SOCIAL EFFICACY BELIEFS IN CARDIAC REHABILITATION

SOCIAL EFFICACY BELIEFS AND EXERCISE BEHAVIOUR IN CARDIAC REHABILITATION

By

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Abstract

Participation in exercise-based cardiac rehabilitation is a fundamental component for recovery and secondary prevention efforts following a cardiac event (Smith et al., 2006). However, despite the known benefits of regular exercise for cardiac patients (Jolliffe et al., 2001) and the ever-increasing availability of cardiac rehabilitation and related programs, individuals affected by cardiovascular disease continue to demonstrate poor attendance and follow-up adherence to exercise programming; this is particularly true for female participants (Daly et al., 2002; Halm et al., 1999, Woodgate & Brawley, 2008). Previous research has shown self-efficacy to be a reliable and strong predictor of exercise adherence in both the general and cardiac rehabilitation populations. Using social cognitive theory (Bandura, 1986, 1997, 2001), the present study investigated several socially-mediated perceptions that were theorized to predict self-efficacy, and in turn, its relationship to adherence to cardiac rehabilitation programming. In particular, this study was designed to investigate proxy efficacy and a newly-proposed socially-mediated efficacy construct (instructor support efficacy) and the relations between those variables, self-efficacy and exercise adherence within the cardiac rehabilitation setting. It was hypothesized that proxy efficacy for self-regulation and instructor support efficacy measured during the third week of cardiac rehabilitation would independently predict self-efficacy for self-regulation at week 9 of cardiac rehabilitation. It was also hypothesized that instructor support efficacy at week 3 of cardiac rehabilitation would be a stronger predictor of self-efficacy for self-regulation at week 9 of cardiac rehabilitation among women compared to men. Lastly, the study

aimed to investigate proxy efficacy, instructor support efficacy and self-efficacy as predictors of exercise class attendance and adherence during participation in the cardiac rehabilitation program. Sixty cardiac rehabilitation participants (of which approximately 73% were male) who were enrolled in a hospital-based cardiac rehabilitation program completed assessments for self-efficacy for self-regulation, proxy efficacy for self-regulation, proxy efficacy for in-class exercise and instructor support efficacy at weeks 3 and 9 of program participation. Exercise attendance and exercise prescription adherence records were collected (at week 15 of program participation) using attendance records and exercise logbooks from the cardiac rehabilitation centre. In general, scores for all variables of interest were relatively high. Consistent with the first hypothesis, proxy efficacy for self-regulation and instructor support efficacy measured during the third week of cardiac rehabilitation independently predicted self-efficacy for self-regulation at week 9 of participation in the cardiac rehabilitation program. However, contrary to the hypotheses, when sex was investigated as a moderator of the instructor support efficacy – self-efficacy relationship, instructor support efficacy at week 3 did not predict self-efficacy for self-regulation at week 9 for either women or men. Finally, self-efficacy for self-regulation and proxy efficacy for in-class exercise independently predicted exercise class attendance between weeks 3-9, but no other significant predictors were found for exercise class attendance or program adherence throughout the remainder of the program. The findings from the present study provide a promising starting point in the development and assessment of instructor support efficacy within the cardiac rehabiliation population.

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Literature Review

Cardiovascular Disease

Cardiovascular disease (CVD), including myocardial infarction, ischemic heart disease, valvular heart disease, peripheral vascular disease, arrhythmias, high blood pressure, and stroke, is the leading cause of mortality among men and women in Canada (Heart and Stroke Foundation of Canada, 2003; Statistics Canada, 2005). In 2004, CVD was responsible for the deaths of approximately 71,000 Canadians, accounting for one third of all deaths nationwide (Statistics Canada, 2005). Although both men and women are affected by CVD equally (30% and 31%, respectively), women are generally older than men at the time of their initial event (Heart and Stroke Foundation of Canada, 2003; Statistics Canada, 2005). Women with CVD are also more likely to be severely ill, to have lower socioeconomic status, to live alone, and to be less educated than men (Grace et al., 2002b). Despite emergent evidence that women experience CVD much differently than men, until recently, women have been understudied and underrepresented in CVD research (Arthur et al., 2007). Therefore, research aimed at understanding factors that differentiate men and women in their experience is of paramount importance.

Cardiac Rehabilitation

Risk factors for CVD include those that are non-modifiable (e.g., age, gender, ethnicity and family history) and modifiable (e.g., smoking, physical inactivity, obesity, hypertension, dyslipidemia, diabetes, and depression) (Stone & Arthur, 2004). Given the prevalence of CVD in Canada, secondary prevention programs are often employed as a means to aid in risk factor management and modification (Clark, Hartling,

Vandermeer, & McAlister, 2005). Cardiac rehabilitation (CR) is an intervention designed to facilitate such changes. The Canadian Association of Cardiac Rehabilitation (CACR; 1999) defines CR as the "...enhancement and maintenance of cardiovascular health through individualized programs designed to optimize physical, psychological, social, vocational and emotional status" (p. 1). The primary goal of CR is secondary prevention. This objective is accomplished through the identification and modification of risk factors (Stone, Arthur, Austford & Blair, 2004). As a result, CR assists in the prevention of disease progression and the recurrence of cardiac events (Stone et al., 2004). Participation in CR is a fundamental component of an individual's recovery following acute myocardial infarction (MI), coronary artery bypass graft surgery (CABG) and stable angina (Smith et al., 2006). CR programs are designed to improve physical and emotional functioning in individuals affected with CVD and typically involve exercise and education components aimed to promote secondary prevention and improve quality of life (Arthur, Swabey, Suskin, & Ross, 2004; Grace et al., 2002b).

Traditional CR programs incorporate cardiovascular endurance exercise as the main component of risk factor modification and prevention of disease progression. A meta-analysis of 48 trials (n=8940) by Taylor et al. (2004), reviewed the effectiveness of exercise-based CR in patients with CVD and reported that compared with usual care, CR was associated with a significant reduction in modifiable risk factors (hypertension, dyslipidemia, and smoking), and a reduction in all-cause and cardiac mortality. The benefits associated with CR on mortality were independent of CVD diagnosis and exercise type, dose, or frequency. More recently, Jolliffe et al. (2006) reported similar

conclusions based on data showing that comprehensive CR (which included an exercise component) and exercise only CR reduced total cardiac mortality by 31% and 26%, respectively.

Exercise Adherence in Cardiac Rehabilitation

Despite numerous physical and psychosocial benefits associated with CR participation, non-adherence to exercise during and following CR is problematic. Evidence suggests that only one-third of cardiac patients participate in CR exercise programs, and of those who participate, only about 30% maintain the CR exercise levels after six months (Daly et al., 2002; Sharp & Freeman, 2009). Numerous factors have been associated with non-adherence to CR; including advancing age, being a woman, lower education levels, lack of social support, lack of perceived benefits of CR, having angina, and lower levels of leisure-time physical activity (Beswick et al., 2005; Daly et al, 2002; Sharp & Freeman, 2009; Worcester, Murphy, Mee, Roberts & Goble, 2004).

Previous research has demonstrated that women who enroll in CR have less positive psychosocial profiles when they begin CR, demonstrate poor attendance at CR, and are less likely to adhere to or complete their exercise prescriptions than men who enroll in CR (Brezinka & Kittel, 1995; Daly et al., 2002; Grace et al., 2009; Halm, Penque, Doll, & Behrs, 1999; Moore, Dolanksy, Ruland, Pashkow, & Blackburn, 2003). This fundamental difference between female and male CR participants is of particular interest for the present thesis. It has been suggested that there are several unique barriers that may affect CR adherence among women, including low levels of self-efficacy for exercising and low levels of social support for exercise (Beswick et al., 2005; Grace et

al., 2002b; Jackson, Leclerc, Erskine & Linden, 2005). The use of theory-based research to understand, evaluate and develop programs to improve adherence to CR programs for women has been recommended (Sharp & Freeman, 2009).

Social Cognitive Theory

A theoretical framework that has formed the basis of several investigations of exercise adherence in CR programs is Bandura's (1986, 2001) social cognitive theory (SCT). SCT outlines three modes of agency: personal agency (self as the agent), collective agency (a group as the agent), and proxy agency (a third party acting as an agent on one's behalf) (Bandura, 1997, 2001). According to Bandura, efficacy beliefs are the cognitive foundation of agency. Thus, efficacy beliefs pertaining to each of personal, collective, and proxy agency are self-efficacy, collective efficacy, and proxy efficacy.

Self-efficacy is defined as one's confidence in his/her ability to perform behaviours required to produce desired outcomes (Bandura, 1986; 1997; 2000). Self-efficacy is positively associated with physical activity levels in the general population and is a primary target of intervention efforts to promote physical activity behaviour change (Bandura, 1997; McAuley, Pena & Jerorme, 2001; Rhodes, Martin & Taunton, 2001). With respect to CR, self-efficacy has been found to be predictive of CR adherence (Blanchard, Rodgers, Courneya, Daub & Knapik, 2002; Evon & Burns, 2004; Ewart, Stewart, Gillilan, & Kelemen, 1986; Millen & Bray, 2008).

Although an overall relationship between self-efficacy and CR adherence has been observed, it has been reported that women referred to CR have lower self-efficacy

levels than men and consequently, "because CR places considerable emphasis on physical skills, women's perceptions of their physical abilities may influence their decision to participate in CR" (Grace et al., 2002a, p. 123). In other words, because they doubt their capabilities to exercise, women may often withdraw from CR prior to realizing any of its benefits. However, when women do participate in CR, they have been found to gain self-efficacy and show equal or greater improvements than those seen in men (Gardener et al., 2003). Additionally, research has indicated that during participation in CR, female cardiac patients have lower barrier efficacy for overcoming specific exercise barriers (i.e. confidence in their ability to carry out a basic task under challenging conditions) than men (Blanchard et al., 2002). Therefore, given the lower self-efficacy levels of women, it has been suggested that CR programs should recognize that women may initially require careful treatment and that programs be tailored appropriately to address these issues (Blanchard et al., 2002; Gardener et al., 2003; Grace et al., 2002a). In particular, CR programs should be designed in a manner that nurtures self-efficacy from a very weak and fragile state at the outset.

One avenue for building self-efficacy, especially from very low levels, that may be important for women in CR is through socially-mediated efficacy determinants. Proxy efficacy represents a socially-mediated determinant of self-efficacy. Proxy efficacy was first examined by Bray, Gyurcsik, Culos-Reed, Dawson and Martin (2001), and was defined as "one's confidence in the skills and abilities of a third party or parties to function effectively on his or her behalf" (p. 426). In the healthcare and exercise settings, it has been suggested that individuals engaging in exercise or exercise

rehabilitation develop beliefs (e.g., confidence) in their exercise leader or rehabilitation professional's abilities (Bray et al., 2001; Christensen, Wiebe, Benotsch & Lawton, 1996). Proxy efficacy is important in the early stages of behaviour change, when individuals may doubt their own capabilities and can rest some of the burden of personal agency on a trusted other (Bandura, 2001; Bray, Brawley, & Millen, 2006, Bray & Shields, 2007). This dual agency interaction may be particularly important when behaviours are novel, challenging, and complex – such as cardiovascular exercise in CR. That is, because the proxy agent takes on some of the responsibility for the behaviour, one can focus his or her efforts on the components of the behaviour s/he can do and, over time, can develop stronger self-efficacy for the whole behaviour.

Two studies have investigated proxy efficacy perceptions and their correlates among healthy novice exercisers. In each of those studies, Bray and colleagues found proxy efficacy to be positively related to self-efficacy, exercise intentions and adherence to exercise (Bray et al., 2001; Bray, Gyurcsik, Martin Ginis, Culos-Reed, 2004).

In the CR setting, Bray and Cowan (2004) found that proxy efficacy was positively related to patients' self-efficacy for exercising and their intentions to continue exercising post – CR. In a more recent longitudinal study, Bray et al. (2006) found proxy efficacy for in-class exercise predicted exercise self-efficacy and proxy efficacy for home-based exercise predicted self-efficacy for self-regulating exercise outside of CR. In concert, these findings support the positive role that proxy efficacy plays in the development of self-efficacy among beginner exercisers and CR patients. As suggested

by Bandura (1997) and demonstrated by Bray and colleagues, the proxy efficacy beliefs exercisers develop in proxy agents such as CR exercise therapists may contribute to the development of self-efficacy and assist in the achievement of positive outcomes (e.g., successful adherence to an exercise program) for CR patients.

Although proxy efficacy has been associated with positive psychosocial and behavioural outcomes in CR, it may be that exercise therapists in CR settings may also contribute to the development of CR participants' self-efficacy through other socially-mediated processes. For instance, Lent and Lopez (2002) suggest beliefs in another's capabilities to provide social support (i.e., other efficacy) can also affect self-efficacy for behaviour. For example, when a person believes strongly in a supportive other's abilities to provide support, they can develop a stronger sense of self-efficacy because they perceive that assistance, in the form of encouragement or instruction, is being provided or is available when needed. While other efficacy for social support has some similar attributes to proxy efficacy, the two constructs differ because the "other" does not serve in the proxy's role as someone empowered with a portion of personal agency, rather, s/he provides support as part of his or her role as an external agent. In other words, proxy efficacy refers to one's perceptions of another's ability to assist one in performing a task, or achieving an outcome by taking on some of the instrumental burden of the task, whereas other efficacy for social support refers to the confidence an individual has in a supportive individual's ability to provide emotional or informational support. A major aim of this thesis was to examine other efficacy beliefs regarding social support for exercise in CR. Given the "other" to which this form of efficacy is

directed is the exercise instructor in CR, the term "instructor support efficacy" was adopted to represent this construct.

Social Support

Perceived social support for exercise received from others (such as family and friends) has been associated with exercise participation (Courneya & McAuley, 1995). Additionally, social support has been found to have a positive effect on the promotion and restoration of health following a cardiac event in both males and females (Berkman, Leo-Summers, & Horwitz, 1992; Con, Linden, Thompson, & Ignazewski, 1999; Halm et al., 1999). To date, research examining the relationship between social support and exercise adherence in CR has primarily focused on spousal support. However, as summarized by Woodgate, Brawley and Shields (2007), "the inherent provision of social assistance and support from both rehabilitation staff and other participants in the CR program (e.g., social integration, guidance) may be useful to individuals as they strive to become self-efficacious in their adjustment, acquisition of new skills, and adherence to their exercise regimen" (p. 1042). Social support is often characterized as a multidimensional construct. Wills and Shinar (2000) summarize these constructs to include emotional support (i.e., the availability of an individual who can listen, share or express feelings, provide approval, caring and acceptance), instrumental support (i.e., provision of tangible help with various tasks), information support (i.e., provision of knowledge, advice and aid in the solution of problems) and companionship support (i.e., availability or presence of an individual to participate in activities with the supported individual). For the purpose of this thesis, social support dimensions of primary

relevance were emotional support and informational support. Emotional support is also referred to in the literature as esteem support, or confidant support (Wills & Shinar, 2000).

Given that women are likely to begin CR with generally low levels of self-efficacy, (Beswick et al., 2005; Grace et al., 2002b; Jackson et al., 2005) having confidence in their exercise instructors' capabilities to provide emotional and informational support as they pursue the challenges of CR exercise may be an important contributor to their self-efficacy for exercising. It is important to differentiate between the efficacy for support and actual support; other efficacy for social support refers to the confidence an individual holds in the ability of another person (e.g., their exercise leader) to provide social support. Whether or not perceived, received, or actual support occurs, however, is another matter. Thus, CR participants' proxy efficacy and instructor support efficacy beliefs offer two socially-mediated pathways through which self-efficacy may be nurtured and developed. Because they lack experience and self-efficacy for exercising, instructor support efficacy may be a particularly important determinant of self-efficacy for older women taking part in CR.

Statement of the Problem

Participation in exercise-based CR is vital to recovery and secondary prevention efforts following a cardiac event (Smith et al., 2006). Previous research has demonstrated that CR participants demonstrate variable attendance and poor follow-up adherence to their exercise prescriptions, particularly among women (Daly et al., 2002; Halm et al., 1999; Woodgate & Brawley, 2008). Self-efficacy is a consistent and strong

predictor of exercise adherence in CR. Therefore, modifiable factors such as proxy efficacy and instructor support efficacy that can influence self-efficacy should be explored. This research aims to provide an empirical foundation that may guide future research to develop strategies to assist CR interventionists in appropriately tailoring CR programs for both men and women by examining potential social and psychosocial factors associated with adherence to exercise-based CR.

Purpose

The present study had three purposes. The first purpose was to examine prospective relationships between self-efficacy, proxy-efficacy, and instructor support efficacy in CR. The second purpose was to investigate whether gender moderates the prospective relationship between instructor support efficacy and self-efficacy. The third purpose was to investigate proxy efficacy, instructor support efficacy, and self-efficacy as predictors of exercise attendance and adherence during CR.

Hypotheses

Based on social cognitive theory (Bandura, 1997; 2001; Lent & Lopez, 2002) and previous research examining self-efficacy and proxy efficacy in both the cardiac and general exercise populations (see reviews by Bandura, 1997, 2004; Bray & Cowan, 2004; Bray et al., 2001, 2004, 2006; McAuley & Blissmer, 2000; McAuley, Pena, & Jerome, 2001; Shields & Brawley, 2006), it was hypothesized that:

1. Proxy efficacy for self-regulation and instructor support efficacy measured during the third week of CR would independently predict self-efficacy for self-regulation at week 9 of CR.

2. Instructor support efficacy at week 3 of CR would be a stronger predictor of self-efficacy for self-regulation at week 9 of CR among women compared to men.
3. i. Self-efficacy, proxy efficacy, and instructor support efficacy measured at week 3 of CR should predict CR class attendance and exercise adherence during CR sessions during weeks 3-9 of CR;

   ii. Self-efficacy, proxy efficacy, and instructor support efficacy measured at week 9 of CR should predict CR class attendance and exercise adherence during CR sessions during weeks 9-15 of CR.

Method

Participants

Male and female participants were recruited from the Cardiac Health and Rehabilitation Centre (CHRC) CR program at Hamilton Health Sciences (HHS). The CHRC is a multidisciplinary, outpatient CR program, which provides supervised, hospital-based exercise classes, nursing education and support and dietary counseling. Ninety-minute supervised exercise classes are held twice weekly over a six-month period for a total of approximately 48 exercise sessions. The program curriculum is based on the Canadian Association of Cardiac Rehabilitation (CACR) guidelines (Stone & Arthur, 2009). The CHRC receives all post-discharge coronary artery bypass graft (CABG) referrals for CR in the City of Hamilton and surrounding communities, as well as most myocardial infarction (MI) referrals. All patients who are referred to the CHRC are offered participation in the supervised exercise program. Approximately 1100

patients are referred to the CHRC per year and of those, approximately 75% elect to participate in the supervised exercise program (R. D'Oliveria, personal communication, October 22, 2009). Individuals are referred to the supervised exercise program at the CHRC by their cardiologist or general practitioner and are eligible to participate if they: 1) have been referred for CR and secondary prevention with any cardiac diagnosis; 2) are over the age of 18; 3) provide informed consent; and 4) are able to read and write English at or above a Grade 8 level.

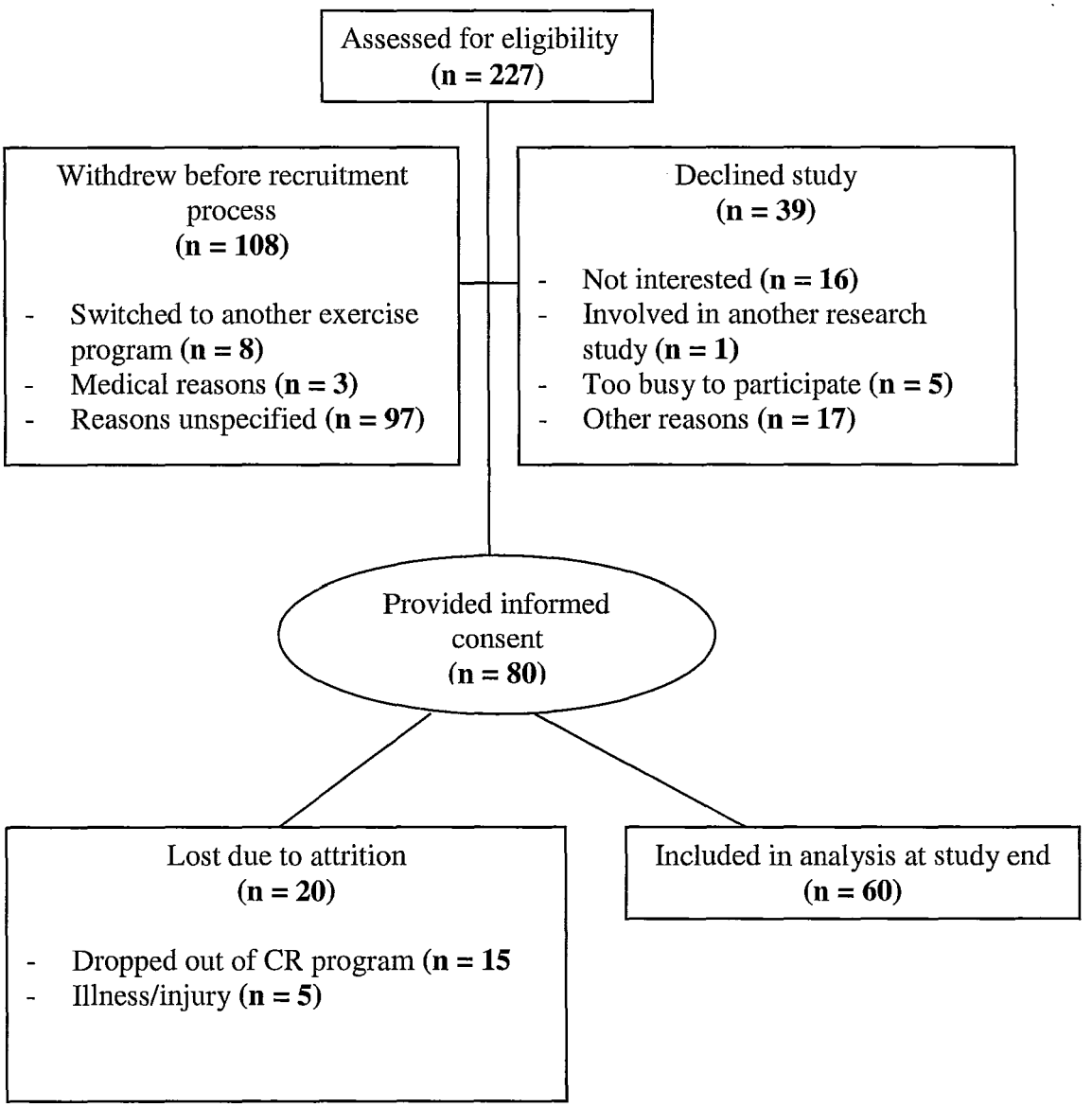
Of the 227 program participants who were assessed for eligibility to participate in the study (i.e., those individuals who were scheduled to begin the CR program during the recruitment window), 108 individuals were deemed ineligible to participate or withdrew from the program before the recruitment process for those individuals began. Reasons included language barriers, switching to another exercise program closer to home, medical reasons, or reasons unspecified. Thirty-nine otherwise eligible patients declined the invitation to participate in the study. Reasons for declining participation included, not being interested, being involved in other research studies and being too busy to participate.

Eighty CR patients agreed to participate in the study; of this total, 20 (33%) were lost due to attrition. The majority of these participants were also dropouts of the CR program, although a few left the study due to subsequent personal illness or injury. Efforts were made to contact the dropouts; however, despite numerous efforts to contact them, their reasons for leaving the program could not be determined. Therefore, the

final sample for the present study consisted of 60 participants. The flow of program participants throughout the study is presented in Figure 1.

Figure 1.

Flow of program and study participants.



Measures

Self-efficacy for self-regulation. Previous research has utilized various measures to assess an individual's self-efficacy in CR; these include measures assessing barrier self-efficacy, task self-efficacy, self-regulatory self-efficacy and scheduling self-efficacy (Petter et al., 2009; Woodgate & Brawley, 2008). In an effort to minimize participant burden in the current study, and to provide consistency with the research question, self-efficacy for self-regulation was measured and assessed using an 8-item questionnaire developed by Shields (2007). This questionnaire asked participants about their confidence in their ability to manage various aspects of their exercise participation. Example items included assessment of the participant's confidence to do the following: "motivate yourself to get to at least 30 minutes of activity a day, 3 days per week"; "schedule exercise sessions into your weekly routine so that you can get at least 30 minutes of exercise a day, 3 times per week"; "set realistic, weekly, exercise goals for yourself (e.g. exercising 3 days/week)" and "plan exercises that fit within your other daily activities". Participants were asked to rate their confidence in their own abilities regarding each item on a scale of 0 % *(not at all confident she or he can do this)* to 100% *(completely confidence she or he can do).* The mean of the 8-item scale was used as the measure of self-efficacy for exercise. The scale showed good internal consistency at both assessment points, with the alpha value ranging from .92 to .95 (Tabachnick & Fidell, 2001; see Table 1).

Proxy efficacy for exercise. Proxy efficacy for exercise was represented by two measures of proxy efficacy: proxy efficacy for self-regulation and proxy efficacy for in-class exercise.

Proxy efficacy for self-regulation was assessed using an 8-item questionnaire assessing participants' confidence in their CR program/staff leaders' ability to assist them with self-regulation of their exercise participation (Shields, 2007). Example items included the exercise leader's abilities to do the following: "help you to use safe, effective exercise techniques (e.g., warm-up, stretching)"; "help you to monitor your exercise progress by recording what exercises you do, how often you do them and for how long"; "help you return to exercising after missing a session"; and "help you develop solutions to cope with potential barriers that can interfere with your exercise". Participants were asked to rate their confidence in their exercise leaders' abilities regarding each item on a scale of 0 *% (not at all confident she or he can do this)* to 100% *(completely confidence she or he can do).* The mean of the 8-item scale was used as a measure of proxy efficacy for exercise. The scale showed good internal consistency at both assessment points, with an alpha value of .95 at each assessment point (Tabachnick & Fidell, 2001; see Table 1).

Proxy efficacy for in-class exercise was assessed using an 18-item instrument reflecting CR participants' confidence in their CR program staff/leaders' abilities to offer specific behaviours and lead their exercise program during their CR sessions (Bray, Brawley, & Gunn, 2009; Bray et al., 2006). Example items included participants' confidence in their exercise leaders' abilities to do the following: "provide easy to

follow instructions"; "provide encouragement to me"; "give me appropriate feedback on my exercising form"; "give me individualized feedback and attention"; "include a variety of different exercises in my program"; "incorporate new activities/exercises in my sessions"; and "reduce my fears about exercising". Participants were asked to rate their confidence in their exercise leaders' abilities regarding each item on a scale of 0 *(not at all confident she or he can do this)* to 10 *(totally confidence she or he can do this)* scale. The mean of the 18-item scale was used as a measure of proxy efficacy for exercise. The scale showed good internal consistency at both assessment points, with an alpha value of .98 at each assessment point (Tabachnick & Fidell, 2001; see Table 1).

Instructor support efficacy. Instructor support efficacy was measured using a 7-item instrument developed for use in the current study. This measure was based on the emotional and informational support items measured by the Medical Outcomes Study (MOS) Social Support Survey (Sherbourne & Stewart, 1991), a widely used tool to assess the social support of individuals with chronic illness. Participants were asked to rate their confidence in their CR program staff/leaders' abilities to provide social support when they come to their exercise program. Example items included confidence in their CR program staff/leaders' abilities to "listen to me when I need to talk about my cardiac health concerns"; "give me good advice about my cardiac health"; and "allow me to share my worries and fears about my cardiac health with him/her". Participants will be asked to rate their confidence in their exercise leaders' abilities regarding each item on a scale of 0 *(not at all confident she or he can do this)* to 10 *(totally confidence*

she or he can do this) scale. The mean of the 7-item scale was used as a measure of instructor support efficacy. The scale showed good internal consistency at both assessment points, with the alpha value ranging from .95 to .98 (Tabachnick & Fidell, 2001; see Table 1).

Table 1

Internal Consistency Reliabilities (Cronbach's α) for Self-efficacy, Proxy Efficacy and Instructor Support Efficacy Variables

Variable	Week 3	Week 9
Self-efficacy for self-regulation	.92	.95
Proxy efficacy for self-regulation	.95	.95
Proxy efficacy for in-class exercise	.98	.98
Instructor support efficacy	.95	.98

Note. $n = 60$. Self-efficacy = 8 items; Proxy efficacy for self-regulation = 8 items; Proxy efficacy for in-class exercise = 18 items; Instructor support efficacy = 7 items. All internal consistency reliabilities were acceptable ($\alpha > .70$; Tabachnick & Fidell, 2001).

Exercise Adherence. Participants' adherence to their exercise program during their enrollment in CR was assessed in two different ways. Attendance during CR was calculated by adding the number of sessions attended between weeks 3-9 and 9-15 of CR divided by the number of sessions scheduled (12), multiplied by 100. Adherence to their exercise prescription was calculated by summing the total number of minutes of exercise completed during the CR classes attended between weeks 3-9 and 9-15 of CR divided by the number of minutes of exercise prescribed for those classes by their supervising kinesiologist, multiplied by 100. This information was collected using the supervised exercise program attendance records and exercise logbooks at the CHRC.

Procedure

Recruitment process. New patients of the supervised exercise program at the CHRC were screened for study eligibility and approached by their exercise leader (a kinesiologist employed by the CHRC) during the first week of their exercise program. The kinesiologist then provided the patient with a study information sheet and asked the patient if they were willing to be contacted by a research assistant. Once permission was given to the kinesiologist, a graduate researcher contacted the patient. Those participants who expressed an interest to be involved in the study were then scheduled for an appointment (3 weeks following the start of their exercise program) to complete their consent and Time 1 questionnaires. Appointments were scheduled at a time that was convenient for participants and/or coordinated with their supervised exercise class schedule.

Time 1 assessment (week 3 of CR program participation). The Time 1 assessment was conducted during week 3 of program participation. This was done in order to provide patients with a short amount of time to familiarize themselves with the program and their exercise leaders, and consequently allow for relational efficacies to form. As suggested by McAuley and Mihalko (1998) if experience with an activity is minimal, an individual's perception of their efficacy level may be clouded. Therefore, baseline assessments were taken during the third week of exercise participation. At Time 1, participants, a) received an information letter containing a detailed description of the study protocol, participant responsibilies, confidentiality of information, right to withdraw from the study at any time and contact information of the student investigator, her supervisor and the research ethics board; b) provided informed consent; and c) completed all study measures (demographics, self-efficacy for self-regulation, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy). The demographic questionnaire was used to identify the participants' sex, age, marital status, ethnicity, current occupation and employment status, education level, and cardiac event/diagnosis. This procedure took participants approximately 30 minutes to complete.

Time 2 assessment (week 9 of CR program participation). At Time 2 self-efficacy for self-regulation, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy were assessed again.

Time 3 assessment (week 15 of CR program participation). Program attendance and exercise adherence were collected from supervised exercise program

attendance records and exercise logbooks at the CHRC. It should be noted that for the majority of study participants, week 15 of program participation did not represent the end of their participation in the CR supervised exercise program. It is possible that participants in this particular CR program may be kept in the program for additional nine or more weeks (this is dependant on individual patient progress and completion times are decided upon by their exercise leaders).

Results

Screening of Data

The data were initially screened for missing values. Missing data (<10%) was addressed according to the recommendations by Tabachnick and Fidell (2001). In the present study, there were no instances of entire scales being omitted in participants' responses. For the few instances when participants missed an item on a particular scale, their mean score for the completed items of the scale was used, therefore capturing the most representative value of each participants' unique response to that scale.

The procedures outlined by Tabachnick and Fidell (2001) were also followed when examining the data for outliers and normality. The z-distribution scores for skewness and kurtosis using a conservative alpha level of .001 were used to assess the normality of the scores for each of the variables. As shown in Table 2, scores for the proxy efficacy for self-regulation scale (at both Time 1 and Time 2) were substantially negatively skewed and kurtotic, as were scores for the proxy efficacy for in-class exercise and instructor support efficacy scales at Time 1 and Time 2. Standardized scores for these variables were in excess of 3.29 (p = .001, two-tailed test). As

recommended by Tabachnick & Fidell (2001), data transformations were performed to create normally-distributed data for the problematic variables. Scores were first reflected by subtracting the largest score in the distribution from the original scores and a square root transformation was then performed on the reflected scores. Analyses were conducted using the transformed data (means and standard deviations for transformed data are shown in italic font below the untransformed values in Table 2). Because the data were reflected during the transformation process, low scores for the transformed variables should be interpreted as high scores relative to the original scaling of the measures.

Table 2

Means and Standard Deviations for Raw and Transformed Data and Tests for Significance of Skewness and Kurtosis

		Skewness			Kurtosis		
Variable	*M (SD)*	Statistic	SE	*Z*	Statistic	SE	*Z*
Time 1							
Self-efficacy for self-regulation	78.61 (16.30)	-.56	.31	1.82	-.67	.61	1.10
Proxy efficacy for self-regulation	86.0 (14.27) *3.39 (1.88)*	-1.14	.31	3.70*	.80	.61	1.31
Proxy efficacy for in-class exercise	8.96 (1.37) *.66 (.30)*	-1.74	.31	5.63*	2.94	.61	4.84*
Instructor support efficacy	8.96 (1.52) *.70 (.32)*	-1.82	.31	5.88*	2.95	.61	4.84*
Time 2							
Self-efficacy for self-regulation	75.77 (20.34)	-.96	.31	3.11	.57	.61	.942
Proxy efficacy for self-regulation	81.70 (19.70) *3.76 (2.28)*	-1.38	.31	4.48*	2.16	.61	3.55*
Proxy efficacy for in-class exercise	8.71 (1.79) *.61 (.29)*	-2.71	.31	8.76*	8.96	.61	14.74*

Table continues...

Instructor support efficacy	8.95 (1.78) *.69 (.31)*	-3.28	.31	10.62*	13.27	.61	21.83*
Adherence (3-9 weeks)							
Attendance (%)	72.43 (26.21)	-.78	.31	2.52	-.14	.61	.23
Prescription completed (%)	90.65 (16.35)	.58	.31	1.86	.87	.61	1.43
Adherence (9-15 weeks)							
Attendance (%)	74.12 (27.56)	-.94	.31	3.05	-.12	.608	.20
Prescription completed (%)	87.99 (17.33)	-.01	.31	.03	-.60	.61	.98

Note. $n = 60$. SE = standard error. z = (statistic – 0)/standard error. *Standardized Z-score greater than 3.29; significant at the .001 alpha level, two tailed test (Tabachnick & Fidell, 2001).

Descriptives

A summary of the collected characteristics of the sample is reported in Table 3. The sample had a mean age of 65.73 (*SD* = 9.20; range = 48 to 89 years). Participants were primarily Caucasian and married, and 65% were retired. The majority of participants were referred to CR following an interventional procedure (CABG = 43%; angioplasty = 30%).

Table 3

Characteristics of Study Participants

Variable	*N (%)*	*Mean*	*SD*	*Range*
Sex				
Female	16 (26.7%)			
Male	44 (73.3%)			
Age		65.73	9.20	48-89
Marital status				
Married	47 (78.3%)			
Separated	2 (3.3%)			
Widowed	6 (10.0%)			
Single	1 (1.7%)			
Divorced	2 (3.3%)			
Non-married, living with partner	2 (3.3%)			
Employment status				
Employed full-time	12 (20.0%)			
Employed part-time	6 (10.0%)			
Unemployed	1 (1.7%)			
Retired	39 (65.0%)			
Leave of absence	2 (3.3%)			

Table continues....

Ethnicity	
Caucasian	58 (96.7%)
Other	2 (3.3%)
Education	
Less than grade 8	2 (3.3%)
Some high school	10 (16.7%)
Completed high school	14 (23.3%)
Some college	4 (6.7%)
Completed college	15 (25.0%)
Some university	2 (3.3%)
Completed university	8 (13.3%)
Masters or PhD	5 (8.3%)
Referral Event	
Myocardial infarction	8 (13.3%)
CABG	26 (43.3%)
Angioplasty	18 (30.0%)
Angiogram	1 (1.7%)
Risk factor management/Other	7 (11.7%)

Note. $n = 60$. SD = standard deviation. CABG = coronary artery bypass graft. Scores for continuous variables are represented by means and standard deviations. Scores for categorical variables are represented by percentages.

Mean scores for all study variables are reported in Table 4; this table displays the mean scores of the entire study sample as well as a breakdown by sex. No significant differences were found between female and male participants on any of the study variables. As in Table 2, means and standard deviations for transformed data are shown in italic font below the untransformed values. For the duration of the study, participants attended an average of 74% ($SD = 27.56$) of their scheduled supervised exercise sessions at the CHRC. While in attendance, participants completed approximately 88% ($SD = 17.33$) of their prescribed exercise regimen.

Table 4

Descriptive Statistics for Study Variables for the Full Sample and by Gender

	$N = 60$	Women (n = 16)	Men (n = 44)	
Variable	*M (SD)*	*M (SD)*	*M (SD)*	*p*
Time 1				
Self-efficacy for self-regulation	78.61 (16.30)	77.82 (15.21)	78.89 (16.83)	.82
Proxy efficacy for self-regulation	86.0 (14.27) *3.39 (1.88)*	84.84 (17.15) *3.41 (2.19)*	86.42 (13.28) *3.39 (1.78)*	.71 *.96*
Proxy efficacy for in-class exercise	8.96 (1.37) *.66 (.30)*	8.73 (1.96) *.70 (.35)*	9.04 (1.09) *.65 (.29)*	.56 *.59*
Instructor support efficacy	8.96 (1.52) *.70 (.32)*	8.78 (2.06) *.73 (.35)*	9.03 (1.30) *.68 (.31)*	.66 *.63*
Time 2				
Self-efficacy for self-regulation	75.77 (20.34)	77.52 (15.11)	75.26 (21.94)	.75
Proxy efficacy for self-regulation	81.70 (19.70) *3.76 (2.28)*	78.52 (24.38) *4.05 (2.54)*	82.87 (17.90) *3.66 (2.20)*	.45 *.56*
Proxy efficacy for in-class exercise	8.71 (1.79) *.61 (.29)*	8.39 (2.42) *.57 (.28)*	8.83 (1.53) *.63 (.29)*	.41 *.48*
Instructor support efficacy	8.95 (1.78) *.69 (.31)*	8.64 (2.44) *.65 (.32)*	9.06 (1.48) *.71 (.31)*	.43 *.53*

Table continues…

Adherence (3-9 weeks)				
Attendance (%)	72.43 (26.21)	74.44 (24.13)	71.69 (27.15)	.73
Prescription completed (%)	90.65 (16.35)	90.18 (18.67)	90.82 (17.55)	.89
Adherence (9-15 weeks)				
Attendance (%)	74.12 (27.56)	73.53 (31.47)	74.33 (26.40)	.92
Prescription completed (%)	87.99 (17.33)	89.76 (18.67)	87.35 (16.99)	.64

Note. SD = standard deviation. P-values reflect significance tests of t-tests (2-tailed) between mean scores for men and women.

Relationships between Self-Efficacy, Proxy Efficacy, Instructor Support Efficacy and Exercise Adherence

Prior to conducting regression analyses to predict self-efficacy and exercise adherence, the bivariate correlations between the variables were considered according to guidelines provided by Cohen and colleagues (2003). Correlation matrixes for both the raw and transformed data are presented in Tables 5 and 6, respectively. However, as previously mentioned, analyses for the current study were conducted using the transformed data. As shown in Table 6, the proxy efficacy for self-regulation and instructor support efficacy variables at Time 1 were significantly correlated. Cohen and colleagues (2003) have offered a number of indices and corresponding statistical cutoff values for measuring the degree of multicollinearity between several independent variables in multiple regression analyses. Cutoff values indicating potentially serious problems of multicollinearity include any variance inflation factor (VIF) of 10 or more, or tolerance values of .10 or less. Based on these criteria, multicollinearity was not problematic in the regression analysis for the current study (i.e., VIF < 1.63; tolerance > .61). Therefore, for the hypothesis tests, all a-priori determined variables were entered into the regression equation. Additionally, Cohen and colleagues (2003) advocate that "if a researcher is interested solely in the prediction of Y or in the value of R^2, multicollinearity has little effect and no remedial action is needed" (p. 425).

Table 5

Correlations for Efficacy Variables and Exercise Adherence (Raw Data)

		1	2	3	4	5	6	7	8	9	10	11	12
1	Self-efficacy for self-regulation (T1)	_	.55**	.30*	.22	.78**	.41**	.19	.14	.25	.23	.18	-.00
2	Proxy efficacy for self-regulation (T1)		_	.81**	.71**	.39**	.72**	.63**	.54**	.20	.13	.08	.02
3	Proxy efficacy for in-class exercise (T1)			_	.85**	.15	.57*	.72**	.63**	.24	.21	.04	.08
4	Instructor support efficacy (T1)				_	.12	.54**	.62**	.54**	.28*	.19	.01	.02
5	Self-efficacy for self-regulation (T2)					_	.50**	.25	.19	.20	.14	.14	-.07
6	Proxy efficacy for self-regulation (T2)						_	.71**	.67**	.09	.04	.03	-.01
7	Proxy efficacy for in-class exercise (T2)							_	.93**	.03	-.04	.02	-.08
8	Instructor support efficacy (T2)								_	.04	-.01	-.05	-.03
9	Attendance (%) (Weeks 3-9)									_	.11	.46**	.22
10	Prescription completed (%) (Weeks 3-9)										_	.04	.44*
11	Attendance (%) (Weeks 9-15)											_	.14
12	Prescription completed (%) (Weeks 9-15)												_

Note. $*p < .05$; $**p < .01$. T1 = Time 1. T2 = Time 2.

Table 6

Correlations for Efficacy Variables and Exercise Adherence (Transformed Data)

		1	2	3	4	5	6	7	8	9	10	11	12
1	Self-efficacy for self-regulation (T1)	_	.54[a]**	-.15[a]	-.10[a]	-.78[a]**	.40[a]**	.04[a]	.04[a]	-.25[a]	.23	.18	-.00
2	Proxy efficacy for self-regulation (T1)		_	.71[a]**	.62[a]**	.39[a]**	-.62[a]**	.44[a]**	.31[a]	.21[a]	.13[a]	.07[a]	.02[a]
3	Proxy efficacy for in-class exercise (T1)			_	-.86[a]**	-.09[a]	.46[a]**	-.63[a]**	-.48[a]**	-.30[a]*	-.15[a]	-.07[a]	-.06[a]
4	Instructor support efficacy (T1)				_	-.05[a]	.41[a]**	-.46[a]**	-.38[a]**	-.28[a]*	-.15[a]	-.06[a]	-.06[a]
5	Self-efficacy for self-regulation (T2)					_	.50[a]**	-.10[a]	-.11[a]	-.20[a]	.14	.14	-.07
6	Proxy efficacy for self-regulation (T2)						_	.50[a]**	.53[a]**	.13a[a]	.07[a]	.01[a]	-.06[a]
7	Proxy efficacy for in-class exercise (T2)							_	.86[a]**	-.03[a]	.10[a]	.05[a]	.14[a]
8	Instructor support efficacy (T2)								_	-.08[a]	-.01[a]	.11[a]	.11[a]
9	Attendance (%) (Weeks 3-9)									_	.12	.46**	.22
10	Prescription completed (%) (Weeks 3-9)										_	.04	.44*
11	Attendance (%) (Weeks 9-15)											_	.14
12	Prescription completed (%) (Weeks 9-15)												_

Note. [a]Direction of correlation has been adjusted due to reflected scores for proxy efficacy for self-regulation , proxy efficacy for in-class exercise, and instructor support efficacy. *$p < .05$; **$p < .01$. T1 = Time 1. T2 = Time 2.

Hypothesis 1: Proxy efficacy for self-regulation and instructor support efficacy measured during the third week of CR (Time 1) will independently predict self-efficacy for self-regulation at week 9 of CR (Time 2).

A hierarchical multiple linear regression analysis was computed regressing self-efficacy for self-regulation on proxy efficacy for self-regulation and instructor support efficacy. The overall model was significant, F (2, 57) = 7.97, p <. 001, explaining 19% of the variance in self-efficacy for self-regulation at Time 2 (R^2_{adj} = .19). Proxy efficacy for self-regulation at Time 1 was entered first in the hierarchical model, because it has been shown to be a reliable predictor of exercise self-efficacy in previous research (Bray et al., 2006). Instructor support efficacy at Time 1 was entered as the second step in the model. Proxy efficacy for self-regulation accounted for 15% of the variance (R^2 change = .15, p < .01), while instructor support efficacy at Time 1 accounted for an additional 6% of the variance (R^2 change = .06, p = .04). Furthermore, given that proxy efficacy for self-regulation and instructor support efficacy were correlated, a decision was made to further probe the relationship between those variables and self-efficacy by examining the partial and semi-partial correlations between self-efficacy and the predictor variables. Table 7 shows the model summary for the regression as well as the partial and semi-partial correlation coefficients (Model 1). Those results indicate the shared variance unique to both the proxy efficacy for self-regulation – self-efficacy and instructor support efficacy – self-efficacy relationships were reflective of moderate to large effects (i.e., sr = -.25 – sr = -.47). As a final step of analysis, self-efficacy for self-regulation at Time 1 was added on a final step in the hierarchical model

(Model 2). This order of entry was determined a priori because our main objective was to examine the primary variables of interest (proxy efficacy and instructor support efficacy) ahead of self-efficacy for exercise. The overall model was significant, F (3, 56) = 28.79, p <. 001, explaining 59% of the variance in self-efficacy at Time 2 (R^2_{adj} = .59). Self-efficacy for self-regulation contributed an additional 39% of the variance to the model (R^2 change = .39, p < .001). Table 8 shows the model summary for the final regression model (Model 2).

Table 7

Multiple Linear Regression Analysis Summary for Hypothesis 1(Model 1)

Variable	B	SEB	β	R^2_{adj}	R^2 change	F	P	Correlations Partial	Correlations Semi-Partial
Proxy efficacy for self-regulation (Time 1)	-6.39	1.61	-.59**	.14	.15	10.58	.002	-.47	-.47
Instructor support efficacy (Time 1)	-20.58	9.51	-.32*	.19	.06	4.69	.035	-.28	-.25

Note. $*p < .05$, $** p < .001$.

Table 8

Multiple Linear Regression Analysis Summary for Hypothesis 1 (Model 2)

Variable	B	SEB	β	R^2_{adj}	R^2 change	F	p
Proxy efficacy for self-regulation (Time 1)	.19	1.45	.02	.14	.15	10.58	.002
Instructor support efficacy (Time 1)	-1.28	7.29	-.02	.19	.06	4.69	.035
Self-efficacy for self-regulation (Time 1)	.98	.13	.79**	.59	.39	55.25	.000

Note. $** p < .001$.

Hypothesis 2: Instructor support efficacy at week 3 of CR will be a stronger predictor of self-efficacy for self-regulation at week 9 of CR among women compared to men.

To investigate sex as a moderator of the instructor support efficacy – self-efficacy relationship, a moderated regression analysis was undertaken. This analysis involved regressing self-efficacy at week 9 of CR on the categorical variable: sex (men, women), the continuous variable: instructor support efficacy (at week 3) and an interaction term: sex * instructor support efficacy (at week 3). Prior to conducting the analysis, an interaction term was formed by zero-centering both the categorical variable (men = -1, women = 1) and the continuous variable and creating a product term (the interaction term: sex * instructor support) by multiplying the centered variables (as recommended by Frazier, Tix and Barron, 2004). As suggested by Frazier et al. (2004), a hierarchical multiple regression analysis was then conducted, with the main effects of sex and instructor support efficacy controlled on the first step and the interaction term entered as the final step in the model. The overall model was not significant, F (3, 56) = .11 p = .96. Table 9 shows the model summary for the moderated regression analysis.

Additionally, separate bivariate correlations were calculated to further examine the relationship between instructor support efficacy (at week 3) and self-efficacy (at week 9) for both female and male CR participants. Correlations were not significant for either women (r = .16, n = 16, p = .55) or men (r = .01, n = 44, p = .94).

Table 9

Hierarchical Multiple Linear Regression Analysis Summary for Hypothesis 2

Variable	*B*	*SEB*	β	R^2_{adj}	R^2change	*F*	*P*
1.Sex	-1.69	6.07	-.04	-.02	.00	.11	.75
2.Instructor support efficacy	3.98	9.25	.06	-.03	.00	.11	.75
3. Sex * Instructor support efficacy	3.15	9.25	.05	-.05	.00	.12	.73

Hypothesis 3i: Self-efficacy, proxy efficacy, and instructor support efficacy measured at week 3 should predict CR class attendance and exercise adherence during CR sessions during weeks 3-9 of CR.

To investigate self-efficacy, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy as predictors of CR exercise attendance and adherence between weeks 3-9, two separate multiple regression analyses were conducted. For all analyses (i.e. 3i and 3ii) investigating CR class adherence and exercise adherence, order of entry was determined a priori; self-efficacy was entered first given the breadth of research showing self-efficacy as a reliable predictor of exercise adherence, followed by proxy efficacy (also shown to be a reliable predictor of exercise adherence), and finally instructor support efficacy was entered as the final step in the model (Bray et al., 2001; Bray, Gyurcsik, Martin Ginis, Culos-Reed, 2004, Evon & Burns, 2004; Ewart, Stewart, Gillilan, & Kelemen, 1986; Millen & Bray, 2008). The first model (Model 1) regressed CR attendance (percent classes attended between weeks 3-9) on self-efficacy, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy at week 3 (Time 1). The overall model was significant, F (4, 55) = 2.74 p = .04 explaining 11% of the total variance in CR attendance between weeks 3-9 (R^2 = .15; R^2_{adj} = .11). Self-efficacy (at Time 1) accounted for 6% of the variance in the model (R^2change = .06, p = .05), while proxy efficacy for in-class exercise at Time 1 accounted for 9% of the variance (R^2change = .09 p = .02). However, neither proxy efficacy for self-regulation or instructor support efficacy measured at Time 1 added any significant increase in the amount of variance

explained (p = .50 and p = .48, respectively). A summary of the regression for Model 1 is presented in Table 10.

In the second model, CR exercise prescription adherence (percent exercise minutes performed during classes between weeks 3-9) was regressed on self-efficacy, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy at week 3 (Time 1). The overall model was not significant, F (4, 55) = 1.20 p = .32 and no significant effects were observed for any of the independent predictors (p > .10).

Table 10

Model 1: Multiple Linear Regression Analysis Summary for CR Exercise Class Attendance (weeks 3-9)

Variable	*B*	*SEB*	*β*	R^2_{adj}	R^2 Change	*F*	*P*
Self-efficacy for self-regulation (Time 1)	.57	.26	.36*	.05	.06	3.90	.05
Proxy efficacy for self-regulation (Time 1)	4.35	3.10	.31	.04	.01	.47	.50
Proxy efficacy for in-class exercise (Time 1)	27.14	23.66	.31	.11	.09	5.83	.02
Instructor support efficacy (Time 1)	14.25	20.07	.17	.11	.01	.50	.48

Note. *p < .05.

Hypothesis 3ii: Self-efficacy, proxy efficacy, and instructor support efficacy assessed at week 9 of CR should predict CR class attendance and exercise adherence during CR sessions during weeks 9-15 of CR.

To investigate self-efficacy, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy as predictors of CR exercise attendance and adherence between weeks 9-15, separate multiple regression analyses were conducted. Model one regressed CR attendance (percent classes attended between weeks 9-15) on self-efficacy, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy at week 9 (Time 2). Model two regressed CR exercise prescription adherence (percent exercise minutes performed during classes between weeks 9-15) on self-efficacy, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy at week 9 (Time 2). Results of both models showed non-significant overall effects; model one: F (4, 55) = .57 p = .69 and model two: F (4, 55) = .36, p = .84.

Discussion

Despite the fact that participation in exercise-based CR is vital to recovery and secondary prevention efforts following a cardiac event (Smith et al., 2006), it has been repeatedly documented that CR adherence remains problematic. Thus, a greater understanding of factors that may increase CR adherence is needed. Previous research has revealed that self-efficacy is a reliable predictor of exercise adherence in CR. The current study proposed to explore several socially-mediated perceptions that were theorized to predict self-efficacy and, in turn, its association with exercise-based CR adherence. More specifically, this study was designed to investigate proxy efficacy and instructor support efficacy and the associations between those variables and self-efficacy and exercise adherence within the CR setting.

The study first examined proxy efficacy for self-regulation and instructor support efficacy measured during the third week of CR as predictors of self-efficacy for self-regulation at week 9 of CR. Results indicated that proxy efficacy for self-regulation and instructor support efficacy independently predicted self-efficacy for self-regulation at week 9. As an extension of this primary question, sex was investigated as a moderator of the instructor support efficacy – self-efficacy relationship. Contrary to the hypotheses, which predicted a stronger effect for women compared to men, instructor support efficacy at week 3 did not predict self-efficacy for self-regulation at week 9 for women or men. The study also aimed to explore self-efficacy for self-regulation, proxy efficacy for self-regulation, proxy efficacy for in-class exercise and instructor support efficacy as predictors of CR exercise class attendance and exercise

prescription adherence during weeks 3 to 9 and 9 to 15, respectively. The prediction of exercise class attendance between weeks 3 to 9 was significant, wherein Time 1 (week 3) self-efficacy for self-regulation and proxy efficacy for in-class exercise independently predicted exercise class attendance between weeks 3-9. Surprisingly, none of the efficacy variables predicted exercise prescription adherence between weeks 3 and 9 or between weeks 9 to 15 in the study sample.

The following sections will explore the results of the study in more detail and address study limitations and future directions for research examining self-efficacy, proxy efficacy, instructor support efficacy and exercise adherence within the CR patient population.

Proxy Efficacy for Self-Regulation and Instructor Support Efficacy as Predictors of Self-efficacy for self-regulation

According to social cognitive theory, proxy efficacy is a socially-mediated perception that may lend itself to being a very important component in the building of one's self-efficacy. As evidenced by previous research, this may be particularly true for individuals participating in an exercise or exercise rehabilitation settings (Bray et al., 2001; Christensen, Wiebe, Benotsch & Lawton, 1996). People in such environments may develop beliefs (i.e., confidence) in their exercise leader or rehabilitation professional's skill that may in turn affect their self-efficacy and subsequently positively shape their abilities to engage in and adhere to an exercise program (Bray & Cowan, 2004). This hypothesis was explored in the present study. In addition to proxy efficacy, the current study explored a newly-conceived socially-mediated perception in

an effort to understand additional factors through which CR exercise leaders may contribute to the development in self-efficacy beliefs in CR participants. Following suggestions by Lent and Lopez (2002), a measure of one's confidence in another's abilities to provide social support was investigated. The construct was labeled: instructor support efficacy. Previous research has suggested that perceived social support for exercise has been positively associated with adherence to an exercise program and may contribute to the development of self-efficacy in individuals as they pursue new skills and participate in exercise programs (Courneya & McAuley, 1995; Woodgate, Brawley & Shields, 2007). These latter findings provided a foundation for the expectation that instructor support efficacy could play a role in the development of exercise-related self-efficacy among individuals who were participating in CR.

Correlational analysis in the current study showed proxy efficacy was positively related to self-efficacy for self-regulation. These findings were consistent with previous research examining the relationship between proxy efficacy and self-efficacy in both the novice exercise population and in the CR setting (Bray et al., 2006; Bray & Cowan, 2004; Bray et al., 2001; 2004). Results of the hierarchical multiple linear regression analysis revealed that for study participants, proxy efficacy for self-regulation and instructor support efficacy at Time 1 were predictive of self-efficacy for self-regulation at Time 2. As hypothesized and in concert with previous research, in the current study, proxy efficacy continues to be a reliable and independent predictor of self-efficacy (Bray et al., 2001; Christensen et al., 1996). The addition of instructor efficacy support and the increased variance that it added above and beyond the predictive value of proxy

efficacy lends a new and important dimension to previous research focusing purely on proxy efficacy as a socially-mediated efficacy determinant. Therefore, as suggested earlier, whereas proxy efficacy refers to the belief in another's ability to assist in instrumental tasks (i.e., provision of tangible help to carry out a task), instructor support efficacy reflects the confidence one has in their leader's ability to provide emotional and informational assistance above and beyond that of proxy efficacy.

Furthermore, the addition of self-efficacy for self-regulation at Time 1 contributed a large amount of explained variance in self-efficacy for self-regulation at Time 2. In the context of the present study, the data indicated that study participants began their exercise program with relatively high self-efficacy scores (as indicated by high baseline – week 3 scores) and these scores did not change significantly from the Time 1 assessment to the Time 2 assessment. It is suggested that these high and consistent scores may be due to familiarity with the measure or to the experience (and therefore confidence) gained exercising within the CR environment before the study began and between the study measurement points.

Participants also reported high levels of proxy efficacy and instructor support efficacy at their Time 1 assessment. This finding is also consistent with previous research examining efficacy beliefs among exercise participants (Bray et al., 2001; Dawson & Brawley, 2000; DuCharme & Brawley, 1995; Estabrooks & Carron, 1998). Therefore, even as early as three weeks into their CR program, participants held great confidence in their exercise leaders abilities to motivate, teach, provide emotional support and communicate with them. It may also be of particular interest to note that

there is quite a substantial wait time (approximately 6 months post-event) for patients to enter into and begin the CR program (J. Dubberly, personal communication, August 10, 2010). Therefore, patients are provided with a very long recovery and adaptation time post-event and prior to the start of their CR program. During this wait time they are often encouraged to begin some exercise on their own at home by their cardiologists and or surgeons (J. Dubberly, personal communication, August 10, 2010). Therefore, it is important to reiterate that proxy efficacy has been shown to be particularly important for building self-efficacy from very low levels and consequently may be very important in the initial entry into an exercise program when individuals may doubt their abilities and can rest some of their burden on their exercise leaders (Bandura, 2001; Bray et al., 2006, Bray & Shields, 2007). In the case of this particular CR program, it is possible that individuals were exercising prior to the start of their participation in the CR program, and the CR exercise introduced to them to them was not novel enough to warrant initial low self-efficacy levels for exercise.

In summary, it appears that the CR participants were highly efficacious in their abilities to exercise and to be supported in their exercise efforts by their interventionists. This may suggest that from a very early stage of participation in the CR program, the exercise environment and leaders supported the efficacy needs of the patients.

Sex as a Moderator of the Instructor Support Efficacy – Self-Efficacy Relationship

An important focus of the current study was to examine whether gender played a role in the relationship between instructor support efficacy and self-efficacy among CR participants. As previously mentioned, the investigation of instructor support efficacy in

this study is a novel concept and has not been explored in previous research. It was hypothesized that the ability of exercise leaders to provide emotional and informational support to the CR participants as they participate in a CR exercise environment may provide an important contribution to their self-efficacy for self-regulation. It was thought that this may be of particular importance for women given that previous research has indicated that female CR participants are more likely to begin a CR program with lower levels of self-efficacy than their male counterparts (Blanchard et al., 2002; Grace et al., 2002a). However, in the current study, there was no significant difference in baseline self-efficacy scores between male and female participants (p = .82) and, contrary to the hypothesis, instructor support efficacy did not differentially predict self-efficacy for self-regulation for women or men. Additionally, there were no significant correlations for instructor support efficacy and self-efficacy for exercise for either gender. As with the first hypothesis in the study, ceiling effects in the self-efficacy and instructor support efficacy scores are factors that may have limited detection of main or interaction effects associated with gender differences.

Although the current study did not support the hypotheses with respect to differences between male or female participants and instructor support efficacy, it is suggested that gender may still be an important moderator to examine in future research. Given that earlier research has shown that women have unique barriers that may affect their ability to adhere to CR programs (including lower levels of social support for exercise, lack of exercise experience and low levels of self-efficacy for exercising), having confidence in their exercise instructors' capabilities to provide

emotional and informational support as they pursue the challenges of CR exercise may still be an essential contributor to their self-efficacy (Beswick et al., 2005; Grace et al., 2002b, Jackson et al., 2005). It is possible that a larger sample size may have detected differences between male and female CR participants with respect to the instructor support efficacy – self-efficacy relationship. In fact, Aguinis (2004) suggests that a sample size of over 200 is necessary in order to have reasonable power to detect moderator effects when one of the variables is continuous.

Social Cognitive Theory and Exercise Adherence in Cardiac Rehabilitation

Previous research has established self-efficacy as a strong and consistent predictor of exercise adherence in both the general population as well as the CR population (Bandura, 1997; Evon & Burns, 2004; Ewart et al, 1986; McAuley et al., 2001; Millen & Bray, 2008; Rhodes et al., 2001). In the current study, examination of the efficacy variables (self-efficacy for self-regulation, proxy efficacy for self-regulation, proxy efficacy for in-class exercise, and instructor support efficacy) was performed to assess the ability of those variables to predict both exercise attendance (i.e., adherence to the number of exercise classes scheduled) and exercise prescription adherence (i.e., adherence to the number of minutes of exercise prescribed at each session). This combination of efficacy variables (measured at baseline – week 3) accounted for a significant variance in exercise class attendance among the study participants between the initial weeks of the study (weeks 3-9), but did not predict exercise prescription adherence. This finding is consistent with previous work by Bray et al. (2001) examining self-efficacy and proxy efficacy as predictors of exercise class

attendance. Conversely, the combination of efficacy variables (measured at Time 2 – week 9) did not predict either exercise class attendance or exercise prescription adherence during the later weeks of study participation (weeks 9-15). Taken together, these results suggest that perhaps the earlier perceptions that exercise participants form about their own self-efficacy beliefs and their exercise leaders shape their participation during the initial stages of CR program participation (at time at which exercise attendance has been shown to be problematic).

Study Limitations

There are a number of limitations to address in the current study. One such limitation that should be noted is the small sample size and the fact that participants were recruited from a convenience population at one CR centre. Consequently, the results of this study may not be generalizable to other hospital or community CR settings. Additionally, it has been noted in previous research that only a small number of individuals who are referred to CR actually participate in a CR supervised exercise program (Daly et al. 2002; Sharp & Freeman, 2009). Therefore, it should be put forward that this assessment may only include CR participants who were more motivated to participate in CR and who also may have been more confident in their ability to participate in CR. This proposition is supported by the fact that efficacy scores were high even at the outset of the study.

A second limitation is that proxy efficacy responses of the participants were very high and somewhat restricted in range due to ceiling effects. It is possible that the study participants may have believed their CR exercise leaders to be highly trained and

experienced upon initial entry into the CR program. It may be beneficial to study a larger sample of CR participants from a combination of hospital and community CR settings to determine if high proxy efficacy scores are representative across different programs and within a larger patient population.

Another important limitation that should be noted is that the study was primarily composed of a male sample (73% of the sample were men). This uneven distribution coupled with the small sample size of the study made it extremely difficult to conduct a proper or fair moderation analysis between the male and female participants. As suggested by Aguinis (2004), samples sizes of at least 200 are necessary to have reasonable power to detect a moderator effect. It should be noted, however, that there was an abundance of male patients in the initial recruitment sample and therefore, this may in fact be representative of the patient population within this centre.

An additional limitation concerns the timing of the baseline (Time 1) data collection. It was decided that data collection would begin three weeks post-entry into the CR program in order to facilitate familiarity with the program and the exercise leaders. During these three weeks, no assessments were made and it is possible that this may have been a time in which significant changes in several of the study variables may have occurred. Retrospectively, it may have been useful to measure the efficacy variables prior to the start of the exercise program in order to observe if the scores measured at week 3 were representative of initial efficacy levels or if they were in fact changes that occurred during the initial weeks of program participation. A final limitation of the study is that the study employed a never before used and newly

developed questionnaire (the Instructor Support Efficacy scale). As noted earlier, this questionnaire was based on the emotional support items measured by the MOS Social Support Survey (Sherbourne & Stewart, 1991). It may have been beneficial to conduct a pilot study or focus group prior to the development of the questionnaire in order to determine which exercise leader support behaviours are considered to be important by CR program participants. Future work on the development, reliability and construct validity of this measure is warranted.

Study Strengths and Future Directions

Strengths of the present study include the continued examination of proxy efficacy; still a fairly innovative efficacy construct in sport and exercise psychology and the introduction of instructor support efficacy as an original socially-mediated efficacy construct. The examination of these efficacy variables is comparatively novel to the existing efficacy research, which has for the most part focused on self-efficacy, and may help to provide exercise leaders and program developers in their understanding of patient perceptions and development of their exercise and rehabilitation programs. The introduction of the idea of instructor support efficacy has important implications for future research in the CR exercise environment as well as other exercise and health-related fields. Future research should include qualitative needs assessments of CR program participants, focusing on what they believe to be important in terms of social, emotional and instructor support from their exercise leaders or health professionals. For example, it may be useful to utilize CR patients to modify and generate additional questionnaire items. Additionally, it may be beneficial to include all of the social

support constructs set out by Wills and Shinar (2000) in addition to emotional and informational support (i.e., instrumental support and companionship support). An additional strength of this study is its prospective design and examination of the efficacy variables throughout an individuals' participation in a CR program. Finally, although the numbers of females involved in this study were small, the examination and understanding of female participants in CR is still limited, as the majority of CR research has focused on male participants. Therefore, this study may provide important groundwork for future research to help us understand if or how perceptions about social support affect women's abilities to adhere to their exercise programs.

Conclusion

The findings from the present study provide a positive starting point in the development and assessment of other efficacy (particularly efficacy for social support) in both the CR setting and general exercise population. It is widely known that exercise adherence following a cardiac event is problematic despite the numerous physical and psychosocial benefits associated with CR participation. This is particularly true for the female CR population. Further theory-based research should help build knowledge necessary to help us understand, evaluate, and implement programs to improve CR adherence.

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Appendix A

Demographics

Please check (√) the appropriate box for each question.

1. Gender (check √ one):

   ❑ Female
   ❑ Male

2. Age: _____ years

3. Marital Status (check √ one):

   ❑ Married
   ❑ Separated
   ❑ Widow(ed)
   ❑ Single
   ❑ Divorced
   ❑ Not married, living with partner

4. Employment Status (check √ one):

   ❑ Full-time
   ❑ Part-time
   ❑ Unemployed
   ❑ Retired
   ❑ Leave of absence

   Current Occupation (if applicable):
   _____

5. Cultural Background (check √ one):

   Please indicate the option which you feel best represents your cultural background

   ❑ Caucasian
   ❑ Black (e.g. African, Haitian, Jamaican, Somali)
   ❑ Arab/West Asian (e.g. Egyptian, Iranian, Lebanese)
   ❑ Asian (e.g. Chinese, Japanese, Korean)
   ❑ Indigenous Peoples (e.g. Inuit Metis, North American Indian)
   ❑ Other (please specify
   _____

6. Education Level (check √ one):

   ❑ Less than grade 8
   ❑ Grade 8
   ❑ Some high school
   ❑ Completed high school
   ❑ Some college
   ❑ Completed college
   ❑ Some university
   ❑ Completed university
   ❑ Masters or PhD
   ❑ No formal schooling

7. What is the nature of your referral to the Cardiac Health & Rehabilitation Centre? (check √ one):

- ❑ Myocardial Infarction (MI)
- ❑ Coronary Artery Bypass Graft Surgery (CABG)
- ❑ Angiogram
- ❑ Angioplasty
- ❑ Risk Factor Management
- ❑ Other (please indicate: _____)

Appendix B

Self-Efficacy for Self-Regulation

Using the scale provided, please circle the option for EACH question below that best reflects **how confident YOU ARE in your ability** to manage that aspect of your exercise participation **over the next 6 weeks.**
1. How confident are you that you can **motivate yourself to get at least 30 minutes of activity a day, 3 times per week**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
2. How confident are you that you can use **safe, effective exercise technique (e.g., warm-up, stretching**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
3. How confident are you that you **can plan exercise sessions that will be at least moderately difficult (e.g., have you breathing a little hard, your heart rate increases)**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
4. How confident are you that you can **monitor your exercise progress by recording what exercises you do, how often you do them and for how long**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
5. How confident are you that you can **set realistic, weekly exercise goals for yourself (e.g., exercising 3 days/week)**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely

6. How confident are you that you can **monitor and regulate the intensity of your exercise so that it is moderately difficult**?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Not at all Somewhat Completely

7. How confident are you that you can **develop solutions to cope with potential barriers that can interfere with your exercise**?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Not at all Somewhat Completely

8. How confident are you that you can **schedule exercise sessions into your weekly routine so that you get at least 30 minutes of exercise a day, 3 times per week**?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Not at all Somewhat Completely

Appendix C

Proxy Efficacy for Self-Regulation

In the exercise setting, exercise leaders provide different types of assistance to many participants. Based on your experience in this program, using the scale provided, please circle the option for each question below that best reflects how confident you are **in YOUR EXERCISE LEADER'S ABILITY TO HELP YOU** to manage that aspect of your exercise participation **over the next 6 weeks.**
1. How confident are you that your exercise leader can help you to **motivate yourself to get at least 30 minutes of activity a day, 3 times per week**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
2. How confident are you that your exercise leader can help you to **use safe, effective exercise technique (e.g., warm-up, stretching**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
3. How confident are you that your exercise leader can help you to **schedule exercise sessions into your weekly routine so that you get at least 30 minutes of exercise a day, 3 times per week**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
4. How confident are you that your exercise leader can help you to **plan exercise sessions that will be at least moderately difficult (e.g., have you breathing a little hard, your heart rate increases)**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely

5. How confident are you that your exercise leader can help you to **monitor your exercise progress by recording what exercises you do, how often you do them and for how long**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
6. How confident are you that your exercise leader can help you to **set realistic, weekly exercise goals for yourself (e.g., exercising 3 days/week)**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
7. How confident are you that your exercise leader can help you to **monitor and regulate the intensity of your exercise so that it is moderately difficult**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely
8. How confident are you that your exercise leader can help you to **develop solutions to cope with potential barriers that can interfere with your exercise**? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Not at all Somewhat Completely

Appendix D

Proxy Efficacy for In-Class Exercise

Please rate the confidence you have in your exercise leader's **abilities to do the following over the next 6 weeks.** Use the following 0-10 scale to make your ratings: 0 1 2 3 4 5 6 7 8 9 10 Not at all Confident Moderately Confident Extremely Confident	
	Confidence 0-10
1. My confidence in my exercise leader's abilities to **provide easy-to-follow instructions** is:	
2. My confidence in my exercise leader's abilities to **clearly explain the exercises s/he wants me to do** is:	
3. My confidence in my exercise leader's abilities to **give me advice about how to exercise properly** is:	
4. My confidence in my exercise leader's abilities to **educate me about effective exercising** is:	
5. My confidence in my exercise leader's abilities to **provide encouragement to me** is:	
6. My confidence in my exercise leader's abilities to **give me appropriate feedback on my exercising form** is:	
7. My confidence in my exercise leader's abilities to **give praise for my good efforts** is:	
8. My confidence in my exercise leader's abilities to **be easily approachable if I have questions about my exercising** is:	
9. My confidence in my exercise leader's abilities to **give me individualized feedback and attention** is:	

10. My confidence in my exercise leader's abilities to **be committed to me as a participant in the program** is:	
11. My confidence in my exercise leader's abilities to **look after me if I have difficulties** is:	
12. My confidence in my exercise leader's abilities to **include a variety of different exercises in my program** is:	
13. My confidence in my exercise leader's abilities to **incorporate new activities/exercises in my sessions** is:	
14. My confidence in my exercise leader's abilities to **design exercises that are challenging** is:	
15. My confidence in my exercise leader's abilities to **set up exercises that are fun to do** is:	
16. My confidence in my exercise leader's abilities to **boost my confidence in my abilities to exercise** is:	
17. My confidence in my exercise leader's abilities to **motivate me to exercise** is:	
18. My confidence in my exercise leader's abilities to **reduce my fears about exercising** is:	

Appendix E

Instructor Support Efficacy

Please rate the confidence you have in your exercise leader's **abilities to do the following <u>when you come to do your exercise program</u> over the next 6 weeks.** Use the following 0-10 scale to make your ratings: 0 1 2 3 4 5 6 7 8 9 10 Not at all Confident — Moderately Confident — Extremely Confident	
	Confidence 0-10
1. My confidence in my cardiac rehabilitation program staff/leaders' abilities to **listen to me when I need to talk about my cardiac health concerns** is:	
2. My confidence in my cardiac rehabilitation program staff/leaders' abilities to **give me information to help me understand the importance of exercise for my cardiac health** is:	
3. My confidence in my cardiac rehabilitation program staff/leaders' abilities to **give me good advice about my cardiac health** is:	
4. My confidence in my cardiac rehabilitation program staff/leaders' abilities to **allow me to confide in him/her or talk to about my concerns about exercise and my cardiac health** is:	
5. My confidence in my cardiac rehabilitation program staff/leaders' abilities to **allow me to share my worries and fears about my cardiac health** is:	
6. My confidence in my cardiac rehabilitation program staff/leaders' abilities to be **available to help me with suggestions about how to deal with problems I run into with my exercise program (e.g., feeling too tired, not motivated, missed a few sessions, etc.)** is:	

7. My confidence in my cardiac rehabilitation program staff/leaders' abilities to **understand my cardiac health concerns** is:	