other study found no relationship (Jeng & Braun, 1997). However, when studying task efficacy as an *outcome* variable, three studies have shown that task efficacy significantly increased from pre- to post-phase II CR (Schuster, Wright, & Tomich, 1995; Jeng & Braun, 1997; Foster et al., 1995). Furthermore, Schuster and Waldron (1991) found that men's task efficacy upon entry into a phase II CR program was significantly higher compared to women's, but this study did not explore the change in task efficacy over time. There is evidence to suggest, however, that men and women have similar increases in task efficacy from pre-bypass surgery to one week post-surgery that persisted up to 12 months post surgery (Carroll, 1995; Jenkins & Gortner, 1998). Nonetheless, men's task efficacy was significantly higher at all time points.

Unfortunately, there is no information regarding the change in task efficacy specifically associated with a structured phase II CR program directly comparing men and women. McAuley, Courneya, and Lettunich (1991), however, have found that women had a larger increase in task efficacy than men over a 20 week structured exercise program in the general population. This suggests that it is important to consider potential gender differences in a phase II CR context as well. Furthermore, it is also important to examine the relationship between exercise adherence and the change in task efficacy in men and women separately because it is not clear whether increases in task efficacy reported in the literature (Schuster, Wright, & Tomich, 1995; Jeng & Braun, 1997; Foster et al., 1995) are actually related to exercise adherence during phase II CR, or to continued exercise following the completion of a phase II CR program.

Barrier efficacy (i.e., confidence in one's ability to perform a task *under challenging conditions*) has also been considered as an important outcome of phase II CR (Blanchard et al., 2001). This is based on the idea that individuals who are more efficacious in overcoming context relevant barriers (e.g., exercise barriers) will be more likely to persist in the face of those barriers than individuals less efficacious in doing so (cf. Bandura, 1997). It has been consistently shown that barrier efficacy is a significant *predictor* of exercise adherence in cross-sectional (Sallis et al., 1988; Horne, 1994) and prospective (McAuley, 1993; Sallis et al., 1992) designs in the general exercise population. Furthermore, Blanchard et al. (2001) found that barrier efficacy was significantly related to exercise adherence during phase II CR.

There is only one study that has examined barrier efficacy as an *outcome* variable in a phase II CR context. Bock et al. (1997) found that barrier efficacy significantly increased from pre- to post- phase II CR. However, gender differences were not examined in that study. Therefore, although Blanchard et al. (2001) found that men had significantly higher barrier efficacy compared to women (cross-sectional) during phase II CR, it remains unknown whether phase II CR differentially influences barrier efficacy in men and women. Furthermore, it is unknown whether efficacy for barriers associated with phase II CR has a similar influence on men and women's exercise adherence during and following phase II CR.

The first purpose of the present study was to examine the time course changes of task and barrier efficacy during and following phase II CR in men and women. The second purpose was to examine the relationship between the change in task and barrier efficacy and exercise adherence to phase II CR in men and women. The third purpose was to examine the relationships between task and barrier efficacy at the end of phase II CR on exercise adherence following completion of the phase II CR program (i.e., from post-rehabilitation to follow-up).

Why does cardiac rehabilitation improve moods?

There is accumulating evidence to suggest that phase II CR significantly reduces anxiety and depression (Kugler, Seelbach, & Kruskemper, 1994; Milani, Lavie, & Cassidy, 1996; Lavie & Milani, 1996; Lavie & Milani, 1997) and increases positive moods (e.g., vigor) (Oldridge, et al., 1995; Engebretson et al., 1999) in men and women. However, limited research exists which attempts to explain these changes in mood. Recently, studies have begun to take a social cognitive approach to explain mood changes in cardiac populations (Perkins & Jenkins, 1998; Gortner & Jenkins, 1990). Social cognitive theory suggests that there is a bi-directional relationship between self-efficacy and mood such that a change in one may lead to a change in the other (Bandura, 1997).

To date, there are no studies that have directly examined this relationship in a phase II CR program. However, there is evidence to suggest that task efficacy is related to mood disturbance two weeks after a coronary angioplasty (Perkins & Jenkins, 1998) and to vigor at four, 12, and 24 weeks post bypass surgery (Gortner & Jenkins, 1990). Although these studies provide initial insight on the task efficacy / mood relationship in a cardiac population, they did not demonstrate that a change in task efficacy was associated with a change in mood (i.e., they did not test the bi-directional relationship). Stewart, Kelemen, and Ewart (1994), however, showed that a significant increase in task efficacy was associated with a significant decrease in anxiety and depression in mildly hypertensive men after a 10 week training program. Therefore, it does appear that an increase in task efficacy experienced during an exercise program is associated with a decrease in anxiety and depression. Nonetheless, this relationship has not been demonstrated in a phase II CR context.

With respect to barrier efficacy, there is also no information regarding the bi-directional relationship between barrier efficacy and moods in phase II CR. Although McAuley (1991) has shown that barrier efficacy was significantly related to positive mood mid-way through an exercise program in sedentary middle-aged participants, there has yet to be a study that directly examines the bi-directional relationship between barrier efficacy and mood proposed by social cognitive theory (Bandura, 1997). If a bi-directional relationship between barrier efficacy and mood exists during phase II CR, this will underscore the importance of designing exercise interventions to increase barrier efficacy. In doing so, a phase II CR program that effectively increases barrier efficacy will increase exercise adherence during phase II CR (Blanchard et al., 2001) and also improve the psychological well-being of the patients. Therefore, the fourth purpose of the present study was to examine the relationships between the changes in task and barrier efficacy, and the changes in anxiety, depression, and vigor during and following phase II CR in men and women. Finally, associated with the first purpose, the time course changes of anxiety, depression, and vigor in men and women during and following phase II CR were examined.

Purpose of the Present Study

The first purpose of the present study was to examine the time course changes of task and barrier efficacy, anxiety, depression, and vigor during and following phase II CR in men and women. It was hypothesized that barrier and task efficacy, and vigor would significantly increase and anxiety and depression would significantly decrease from pre- to post-phase II CR. It was further hypothesized that these post rehabilitation levels would be maintained at follow-up (i.e., 6 to 10 weeks post-rehabilitation). Finally, based on previous research (McAuley et al.,1991), it was hypothesized that the changes in task and barrier efficacy would be larger in women compared to men, however, no gender differences were expected for any of the mood changes (Kugler et al., 1994; Engebretson et al., 1999).

The second purpose of the present study was to examine the relationships between the *changes* in task and barrier efficacy during phase II CR and exercise adherence in men and women. It was hypothesized that men and women with higher exercise adherence during phase II CR would experience larger changes in task and barrier efficacy. The third purpose of the present study was to examine the relationships between task and barrier efficacy at the end of phase II CR and exercise adherence following completion of the program (i.e., from post-rehabilitation to follow-up). It was hypothesized that task and barrier efficacy at the end of phase II CR would be significantly related to exercise adherence post-rehabilitation in men and women. Finally, based on the tenets of social cognitive theory, it was hypothesized that increases in task and barrier efficacy during and following phase II CR would be significantly related to decreases in anxiety and depression and an increase in vigor in men and women (fourth purpose).

Method

Design

The present study utilized at 2 (gender) x 4 (time: initial mail-out 3 to 5 weeks prior to starting phase II CR; immediately prior to starting phase II CR; post phase II CR; and follow-up 6 to 10 weeks post phase II CR) mixed factorial design.

Phase II Cardiac Rehabilitation at the Glenrose Program

Phase II CR follows phase I CR which involves in-hospital education while the patient is in hospital due to his/her cardiac event. Phase II CR usually begins within 2 to 4 weeks post- hospital discharge (American Association of Cardiovascular Pulmonary Rehabilitation, 1995). The Glenrose phase II program combines medically supervised exercise with nutrition and behavior modification education to reduce risk factors associated with coronary heart disease. The program duration ranges from 4 to 8 weeks depending on the severity of the patient's condition. Exercise frequencies vary from 1 to 3 times per week and last approximately 1 hour. The program duration and exercise frequency is determined on the basis of each patient's cardiac condition. Both can be altered on an ongoing basis depending on the patient's response to the rehabilitation. The exercise program details are determined by the physician, other medical staff, and the exercise specialists. The Glenrose program also includes weekly education classes on topics such as cardiac risk factors, sexual activity post-coronary event, stress management, and nutrition planning.

Participants

Participants versus non-participants. All patients entering the Glenrose rehabilitation program were eligible to participate. Over the 9 month recruitment period, 253 patients were sent out an initial questionnaire package and 107 (78 men and 29 women) returned their questionnaires to their initial orientation meeting at the Glenrose. This yielded a response rate of 43%. The most common reasons for refusal to participate were lack of interest and being non-English speaking.

To evaluate the representativeness of our sample, the 146 individuals who were approached but did not participate in our study and the 107 who did initially participate were compared on numerous demographic (e.g., marital status, education level, and employment status) and medical variables (e.g., cholesterol levels and type of cardiac event). No differences were found on any of these variables.

Adherers versus drop-outs. Throughout the duration of the study, 26 (21 men and 5 women) of the 107 participants dropped out yielding a completion rate of 76%. Five of these participants never returned a questionnaire and remained in rehabilitation, eight were discharged early, four did not attend any exercise sessions, two patients' programs were put on hold due to health reasons, and seven patients missed their post-rehabilitation follow-up stress test.

Again, to further evaluate the representativeness of our findings, the adherers and dropouts were compared on the same demographic and medical variables analyzed above and no group differences were found. Finally, as pre-rehabilitation data was obtained on all of our 107 patients, further comparisons between the adherers and dropouts on the theoretical variables in question prior to the start of their phase II CR were made. Results showed that adherer's and drop-outs had similar levels of task efficacy (duration and frequency), barrier efficacy, vigor, anxiety, and depression.

Final Sample. The final sample consisted of 57 men and 24 women who completed all four questionnaires. The men and women were similar in age t (79) = -1.10, p >.05 (men mean age = 58.68; women mean age = 61.75) and Body Mass Index t (79)=-.24, p >.05 (men mean BMI = 28.82; women mean BMI = 29. 14), however, women had a larger %body fat (mean = 32.55%) compared to men (mean = 24.74%) t (78) = -8.11, p < .01. As can bee seen from Table 1, women also had more thyroid problems and were more likely to be homemakers compared to men.

Table 3-1

Demographic characteristics of the sample

Demographic Variable	Men		Women			
	N	%	N	%	χ^2	p
Marital Status						
Married/common law	41	80.4	18	75.0		
Divorced/separated	8	14.3	1	4.2		
Single/widowed	3	5.4	5	20.8	χ^2 (5) = 7.14	ns
Education Level						
Grade 9 or less	9	15.8	2	8.3		
High school	27	47.4	10	41.7		
Post-secondary	21	36.8	12	50	χ^2 (2) = 1.52	ns
Employment Status						
Retired	27	49.1	14	58.3		
Homemaker	-	0	5	20.8		
Employed	24	43.6	5	20.8		
Unemployed	4	7.3	-	0	χ^2(3) = 15.85	<.01
Admitting Diagnosis						
Myocardial Infarction	32	57.1	13	54.2		
Angina	2	3.6	1	4.2		

Bypass Surgery	12	21.4	3	12.5		
Angioplasty/angiogram	9	16.1	7	29.1	$\chi^2(5) = 6.07$	ns
Health-related Problems						
Arthritis	20	35.1	10	41.7	$\chi^2(1) = 0.31$	ns
Asthma	8	14.0	5	20.8	$\chi^2(1) = 0.58$	ns
High Blood Pressure	25	44.0	10	41.7	$\chi^2(1) = 0.03$	ns
Diabetes	5	8.8	3	20.8	$\chi^2(1) = 0.26$	ns
Stomach Problems	7	12.3	5	20.8	$\chi^2(1) = 0.97$	ns
Gallbladder Problems	5	8.8	6	25.0	$\chi^2(1) = 3.79$	ns
Thyroid Problems	3	5.3	9	37.5	$\chi^2(1) = 13.9$	<.01
Smoking Status						
Currently Smoke	15	26.3	8	33.3		
Never Smoked	4	7.0	1	4.2		
Quit	38	66.7	15	62.5	$\chi^2(2) = 0.56$	ns

Measures

Barrier efficacy. The barrier efficacy scale comprised nine exercise barriers specific to phase II CR that were developed by Blanchard et al. (2001). The nine exercise barriers were: a) fear of having a cardiac incident, b) back pain, c) medication side effects, d) angina/chest pain, e) health-related problems, f) bad weather, g) too much work, h) lack of time, and i) too expensive to exercise. Each exercise barrier was preceded by the statement "How confident are you that you can exercise at some point during the day when...." Patients rated their confidence on a scale from 1(not at all confident) to 10 (very confident). The average of the nine exercise barriers was calculated and used as an indicator of overall barrier efficacy at all four time points. The scale showed acceptable internal consistency at a) mail out ($\alpha = .86$), b) pre-rehabilitation ($\alpha = .87$), post-rehabilitation ($\alpha = .64$), and at follow-up ($\alpha = .79$).

Task efficacy. Two types of task efficacy were assessed in the present study. The first type of task efficacy measured confidence in exercising at various durations of exercise. It was assessed by asking patients "How confident are you that you can exercise at a moderate, but comfortable intensity for..." a) 10 minutes, b) 20 minutes, c) 30 minutes, d) 40 minutes, and e) 50 minutes. Patients rated their confidence on a scale from 1(not at all confident) to 10 (very confident). The five ratings were then averaged to obtain the task efficacy (duration) score. Internal consistencies were acceptable at a) mail out ($\alpha = .96$), b) pre-rehabilitation ($\alpha = .95$), post-rehabilitation ($\alpha = .82$), and at follow-up ($\alpha = .85$).

The second type of task efficacy measured confidence in exercising at various frequencies of exercise. It was assessed by asking patients "How confident are you that you can exercise for 30 continuous minutes at a moderate, but comfortable intensity..." a) two times per week, b) three times per week, c) four timers per week, and d) five times per week. Patients rated their confidence on a scale from 1(not at all confident) to 10 (very confident). Again, the four ratings were averaged to obtain the task efficacy (frequency) score. Internal consistencies were acceptable at a) mail out ($\alpha = .97$), b) pre-rehabilitation ($\alpha = .97$), post-rehabilitation ($\alpha = .87$), and at follow-up ($\alpha = .85$). The format used for these scales is similar to previous studies (Foster et al., 1995; Jeng & Braun, 1997).

Anxiety, Depression, and Vigor. These three moods were assessed by using the abbreviated subscales of the Profile of Mood States developed by Grove and Prapavessis (1992). Anxiety was assessed using the following items: a) restless, b) nervous, c) on-edge, d) tense, e) uneasy, and f) anxious. Depression was assessed using the following items: a) hopeless, b) helpless, c) sad, d) worthless, e) miserable, and f) uncertain. Vigor was assessed using the following items: a) cheerful, b) vigorous, c) full of pep, d) active, e) energetic, and f) lively. Each adjective was preceded by the statement "Over the past week, I have felt…". Patients rated how they felt on a scale from 0 (not at all) to 4 (extremely). Higher scores on anxiety and depression indicate greater mood disturbance, however, the opposite is true for vigor. Internal consistencies were acceptable at a) mail out (anxiety $\alpha = .90$; depression $\alpha = .92$; vigor $\alpha = .91$), b) pre-rehabilitation (anxiety $\alpha = .90$; depression $\alpha = .92$; vigor $\alpha = .87$), c) post-rehabilitation (anxiety $\alpha = .90$; depression $\alpha =. 95$; vigor $\alpha = .83$), and at follow-up (anxiety $\alpha = .88$; depression $\alpha = .94$; vigor $\alpha = .84$).

Exercise Adherence During Rehabilitation. In order to obtain an objective measure of the patients' exercise adherence during their phase II CR, the following formula was used: [# of exercise sessions attended / # exercise sessions prescribed at the start of rehabilitation] * 100. The percentage approach was necessary because patients' exercise frequencies varied from 1 to 3 times per week depending on the severity of their condition. A percentage score is standardized across patients. Patients' objective exercise attendance was verified by medical information recorded during each exercise session by the Glenrose staff. If a patient did not show up for his/her scheduled exercise session, he/she was marked absent for that day in the medical file.

Self-reported Exercise was assessed by the leisure score index (LSI) of the Godin Leisure-Time Exercise Questionnaire (Godin, Jobin, & Bouillon, 1986). The LSI contains three questions that assessed the frequency of mild, moderate, and strenuous exercise performed for at least 15 minutes in duration during free time in a typical week. A total LSI score was calculated by adding the frequency of exercise within the mild, moderate, and strenuous categories. An independent evaluation of this measure found its reliability and validity to compare favourably to nine other self-report measures of exercise based on various criteria including test-retest scores, objective activity monitors, and fitness indices (Jacobs et al., 1993). In the present study, the LSI was used to measure frequency of exercise from post-rehabilitation to follow-up (i.e., 6 to 10 weeks post-rehabilitation).

Procedure

Once participants were referred to the Glenrose Rehabilitation program, they were sent a questionnaire package along with the information package that the Glenrose program typically sends out to their patients. The questionnaire package contained a cover letter from the Glenrose to support the research (see appendix A), a cover letter explaining the details of the study and two informed consents (one for the patient and one for the researcher)(see appendix B), and the questionnaire that included the task efficacy, barrier efficacy, and the three mood scales (see appendix C). If the patients agreed to participate, the cover letter asked them to complete the questionnaire immediately and to contact the researchers if they had any questions or concerns. They were then asked to return the completed questionnaire and informed consent to their initial orientation meeting at the Glenrose. This time ranged from 3 to 5 weeks. Patients who returned their completed questionnaires at their orientation meeting at the Glenrose were met by the researcher who then gave them the same questionnaire to be completed and returned to their first scheduled exercise session which ranged from 2 to 10 days from the orientation meeting.

The patients were given their third questionnaire at their second last exercise session and were asked to return it to their last session. Finally, patients completed their fourth questionnaire, which included the LSI at their post-rehabilitation follow-up stress test, which ranged in time from 6 to 10 weeks following the completion of their phase II

CR program. Once patients completed their final questionnaire, they were debriefed. The debriefing entailed a conversation regarding the hypotheses of the study, answering any questions the patients had about the study in general or their own responses to the questionnaires, and confirmation that the patients could get the results of the study at any time.

Results

Purpose 1: Self-efficacy and Moods Over Time

In order to examine potential gender differences in the changes in task and barrier efficacy, anxiety, depression, and vigor throughout phase II CR, 2 (gender) x 4 (mail out, pre-rehabilitation, post-rehabilitation, follow-up) mixed-model ANOVA's were conducted for each of the self-efficacy and mood variables. Gender x time interactions were followed up with 2(gender) x 2(time) mixed-model ANOVA's. All interactions from these analyses were then followed up with one-way repeated measure ANOVA's. If there were no gender x interactions present in the 2(gender) x 4(time) mixed-model ANOVA for a particular variable, but there was a main effect for time, it was followed up with a one-way repeated measure ANOVA. In all cases, follow-up analyses were conducted using three different time periods. The first follow-up analysis used mail out to pre-rehabilitation as the time period. The purpose of this analysis was to rule out history and maturation as potential threats to the internal validity of our study and was treated as a control condition. For example, if it was found that barrier efficacy significantly increased during phase II CR and there was no change in the control condition, then one can make a stronger case that phase II CR was responsible for this change. The second follow-up analysis used pre-rehabilitation to post-rehabilitation as the time period and examined the changes in self-efficacy and mood during phase II CR. The third follow-up analysis used post-rehabilitation to follow-up as the time period and examined the changes in self-efficacy and mood following completion of phase II CR at the follow-up stress test. Descriptive statistics for task and barrier efficacy, anxiety, depression, and vigor in men and women for each time are presented in Tables 3-2 to 3-6.

Table 3-2

Zero-order correlations among the self-efficacy and mood variables at mail out by gender

Variable		2.	3.	4.	5.	6.
1. Barrier efficacy	men	.28*	.30*	.23	-.53**	-.39**
	women	.46*	.32	.36	-.07	-.15
2. Task eff (dur)	men	-	.67**	.41**	-.12	-.09
	women	-	.65*	.39	-.44*	-.11
3. Task eff(freq)	men	-	-	.38**	-.05	-.10
	women	-	-	.44*	-.23	-.10
4. Vigor	men	-	-	-	-.37**	-.33*
	women	-	-	-	-.36	-.68**
5. Anxiety	men	-	-	-	-	.66**
	women	-	-	-	-	.49*
6. Depression	men	-	-	-	-	-
	women	-	-	-	-	-

Note. *p<.05; **p<.01; Task eff (dur) = task efficacy (duration); Task eff (freq) = task efficacy (frequency).

Table 3-3

Zero-order correlations among the self-efficacy and mood variables pre-rehabilitation by gender

Variable		2.	3.	4.	5.	6.
1. Barrier efficacy	men	.26	.34*	.20	-.33*	-.18
	women	.61**	.52*	.47*	-.36	-.41*
2. Task eff (dur)	men	-	.65**	.40**	-.20	-.18
	women	-	.66**	.46*	-.54**	-.20
3. Task eff(freq)	men	-	-	.52**	-.11	-.07
	women	-	-	.55**	-.34	-.18
4. Vigor	men	-	-	-	-.27*	-.30*
	women	-	-	-	-.34	-.64*
5. Anxiety	men	-	-	-	-	.66**
	women	-	-	-	-	.44*
6. Depression	men	-	-	-	-	-
	women	-	-	-	-	-

Note. *p<.05; **p<.01; Task eff (dur) = task efficacy (duration); Task eff (freq) = task efficacy (frequency).

Table 3-4

Zero-order correlations among the self-efficacy and mood variables post rehabilitation by gender

Variable		2.	3.	4.	5.	6.
1. Barrier efficacy	men	.39**	.45**	.41**	-.44**	-.32*
	women	.42*	.42*	.07	-.33	-.17
2. Task eff (dur)	men	-	.52**	.50**	-.30*	-.38**
	women	-	.66**	.17	-.07	-.18
3. Task eff(freq)	men	-	-	.44**	-.05	-.20
	women	-	-	.25	-.17	-.14
4. Vigor	men	-	-	-	-.29*	-.34**
	women	-	-	-	-.20	-.43*
5. Anxiety	men	-	-	-	-	.43**
	women	-	-	-	-	.10
6. Depression	men	-	-	-	-	-
	women	-	-	-	-	-

Note. *p<.05; **p<.01; Task eff (dur) = task efficacy (duration); Task eff (freq) = task efficacy (frequency).

Table 3-5

Zero-order correlations among the self-efficacy and mood variables at follow-up by gender

Variable		2.	3.	4.	5.	6.
1. Barrier efficacy	men	.14	.17	.15	-.39**	-.35**
	women	.64**	.62**	.03	-.27	-.26
2. Task eff (dur)	men	-	.33*	.49**	-.27*	-.37**
	women	-	.64**	.27	-.12	-.33
3. Task eff(freq)	men	-	-	.28*	-.29*	-.19
	women	-	-	.28	-.22	-.29
4. Vigor	men	-	-	-	-.22	-.27*
	women	-	-	-	-.18	-.11
5. Anxiety	men	-	-	-	-	.51**
	women	-	-	-	-	.08
6. Depression	men	-	-	-	-	-
	women	-	-	-	-	-

Note. *p<.05; **p<.01; Task eff (dur) = task efficacy (duration); Task eff (freq) = task efficacy (frequency).

Table 3-6

Means and standard deviations for the self-efficacy and mood state variables across time by gender

Variable	Gender		Mail out	Pre -rehab	Post -rehab	Follow -up
Barrier efficacy	Men	Mean	6.99	6.82	8.49	7.71
		SD	*1.63*	*1.69*	*.73*	*1.12*
	Women		5.60	5.63	8.09	7.36
			1.93	*1.63*	*.86*	*1.52*
Task efficacy (Dur)	Men		6.53	6.64	9.04	8.72
			2.67	*2.44*	*.97*	*.94*
	Women		4.99	5.23	8.74	8.23
			2.43	*2.72*	*1.38*	*1.53*
Task efficacy(Freq)	Men		6.04	6.21	8.55	8.12
			2.89	*2.64*	*1.17*	*.93*
	Women		4.36	4.49	8.21	7.49
			2.88	*2.43*	*1.91*	*1.97*
Anxiety	Men		1.25	1.20	.77	.79
			.86	*.92*	*.73*	*.71*
	Women		1.21	1.13	.73	.73
			.99	*.91*	*.84*	*.59*
Depression	Men		.60	.58	.48	.52
			.82	*.78*	*.76*	*.78*
	Women		.79	.79	.61	.56
			.98	*.97*	*.91*	*.85*
Vigor	Men		2.03	1.97	2.49	2.31
			.70	*.65*	*.57*	*.57*
	Women		1.41	1.5	2.11	2.06
			.66	*.54*	*.38*	*.44*

Note. Dur = duration; Freq = frequency; Rehab = rehabilitation.

2(gender) x 4 (time) mixed-model ANOVA's. Gender x time interactions were found for barrier efficacy $F(3,76)=2.87$, $p<.05$ and task efficacy (frequency) $F(3,75)=3.10$, $p<0.05$. Furthermore, as the gender x time interaction for task efficacy (duration) $F(3,75) = 2.63$, $p<.06$ approached significance, it was followed up as well. There were no gender x time interactions present for barrier efficacy $F(3,76)=1.82$, $p>.05$, vigor $F(3,73) = 2.13$, $p > .05$, anxiety $F(3,73) = .04$, $p > .05$, or depression $F(3,73) = .58$, $p >.05$. However, main effects of time were found for vigor $F(3,73)=27.95, p<.01$ and anxiety $F(3,73)=19.43, p<.01$, but not depression $F(3,73) = .48$, $p >.05$.

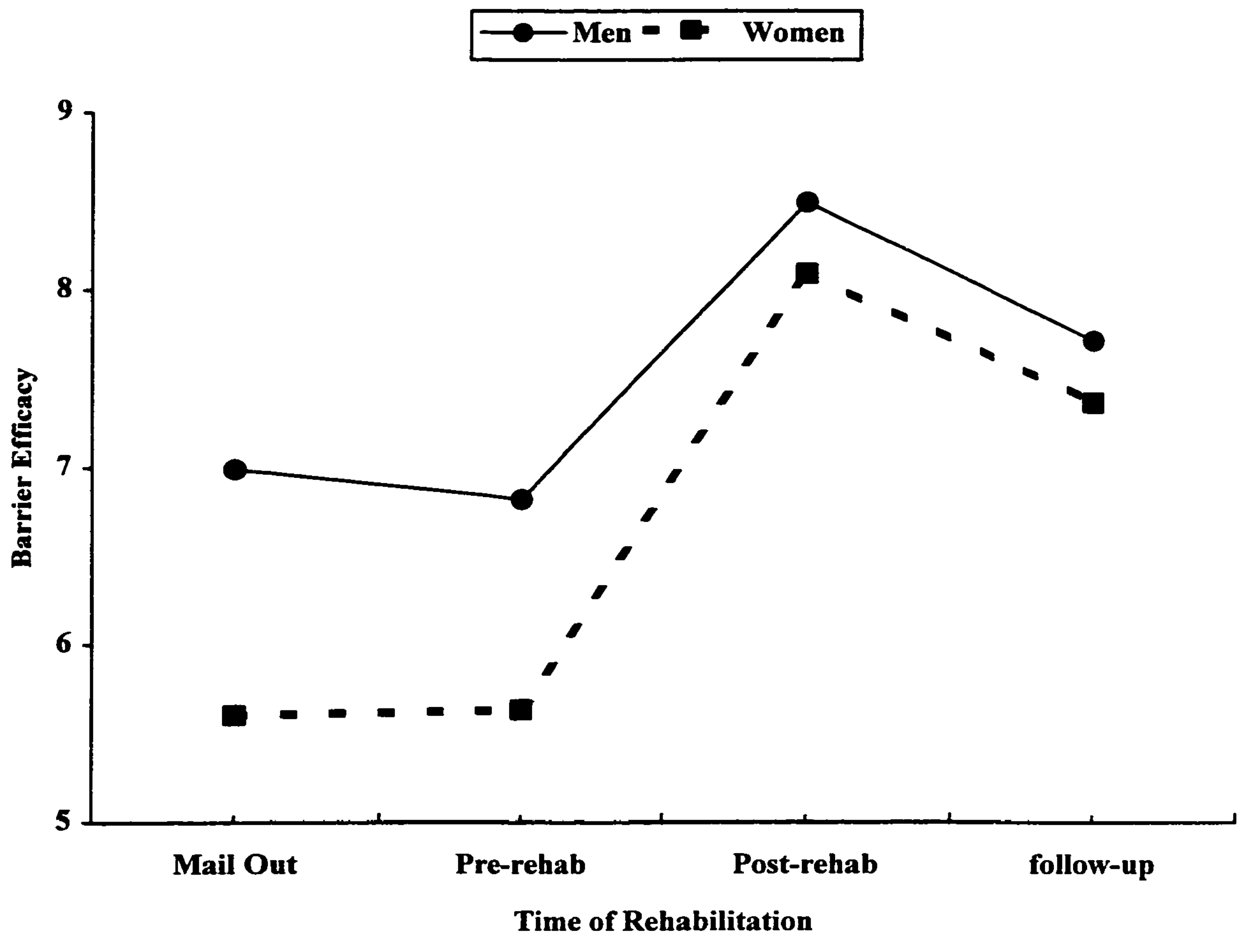
Mail-out to pre-rehabilitation follow-up analyses. From mail out to pre-rehabilitation, there was no gender x time interaction for barrier efficacy $F\ (1,78) = .51$, $p > .05$, task efficacy (frequency) $F\ (1,77) = .01$, $p > .05$, or task efficacy (duration) $F\ (1,77) =. 17$, $p > .05$. There were also no main effects for time for any of the self-efficacy or mood variables. Therefore, it appears that our control condition was effective in ruling out history and maturation as potential threats to the internal validity of our study.

Pre-post phase II CR follow-up analyses. From pre- to post-phase II CR, there was a significant gender x time interaction for barrier efficacy $F\ (1,78) = 4.4$, $p < .05$ ($\eta^2 = .05$), task efficacy (frequency) $F\ (1,78) = 6.58$, $p < .02$ ($\eta^2 = .08$), and task efficacy (duration) $F\ (1,78) = 5.03$, $p < .05$ ($\eta^2 = .06$). Further one-way repeated measure ANOVA's showed that men had significant increases in barrier efficacy $F\ (1,56) = 75.96$ $p < .01$ ($\eta^2 = .52$), task efficacy (frequency) $F\ (1,56) = 64.81$, $p < .05$ ($\eta^2 = .53$), and task efficacy (duration) $F\ (1,56) = 94.28$, $p < .05$ ($\eta^2 = .62$). However, the magnitude of change in women was larger for barrier efficacy $F\ (1,22) = 53.85$, $p < .01$ ($\eta^2 = .71$), task efficacy (frequency) $F\ (1, 22) = 64.16$, $p < .05$ ($\eta^2 = .75$), and task efficacy (duration) F

(1,22) = 58.31, p < .05 (η^2 = .73). See Figures 1 to 3 for the time course changes of the task (frequency and duration) and barrier efficacy throughout the CR process.

Figure 3-1

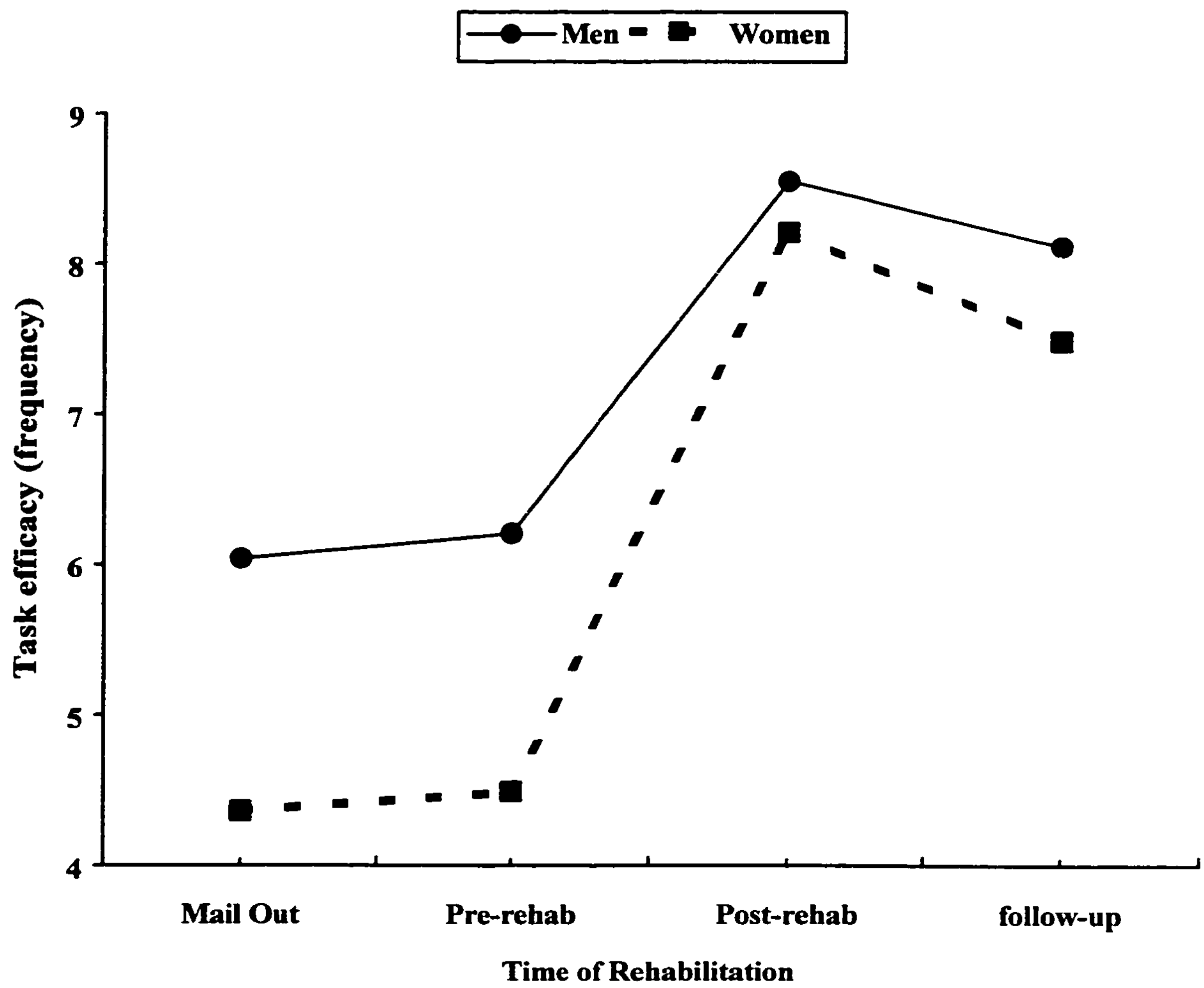
Barrier efficacy throughout phase II CR by gender



Note. Pre-rehab = pre phase II CR; Post-rehab = post phase II CR.

Figure 3-2

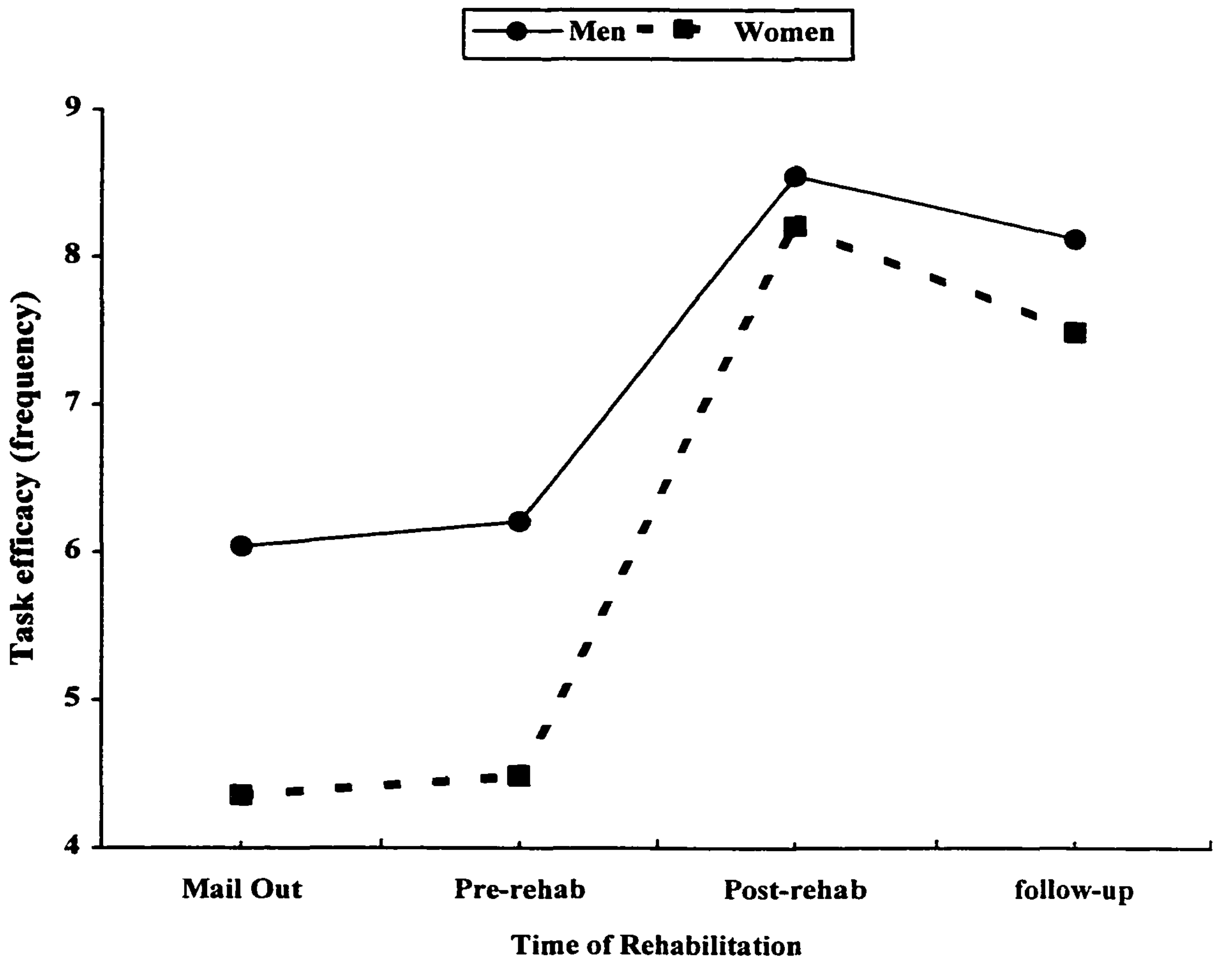
Task efficacy (duration) throughout phase II CR by gender



Note. Pre-rehab = pre phase II CR; Post-rehab = post phase II CR.

Figure 3-3

Task efficacy (frequency) throughout phase II CR by gender



Note. Pre-rehab = pre phase II CR; Post-rehab = post phase II CR.

With respect to mood, main effects of time showed that vigor significantly increased F (1,77) = 92.12, $p < .01$ ($\eta^2 = .55$) while anxiety significantly decreased F (1,77) = 65.12, $p < .01$ ($\eta^2 = .46$).

Post rehabilitation to 14-week stress test follow-up analyses. There were no gender x time interactions for barrier efficacy or task efficacy (frequency and duration). However, there were significant main effects for time for barrier efficacy F (1,78) = 38.29, $p < .01$ ($\eta^2 = .33$), task efficacy (frequency) F (1,78) = 28.69, $p < .01$ ($\eta^2 = .27$), task efficacy (duration) F (1,78) = 25.34, $p < .01$ ($\eta^2 = .25$) and vigor F (1,77) = 17.11, $p < .01$ ($\eta^2 = .18$). All four variables significantly decreased. However, there was no change in anxiety F (1,77) = .12, $p > .05$. It is important to note, however, that the self-efficacy levels reported at follow-up were significantly higher than the levels reported at pre-rehabilitation for barrier efficacy $F(1,79) = 46.30$, $p < .01$ ($\eta^2 = .37$), task efficacy (duration) $F(1,79) = 95.37$, $p < .01$ ($\eta^2 = .55$), and task efficacy (frequency) = $F(1,79) = 61.33$, $p < .01$ ($\eta^2 = .44$). This was also the case for vigor $F(1,76) = 43.07$, $p < .05$ ($\eta^2 = .36$).

Purpose 2: Exercise Adherence During Phase II CR and Changes in Self-efficacy

In order to examine the influence of exercise adherence on the changes in task and barrier efficacy, a change score approach was utilized. Although pre-post change scores are acceptable for those physiological variables where reliability is high, such a strategy is less advisable when using psychosocial variables (Cohen & Cohen, 1985). Therefore, in order to represent changes in the self-efficacy variables, residual scores were created by regressing each of the the post-rehabilitation scores on their own pre-rehabilitation scores. Then, zero-order correlations (one-tailed) between exercise adherence and each residual score for men and women separately as they had differential increases in all three self-efficacy variables.

Results showed that exercise adherence was significantly related to changes in a) barrier efficacy for men ($r = .58$, $p < .01$) and women ($r = .37$, $p < .05$), b) task efficacy (frequency) for men ($r = .33$, $p < .01$) and women ($r = .48$, $p < .01$), and c) task efficacy (duration) for men ($r = .32$, $p < .01$) and women ($r = .58$, $p < .01$).

Purpose 3: Self-efficacy and Exercise Adherence Following Phase II CR

Prior to establishing a relationship between the self-efficacy variables and exercise adherence post-rehabilitation (i.e., at follow-up), a between-subjects ANOVA (i.e., gender) on exercise adherence was performed. Results showed that the frequency of exercise was similar between men (mean = 4.11 times per week) and women (mean = 4.28 times per week) F (1, 78) = .09, $p > .05$. Therefore, the sample in our subsequent analysis was collapsed. Here, the self-efficacy scores post- phase II CR were correlated to the frequency of exercise reported at follow-up (i.e., LSI). Zero-order correlations (one-tailed) showed that frequency of exercise was not correlated to barrier efficacy $r = .05$, $p > .05$, or task efficacy (duration) $r = .14$, $p > .05$, however, it was correlated with task efficacy (frequency) $r = .33$, $p < .01$.

Purpose 4: Bi-directional Relationship Between Self-efficacy and Mood

Pre-post rehabilitation. In order to explain the vigor/anxiety changes from pre- to post-phase II CR found in our first analysis, residual scores were created using the same procedure outlined under purpose two. Then, zero-order correlations (one tailed) on the mood and self-efficacy residualized scores were done. As there were no gender differences present in the mood changes shown in the first analysis (purpose 1), the sample was collapsed for this analysis. Results showed that vigor was positively correlated with barrier efficacy $r = .31$, $p < .01$, task efficacy (frequency) $r = .26$, $p < .01$, and task efficacy (duration) $r = .22$, $p < .05$. Furthermore, anxiety was negatively correlated with barrier efficacy $r = -.38$, $p < .01$, task efficacy (frequency) $r = -.20$, $p < .05$, and task efficacy (duration) $r = -.30$, $p < .01$.

Post-rehabilitation to follow-up. As was shown with the ANOVA's from the first analysis (purpose 1), only vigor changed significantly from post-rehabilitation to follow-up while all three self-efficacy variables significantly decreased equally in men and women. Therefore, to explain the decrease in vigor, residualized scores were created (from post-rehabilitation to follow-up) for all 4 variables in question and zero-order correlations (one-tailed) were performed on the newly created scores. Results showed that vigor was positively correlated with task efficacy (duration) $r = .20$, $p < .05$, but was not correlated with to barrier efficacy $r = .03$, $p > .05$ or task efficacy (frequency) $r = .05$, $p > .05$.

Discussion

The present study had four main purposes. The first purpose was to examine the time course changes of task and barrier efficacy, anxiety, depression, and vigor during and following phase II CR in men and women. The second purpose was to examine the relationship between the *changes* in task and barrier efficacy during phase II CR and exercise adherence while the third purpose was to examine the relationship between task and barrier efficacy at the end of phase II CR and exercise adherence following completion of the program in men and women. Finally, the fourth purpose was to examine the bi-directional relationships between task/barrier efficacy and mood during and following phase II CR in men and women.

Purpose 1: Self-efficacy and Moods Over Time

Self-efficacy. As anticipated, task (duration and frequency) and barrier efficacy significantly improved from pre- to post- phase II CR. An interesting finding was that the size of these changes was significantly larger in women compared to men. This finding is in accord with McAuley et al.'s (1991) finding that task efficacy increased with exercise in middle-aged adults. However, this is the first study to demonstrate a differential increase in barrier efficacy between men and women. In examining the means from Table 2, one can see that women entered the rehabilitation program with significantly lower self-efficacy for all three variables compared to men which is consistent with previous research (Schuster & Waldron, 1991; Blanchard et al., 2001). However, women's task and barrier efficacy increased to levels that were similar to men at the end of phase II CR. All three self-efficacy variables, however, significantly decreased at post-rehabilitation follow-up. It is important to note, however, that further analyses revealed that these levels of self-efficacy at post-rehabilitation follow-up were significantly higher compared to their pre-rehabilitation levels. Therefore, the data suggest that even though men and women had significant gains in all three self-efficacy variables during phase II CR, it appears that women may have more to gain from this phase of rehabilitation than men in terms of increasing task and barrier efficacy that persists once they leave the program. This has important implications for physicians as it has been consistently shown that they refer more men to phase II CR programs than women (Halm et al., 1999; Richardson et al., 2000). The present data suggest the need to alleviate this bias as women may actually benefit more from phase II CR than men in strengthening their confidence to exercise and their confidence to overcome barriers so they will continue to exercise.

Moods. The present study's results are consistent with previous literature, which showed that phase II CR significantly decreased anxiety (Kugler et al., 1994; Yoshida et al., 1999) and significantly increased vigor (Oldridge, et al., 1995; Engebretson et al., 1999) in men and women. Furthermore, the patients sustained this reduced level of anxiety at the post-rehabilitation follow-up, however, vigor significantly decreased. It should be noted, however, that further analyses showed that vigor was significantly higher at follow-up than at pre-rehabilitation.

An interesting finding in the study was the lack of change in depression from pre- to post phase II CR in men and women, which is inconsistent with previous literature (Kugler et al., 1994; Yoshida et al., 1999). However, as one can see from Table 2, there appears to be a floor effect in the present study with the sample showing very low depression scores at study outset. This is problematic because a floor effect does not leave much room for a significant decrease in depression to occur over time. Nonetheless, the fact that men and women had similar levels of depression prior to starting a CR program is consistent with previous research (Brezinka, Dusseldorp, & Maes, 1998) and may suggest that one should not expect a gender difference on depression levels in phase II CR.

Purpose 2 and 3: Self-efficacy and exercise adherence during and following phase II CR

An interesting finding in the present study was that task efficacy (frequency) was the only self-efficacy variable related to exercise adherence once patients left their phase

II CR program in men and women. However, during phase II CR, task and barrier efficacy were related to exercise adherence. This suggests that task and barrier efficacy are important determinants of exercise adherence during the initial phase of CR (i.e., phase II), however, only task efficacy (frequency) may be the important efficacy variable in a more maintenance phase of rehabilitation (i.e., phase III). That is, in the early stages of CR (i.e., phase II), the frequency of exercise is related to one's general beliefs of his/her capabilities to exercise at various durations and frequencies and one's confidence to continue exercising in the face of exercise barriers. During this phase, more efficacious patients are likely to adhere more to their exercise program and reach a point where exercise has become a routine in their daily lives. At this point, exercise barriers may play less of a role in influencing the patients' frequency of exercise. Therefore, once patients make the transition from adopting exercise during phase II CR to maintaining it once they leave the program (i.e., phase III rehabilitation), it is their confidence in performing the behavior on a regular basis that is important in continued exercise behavior. This supports McAuley's (1993) notion that different efficacy cognitions play a more salient role at different stages of the exercise/ rehabilitation process.

Purpose 4: Bi-directional Relationship Between Self-efficacy and Mood

Another purpose of the present study was to explain the mood changes during and following phase II CR. A social cognitive perspective was used in the present study in an attempt to explain these mood changes. The present study showed that task and barrier efficacy were negatively related to anxiety and positively related to vigor during phase II CR, which supported the tenets of social cognitive theory (Bandura, 1997) and previous research (Stewart et al., 1994; Perkins & Jenkins, 1998). However, only task efficacy (duration) was positively related to vigor at post-rehabilitation follow-up. This reiterates an earlier point that different types of self-efficacy may be more important at various phases of a rehabilitation program (McAuley, 1993). More specifically, it appears that task efficacy (frequency), task efficacy (duration), and barrier efficacy are all related to exercise adherence and changes in moods during phase II CR, however, only task efficacy (frequency) is related to exercise adherence once patients leave the program. Furthermore, the decrease in task efficacy (duration) appears to have the only significant relationship with the decrease in vigor once patients leave phase II CR. Therefore, it is recommended that future studies in CR continue to include various task efficacy measures along with a barrier efficacy measure to maximize the potential to explain relationships among self-efficacy and other psychosocial (e.g., mood) and behavioral variables (e.g., exercise adherence).

Limitations

Despite the promising findings of the present study, it does have limitations that need to be taken into consideration when interpreting the findings and planning future research. First of all, it is possible that the patients sampled in the present study may not have previously experienced these particular exercise barriers on the barrier efficacy scale and may have over- or underestimated their efficacy judgment as a result (DuCharme & Brawley, 1995). Third, the barriers assessed in the present study were specific to phase II CR (Blanchard et al., 2001) and may not generalize to phase III CR. Therefore, future research is needed to discover barriers to continued exercise involvement in phase III CR. A fourth limitation is that there was no information on the medication usage of the patients. It is possible that some medication usage could have been responsible for the decrease in anxiety and increase in vigor. Fifth, although a control condition was included to help control for threats of history and maturation, the length of this control condition varied from 3 to 5 weeks. Despite this variation, there was no change in any of our psychological variables, which supports the utility of using such a condition. However, future studies should use randomized clinical trials that would allow one to have a control and experimental condition of similar lengths in time to strengthen the validity of the findings. Finally, the problem of time may have also existed in the post-rehabilitation follow-up assessment, which varied in length from 6 to 10 weeks. However, correlations were done between the number of weeks from post-rehabilitation to the follow-up assessment to the task efficacy (duration), task efficacy (frequency), barrier efficacy, and vigor residual scores (i.e., the four variables that significantly changed during this period) and found no significant relationships. Therefore, the variation in the length of time between post-phase II CR and the follow-up assessment does not appear to be a confounding variable in the present study. Nonetheless, future studies should standardize the timing of assessments in order to strengthen the internal validity of the study.

Conclusions

Despite these limitations, the present study found that women had significantly larger increases in task and barrier efficacy during phase II CR compared men, however, men and women had similar decreases at post-rehabilitation follow up. Furthermore, changes in anxiety and vigor throughout the rehabilitation process were associated with changes in task and barrier efficacy in men and women. Future studies should continue to compare men and women on various psychosocial variables throughout the rehabilitation process in order to obtain a thorough understanding of gender differences during and following phase II CR.

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Appendix 3-A

Glenrose Cover Letter

Dear patient:

Included in this package is information on a research study that we are currently working on with researchers from the University of Alberta. This investigation will help determine which factors affect people's ability to maintain long term exercise. As exercise itself is a major risk factor for heart disease, and it also affects many other risk factors such as cholesterol and body weight, we support and encourage this research. We are hopeful that the results will improve our ability to assist patients make positive lifestyle modifications.

We would be most appreciative if you would participate in this study and fill out the enclosed questionnaire. We are constantly looking for ways to improve our program.

Sincerely,

Bill Daub
Research Coordinator
Northern Alberta Cardiac Rehabilitation Program

Appendix 3-B
Cover letter and Informed Consent

Project Title: The Influence of Social Cognitive Theory on Males and Females in Cardiac Rehabilitation

Principal Investigators:

Chris Blanchard, M.A., University of Alberta, 492-7424
Dr. Wendy Rodgers, University of Alberta, 492-2677
Dr. Kerry Courneya, University of Alberta, 492-1031

Co-Investigators:

Bill Daub, Research Co-ordinator, Glenrose Rehabilitation Hospital, 471-8206
Grant Knapik, Exercise Specialist, Glenrose Rehabilitation Hospital, 471-8206

Dear cardiac rehabilitation patient:

Exercise is an important part of improving overall health. The purpose of this study is to look at factors that may influence your exercise during and after your cardiac rehabilitation program. We are interested in studying your confidence in your exercise skills and your confidence to overcome obstacles that could prevent you from exercising. We are also interested in your expectations of your exercise and how your exercise may influence your psychological health. Finally, we want to see if these variables change as a result of your rehabilitation.

If you agree to participate, we ask that you complete the questionnaire package enclosed. Then, take it to your first orientation meeting at the Glenrose Hospital. It will take approximately **20 minutes** to complete. After your meeting at the Glenrose, you will be asked to take home and complete the questionnaire again. Finally, you will be asked to complete the questionnaire at the end of your rehabilitation and at your 14 week stress test. After you complete the final questionnaire, your participation in the study will officially end. To save you time, Bill Daub and Grant Knapik will provide the following information: age, sex, marital status, education, employment status, height, weight, and type of cardiac event. If you have any questions involving your commitment in the study, please contact Chris at the above number.

Participating in the study is not required by the Glenrose program. As well, if you choose not to participate, this will NOT affect your care at the Glenrose in any way. There are no known physical risks. However, there is a possibility that a question could make you feel uncomfortable. If this occurs, there is a social worker at the Glenrose who will be able to assist you by appointment. As well, you can skip any question you prefer. It is important to know that there are no right or wrong answers to the survey questions. You can also refuse to participate or withdraw from the study at any time. The information you provide will be used to develop future projects and exercise choices for other cardiac patients, as well as to improve the present program.

All information will be held confidential except when professional codes of ethics and/or legislation require reporting. Dr. Rodgers and Chris Blanchard will be the only ones who will have access to your data. Your data will be held in locked filing cabinets for seven years in a laboratory with limited access at the University of Alberta. Personal information will be removed and replaced with numerical codes as it is collected. No person's identity will be revealed in any reports in this project. If you have any questions about any aspect of this study, contact the Patient Concerns Office of the Capital Health Authority at 407-1040. This office has no connection with study investigators.

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate or withdraw from the study at any time? You do not have to give a reason and it will not affect your care.	Yes	No
Has the issue of confidentiality been explained to you?	Yes	No
Do you understandwho will have access to the information you provide?	Yes	No
Do you want the investigator(s) to inform your family doctor that you are participating in this research study? If so, please provide your doctor's name:______________________	Yes	No

This study was explained to me by: Chris Blanchard

I agree to take part in this study.

______________________ ______________ ______________

Signature of Research Participant Date Printed Name

Appendix 3-C

Questionnaire

PART ONE

Instructions: The following questions deal with obstacles that could prevent you from exercising. For each question, we ask you to circle a number using the scale provided to **rate your confidence** that you can exercise **when OR if** you experience the obstacle.

1) How confident are you that you can exercise at some point during the day when **OR** if **you have a fear of having a cardiac incident....**

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

2) How confident are you that you can exercise at some point during the day when **OR** if **you experience back pain....**

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

3) How confident are you that you can exercise at some point during the day when **OR** if **you have medication side effects....**

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

4) How confident are you that you can exercise at some point during the day when **OR** if **there is bad weather....**

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

5) How confident are you that you can exercise at some point during the day when **OR** if **you feel you have too much work to do....**

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

6) How confident are you that you can exercise at some point during the day when **OR** if **you feel you don't have time....**

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

7) How confident are you that you can exercise at some point during the day when **OR** if **you HAD angina/chest pain earlier in the day....**

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

8) How confident are you that you can exercise at some point during the day when **OR** if **you are having health problems....**

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

9) How confident are you that you can exercise at some point during the day when **OR** if **you feel it is too expensive too exercise....**
1 2 3 4 5 6 7 8 9 10
not at all confident completely confident

PART TWO

Instructions: For the following questions, please indicate how **CONFIDENT** you are that you can exercise **NOW** by circling a number on the scale provided.

1) I am confident that I can exercise at a **moderate, but comfortable intensity** for **10 minutes**

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

2) I am confident that I can exercise at a **moderate, but comfortable intensity** for **20 minutes**

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

3) I am confident that I can exercise at a **moderate, but comfortable intensity** for **30 minutes**

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

4) I am confident that I can exercise at a **moderate, but comfortable intensity** for **40 minutes**

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

5) I am confident that I can exercise at a **moderate, but comfortable intensity** for **50 minutes**

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

6) I am confident of being able to exercise for **30 continuous minutes** at a **moderate, but comfortable intensity: TWO TIMES EVERY WEEK**

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

7) I am confident of being able to exercise for **30 continuous minutes** at a **moderate, but comfortable intensity: THREE TIMES EVERY WEEK**

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

8) I am confident of being able to exercise for **30 continuous minutes** at a **moderate, but comfortable intensity: FOUR TIMES EVERY WEEK**

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

9) I am confident of being able to exercise for **30 continuous minutes** at a **moderate, but comfortable intensity: FIVE TIMES EVERY WEEK**

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

PART THREE

Instructions: Below is a list of words that describes feelings people have. Please read each one carefully. Please use the scale below to describe how you have been feeling during the past week including today for **EACH WORD**.

OVER THE PAST WEEK, I HAVE FELT...(Please answer questions 1 to 18)

	0 Not at all	1 A little	2 Moderately	3 Quite a bit	4 Extremely
1. cheerful	0	1	2	3	4
2. restless	0	1	2	3	4
3. hopeless	0	1	2	3	4
4. vigorous	0	1	2	3	4
5. nervous	0	1	2	3	4
6. helpless	0	1	2	3	4
7. full of pep	0	1	2	3	4
8. on-edge	0	1	2	3	4
9. sad	0	1	2	3	4
10. active	0	1	2	3	4
11. tense	0	1	2	3	4
12. worthless	0	1	2	3	4
13. energetic	0	1	2	3	4
14. uneasy	0	1	2	3	4
15. miserable	0	1	2	3	4
16. lively	0	1	2	3	4
17. anxious	0	1	2	3	4
18. discouraged	0	1	2	3	4

Appendix 3-D

Modified LSI for the post-rehabilitation follow-up

Instructions: Considering a typical week (7 days) **BSINCE YOU COMPLETED YOUR REHABILITATION AT THE GLENROSE,** please **circle** the number of times on average that you did the following kinds of exercise for **more than 20 minutes**?

Times Per Week

a. Category one:
(e.g., running, jogging, squash, cross country skiing, vigorous swimming, long distance bicycling, vigorous aerobic classes, heavy weight training) _____

b. Category two:
(e.g., fast walking, baseball, tennis, easy bicycling, easy swimming, dancing) _____

c. Category three:
(e.g., easy walking, yoga, archery, fishing, bowling, horseshoes, golf) _____

Chapter Four

General Discussion

<u>Introduction</u>

It has been consistently shown that women have lower adherence rates to phase II cardiac rehabilitation (CR) compared to men (Halm, Penque, Doll, & Beahrs, 1999; Schuster, & Waldron, 1991; Oldridge, Ragowski, & Gottlieb, 1992; Ades, Waldmann, Polk, & Coflesky, 1992). Furthermore, only 25% of phase II CR patients are women (Thomas et al., 1996). As a result of the small enrollment numbers, low adherence rates, and high drop out rates of women to phase II CR, very little research has been conducted to examine a) theoretical variables (e.g., self-efficacy) which may help explain gender differences in adherence to phase II CR programs, and b) any potential gender differences in the outcomes (e.g., self-efficacy, anxiety, and depression) of phase II CR.

The present dissertation attempted to address both of these unanswered questions by conducting two studies. The first study attempted to explain gender differences in exercise adherence to phase II CR through the examination of barrier efficacy. More specifically, it was tested whether barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. It was hypothesized that men would have significantly higher barrier efficacy compared to women, which in turn, would be associated with significantly higher exercise adherence during phase II CR. The second study examined potential gender differences in the outcomes of phase II CR. In this study, it was examined whether phase II CR had a similar influence on task efficacy and barrier efficacy, anxiety, depression, and vigor in men and women. It was hypothesized that women would experience larger changes in task and barrier efficacy during phase II CR, however, no gender differences were expected for the changes in mood. Furthermore, as previous studies (Kugler et al., 1994; Engebretson et al., 1999) in phase

II CR have not offered theoretical explanations of mood changes associated with these programs, the bi-directional relationship between self-efficacy and mood proposed by social cognitive theory (Bandura, 1997) was tested to explain these mood changes. It was hypothesized that an increase in task and barrier efficacy would be associated with a decrease in anxiety and depression and an increase in vigor.

Study One

As previously stated, the purpose of the first study was to examine whether barrier efficacy mediated the gender / exercise adherence relationship during phase II CR. Indeed, the results from the first study showed that men had significantly higher barrier efficacy compared to women, which in turn, was significantly related to their significantly higher exercise adherence during their phase II CR program. Furthermore, examination of the individual barrier efficacy items showed that efficacy for overcoming six of the nine barriers also mediated the gender / exercise adherence relationship. More specifically, men were more confident than women that they could exercise when they a) were experiencing back pain, b) felt they had no time, c) felt it was too expensive to exercise, d) had a fear of having a cardiac event, e) were experiencing medication side effects, and f) had angina/chest pain at some point earlier in the day, which in turn, was associated with higher exercise adherence during phase II CR.

The results of study one were consistent with previous literature in the general exercise domain (McAuley, 1993; Yordy & Lent, 1993; Sallis et al., 1992), which showed that higher barrier efficacy was significantly related to higher exercise adherence. The results were also consistent with Bandura's (1997) notion that individuals who are more efficacious in overcoming context relevant barriers (e.g., specific exercise barriers) will be more likely to persist in the face of those barriers than individuals less efficacious in doing so (cf. Bandura, 1997). In study one, men were more efficacious in overcoming six exercise barriers specific to phase II CR than the women, which resulted in higher exercise adherence. Therefore, these results coupled with the tenets of social cognitive theory suggest that phase II CR programs may want to target these six exercise barriers in women in the early stages of rehabilitation. If the interventions are successful in increasing women's confidence to overcome these exercise barriers, then social cognitive theory suggests that they will have higher exercise adherence.

Although study one offers novel information regarding gender differences in phase II CR from a barrier efficacy standpoint, it did have a main limitation that needed to be taken into consideration when planning future research. More specifically, although this study used a prospective design, it is well known that self-efficacy expectations increase due to various experiences (e.g., mastery experiences or vicarious experiences) incurred over time (e.g., see McAuley et al., 1991). As this study only assessed barrier efficacy at one point in time, it could not be established whether efficacy to overcome certain barriers is more prevalent at different times throughout phase II CR. Furthermore, it could not be determined whether men and women had similar increases in barrier efficacy throughout phase II CR. Therefore, these limitations were addressed when designing the second study.

The data from study one indicate that men had significantly higher barrier efficacy than women, which in turn, was associated with higher exercise adherence during phase II CR. As women's exercise adherence rates have been found to be significantly lower compared to men, it has been suggested that special strategies be developed to prevent dropout and to increase adherence rates for those women who are particularly at risk of poor exercise adherence (Brezinka & Kittel, 1995, Emery, 1995). Study one suggests that one can develop interventions that focus on building women's confidence to overcome specific exercise barriers as one possible avenue. As was suggested and outlined in study one, researchers should manipulate the various determinants (i.e., performance experiences, vicarious experiences, verbal persuasion, and physiological arousal) of barrier efficacy when designing these interventions.

Study Two

Study two had three main purposes. The first purpose was to examine the time course changes of task and barrier efficacy, anxiety, depression, and vigor during and following phase II CR. It was hypothesized that all variables would significantly improve from pre- to post-phase II CR and these post rehabilitation levels would be maintained at follow-up (i.e., 6 to 10 weeks post-rehabilitation). Furthermore, based on previous research (McAuley, Courneya, & Lettunich, 1991), it was hypothesized that the changes in task and barrier efficacy would be larger in women compared to men, however, no gender differences were expected for any of the mood state changes (Kugler et al., 1994; Engebretson et al., 1999).

As anticipated, task efficacy (duration and frequency) and barrier efficacy significantly increased from pre- to post- phase II CR. Furthermore, the size of these changes was significantly higher in women compared to men which was consistent with McAuley et al's (1991) finding in middle-age adults. More specifically, women entered the rehabilitation program with significantly lower self-efficacy for all three variables compared to men, however, women's task and barrier efficacy increased to levels that were similar to men at the end of phase II CR. Although all three self-efficacy variables significantly decreased at post-rehabilitation follow-up, the levels of self-efficacy at post-rehabilitation follow-up were significantly higher compared to their pre-rehabilitation levels.

In terms of mood, study two's results were consistent with previous research that showed phase II CR significantly decreased anxiety (Kugler, Seelbach, & Kruskemper, 1994; Yoshida et al., 1999) and significantly increased vigor (i.e., positive mood) (Oldridge, et al., 1995; Engebretson et al., 1999) in men and women. Furthermore, the patients sustained this reduced level of anxiety to the post-rehabilitation follow-up. Although vigor was significantly reduced from post-rehabilitation to follow-up, the follow-up levels were still significantly higher than the pre-rehabilitation levels. In regards to depression, study two did not show a change in depression, which was inconsistent with previous literature (Kugler, Seelbach, & Kruskemper, 1994; Yoshida et al., 1999). This was not surprising, however, as it appeared that a floor effect was present with the depression scale upon entry into the program. As noted in study two, this is problematic because a floor effect does not leave much room for a significant decrease in depression to occur over time.

The second purpose of study two was to examine the relationships between a) the *changes* in task and barrier efficacy during phase II CR and exercise adherence, and b) task and barrier efficacy at the end of phase II CR and exercise adherence following completion of the program (i.e., from post-rehabilitation to follow-up). It was hypothesized that a) men and women with higher exercise adherence during phase II CR would experience larger changes in task and barrier efficacy, and b) task and barrier efficacy at the end of phase II CR would be significantly related to exercise adherence post-rehabilitation in men and women.

The results did show that patients (men and women) who had higher exercise adherence during phase II CR had the largest increase in task (duration and frequency) and barrier efficacy. However, once patients left the phase II CR program, only task efficacy (frequency) was related to exercise adherence. This finding was quite interesting as it supported McAuley's (1993) notion that different efficacy cognitions may play a more salient role at different stages of the exercise/ rehabilitation process. In study two, it appears that task (duration and frequency) and barrier efficacy are significantly related to exercise adherence during phase II CR while task efficacy (frequency) is a key efficacy variable in a more maintenance type phase of rehabilitation (i.e., phase III).

The third purpose of study two was to examine the bi-directional relationship between self-efficacy and mood during and following phase II CR. Based on the tenets of social cognitive theory (Bandura,1997), it was hypothesized that changes in task and barrier efficacy during and following phase II CR would be significantly related to the changes in all three moods in men and women. Indeed, study two found that increases in task and barrier efficacy were significantly related to a decrease in anxiety and an increase in vigor during phase II CR, which supported the tenets of social cognitive theory and previous research in non-rehabilitation settings (Stewart et al., 1994; Perkins & Jenkins, 1998). However, only the decrease in task efficacy (duration) was significantly related to the significant decrease in vigor at post-rehabilitation follow-up. This finding was also important because it reiterated an earlier point that different types of self-efficacy may be more important at various phases of a rehabilitation program.

Therefore, it is recommended that future studies in CR continue to include various task efficacy measures along with a barrier efficacy measure to maximize the potential to explain relationships among self-efficacy and other psychosocial (e.g., mood) and behavioral variables (e.g., exercise adherence).

In summary, study two showed that women may have more to gain from a self-efficacy standpoint compared to men during phase II CR, which diminishes once patients leave the program and are on their own (i.e., they enter phase III CR). Furthermore, there does not appear to be any gender advantage in improving mood (i.e., decreasing anxiety and vigor) during and following phase II CR. Finally, it appears that self-efficacy can be used to explain mood changes during and following phase II CR.

Theoretical Implications.

Although the results from study one supported Bandura's (1997) argument that patients with higher barrier efficacy should have higher exercise adherence, it is the results from study two that offer an important theoretical implication. More specifically, Bandura (1997) would suggest that perceived operative capability in the face of changing and unpredictable circumstances is the only type of self-efficacy (i.e., Kirsch's (1995) concept of barrier efficacy) that should influence patients exercise adherence during and following phase II CR. In other words, Kirsch's (1995) concept of task efficacy need not be considered in this phase II CR context. As can be seen from study two, Bandura's (1997) argument was not supported.

The results from study two showed that task and barrier efficacy were significantly related to exercise adherence during phase II CR (i.e., patients with higher exercise adherence had larger increases in task and barrier efficacy). Therefore, the data would suggest that task *and* barrier efficacy are sub-types of self-efficacy that should be considered during phase II CR, thus supporting Kirsch's (1995) argument that task efficacy is an important efficacy sub-type. However, at this point, the data are simply suggesting a bivarate relationship between task and barrier efficacy and exercise adherence. The evidence of task efficacy's importance would be stronger if it could be demonstrated that a) task efficacy was significantly related to exercise adherence while barrier efficacy was not, or b) task efficacy had a stronger bivariate relationship with exercise adherence compared to barrier efficacy (with both being significantly related). Indeed, when examining the influence of task and barrier efficacy on exercise adherence following phase II CR (i.e., during phase III CR), the results provide such evidence. More specifically, task efficacy was the only efficacy variable significantly related to exercise adherence during phase III CR. Therefore, the results from study two suggest that task efficacy has a significant influence on exercise adherence during and following phase II CR. This supports Kirsch's (1995) argument that task efficacy be considered a unique and important sub-type of self-efficacy.

Measurement of Barrier Efficacy a Problem? An important point to consider when discussing the above theoretical implication is that Kirsch (1995) would argue that task and barrier efficacy should be significantly related to exercise adherence following phase II CR (i.e., during phase III CR) and not just during phase II CR. Nonetheless, it was noted in study two that barrier efficacy at the end of phase II CR may not have had an influence on exercise adherence during phase III CR because exercise become a routine in the patients' daily lives, thus reducing the influence of the exercise barriers in phase III CR. Therefore, testing the unique importance of task and barrier efficacy at this point may not have been reasonable.

There is another explanation as to why it may not be warranted to test the independence of task and barrier efficacy at the end of phase II CR in the present study. More specifically, it is also important to consider the fact that barrier efficacy may not have been related to exercise adherence once patients left phase II CR and moved into phase III CR because the phase II CR exercise barriers were not relevant in the phase III CR context. Indeed, social cognitive theory (Bandura, 1997) suggests that self-efficacy is situation/context specific. One could argue that the transition from phase II to phase III CR poses new challenges/barriers for patients that may not be prevalent in a phase II CR context. For example, patients participating in a structured phase II CR program have a facility to exercise during this time. Therefore, one would not expect this barrier to be an issue during phase II CR. However, once patients complete the phase II CR program and move into phase III CR, many do not have access to exercise facilities due to the costs. Therefore, access to a facility becomes a prominent barrier for the patients. Unfortunately, the present study's barrier efficacy scale would not capture this. Thus, the barriers used in study two may not have been relevant to the phase III CR context and therefore one would not expect barrier efficacy to be related to exercise adherence. If this were to be the case, then it may be misleading to say that task efficacy is significantly related to exercise adherence during phase III CR while barrier efficacy is not.

General Limitations and Future Directions

Despite the promising findings of study one and study two, there are general limitations in both studies that need to be taken into consideration when planning future research. First, as previously stated, it is possible that the patients may not have previously experienced the particular exercise barriers on the barrier efficacy scale and may have over- or underestimated their efficacy judgment as a result (DuCharme & Brawley, 1995). A potential way of correcting this problem in future studies is outlined by DuCharme and Brawley (1995). More specifically, patients could indicate the barriers that they anticipate encountering more than one time per week during their phase II CR. Once these barriers are identified, the patients could then estimate their efficacy for overcoming each exercise barrier in order to exercise. Then, the efficacy judgments could be averaged to obtain a barrier efficacy score. Future studies may want to utilize this measurement technique when examining barrier efficacy. Furthermore, it will be important to generate barriers specific to phase III CR. Once this is done, researchers can be confident that they have a comprehensive list of barriers that could be used for phase II and phase III CR when establishing the patients' efficacy judgments.

A second limitation in both studies was the lack of a randomized control group to rule out selection bias, history, and maturation as threats to the internal validity of the studies. Future studies should use randomized clinical trials that would allow one to have a control condition (i.e., patients assigned to usual home care) and an experimental condition (i.e., patients going through a structured phase II CR program). Furthermore, in line with this limitation, it is very important to have patients' programs be similar in length because history and maturation may have a stronger confounding effect in patients who participate in an eight week CR program compared to patients participating in a two week CR program. Unfortunately, due to various factors, the Glenrose program does not have a standard program length for patients. This will make utilizing such a procedure difficult, particularly when one is trying to match patients (e.g., on age and gender) in a control condition. However, for programs that do have a standard length of rehabilitation, including a control condition stratified by age and gender is the optimal design to use.

A third limitation that mainly comes from study two is that barrier and task (duration and frequency) efficacy were assessed at pre- and post- phase II CR to examine the program's influence on self-efficacy. Although this was an important initial step in the research process, my experience at the Glenrose would suggest that a significant change in these self-efficacy variables occur early in the program. For example, in terms of patients' efficacy in overcoming a fear of having a cardiac incident, I would hypothesize that the patients' efficacy judgments significantly increase after their first exercise session compared to their pre-program levels. Therefore, it may be that barrier efficacy significantly increases and plateaus early in a phase II CR program. If this was to be the case, it would suggest that interventions to increase patients' barrier efficacy are more important early in a phase II CR program compared to later. Therefore, future studies should assess task and barrier efficacy repeatedly (particularly early in the program) throughout a phase II CR program to examine when the actual changes are occurring in these variables.

It is also important to consider gender in this process as study two demonstrated the men and women had differential increases in task and barrier efficacy. For example, it may be that men's task and barrier efficacy significantly increase after the first week, whereas women's doesn't significantly increase until the third week. If this was to be the case, it would have important implications for phase II CR programs because it would suggest that interventions should target female patients in the early stages of phase II CR, however, it may not be as important to target male patients at that time.

Finally, a fourth limitation is that although the exercise barriers that were generated via interviews with phase II CR patients were specific to the phase II CR context and reflect the various exercise barriers within the context, Bandura (1997) suggests that aggregating the 9 exercise barriers into a unitary measure will only tap into one facet of the construct known as barrier efficacy. As such, Bandura (1997) suggests that factor analytic techniques be used to determine if there are sub-facets within the barrier efficacy construct. However, the sample sizes in the present studies did not allow for such analyses to be done. Therefore, future studies should obtain larger sample sizes in order to determine whether the present barrier efficacy scale is multi-faceted.

Practical Implications

Despite the limitations of the present dissertation, the results of the studies have numerous practical implications for phase II CR programs. First, phase II CR program staff can administer the barrier efficacy scale developed from study one to identify patients that may have difficulties in adhering to their program. By administering the scale, the staff can determine specific exercise barriers that are problematic for the patients. Then, the staff can help the patients using the various determinants of self-efficacy (e.g., verbal persuasion) to increase their confidence to overcome their prevalent exercise barriers.

A second practical implication is that phase II CR programs need to know that the task efficacy scales should also be utilized when identifying patients who may have problems adhering to their program. For example, if the staff discovers that a patient's confidence in exercising at a prescribed intensity for a given duration is very low, the present data suggest that this patient will have adherence problems. Therefore, the phase II CR staff could reduce the original intensity to build the patient's confidence and then gradually increase the intensity to the desired level. In this way, the patient's confidence will gradually increase throughout the phase II CR and this increase will be related to increased exercise adherence.

A third implication of the present dissertation is that phase II CR programs now have a theoretical foundation to explain mood-related changes to phase II CR. More specifically, the bi-directional relationship between self-efficacy and mood hypothesized by social cognitive theory (Bandura, 1997) was supported. This is quite advantageous because phase II CR programs can be confident that designing program interventions to increase task and barrier efficacy will a) increase the patients exercise adherence to the program, and b) improve the patients psychological well-being (e.g., a decrease in anxiety).

Conclusions

Despite the limitations pointed out above and within the studies presented in the dissertation, the results from study one showed that men have significantly higher barrier efficacy than women, which was associated with higher exercise adherence during phase II CR. Furthermore, study two showed that women had significantly larger increases in task and barrier efficacy during phase II CR compared men, however, men and women had similar decreases at post-rehabilitation follow up. As well, changes in anxiety and vigor throughout the rehabilitation process were associated with changes in task and barrier efficacy in men and women. Therefore, future studies should continue to consider gender when examining various psychosocial variables (e.g., self-efficacy and mood) throughout the rehabilitation process. Finally, further research is needed examining the unique influence of task and barrier efficacy on exercise adherence during and following phase II CR (i.e., during phase III CR).

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