RESISTANCE TRAINING AND CARDIAC REHABILITATION

PROMOTING AND ENABLING ADHERENCE TO RESISTANCE TRAINING FOLLOWING CARDIAC REHABILITATION

By

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Abstract

The mortality/morbidity and quality of life benefits of exercise-based cardiac rehabilitation (CR) are well established, yet adherence to exercise is generally poor post-discharge. Recent trials have attempted to enhance adherence to aerobic activities during transition from CR to home-based exercise. However, these trials have not addressed resistance training, which is also an integral part of many participants' CR exercise routines. Because accessibility to familiar training equipment (e.g., weight machines) and instruction may be limited for many patients upon completion of CR, poor adherence to this beneficial form of exercise can be resultant. The purpose of this study was to examine the effects of a brief intervention involving the provision of a motivation-enhancing instructional manual and elastic Thera-Bands® on self-efficacy for, outcome expectancies for, and adherence to, upper body resistance exercise. It was hypothesized that participants receiving the intervention would report higher self-efficacy, outcome expectancies and greater adherence than those in a standard care control condition. The study was a randomized controlled trial involving informed and consenting CR participants recruited from an established outpatient CR programme at a major urban hospital ($N = 40$; $n_{males} = 32$; $M_{age} = 61.20 \pm 11.10$). Participants in the intervention group (n=20) received an orientation to home-based upper body resistance training, a theory-based instructional manual designed to enhance self-efficacy and outcome expectations, and Thera-Bands®. The standard care control group received an orientation to home-based upper body resistance training and standard care CR follow-up (n=20). Participants completed baseline measures of self-efficacy for performing resistance

training and activities of daily living as well as outcome expectancy measures one week prior to discharge from CR. The same measures were completed again one week later (i.e., at the end of the CR program), and at 4-weeks post-discharge. Participants logged their sets of upper-body resistance exercises continuously throughout the 4-week period following completion of the CR program. There were no differences between groups on any of the study variables at baseline. Participants in the intervention condition reported higher self-efficacy and outcome expectations for resistance training than controls at the 4-week follow-up assessment. Adherence to resistance training was significantly greater with the intervention group completing over twice as many (105%) sets over the four weeks than the control group. Maintaining or increasing upper body strength is an important outcome of CR as it relates to the performance of many activities of daily living. However, adherence to resistance exercises may be difficult upon completion of supervised, facility-based CR. This study illustrates that the provision of a motivation-enhancing instructional manual and low cost materials has a positive impact on self-efficacy, outcome expectations and adherence to resistance training, and may help participants make a successful transition to home-based resistance exercise.

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Literature Review

"Since my heart attack, I now view everyday as a bonus day" Cardiac Rehab Patient, 2006

Cardiovascular disease (CVD) is the leading cause of mortality in Canada, accounting for nearly 34% of all deaths in 2001 (Canadian Association of Cardiac Rehabilitation (CACR), 2004). According to the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR, 2004), over eight million individuals are living with a form of CVD and/or have survived a cardiac event. CVD affects the heart and circulatory system and includes the following: coronary artery disease, hypertension, stroke, congestive heart failure, valvular and rheumatic heart diseases, peripheral arterial disease and congenital heart defects.

Coronary artery disease is the most detrimental affliction and is responsible for more than 50% of deaths caused by CVD (Katzmarzyk, 2004). This highly prevalent disease (CVD) was reported by Health Canada (2002) to have incurred the greatest costs to the Canadian health care system in 1998; total costs (direct and indirect) of CVD exceeded 18.5 billion dollars (Health Canada, 2002). It has been postulated that by the year 2020, heart disease will remain the dominant cause of mortality and disability in North America (AACVPR, 2004). It can therefore be assumed that cardiovascular diseases will continue to consume significant resources from the Canadian health care system for some time. Given the long-term and widespread impact of cardiovascular illness, the development, maintenance, and expansion of effective treatment and

secondary and tertiary prevention programs such as cardiac rehabilitation seems an essential direction.

Cardiac Rehabilitation Programs

Cardiac rehabilitation has been defined as the "enhancement and maintenance of cardiovascular health through individualized programs designed to optimize physical, psychological, social, vocational and emotional status" (Stone, Arthur, Austford & Blair, 2004). Aims of the cardiac rehabilitation process include efforts toward secondary prevention through risk factor identification and modification directed toward preventing disease progression and the recurrence of cardiac events (Stone, Arthur, Austford & Blair, 2004). Traditional cardiac rehabilitation programs are generally multifaceted, with an emphasis primarily on exercise. Additional services provided by these programs can include psychological counselling and instruction for nutrition, medication, stress management and risk factor modification.

There are two defined categories of risk factors for cardiovascular disease: modifiable and non-modifiable. Factors such as age, male sex, ethnicity, family history and genetic factors fall under the non-modifiable risk factors and are factors that individuals cannot control or change. On the other hand, modifiable risk factors are those that individuals do have potential to change. These include tobacco smoking, obesity, excessive alcohol consumption, hypertension, dyslipidemia, diabetes mellitus, depression and physical inactivity (Katzmarsyk, 2004).

Physical inactivity is one major risk factor for cardiovascular disease and has become the primary focus of cardiac rehabilitation. The efficacy and effectiveness of

exercise-based cardiac rehabilitation has been documented for over 20 years (Thompson & Franklin, 2004). A recent meta-analysis by Taylor et al. (2004) compared the effectiveness of exercise-based cardiac rehabilitation programs (CRP) to standard care (no structured exercise training or advice) in 48 randomized controlled trials. Findings from their meta-analysis suggest that participation in exercise-based CRP is associated with a significant reduction in all-cause mortality and total cardiac mortality with reductions in cardiac mortality ranging from 20% to 32% (Taylor et al., 2004). Furthermore, significant survival benefits for cardiac patients who partake in exercise therapy and risk factor modification has been revealed in the literature (Jolliffe et al., 2001). A comparison of survival rates between attendees and non-attendees of cardiac rehabilitation demonstrated that attendees had a 35% improvement in 5-year survival compared to non-attendees (Sundararajan, Bunker, Begg, Marshall & McBurney, 2004). Furthermore, studies have shown that individuals who participate in cardiac rehabilitation have lower rates of re-hospitalization (Ades, Huang & Weaver, 1992; Hambrecht et al., 2004) when compared people who do not take part in CRP.

Benefits of Aerobic Exercise for Cardiac Rehabilitation Patients.

Exercise training in cardiac rehabilitation usually takes place in a supervised group setting, with most programs focusing on aerobic exercise (Daub, Knapik & Black, 1996; Merril, 1997). Physical outcomes achieved through aerobic exercise participation for cardiac rehabilitation patients have been clearly identified by Pollock et al. (2000). According to Pollock and colleagues, risk factors associated with the development of coronary artery disease are most effectively modified by aerobic exercise. Effects such

as increases in bone mineral density, stroke volume, maximal oxygen uptake and decreases in resting heart rate and percent body fat are some health and fitness outcomes resultant of engagement in aerobic exercise (Pollock et al., 2000). Other outcomes that have been illustrated in a recent meta-analysis are reductions in total cholesterol, triglycerides, and systolic blood pressure and improvements in quality of life (Taylor et al., 2004). Taken together, there is compelling evidence that cardiac rehabilitation participants can gain greatly from aerobic exercise training. Although these findings reinforce the importance of inclusion of aerobic exercise in rehabilitation, current research also indicates that resistance training is another beneficial form of exercise for cardiac patients.

Benefits of Resistance Training for Cardiac Rehabilitation Patients

The benefits from engagement in aerobic forms of exercise for cardiac patients have been well supported in research. However, resistance training has been a concern for cardiac rehabilitation patients. Historically, it was believed that performing resistance-training exercises could cause "adverse" effects for the patient, such as elevated heart rate and/or blood pressure (Stewart, 1989). However, current research supports the inclusion of this form of exercise in CRP.

In a review of the literature, resistance training was found to benefit cardiac patients in terms of increased peak exercise capacity, improved submaximal endurance, reduced ratings of perceived exertion during heavy exercise, and increased dynamic strength (McCartney, 1998). Further benefits associated with resistance training include increases in bone mineral density, basal metabolism and lean body mass (Pollock, 2000).

While all of these benefits may be clinically relevant, the increase in dynamic strength may be of particular importance to many cardiac patients given its positive link to a successful return to everyday activities (McCartney, 1998).

Research has shown decreases in muscular strength may occur as a consequence of a cardiac event (McKelvie & McCartney, 1990). Thus, for many cardiac patients, a successful return to occupational, recreational and domestic activities may depend largely on regaining upper and lower body strength. According to Daub and colleagues (Daub, Knapik & Black, 1996), patient involvement in weight-bearing aerobic exercise (e.g., walking) should be adequate enough to regain sufficient leg strength for successful involvement in many activities of daily living. However, because minimal upper-body strength improvements have been found among cardiac patients involved in CRP consisting of aerobic exercise only (Vescovi & Fernhall, 2000), regaining the ability for daily activities such as lifting objects may be questionable unless specific resistance exercises are incorporated into rehabilitation. This consideration is especially important for those cardiac patients whose occupational or daily activities involve lifting and carrying tasks (Kelemen, 1989; Stewart, 1989).

Studies of resistance training involving cardiac patients have reported significant improvements in upper body strength when compared to aerobic exercise-only controls (Kelemen et al., 1986; McCartney, McKelvie, Haslam & Jones, 1991; Stewart, Mason & Kelemen, 1988). For example, McCartney and colleagues (1991) conducted a study comparing strength gains in cardiac patients who performed either a combination of resistance training and aerobic exercise or engaged in aerobic exercise only. Patients

completed training on 2 days per week for 10 weeks. Results showed that patients involved in both resistance and aerobic training had greater increases in upper-body strength compared to a group of patients who engaged in aerobic exercise only. More specifically, participants in the combined resistance training group experienced increases in arm strength of 42% compared to only 13% in the aerobic-only group. The combined-exercise group also increased their endurance for resistance training as demonstrated by their ability to consecutively lift their baseline one-repetition maximum (1-RM) 14 times after 10-weeks of training compared to the aerobic-only group which could only lift their baseline 1-RM four times. These results illustrate that a combination of resistance and aerobic exercises can be more effective in increasing upper-body strength in cardiac patients than aerobic exercise alone.

A study by Daub and colleagues (1996) examined the effects of different intensities of upper-body resistance training on strength gains in cardiac rehabilitation patients. In that study, all participants completed aerobic exercises three times per week at their CRP. In addition to aerobic exercise, participants in three of four treatment groups completed resistance training. One group performed resistance training at 20% of their 1– RM, another group at 40%, and the third at 60%. Results revealed that upper-body strength in the aerobic-only control group remained unchanged over time, while the three different intensity groups (20%, 40%, and 60% of 1-RM groups) had increases in strength of 10.5%, 11.9% and 13.5%, respectively (Daub et al., 1996). These results demonstrate that resistance training incorporated into cardiac rehabilitation may help patients regain muscular strength that may be lost during their cardiac event.

Further support for the positive effects of resistance training on strength in cardiac patients was demonstrated through another study that compared the effects of combined resistance and aerobic training to aerobic-only training (Peirson et al., 2001). In that study, patients were randomized to one of two exercise groups and completed supervised exercise three days per week. Findings showed that both groups had significant increases in lower body strength. However, the aerobic-only group showed improvements in upper-body strength on three of five exercises, whereas the combined group improved on all five. Furthermore, while upper-body strength increased from baseline for the aerobic-only group by between 13% and 32%; the combined-training group experienced increases ranging from 44% to 81%. Although this study demonstrated improvements in upper body strength in the aerobic only group, the improvements were minimal and the authors cautioned that those results may have been attributable to the resistance components in the aerobic activities (e.g., using rowing machines).

Overall, findings have consistently shown that participation in resistance training results in decreased myocardial demands for activities of daily living, such as lifting objects or carrying moderately heavy things (Pollock et al., 2000) and large increases in strength, which are often necessary for occupational and recreational activities (McCartney, 1998).

Adherence to Cardiac Rehabilitation

Despite the many benefits acquired from engagement in both aerobic and resistance forms of exercise, research has found that participation in CRP is low. In fact, evidence suggests that the majority of individuals with CVD do not participate in cardiac

rehabilitation at all (Lane, Carroll, Ring, Beevers, & Lip, 2001). One recent study by Daly and colleagues (2002) found only 15% to 30% of eligible cardiac patients engaged in formal rehabilitation programs. One important explanation for low entry into cardiac rehabilitation is poor referral rates. A systematic review of referral rates to cardiac rehabilitation (Cortes and Arthur, 2006) showed a mean referral rate of 34%, with high variability across studies (10% to > 60%). Without referral patients are missing the opportunity to gain the benefits associated with cardiac rehabilitation. However, in addition to low referral rates, there is also the problem of poor adherence among participants who partake in cardiac rehabilitation. This non-adherence is manifested at several levels.

At the first level, there is evidence indicating problems with a lack of adherence among patients who do partake in CRP. According to several sources, approximately 50% of the patients who register for cardiac rehabilitation drop out within 6 months of starting a program (Fardy & Franklin, 1998; Oldridge, 1995; Oldridge & Streiner, 1990). The adherence problem is compounded at the next level where it is estimated that only 15% to 50% of those patients who attend and complete their rehabilitation program (which again, are few) continue their engagement in exercise within six months and even fewer are still exercising one year later (Bethell, 1999; Bock, Carmona-Barros, Esler & Tilkemeier, 2003; Moore et al., 2006).

Continuation of exercise post-cardiac rehabilitation is important for the health of the patient, particularly since research has shown that those who are compliant with their exercise prescriptions are less likely to encounter another heart complication when

compared to their noncompliant counterparts (Radtke, 1989). In one illustrative study, Brubaker and colleagues (1996) compared patients who continued in cardiac rehabilitation for greater than one year to patients who were discharged after the standard 3-months. At a follow-up assessment approximately one year later following discharge from cardiac rehabilitation, results showed that patients who remained in the program had increased their functional capacity and decreased their triglycerides and percent body fat beyond the levels established at the end of the standard 3-month program. On the other hand, participants who were discharged at the end of the standard 3-month program had since regressed on each measure to their initial levels prior to starting cardiac rehabilitation. One potential explanation for this finding is that the extended-care group continued to exercise at a level that helped maintain the associated health benefits, while the standard care (3-month) group failed to adhere to a level of exercise that would have helped maintain the benefits gained during the cardiac rehabilitation program. Overall, these findings provide strong evidence to suggest that cardiac rehabilitation participants have considerable difficulty making a successful transition from supervised to unsupervised exercise.

Bridging the Transition from CRP to Home-Based Exercise.

Keeping in mind the challenge of making a successful transition from supervised CRP to independent exercise, intervention efforts have focused on improving adherence to exercise after cardiac rehabilitation. One study by Rejeski and colleagues (2003) compared a group-mediated cognitive behavioural (GMCB) intervention to standard cardiac rehabilitation. The GMCB intervention was designed to help participants learn

how to incorporate physical activity into their daily activities and help promote independence. Participants in that study were randomized to either a standard care cardiac rehabilitation program ($n = 74$) or to a standard care program with the adjuvant of GMCB counselling sessions ($n = 73$). At 3- and 12-month follow-up assessments, the GMCB group scored higher than the standard care group on the following outcomes: MET capacity ($F(1, 91) = 4.56$, $p = .04$), self-reported physical activity ($F(1, 102) = 4.55$, $p = .03$) and self-efficacy ($F(1, 102) = 4.580$ $p = .03$).

Another study focused on self-regulatory skills and examined their effects on changes in exercise maintenance and self-regulatory cognitions over a 4-month period following cardiac rehabilitation (Sniehotta et al., 2005). Participants ($N = 240$) were randomized into one of three groups: standard care, action planning, or action planning plus diary. Measures of self-efficacy, and physical activity were obtained during rehabilitation and again at 2- and 4-months after completion of the cardiac rehabilitation program. Findings showed no significant differences between the three groups in their engagement in physical activity at 4-months post-discharge (F (2, 194) = 1.34, $p > .05$), although the action planning plus diary group tended to have higher levels of physical activity. Self-efficacy was found to be greater in the action planning plus diary group compared to the standard care group at 2- and 4-months.

A third study examined the effects of a lifestyle modification program designed to help increase exercise adherence after CR (Moore et al., 2006). The intervention was based on several theoretical frameworks and included small group counselling sessions as well as behaviour modification. Participants were randomized into either experimental

(n = 119) or control (n = 131) groups. Findings showed that the groups did not differ significantly on compliance to exercise frequency, amount, and intensity. In fact both groups showed a decrease in frequency and amount of exercise over one year of follow-up. An unfortunate finding of this study was that, regardless of the group they were in, most participants were not exercising at the recommended intensity and frequency for this population. Self-efficacy for adhering to an exercise regimen was also shown to decline over time after program discharge. The authors were not surprised at this decline in self-efficacy and commented that patients leaving cardiac rehabilitation must face the reality of struggling to maintain exercise on their own. Overall, the intervention did not have the proposed effect on physical activity maintenance or self-efficacy.

Together, results of these studies illustrate that even with the addition of a well-planned intervention; adherence to exercise is problematic after cardiac rehabilitation. However, it should be noted that while there has been research focusing on adherence in cardiac rehabilitation and on the challenging transition from CRP to home-based exercise, this research has been limited to aerobic forms of activity such as walking. No published research has looked at adherence to resistance training exercises post-cardiac rehabilitation. Keeping in mind the benefits achieved from engagement in resistance training during cardiac rehabilitation researchers should also focus their attention on encouraging adherence to this valuable form of exercise as cardiac patients make the transition to home-based exercise.

Statement of the Problem

The focus of this thesis is on resistance training exercise during the transition from structured cardiac rehabilitation to self-managed, home-based activity. The study examined the effects of providing cardiac patients with an instructional manual designed to enhance their motivation for carrying out upper body strengthening exercises independently following graduation from cardiac rehabilitation.

The importance of focusing on upper-body strength is grounded in McCartney's (1998) research showing the positive health benefits of resistance training for cardiac patients. However, the concern over adherence to resistance training grows from the general non-adherence data presented above, with further recognition of the complexities associated with home-based resistance training exercise. That is, research on adherence rates to exercise in cardiac rehabilitation has traditionally been concerned with aerobic or walking behaviour. As noted above, adherence to aerobic exercise is problematic, even though the act of walking requires no equipment or specialized exercise facilities and can be performed almost anywhere at anytime. In contrast to the relative simplicity of maintaining a walking regimen at home, consider the complexity of adapting resistance training to the home environment. Many cardiac rehabilitation patients are introduced to resistance training using specialized equipment (i.e., weight machines) at a rehabilitation facility. When using the equipment, patients are also supervised by an interventionist who provides instruction and feedback on resistance training components such as amount of weight to use, proper form, etc. Upon graduation from the supervised programs, patients usually lose access to the specialized equipment and instruction to which they

have become accustomed. Because most of these participants do not have similar specialized resistance training equipment at home, the likelihood they will discontinue upper body resistance training after graduation from cardiac rehabilitation could be as high if not higher than their non-adherence to walking or aerobic forms of exercise. In the present study, it was postulated that providing cardiac patients with resistance training elastic Thera-Bands® and an instructional manual would assist them to make a successful transfer from instructor-led resistance exercise to independent resistance exercise at home.

How Do We Intervene?

According to Baranowski, Anderson and Carmack (1998), behaviour change interventions work through mediating variables, rather than affecting behavioural outcomes directly. In other words, mediating variables are mechanisms through which an intervention produces its effect on behavioural outcome variables. With this fundamental issue in mind, there has been a call for research targeting mediating variables (Baranowki et al., 1998). Based on these recommendations, the present study used a theory-based intervention that targeted mediating variables drawn from social cognitive theory (i.e., self-efficacy and outcome expectations relating to resistance training).

Social Cognitive Theory

According to social cognitive theory (Bandura, 1986), human behaviour is regulated through cognitive processes. The theory identifies two major motivational cognitions: self-efficacy and outcome expectations. Self-efficacy represents beliefs about one's capabilities to perform a specific behaviour while outcome expectations are

instrumental beliefs about the link between performance of behaviour and anticipated outcomes or consequences of the behaviour (See Figure 1).

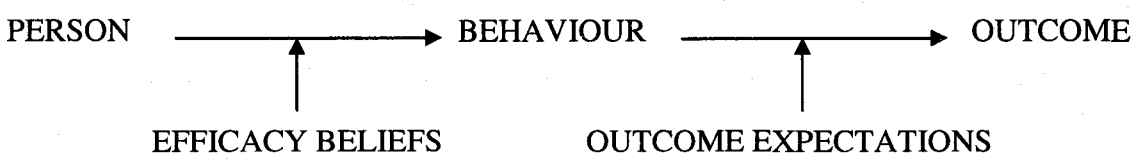

Figure 1. Self efficacy and outcome expectation constructs in the social cognitive theory (Bandura, 1997).

Self-efficacy. Self-efficacy is defined as "an individual's belief in his or her capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3). Bandura (1997) states that unless people *believe* they can produce desired outcomes through their actions they have little incentive to act. People's self-efficacy influences the courses of action they choose, how much effort they put forth, and how long they persevere (Bandura, 1997). In the cardiac rehabilitation literature, self-efficacy has been found to be predictive of adherence to cardiac rehabilitation sessions (Evon & Burns, 2004; Ewart, Stewart, Gillilan, & Kelemen, 1986) and exercise adherence post-program (Millen & Bray, 2006; Vidmar & Rubinson, 1994).

A recent study examined the relationship between self-efficacy and exercise behaviour during and after completion of cardiac rehabilitation (Millen & Bray, 2006). Self-efficacy was found to be a significant predictor of attendance in cardiac rehabilitation ($F(2, 47) = 3.17, p < .05$) and of adherence six ($\beta = .34, R^2_{adj} = .10, p < .05$)

and 12 weeks ($\beta = .32$, $R^2_{adj} = .08$, $p < .05$) post-discharge from cardiac rehabilitation. This study illustrates the potentially important role of self-efficacy in adherence to cardiac rehabilitation and continued independent exercise after program completion.

Another study examined changes in multiple forms of efficacy during and after cardiac rehabilitation and the relationships between self-efficacy, adherence to CRP, and aerobic exercise behaviour upon cardiac rehabilitation completion (Blanchard et al., 2002). Results showed significant increases in self-efficacy over the course of the cardiac rehabilitation program. However, self-efficacy had declined significantly at follow-up, which ranged from 6- to 10- weeks post-cardiac rehabilitation. Self-efficacy was significantly related to adherence during cardiac rehabilitation and independent exercise behaviour following the program.

Both theory and consistent findings from the cardiac rehabilitation literature support self-efficacy as a potentially important target variable for interventions to promote exercise. Therefore, self-efficacy was considered an important variable to target as a mediating mechanism for resistance training behaviour change in the present study of cardiac rehabilitation program participants.

Outcome expectations. Although self-efficacy has been proposed to be the most important prerequisite for behaviour change (Baronowski, Perry & Parcel, 2002) the outcomes one expects to occur as a consequence of the behaviour are also considered to be influential (cf. Rothman, Baldwin & Hertel, 2004). Outcome expectations are defined as expectations one has that an outcome will follow a given behaviour (Bandura, 1997). According to Bandura, an individual's motivation to engage in a specific behaviour is

partially based on the outcomes s/he expects as a consequence of performing or not performing that behaviour. For instance, if an individual does not know or understand the potential positive outcomes of resistance training, s/he may be less inclined to engage in that behaviour.

A review conducted by Williams, Anderson and Winett (2005) illustrated that research on outcome expectations in physical activity is limited. While outcome expectations have not been looked at with regard to resistance training in cardiac rehabilitation, research has found an association between positive outcome expectations and physical activity behaviour. One relevant study by Resnick (2001) examined factors associated with physical activity in older adults. That study found both self-efficacy and outcome expectations were associated with exercise behaviour ($r = .30$ and $r = .17$, $p < .05$, respectively). However, more research and interventions are needed to determine the effects of outcome expectations on exercise behaviour.

The present study focused on self-efficacy and outcome expectancies and made an effort to expand on previous research which has focused largely on self-efficacy alone (Bandura, 1997; Williams et al., 2005). Importantly, the study sought to manipulate these cognitions in an attempt to promote and maintain adherence to resistance training among cardiac rehabilitation participants. Researching both of these constructs stands to make an important contribution to the literature on adherence to resistance training in cardiac rehabilitation, as both are theorized to effect behaviour in the early stages of initiation and continuation of behaviour change (cf. Rothman et al., 2004).

Targeting Social Cognitive Constructs: Strength Training Manual for Cardiac Patients

Research looking at the combined influence of self-efficacy and outcome expectations on physical activity is deficient in the current literature (Williams et al., 2005). This study will target both constructs as they relate to resistance training during transition from cardiac rehabilitation through the use of an instructional manual.

Targeting Self-Efficacy

According to Bandura (1997), there are four major sources of self-efficacy. These sources include mastery experience, vicarious experience, verbal persuasion and physiological and affective states. The following is an explanation of each of these sources along with a description of how these sources were incorporated in the intervention manual.

Mastery experience. The most powerful source of self-efficacy is one's interpretation of his/her previous experiences. In this process, individuals engage in a task and interpret the outcomes of that behaviour (e.g., success, failure). These interpretations are then used as a basis for beliefs of their capabilities regarding that task or similar tasks. If past behaviour is interpreted as successful, an individual's self-efficacy for that task or similar tasks should be increased. However, if that person failed at the previous attempts at performing the task in mind, then their self-efficacy should be lower. The instructional manual provoked successful performance of exercises for patients through guided mastery in the form of easy-to-read and understand instructions, clear pictures of each exercise segment (start and finish of each exercise), and a goal-directed progression of increasing resistance.

Vicarious experience. When individuals are uncertain about their capabilities or if they lack experience with a task, the effects of observing others successfully performing the task helps inform beliefs about their own capabilities. The effects of modeling are even greater when the model shares attributes with the observer (age, medical condition, etc.). The observation of successful models should positively effect individuals' beliefs about their own capabilities. To provide participants with a form of vicarious experience, the instructional manual used photographs of same-sex cardiac rehabilitation program graduates (i.e., separate manuals for men and women) performing the resistance exercises.

Verbal persuasion. Verbal encouragement and feedback individuals receive from others also help to develop self-efficacy. Positive encouragement from a credible source can encourage and increase these beliefs. However, negative criticism can weaken self-efficacy. The instructional manual provided clear explanations of the exercises and was endorsed by a credible source (university researcher). Furthermore, pictures of models used in the manual were accompanied by 'thought bubble' statements which offered encouraging statements in an effort to increase participants' beliefs in their capabilities to perform each exercise presented.

Physiological and affective states. Emotional states and body sensations can influence one's efficacy for performing a task. For example, experiencing fear or being tired lowers efficacy, while feeling happy or excited can positively influence efficacy for a task (Bandura, 1997). The manual presented interpretations of what the participant should be feeling when engaged in resistance training, allowing him/her to understand

what normal sensations are and what possible minor discomforts s/he should be aware of. Furthermore, information was given to help alleviate any fears about participation in resistance training thereby encouraging a more positive emotional state.

Targeting Outcome Expectations

The intervention manual also targeted a number of outcome expectations regarding resistance training. Based on recommendations by Williams and colleagues (2005) cognitive, affective, behavioural outcomes, as well as outcomes related to activities of daily living were targeted in the manual.

Cognitive outcomes. Cognitive outcomes focused on what the participant could expect to learn from his/her participation in the task. The manual was designed to educate participants on resistance training by informing them about proper body position, technique and breathing.

Affective outcomes. Affective outcomes encompassed what the individual should expect to feel as a consequence of engagement in the behaviour. The manual targeted these outcomes through 'thought bubbles' on the pictures of the models. The bubbles included messages indicating that the model is having fun completing the exercises and that the exercises are safe to perform (to help decrease fear).

Behavioural outcomes. Behavioural outcomes pertaining to the behavioural capacities that might be expected to arise from engagement in the behaviour were targeted. The manual targeted these outcomes by informing patients about what they should be able to do after participation in resistance training. For example, the function(s) of the muscles used in each exercise were explained and linked to daily

activities that utilize these muscles. Providing this information was intended to help the participant to believe that these activities should become easier to do (outcome) after involvement in resistance training.

Outcomes related to activities of daily living. Outcomes related to activities of daily living included activities that may be expected to become easier to perform as a result of resistance training. The manual targeted these by listing activities of daily living that the individual might perform along with the exercises that could aid in making the performance of these activities easier.

Training Using Elastic Bands: A Safe and Practical Choice for Cardiac Rehabilitation

Both CACR and AACVPR recommend the use of elastic exercise bands as an effective resistance training option for cardiac patients. Elastic Thera-Bands® were chosen based on convenience, portability, cost and recommendations of their use as a resistance training modality by the AACVPR, which stated that elastic Thera-Bands® provide progressive resistance through a full range of motion (AACVPR, 2004).

There have been very few published studies examining the effects of training with elastic bands in the cardiac population. One study conducted by Vanbiervliet and colleagues (2003) compared high intensity resistance training with weights to elastic band exercises in cardiac rehabilitation participants. This randomized clinical trial compared patients' muscle strength at the beginning and end of a 4-week rehabilitation program. Both groups had significant increases in their strength over time for all exercises. The study concluded that the use of elastic bands was as effective as weight

lifting using weight machines and free weights with regards to increases in strength in the cardiac population and may be an attractive alternative with regards to cost.

Another study compared the effects of aerobic training plus resistance training to aerobic-only training on muscular strength, aerobic power and blood flow in cardiac rehabilitation patients (Reichert, Marzolini, & Goodman, 2003). Patients were randomly assigned to one of the two groups for a 12-week program. Patients in the aerobic-only group walked 5 days per week, while the combined group walked on 3 days and engaged in lower-body resistance training on 2 days per week. Findings revealed greater improvements in leg strength (14.7%), peak VO_2 (16.0%) in the combined group compared to the aerobic only group, which supports the addition of Thera-Bands® in CRP.

Together, results from these studies illustrate the physiological benefits cardiac rehabilitation patients can gain through use of elastic exercise bands for resistance exercise. Furthermore, these studies also demonstrate the safety of elastic bands for use in this special population. Accordingly, participants were provided with elastic Thera-Bands® to carry out their resistance training exercises for the present study.

Development of the Strength Training Manual for Cardiac Patients

The materials presented in the manuals developed for use in the present study were based on suggestions and recommendations from multiple sources. The following summarizes where the information originated and its integration into the resistance training manual. The information obtained can be categorized into four general areas

which include: 1) guidelines and progression; 2) exercises; 3) linking resistance exercises to activities of daily living and 4) safety and benefits of resistance training.

Guidelines and progression. Resistance training guidelines and progression were based on recommendations from the AACVPR (2004) and the CACR (1999). The AAVCPR recommends exercising major muscle groups 2-3 days per week. Accordingly, the manual focused on the major muscles of the upper-body (biceps, triceps, latissimus dorsi, trapezium, and deltoids). Also consistent with the guidelines, participants were asked to exercise these muscles on at least 3-days per week. Participants were instructed to progress steadily towards three sets of 10-15 repetitions for each of the five exercises. The majority of the exercises shown in the manual are also instructed unilaterally, based on recommendation from the CACR.

Breathing during resistance training is an important safety concern due to the blood pressure response. Guidelines for proper breathing techniques were based on AACVPR (2004) and stated that participants should breathe at a normal pace or rhythm and exhale during the concentric phase of the movement (when stretching the band) and inhale during the eccentric phase (when letting the band pull itself back). The manual included these guidelines to help ensure the safety of the participants.

Exercises. AACVPR (2004) guidelines recommend the major muscles groups should be exercised before smaller muscle groups are targeted. The exercises chosen for the manual focused on the major muscle groups of the upper body to minimize the number of exercises participants would need to complete. The exercises included in the

manual were: biceps curls, triceps kickbacks, front raises, rows, shoulder shrugs and seated chest press.

Linking resistance exercises to activities of daily living. The manual provided written examples of activities of daily living that utilized the major muscle groups targeted with each exercise. The innovative principle to link activities of daily living to their related exercises in the manual was drawn from research by Martin Ginis, Latimer, Brawley, Jung and Hicks (2006). That study compared the effects of resistance training to resistance training plus education on older adults' activities of daily living self-efficacy. The findings of that study revealed that older adults who received written materials linking their resistance training to their activities of daily living had higher self-efficacy to perform those activities.

Safety and benefits of resistance training. As part of the outcome expectation manipulation, the manual provided participants with information on the health benefits they may attain from engaging in resistance training. In addition, participants were provided with summaries of basic research evidence (and accompanying resources) that have illustrated the safety of resistance training when compared to other forms of exercise (i.e., aerobic).

Purpose

The purpose of this study was to examine the effects of a brief intervention involving the provision of a motivation-enhancing instructional manual and elastic Thera-Bands® on cardiac rehabilitation participants' self-efficacy, outcome expectations, and

adherence regarding upper-body resistance training during transition from a supervised, hospital-based program to self-managed, home-based exercise.

Hypotheses

The present study had four hypotheses. First, it was hypothesized that participants within the intervention group would report greater self-efficacy for resistance training at both weeks 1 and 5 when compared to the standard care group. The foundation for this hypothesis was the focus of the manual on increasing self-efficacy through the four major efficacy determinants (mastery experience, vicarious experience, verbal persuasion and physiological and affective states).

The second hypothesis was that the intervention group would report greater self-efficacy to complete activities of daily living which utilize upper-body strength at both weeks 1 and 5 when compared to the standard care group. This hypothesis was based on the presentation of exercise information in the manual, which made the connection between the muscles they were strengthening during exercise and the daily living activities they carried out using those muscles.

Third, it was hypothesized that outcome expectations for the intervention group would be significantly higher at weeks 1 and 5 when compared to the standard care group. The basis for this hypothesis was the specific presentation of outcome expectancy information in the manual. Presentation of this information was expected to raise the expectations of the intervention participants by helping them understand the likelihood of certain cognitive, behavioural, and affective outcomes occurring.

The fourth hypothesis was based on social cognitive theory (Bandura, 1997), which indicates that both self-efficacy and outcome expectations are linked to behaviour. Because self-efficacy and outcome expectations were proposed to be higher in the intervention group, it was predicted that participants in that group would show a greater adherence to resistance training over the course of the 4-week intervention when compared to the standard care group.

Method

Participants

For the present study, 40 volunteer participants (n = 8 women) were recruited from a supervised exercise-based outpatient cardiac rehabilitation program (Cardiac Heath and Rehabilitation Centre (CHRC), Hamilton, Ontario). The mean age of the sample was 61.20 years (*SD* =11.10) and participants were primarily Caucasian (95%). A high school education or greater was possessed by 85% of participants. Table 1 in the results section includes complete demographic characteristics of participants.

Inclusion criteria for the study were a minimum reading level of grade 8 and the ability to converse in English. In addition, potential participants must have been involved in resistance training during their rehabilitation classes. Patients were excluded from the study if they showed evidence of any of the following: congestive heart failure, uncontrolled arrhythmias, severe valvular disease, uncontrolled hypertension, and unstable symptoms. These exclusion criteria were based on resistance training deferral guidelines for cardiac rehabilitation set by the AACVPR (2004). Kinesiologists at the CHRC were informed of the study criteria and aided recruitment by recommending potential participants according to their medical history and exercise capacity.

In total, 133 cardiac rehabilitation patients were screened for eligibility. Based on the inclusion/exclusion criteria 57 volunteers were eligible to participate. Among those who were eligible, 40 participants completed the trial and provided complete data for analyses (see Appendix A for a flow chart of participants throughout the study).

Participants generally declined participation because their schedules were too busy or they were not interested in participating.

Design

The present study used a randomized controlled design. After baseline measures were obtained, participants were randomly assigned to one of two conditions: standard care control or intervention. Dependent variables were outcome expectations, upper-body resistance training self-efficacy, activities of daily living self-efficacy and adherence, which were assessed at three time points. Specifically, these measures were obtained one week prior to completion of the cardiac rehabilitation program, at completion of the program, and 4-weeks post-program.

Materials

Motivationally enhanced resistance training manual. A 30-page instructional resistance training manual was designed for the cardiac patients in the intervention group. The content of the manual was based on social cognitive theory, targeting self-efficacy and outcome expectations as described above. Instructions for six upper-body exercises using elastic Thera-Bands® were provided in this manual. Separate manuals were developed for men and women, which depicted gender-specific models performing the exercises (see Appendix B).

Thera-Bands®. Yellow, red, green, blue and black Thera-Bands® were used in this study. Each band offers a different amount of resistance. Bands were matched with

each participant's resistance training levels (i.e., how much weight they could lift) upon completion of their training at the CHRC.

Measures

Demographics. Participants completed a questionnaire providing information on their age, sex, marital status, education level, ethnicity, smoking status and past involvement in CRP (see Appendix C).

Resistance-training self-efficacy. Based on Bandura's (1997) recommendations, which state that self-efficacy measures should be specific and closely related to the task, resistance training self-efficacy measures were developed for this study. The scales focused on the main muscle groups of the upper body. For example, confidence to perform resistance exercises with equipment (i.e., weights or Thera-Band®) for the shoulders was assessed using the following four items: *My confidence to do this exercise using:* a) proper body position; b) the appropriate amount of resistance; c) proper breathing; and d) the correct movement is: ___. Self-efficacy for each item was rated on a scale ranging from 0 (*not at all confident*) to 10 (*completely confident*). The same four items were used to assess participants' self-efficacy for each of the five muscles groups which included back, biceps, chest, shoulders and triceps (see Appendix D). The scale showed adequate internal consistency (Tabachnick & Fidell, 2001) for measuring resistance-training self-efficacy for each exercise (See Table 2).

Activities of daily living self-efficacy. Confidence to perform activities of daily living involving the upper-body was assessed using a fifteen-item questionnaire adopted from a previous study by Martin Ginis (unpublished manuscript). Each item was rated on

a scale anchored at the extremes with 0 *(not at all confident)* to 10 *(completely confident).* An example item from this scale asked: *'How confident are you that you can carry a basket of laundry without difficulty?'* Separate questionnaires were developed for male and female participants due to sex differences in strength (see Appendix E). The scale showed adequate internal consistency (Tabachnick & Fidell, 2001) (See Table 2).

Activities of daily living frequency. Similar to recommendations by Williams and colleagues (2005) for assessing outcome expectations (see below), a decision was made to measure participants' engagement in the activities of daily living assessed by the self-efficacy measure. If participants were not currently engaged in the activity or lacked experience, then ratings of self-efficacy may have been biased (McAuley & Mihalko, 1998). With these issues in mind, participants were asked to rate the likelihood of actually performing 15 activities of daily living in the next week (baseline) and next 4-weeks (time one and two) on an 11-point scale (0 (*not at all likely*) to 10 (*completely likely*) (Appendix F). An example of an item from the scale included: *'How likely are you to carry a basket of laundry in the next four weeks?'* A mean score of five or greater for likelihood of performing the activity was used as a cut-off point for each item to ensure participants were engaging in the activities of daily living that were measured. Mean scores for each item exceeded this cut-off (lowest mean score = 6.10, highest mean score = 9.38).

Outcome expectations. Participants' cognitions regarding the likelihood of certain outcomes resulting from participation in resistance training were measured on an 11-point scale anchored at the extremes with 0 (*not at all likely)* to 10 (*completely likely).*

Baseline questionnaires measured beliefs related to the upcoming week, while the first follow-up and second follow-up questionnaires measured participants' beliefs for the following 4-weeks. As recommended by Williams and colleagues (2005), four different subscales of outcome expectations (cognitive, affective, behavioural and activities of daily living) were measured (Appendix G). Reliability analysis indicated adequate internal consistency for all subscales (Tabachnick and Fidell, 2001) (see Table 2).

Cognitive outcome expectations were assessed using three items that targeted participants' expectations regarding their knowledge of resistance training. An example item was: '*Over the next four weeks do you think it is likely that you will develop a good understanding of what your body/muscles should feel like during resistance training at home?*'

Affective outcome expectations were assessed using three items that targeted participants' expectations regarding what they would feel after resistance training. An example of an affective outcome expectation item included '*Over the next four weeks do you think it is likely that you will have fun resistance training at home?*'

Behavioural outcome expectations were measured using six items that targeted participants' expectations regarding what they thought they would achieve or would be able to perform after resistance training. An example of a behavioural outcome expectation item included: "*Over the next four weeks do you think it is likely that you will become stronger from resistance training at home?*" Four items from the original 10-item scale were removed from this scale because they were judged to be 'not applicable' by over half the participants.

Activities of daily living outcome expectations were measured using three items that targeted participants' expectations for being able to perform certain activities of daily living after resistance training. An example of an activities of daily living outcome expectation item was: '*Over the next four weeks do you think it is likely that opening a heavy door with one hand will become easier from resistance training at home?*'

Value of outcomes. Based on recommendations by Williams and colleagues (2005), when measuring individuals' expectations about an outcome, the value of that outcome should be measured concurrently. The reasoning behind this recommendation is that individuals can believe an outcome is a likely consequence of behaviour, but if they place little or no value on that outcome then they may still be unlikely to perform the behaviour. To satisfy this recommendation, a decision was made to measure the importance participants placed on each outcome expectation assessed (Appendix G). For each outcome, participants rated how important that outcome was to them, using a 10-point scale ranging from 0 (*not at all important*) to 9 (*very important*). An example of an item from this scale included: '*How important is it to you to have fun during strength training?* A mean value of five or greater was used as a cut-off point for each item to ensure participants valued the outcomes that were assessed. Mean scores for each item exceeded this cut-off (lowest mean score = 5.63, highest mean score = 8.28).

Resistance training behaviour. Resistance training behaviour was measured using self-report log books in which participants recorded the days they trained and the number of sets of resistance exercise they completed on each training day. Resistance training behaviour was assessed at two separate time points. The first timeframe included the

week between baseline and time one measurements. At the time one meeting, logbooks were reviewed with each participant for clarity and completeness. The second timeframe included the 4-weeks between time one and time two measurements (see Appendix H). At the time two meeting, logbooks were reviewed with each participant and resistance training behaviour was operationalized as the number of sets of each exercise that were completed during the 4-week timeframe.

Manipulation check. A manipulation check was carried out with the intervention group one week after receiving the intervention materials to determine if participants had become familiar with and understood the information presented in the manual. The manipulation check included two questions. First, participants were asked to describe or demonstrate to the researcher each of the exercises presented in the manual. Second, participants were asked to identify one or more daily activities that were linked to each resistance exercise in the manual. Participants were included in the analysis if they were able to identify a minimum of four of the six exercises and at least one activity of daily living associated with each exercise identified. One participant was removed from the analysis for failure to meet the above criteria.

Procedure

Screening. Both the student investigator and the exercise leaders of the cardiac rehabilitation program screened all patients being discharged prior to their recruitment for the study. Patient files and exercise logbooks were reviewed to determine whether or not patients satisfied the inclusion and exclusion criteria. Exercise leaders identified any additional health problems that may have prevented patients from engaging in upper-

body resistance training (e.g., severe osteoarthritis in the hands) and recommended or deferred them accordingly.

Recruitment. The student investigator approached patients recommended for the study two weeks prior to their discharge from the cardiac rehabilitation program. Once introductions were completed, a verbal explanation of the study was provided and a consent form (see Appendix I) was given to the patient to take home and review. To determine their participation, telephone numbers were obtained from the patients so that the student investigator could contact them to confirm their interest in being involved in the study and to arrange their first meeting. If the patients declined participation, the investigator asked them to provide a reason for declining and thanked them for their time and consideration.

Baseline Measures. One week prior to discharge from the program, participants met with the student investigator before or after one of their regularly scheduled sessions of cardiac rehabilitation. The student researcher reviewed consent forms with participants and had them sign. The consent form explained the purpose of the study, their responsibilities as a participant, confidentiality of the information they provided, their right to withdraw from the study at any time and the contact information of the student investigator, student's supervisor and the ethics board. Copies of the signed consent forms were given to the participants, placed in their health records, and sent to their cardiologists. The original signed form stayed with the researcher.

Participants then filled out questionnaires pertaining to demographics, outcome expectations for resistance training and the importance of those outcomes, self-efficacy

for resistance training and activities of daily living self-efficacy and frequency. After completion of the questionnaire package, participants were randomly assigned to either the intervention group or the standard care control group.

Standard care control group. Participants assigned to this group were informed that they would not be receiving any of the intervention materials until the completion of the study. They were told that they should carry on with their exercise plans as instructed by the program staff at the CHRC. Participants were also given a resistance-training logbook and were asked to keep track of any upper-body resistance training they completed on their own. Participants received an orientation to the upper-body resistance training exercises listed in the logbook and were made aware that most of the exercises in the logbook were exercises they were currently completing in their rehabilitation classes. At that time, a second appointment was scheduled with the student investigator and participants received an appointment reminder card (see Appendix J).

Intervention group. Participants assigned to this group were given the resistance-training manual and Thera-Bands® which were matched to the participants' present resistance training levels in the cardiac rehabilitation program. Participants also received instructions on how to care for their Thera-Bands® (see Appendix K) and a logbook to keep track of their resistance training. They each received an orientation to the exercises in the manual and how to correctly use their Thera-Bands®. At that time, a second appointment was scheduled with the student investigator and participants received an appointment reminder card.

Time one testing (1-week later). Participants in the intervention group completed the manipulation check at the start of this testing session. Completed logbooks were collected and a 4-week logbook was provided. Questionnaire measures of outcome expectations for resistance training and importance of outcomes, self-efficacy for resistance training and activities of daily living self-efficacy and frequency were completed. A final appointment was scheduled for 4-weeks later and participants were given another reminder card.

Time two testing (4-weeks later). One week prior to their last scheduled meeting, the student investigator contacted participants by telephone to confirm the meeting date, time and place of this last appointment. Participants met with the student investigator to complete a final questionnaire package. This questionnaire package was identical to the package completed at Time 1. Completed logbooks were collected at this time and participants were thanked for their participation and debriefed (See Appendix L). Participants in the standard care control group were reminded that in 12-week's time all exercise materials used in the study would be made available to them to assist in their home-based resistance training and that the researcher would contact them again at that time.

Results

Hypothesis Testing

The following data analysis procedures were completed for each hypothesis test.

1) Statistical outliers were identified (+/- 3 SD from mean).

2) Normality of data was assessed by observing the skewness and kurtosis and the Kolmogorov-Smirnov normality test.

3) MANOVAs were computed

4) Univariate ANOVAs were computed and homogeneity of variance assumption was tested using Levene's test. Where indicated, Brown-Forsythe and Welch's version of the *F*-ratio were computed to adjust for unequal variances.

Prior to analyses, distribution of scores obtained on the various dependent measures were examined for outliers. In the variable-by-variable analysis, some extreme scores were identified (~ +/- 3SD), but were retained due to the fact that scores were obtained from a heterogenous sample representative of a heterogenous population (Tabachnick & Fidell, 2001). Normality tests for each variable indicated that some of the distributions were mildly to moderately skewed. However, based on recommendations by Tabachnick and Fidell (2001), indicating the robustness of statistical procedures despite non-normality in the case when there is sufficient sample size and when two-tailed tests are used, a decision was made to continue without transformation of the data.

Descriptive Statistics

Demographic information is summarized in Table 1. Intervention and control groups were compared to investigate whether groups differed based on demographic

variables. Results from chi-square analysis revealed that groups did not differ on these variables (Table 3). Age and participant attendance at CHRC rehabilitation classes was also compared. Results of separate ANOVAs showed that age and attendance did not differ between groups, $F(1, 38) = 0.001$, $F(1, 38) = 1.39$, $p > .05$, respectively.

Table 1

Demographic Characteristics of Participants in Intervention and Standard Care Control Groups

Variable	Intervention (n = 20)			Standard Care Control (n = 20)		
	%	*M*	*SD*	%	*M*	*SD*
Age		61.15	11.78		61.25	10.69
CRP attendance		88.55	6.30		84.50	14.00
Marital Status						
Married	60			85		
Widowed	20			0		
Single	10			5		
Divorced	5			5		
Not married, living with partner	5			5		
Medical History						
CABG	60			55		
MI	15			25		
PTCA	10			15		
Risk Factor Management	5			5		
Congenital Heart Disease	5			0		
Heart Transplant	5			0		
Ethnicity						
Caucasian	90			100		
Other	10			0		
Employment Status						
Employed	35			50		
Retired	65			50		

Smoking Status		
Smoker	5	0
Non-smoker	95	100
Education Level		
< High School	20	10
High School	10	10
College	70	80

Note. Scores for categorical variables are represented by percentages. Scores for continuous variables are represented by means and standard deviations.

Table 2

Internal Consistencies (Cronbach's α) for Resistance Training Self-efficacy, Activities of Daily Living Self-efficacy and Outcome Expectation Scales.

Scale	Baseline	Week 1	Week 5
Back self-efficacy	.97	.95	.85
Biceps self-efficacy	.97	.97	.87
Chest self-efficacy	.97	.97	.90
Shoulder self-efficacy	.98	.97	.90
Triceps self-efficacy	.98	.96	.84
ADL self-efficacy	.92	.91	.92
Cognitive outcome expectations	.94	.75	.77
Affective outcome expectations	.95	.87	.87
Behavioural outcome expectations	.90	.83	.82
ADL outcome expectations	.97	.93	.90

Note. ADL = activities of daily living. Back, Biceps, Chest, Shoulders, Triceps Self-efficacy = 4 items each, Scheduling self-efficacy = 5 items, ADL SE = 15 items, Cognitive outcome expectations = 3 items, Affective outcome expectations = 3 items, Behavioural outcome expectations = 6 items, ADL outcome expectations = 3 items. All reliabilities were acceptable ($\alpha > .70$), Tabachnick & Fidell, 2001).

Table 3

Chi-Square Analyses to Determine Equivalence Between Intervention and Standard Care Control Groups

Demographic Variable	x^2	df	*p*
Marital Status	5.19	4	.27
Medical History	2.74	5	.74
Ethnicity	2.11	1	.15
Employment Status	0.92	1	.34
Smoker	1.03	1	.31
Education Level	9.18	7	.24

Hypothesis 1: Upper-body resistance training self-efficacy will be higher in the intervention group compared to the standard care control at weeks 1 and 5.

Descriptive statistics contrasting self-efficacy scores for the intervention and standard care control groups at baseline, time 1 and time 2 are presented in the left hand columns of Table 4 and are displayed graphically in Figures 2-6.

Comparisons were made to determine if differences existed at baseline between groups. A one-way between-groups MANOVA was conducted with group (intervention vs. standard care control) as the independent variable and resistance training self-efficacy for back, biceps, chest, shoulders and triceps as the dependent variables. Results of the MANOVA showed that both groups were not significantly different at baseline, Wilks' $\lambda = 0.904$, $F(5, 34) = 0.725$, $\eta^2 = .10$, $p > .05$; observed power = 0.23.

Results of an identical MANOVA for self-efficacy at week 1 were not significant, Wilks' $\lambda = 0.891$, $F(5, 34) = 0.830$, $\eta^2 = .11$, $p > .05$; observed power = 0.26. In contrast, at week 5 the MANOVA was significant, $F(5, 34) = 2.589$, $\eta^2 = .276$, $p < .05$; Wilks' $\lambda = 0.724$, observed power = 0.73, indicating participants in the intervention group reported higher self-efficacy overall compared to the standard care control group. Follow-up univariate tests (ANOVA) illustrated significant main effects for group on four of the five self-efficacy variables. Results indicated that the intervention group had significantly greater self-efficacy for performing resistance training exercises for the back, chest, shoulders, and triceps.

Hypothesis 1: Upper-body resistance training self-efficacy will be higher in the intervention group compared to the standard care control at weeks 1 and 5.

Descriptive statistics contrasting self-efficacy scores for the intervention and standard care control groups at baseline, time 1 and time 2 are presented in the left hand columns of Table 4 and are displayed graphically in Figures 2-6.

Comparisons were made to determine if differences existed at baseline between groups. A one-way between-groups MANOVA was conducted with group (intervention vs. standard care control) as the independent variable and resistance training self-efficacy for back, biceps, chest, shoulders and triceps as the dependent variables. Results of the MANOVA showed that both groups were not significantly different at baseline, Wilks' $\lambda = 0.904$, $F(5, 34) = 0.725$, $\eta^2 = .10$, $p > .05$; observed power = 0.23.

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Table 4

Differences between Intervention and Standard Care Control Groups on Resistance Training Self-efficacy

	Intervention (n = 20)		Standard Care Control (n = 20)					
Source	*M*	*SD*	*M*	*SD*	*df*	*F*	η^2	*Power*
Back self-efficacy								
Baseline	6.93	2.55	6.81	3.09	1, 38	0.02	0.01	0.05
Week 1	8.60	1.28	8.45	2.29	1, 38	0.07	0.01	0.06
Week 5	9.16	0.94	7.79	1.62	1, 38	10.75**	0.22	0.89
Biceps self-efficacy								
Baseline	8.44	1.28	8.35	1.87	1, 38	0.03	0.01	0.05
Week 1	8.70	1.35	8.76	2.23	1, 38	0.01	0.01	0.05
Week 5	9.20	0.93	8.80	1.26	1, 38	1.30	0.03	0.20
Chest self-efficacy								
Baseline	7.80	1.69	7.54	2.84	1, 38	0.13	0.01	0.06
Week 1	8.64	1.30	8.51	2.18	1, 38	0.05	0.01	0.06
Week 5	9.24	0.80	8.51	1.42	1, 38	3.95*	0.09	0.49
Shoulder self-efficacy								
Baseline	7.64	1.96	7.40	3.12	1, 38	0.08	0.01	0.06
Week 1	8.54	1.38	8.51	2.20	1, 38	0.01	0.01	0.05
Week 5	9.20	0.99	8.30	1.52	1, 38	4.94*	0.12	0.58
Triceps self-efficacy								
Baseline	7.91	1.63	7.23	3.13	1, 38	0.76	0.02	0.14
Week 1	8.55	1.48	8.46	1.99	1, 38	0.03	0.01	0.05
Week 5	9.25	0.79	8.46	1.21	1, 38	5.91*	0.13	0.66

Note. Self-efficacy scores can range from 0 – 10. * $p < .05$, ** $p < .01$

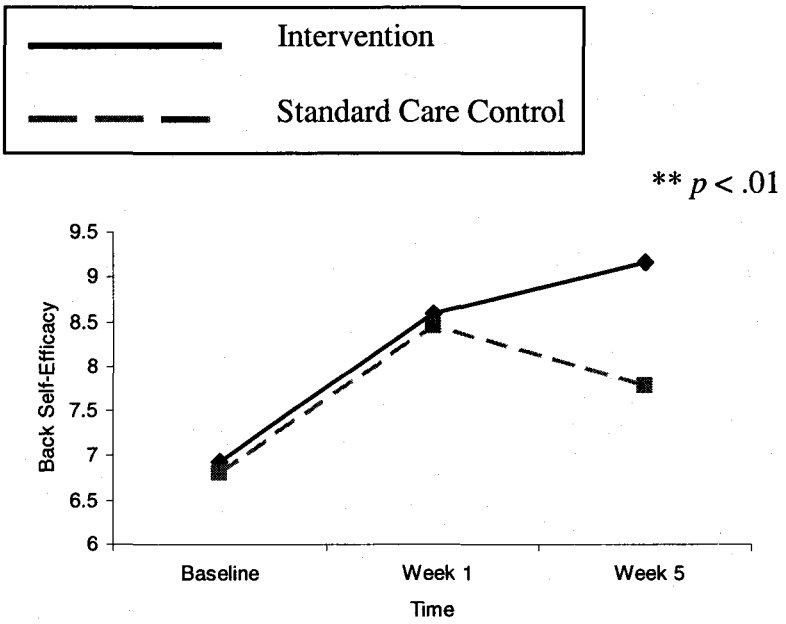

Figure 2. Self–efficacy to perform back exercises at baseline, weeks 1 and 5. Significant effect indicates difference between standard care control and intervention groups at week 5.

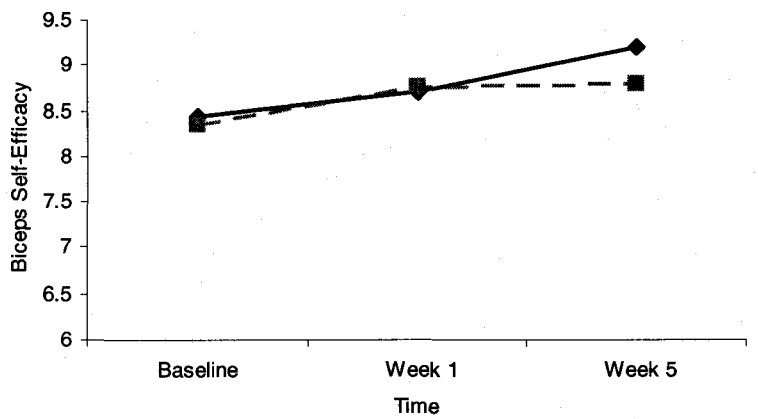

Figure 3. Self-efficacy to perform biceps exercises at baseline, weeks 1 and 5. No significant differences found between standard care control and intervention groups.

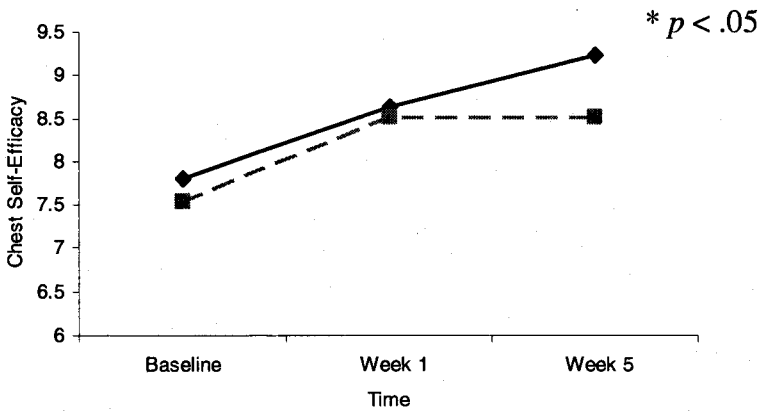

Figure 4. Self–efficacy to perform chest exercises at baseline, weeks 1 and 5. Significant effect indicates difference between standard care control and intervention groups at week 5.

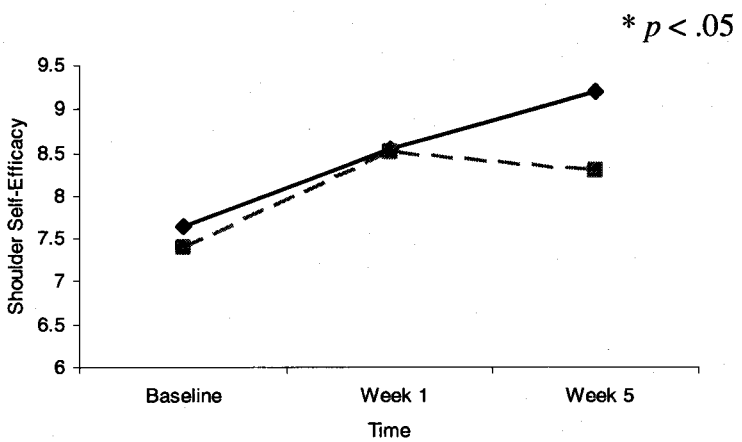

Figure 5. Self–efficacy to perform shoulder exercises at baseline, weeks 1 and 5. Significant effect indicates difference between standard care control and intervention groups at week 5.

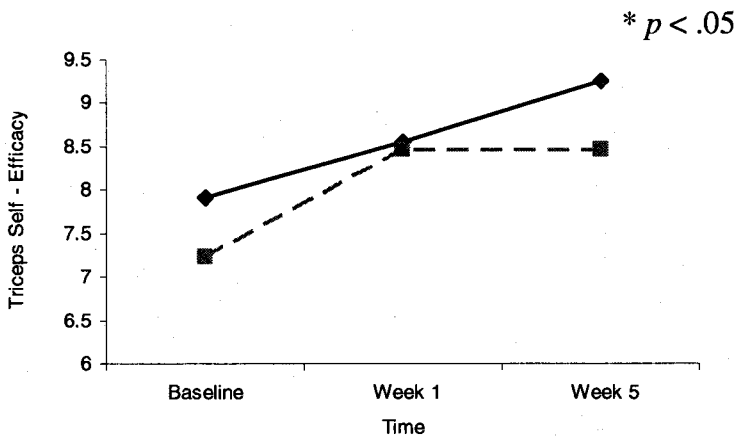

Figure 6. Self–efficacy to perform triceps exercises at baseline, weeks 1 and 5. Significant effect indicates difference between standard care control and intervention groups at week 5.

Hypothesis 2: Activities of daily living self-efficacy will be higher in the intervention group compared to the standard care control group at weeks 1 and 5.

Descriptive statistics contrasting activities of daily living self-efficacy scores for the intervention and standard care control groups at baseline, time 1 and time 2 are presented in the left hand columns of Table 5 and are displayed graphically in Figure 7.

Separate ANOVAs were computed for baseline, weeks 1 and 5 with group (intervention vs. standard care control) as the independent variable and activities of daily living self-efficacy as the dependent variable. Baseline comparisons demonstrated no group differences, $F(1, 38) = 0.16$, $p > .05$, while additional ANOVAs also indicated no significant differences at week 1, $F(1, 38) = 0.76$, $p > .05$ or week 5, $F(1, 38) = 0.47$, $p > .05$. As illustrated by these results, both groups were very efficacious throughout the study.

Table 5

Differences between Intervention and Standard Care Control Groups on Activities of Daily Living Self-Efficacy

	Intervention (n = 20)		Standard Care Control (n = 20)			
Source	*M*	*SD*	*M*	*SD*	*df*	*F*
Activities of daily living self-efficacy						
Baseline	9.10	0.95	8.97	1.17	1, 38	.156
Week 1	9.12	0.75	9.34	0.87	1, 38	.761
Week 5	9.17	1.11	9.38	0.88	1, 38	.465

Note. Self-efficacy scores can range from 0 – 10. * $p < .05$. ** $p < .01$.

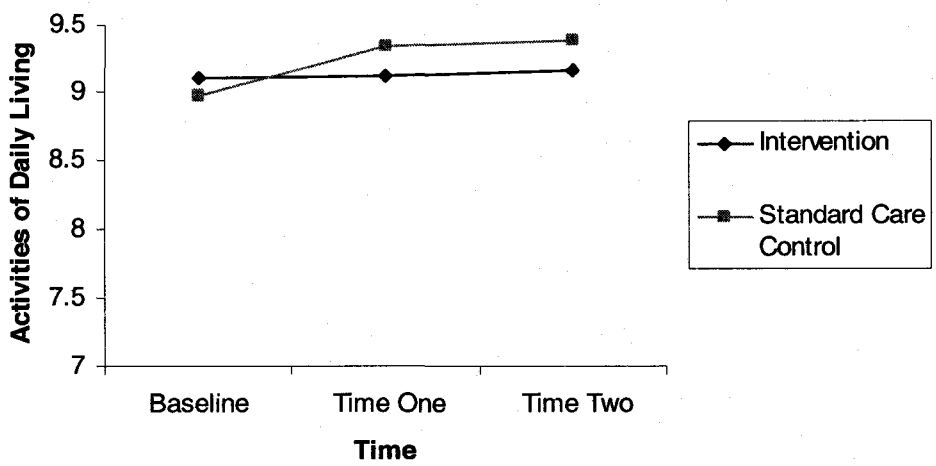

Figure 7. Self–efficacy to perform activities of daily living at baseline, weeks 1 and 5. No significant differences found between standard care control and intervention groups.

Hypothesis 3: Outcome expectations will be higher in the intervention group compared to the standard care control at weeks 1 and 5.

Descriptive statistics contrasting outcome expectations scores for the intervention and standard care control groups at baseline, time 1 and time 2 are presented in the left hand columns of Table 6 and are displayed graphically in Figures 8-11.

A one-way between-groups MANOVA was computed with group (intervention vs. standard care control) as the independent variable and cognitive, affective, behavioural and activities of daily living outcome expectations at baseline as the dependent variables. No significant differences were found at baseline between groups, Wilks' $\lambda = 0.941$, $F(4, 35) = 0.550$, $\eta^2 = .06$, $p > .05$; observed power = 0.17.

At week 1, the MANOVA for outcome expectations was not significant, Wilks' $\lambda = 0.792$, $F(4, 35) = 2.30$, $\eta^2 = .21$, $p > .05$; observed power = 0.61. However, because the graphic data indicated some differences were larger than others, univariate follow-up tests were carried out. A significant Levene's test indicated the variance between groups was not equal ($p > .05$) on affective outcome expectations. To adjust for the unequal variances, a separate univariate test was conducted using the Brown-Forsythe and Welch's version of the *F*-ratio. Results indicated participants in the intervention group were more likely to believe affective outcomes would result from resistance training than the standard care control group, $F(1, 38) = 5.31$, $p < .05$.

At week 5 the MANOVA was not significant, Wilks' $\lambda = 0.18$, $F(5, 34) = 1.86$, $\eta^2 = .175$, $p > .05$, observed power = 0.51. Again, because the graphic results indicated some differences were larger than others, univariate follow-up tests were carried out.

Results of those tests showed main effects for group on both affective and activities of daily living outcome expectations. Furthermore, the between-group main effect for behavioural outcome expectations approached significance ($p < .06$). Assumption of homogeneity of variance was met for affective outcome expectations ($p > .05$), but was not met for activities of daily living outcome expectations ($p < .05$). To adjust for the unequal variances, a separate univariate test was conducted using the Brown-Forsythe and Welch's version of the *F*-ratio. Results of those tests indicated participants in the intervention group were more likely to believe activities of daily living would become easier as a consequence of resistance training when compared to the standard care control group $F(1, 38) = 4.10, p < .05$.

Table 6

Outcome Expectation Differences between Intervention and Standard Care Control Groups

	Intervention ($n = 20$)		Standard care control ($n = 20$)					
Source	*M*	*SD*	*M*	*SD*	*df*	*F*	η^2	*Power*
Cognitive outcome expectations								
Baseline	6.85	2.30	7.00	2.20	1	0.04	0.01	0.06
Week 1	8.53	0.93	7.95	1.29	1	2.67	0.07	0.36
Week 5	8.65	0.81	8.13	1.16	1	2.13	0.05	0.30
Affective outcome expectations								
Baseline	6.60	2.22	6.17	2.19	1	0.39	0.01	0.09
Week 1	7.75	1.24	6.65	1.74	1	5.31*	0.12	0.61
Week 5	8.07	1.63	6.70	1.66	1	6.92*	0.15	0.73
Behavioural outcome expectations								
Baseline	6.55	2.30	6.25	2.35	1	0.16	0.01	0.07
Week 1	7.22	1.65	6.80	2.09	1	0.49	0.01	0.11
Week 5	8.08	1.57	7.14	1.43	1	3.93	0.09	0.49
Activities of daily living outcome expectations								
Baseline	6.07	3.05	5.32	3.19	1	0.58	0.02	0.12
Week 1	7.40	2.19	6.32	2.72	1	1.92	0.05	0.27
Week 5	8.12	1.70	6.68	2.67	1	4.10*	0.10	0.51

Note. Outcome expectation scores can range from 0 – 10. * $p < .05$. ** $p < .01$.

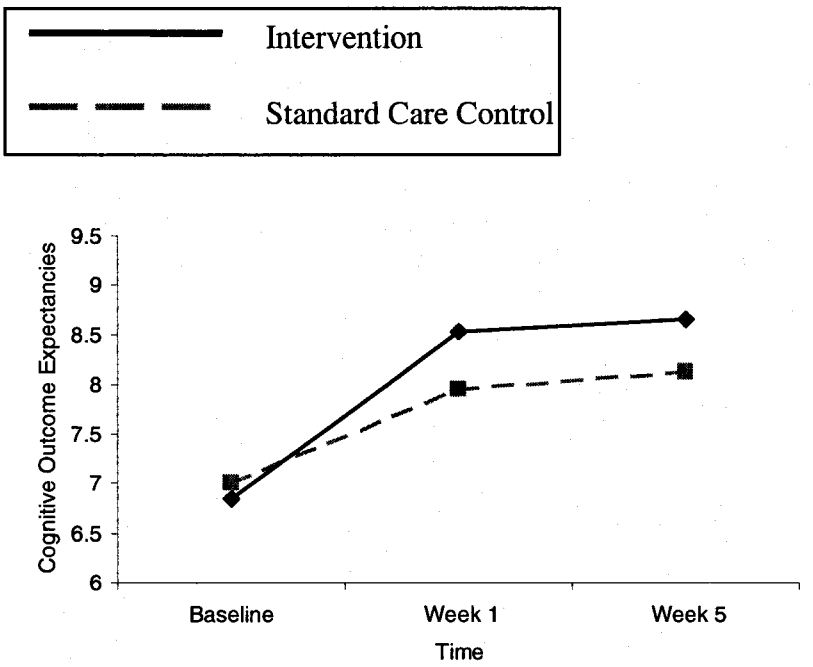

Figure 8. Cognitive outcome expectations at baseline, weeks 1 and 5. No significant differences between standard care control and intervention groups.

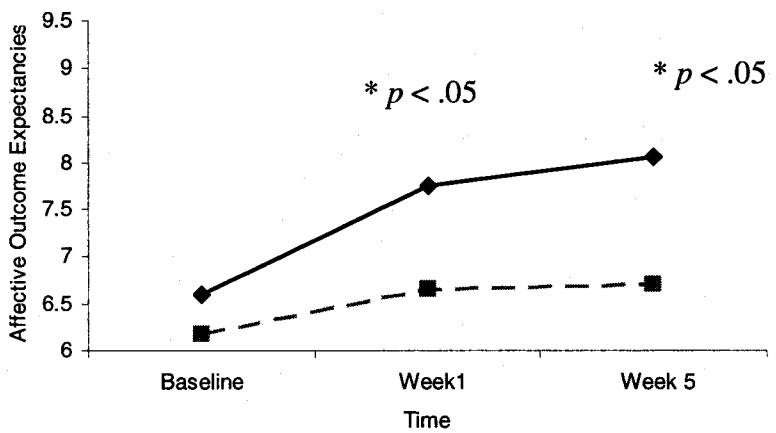

Figure 9. Affective outcome expectations at baseline, weeks 1 and 5. Significant effects indicate differences between standard care control and intervention groups at weeks 1 and 5.

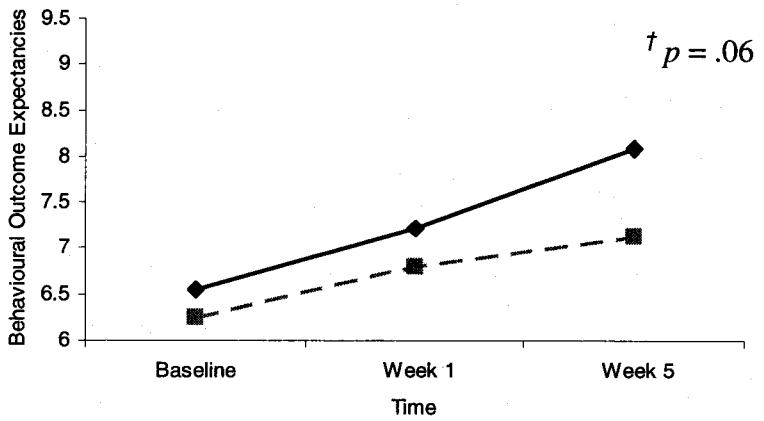

Figure 10. Behavioural outcome expectations at baseline, weeks 1 and 5. Non-significant trend ($p = .06$) indicates a difference between standard care control and intervention groups at week 5.

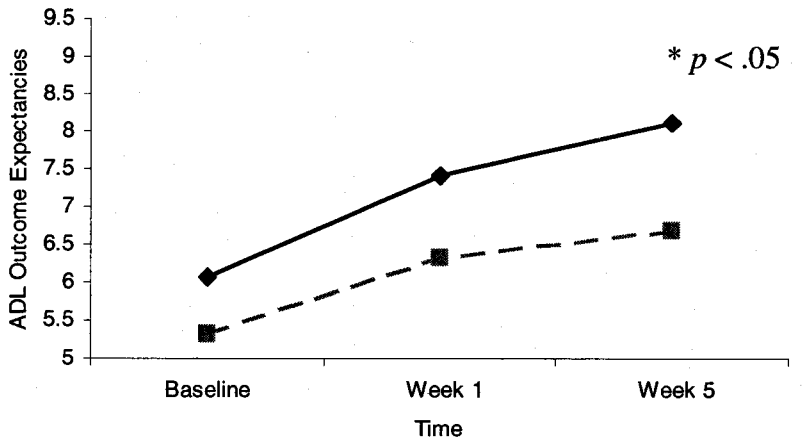

Figure 11. Activities of daily living outcome expectations at baseline, weeks 1 and 5. Significant effect indicates difference between standard care control and intervention groups at week 5.

Hypothesis 4: Adherence to upper-body resistance training will be higher in the intervention group compared to the standard care control for the 4-week timeframe.

Descriptive statistics contrasting adherence scores for the intervention and standard care control groups at time 2 are presented in the left hand column of Table 7 and are displayed graphically in Figure 12.

To test this hypothesis a one-way between-groups MANOVA for adherence was conducted for the 4-week timeframe with group (intervention vs. standard care control) as the independent variable and average number of sets over the 4-weeks of home-based resistance training for biceps curls, triceps pushdowns, front raises, shrugs, seated rows and chest press as the dependent variables.

Results for the MANOVA for adherence was significant, Wilks' $\lambda = 0.437$, $F(6, 33) = 7.09$, $\eta^2 = .56$, $p < .001$, observed power = .998. Univariate follow-up ANOVA tests showed that the intervention group completed significantly more upper-body resistance exercises when compared to standard care controls on five of the six exercises. The intervention group completed a greater number of sets of triceps pushdowns, front raises, shrugs, seated rows, and chest press. Assumptions for homogeneity of variance were met for four of the six ANOVAs. To adjust for unequal variances in the remaining two tests, separate univariate tests were conducted using the Brown-Forsythe and Welch's version of the F-ratio. Results of those tests indicated the intervention group completed significantly more sets of these exercises when compared to the standard care control group, $F(1, 38) = 39.36$, $p < .05$ and $F(1, 38) = 4.74$, $p < .05$ for seated row and shrugs, respectively.

Table 7

Adherence to Upper-body Resistance Training Differences between Intervention and Standard Care Control Groups

	Intervention (n = 20)		Standard care control (n = 20)					
Exercise	*M*	*SD*	*M*	*SD*	*df*	*F*	η^2	*Power*
Biceps Curls	29.30	13.07	22.15	21.92	1	1.57	0.04	0.23
Triceps Pushdowns	29.15	13.27	11.45	17.62	1	12.73***	0.25	0.94
Front Raises	29.10	13.18	15.35	21.35	1	6.01*	0.14	0.67
Shrugs	29.85	13.00	16.49	24.40	1	4.74*	0.11	0.56
Seated Row	28.35	13.48	5.10	9.65	1	39.36***	0.51	1.00
Chest Press	29.95	14.49	15.05	17.10	1	8.89**	0.19	0.83

Note. Adherence is represented as the average number of sets completed during 4 weeks of home-based exercise.
* $p < .05$. ** $p < .01$. ***$p < .001$.

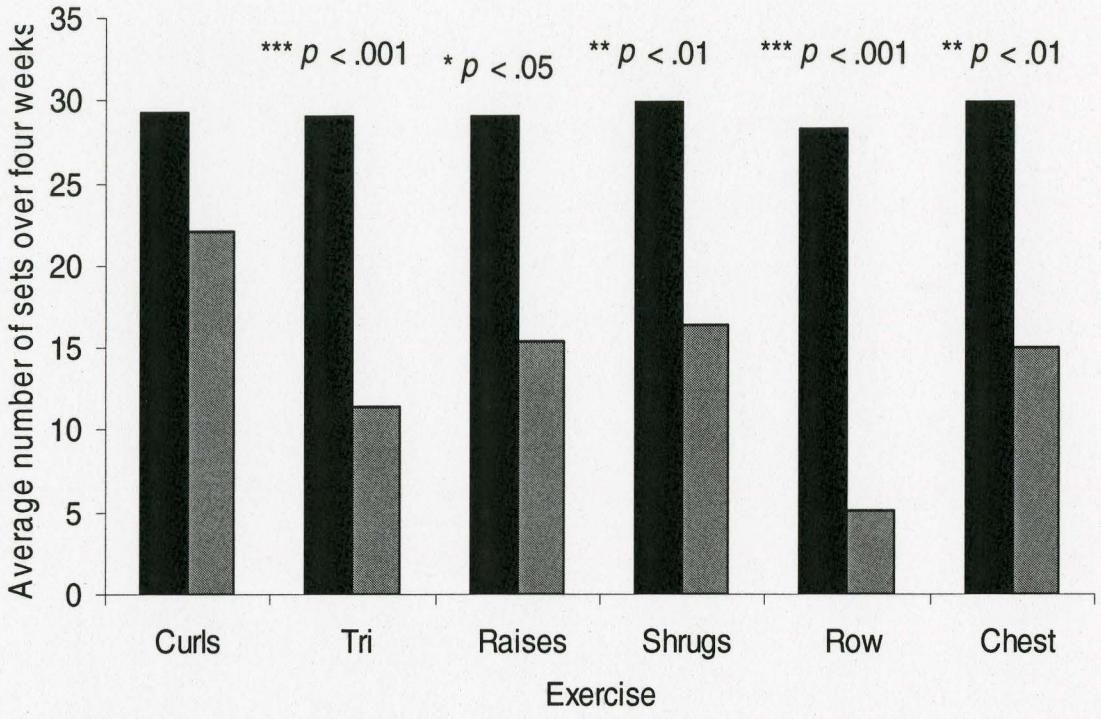

Figure 12. Average number of sets of upper-body resistance training completed over the 4-weeks of home-based exercise for the intervention and standard care control groups.

Discussion

The purpose of this study was to examine the effects of a brief intervention involving the provision of a motivation-enhancing instructional manual and elastic Thera-Bands® on cardiac rehabilitation participants' self-efficacy, outcome expectations for, and adherence to upper-body resistance training during transition from a supervised, hospital-based program to self-managed, home-based exercise. The study was designed to stimulate self-efficacy beliefs and to ingrain positive outcome expectations for resistance training behaviours. Findings from this study illustrated that both of these cognitions were stronger in the intervention group when compared to the standard care control group at the completion of a 5-week intervention. In addition, the intervention group engaged in significantly greater amounts of resistance training than controls. The latter finding is especially encouraging in light of the theoretical basis of the intervention and its intended outcomes. The following sections will discuss these results in more detail and also address some of the implications and limitations of the study as well as future directions for research.

Effect of the Intervention on Self-Efficacy

The findings from the present study showed that cardiac rehabilitation participants who were provided with a motivationally-enhanced manual and Thera-Bands® had stronger self-efficacy for doing home-based resistance training compared to a control group.

Resistance training self-efficacy did not differ between groups one week after baseline; however, differences were evident after 4-weeks. One issue that arises when

interpreting these results is that both groups were still active members of a cardiac rehabilitation program at the first measurement point (week one assessment). At that time, all participants were undertaking resistance training at the hospital and lacked experience in resistance training outside of the program. Bandura (1997) indicates that without experience, individuals are unable to accurately rate their confidence for a task and may over- or under-estimate their confidence. Therefore, inexperience and ambiguity surrounding independent, home-based resistance training may have masked the intended effects of the intervention at that early stage of the intervention.

When resistance-training self-efficacy was measured again 4-weeks following completion of cardiac rehabilitation, the intervention group was more efficacious in performing components of resistance training exercises compared to the control group. This finding was consistent with the hypothesis and can also be related to previous research by Blanchard and colleagues (2002). Blanchard and colleagues found that task and barrier self-efficacy for aerobic activities declined 6- to 10-weeks following a cardiac rehabilitation program. Anticipating there might be a decline in self-efficacy for resistance training following completion of rehabilitation, the present study aimed to promote or, at least, preserve self-efficacy after completion of cardiac rehabilitation. Consistent with Blanchard's (2002) research, after 4-weeks on their own, the control group in this study reported lower self-efficacy when compared to the intervention group. This finding suggests that the introduction of the manual and Thera-Bands® assisted in the preservation of participants' resistance training self-efficacy and may have helped to

slow or stop the natural decline in self-efficacy that has been shown post-CRP in previous research (also cf. Moore et al. 2006).

One explanation for the differences in self-efficacy that emerged between the intervention and control groups during their transition to home-based resistance training relates to successfully targeting the sources of self-efficacy through the intervention material. The manual was designed to manipulate self-efficacy through verbal persuasion, modelling, physiological arousal, and guided mastery. Although the design of the study did not allow examination of the various manipulations independently, it is consistent with theory that the sources had a concerted effect on self-efficacy. Based on theory, however, the strongest determinant of self-efficacy is mastery experience (Bandura, 1997). This predictor could not be directly targeted through a manual-based intervention. Nonetheless, the behavioural data showing the intervention group exercised more often indicates that they were likely to have developed a stronger sense of mastery with home-based resistance training as well.

While the majority of the self-efficacy measures showed differences between groups, activities of daily living self-efficacy did not differ between groups at any time point. Rather, both groups sustained high self-efficacy throughout the duration of the study. One interpretation of these findings is that their previous experience in cardiac rehabilitation left most participants highly functional. The average rating on the activities of daily living self-efficacy scale was quite high ($\geq$ 9 out of 10), which indicates a ceiling effect. It is possible, then, that the activities comprising that measure may have been easy

for all participants to carry out and therefore lacked sensitivity to detect differences between groups.

Considered in concert, the self-efficacy findings were positive and provided solid evidence that the intervention group's greater self-efficacy overall was resultant from their utilization of the intervention material.

Effect of the Intervention on Outcome Expectations.

In addition to positive results relating to self-efficacy, the results pertaining to outcome expectations are also promising. While no differences were found between groups on cognitive, behavioural and activities of daily living outcome expectations one-week after the start of the intervention, participants in the intervention group indicated that they were more likely to have fun, like and enjoy resistance training (affective outcomes) on their own compared to the control group. This finding may be accounted for by way of both the manual being effective in enhancing affective outcome expectations and the novelty of the Thera-Band® exercises compared to the exercise machines and free weights they were using in the CRP. This is an important finding in the present study, as Williams and colleagues (2005) have indicated that affective outcomes may have a profound influence on exercise behaviour, but that this form of outcome expectation has been under-investigated. Based on findings from the present study, affective outcome expectations may be quite amenable to change and could play a role in the greater engagement in resistance training in short-term interventions. These issues should be investigated in future research.

In line with the hypotheses, 4-weeks following completion of cardiac rehabilitation, intervention participants continued to have higher affective outcome expectations than the standard care control participants and showed higher scores on activities of daily living and behavioural outcome expectations ($p = .06$). These findings suggest that the intervention had a positive impact on these beliefs. It may be that cardiac patients are often not aware of the positive outcomes that may result from incorporating resistance training into their weekly exercise routines and through the use of an instructional and educational manual these outcomes became more salient. The lower outcome expectations evident in the control group may also highlight the need for interventions (like the present one) to be conducted to help incur positive beliefs about resistance training in the cardiac population.

While most of the outcome expectation results were positive, contrary to the hypotheses, there were no differences between groups on cognitive outcome expectations. One explanation for these findings is that the items used to measure what individuals believe they will *think* as an outcome of resistance training was not captured effectively in the questionnaire items that measured this construct. It is also possible that the potential for positive cognitive outcomes to arise from resistance training was not effectively articulated in the manual.

Outcome expectations have received little attention in research when compared to self-efficacy beliefs. However, both self-efficacy and outcome expectations can co-exist in the mind prior to and during behavioural enactment (Bandura, 1997; Williams et al. 2005). Therefore, both of these constructs may act as determinants of behaviour and

should be targeted through interventions in order to influence behaviour change (Rodgers & Brawley, 1991). A majority of interventions designed to change outcome expectations have been unsuccessful; however, based on recommendations by Williams and colleagues (2005) to improve the content of such interventions, the following suggestions were integrated into the design of the study: an increased awareness of the benefits associated with the behaviour and suggesting strategies for overcoming barriers to physical activity. The manual listed benefits associated with engagement in resistance training while the provision of the instructional manual and Thera-Bands® were intended to minimize barriers that rehabilitation graduates may be faced with (i.e., knowledge of, and access to, resistance training equipment).

Effects of the Intervention on Resistance Training Adherence

Although adherence was not directly targeted in this study, it was an intended indirect outcome of the intervention that can be explained theoretically. As discussed in the previous sections, both self-efficacy and outcome expectations were greater in the intervention group and the change in behaviour in the intervention group can be attributed to the intervention targeting these two cognitive variables (Baranowski et al. 1998).

In past research, adherence to aerobic forms of exercise (e.g., walking) after cardiac rehabilitation has been shown to drop off dramatically (Bock et al., 2003; Moore et al. 2006) despite the relative simplicity of those activities. Adherence to resistance training after cardiac rehabilitation has not been examined in previous studies of non-adherence, but in comparison, this form of training is much more complex and requires

more knowledge and equipment than aerobic training. By extension of those earlier findings, there was an expectation that adherence to resistance training following standard care cardiac rehabilitation would be nominal.

Because adherence to resistance training has not been examined in previous research, the control group in the present study provided the only available empirical evidence to this effect. Those data showed that when participants were left to their own devices following cardiac rehabilitation, they performed an average of one to five sets (depending on the exercise) of resistance exercise per week. In contrast, people in the intervention group completed seven or more sets of all the exercises in their manual each week. According to participants' logbooks, findings also illustrated that the intervention group consistently performed an equal number of sets of all the exercises in their manuals, whereas people in the control group showed an unbalanced training repertoire of the upper-body muscle groups (highly favouring bicep curls). Overall, findings showed that the intervention significantly influenced the amount of resistance training the participants were completing and assisted in the implementation of a balanced upper-body training routine.

It is important to point out that differences in resistance training behaviour were found despite the use of a self-monitoring logbook in both the intervention and control group. Logbooks have been shown to positively affect adherence in the cardiac population. In a randomized controlled trial, self-monitoring (i.e., recording physical activity in logbooks) was found to effectively increase exercise involvement 6-months after completion of cardiac rehabilitation (Izawa et al., 2005). Based on these findings, it

could be suggested that self-monitoring through the use of logbooks may have positively influenced the control groups' engagement in resistance training in the present study. These considerations raise issues that the present findings may provide a fairly conservative estimate of the effects that might be expected in comparison to a no-treatment control condition that did not engage in self-monitoring.

Implications for Social Cognitive Theory

The present study had a strong theoretical basis and findings from this study provide support for social cognitive theory. According to this theory, if an individual values the outcome, is efficacious in his/her ability to perform the behaviour and expects positive outcomes to result from successful completion of the behaviour, then s/he will be more likely engage in that behaviour (Bandura, 1997). Findings from the present study are consistent with this theorizing. All participants indicated they valued the various outcomes associated with resistance training. The intervention targeted the key social cognitions of self-efficacy and outcome expectations, which were found to be higher at the end of the intervention when compared to the standard care control group. In addition, resistance training behaviour was also found to be greater in the intervention group.

This study focused on both of the major motivational cognitions (self-efficacy and outcome expectations) identified by social cognitive theory and helped to build on previous research, which has focused largely on self-efficacy. Examining both of these constructs together represents an important contribution to research. For example, an individual's self-efficacy for a behaviour may be the most important determinant of the

initiation of that behaviour; however, consistent and prolonged engagement in the behaviour may be determined more by an individual's belief that the behaviour will lead to positive outcomes (Rothman et al., 2004). During transition from cardiac rehabilitation, participants are experiencing maintenance through their continuation of learned behaviours as well as initiation through adaptation of those learned behaviours to a new environment. By targeting both self-efficacy and outcome expectations, the intervention described in this study hoped to maximize its impact on behaviour. Further research is needed to understand the more detailed roles (i.e., independent and combined) that these factors play throughout the behaviour change process (Rothman et al., 2004).

Practical Implications

There are numerous practical implications this study has to offer in the area of cardiac rehabilitation. The findings show that the provision of a motivationally-enhanced manual and cost-effective, transportable equipment can help participants be more self-efficacious, maintain positive outcome expectations, and carry out more resistance training compared to participants who experience standard care. Cardiac rehabilitation programs (especially programs without accessibility to weight training machines) could readily adopt the use of Thera-Bands® for resistance training during rehabilitation classes and also provide a motivationally-enhanced manual to patients upon completion of cardiac rehabilitation. By doing this, patients would not only gain experience and confidence for performing these exercises during their supervised exercise setting, they could make a more seamless transition to a home-based resistance training program.

The home-based manual approach may also benefit women more than men. Although gender differences were not explored in this study, one reoccurring problem mentioned by women in the study was the lack of comfort they experienced at a gym in the weight training section. Through the use of the manual and Thera-Bands®, women would have the option of completing their resistance training in the comfort of their own homes where they can feel at ease and concentrate on doing their exercises rather than being put off by the environment around them. Furthermore, based on participants' feedback in the present study, the Thera-Bands® were seen as much safer than using hand weights at home. Many participants stated that if something were to have happened and they needed to drop the weight it could hurt or damage something, but with the bands, it would just snap back and cause no harm.

Limitations

Although the findings of the present study are largely encouraging, they must be tempered by acknowledging its limitations. One limitation is that the generalizability of the results is limited to patients who completed cardiac rehabilitation and did not possess any contraindicators for resistance training. Recall that participants were heavily screened for participation at the outset of the study. Consequently, the participants in the present study could be viewed as an 'elite' group who were more healthy, physically capable, and efficacious than a 'normal' cardiac rehabilitation graduate. However, it also seems reasonable to propose that this intervention, or one of a similar nature, could have the same or a greater impact on those patients who have lower self-efficacy for resistance training and little in the way of experience. Future research should aim to examine

whether the effects of this, or a similar, intervention could be amplified in a sample that was more representative of the general cardiac population.

A second limitation and one that plagues much of psychological research is that the scores representing cognitions and behaviour were based on self-report. Inaccuracies in self-report responses may occur either involuntarily (e.g., poor memory) or voluntarily (e.g., social desirability; Lox, Martin Ginis & Petruzzello, 2006) and therefore the current self-report data may suffer from questionable reliability and validity.

A third limitation to the study relates to the study design in that it lacked a third study condition which could have examined the effects of providing Thera-Bands® along with information to complete the exercises safely. As it stands, there is no way to tease out whether simply having access to resistance training equipment (i.e., Thera-Bands®) could have accounted for the observed effects. Inclusion of such a condition would allow the findings to be interpreted in terms of the potential additive effects associated with the provision of both the manual and Thera-Bands®. While the provision of both the Thera-Bands® and the manual in combination was intended to provide a useful test of theory and practical application, future studies examining the independent and combined effects of Thera-Bands® and the motivationally-enhanced manual are required.

Strengths

One strength of this study was the use of a theoretical framework in the design of the intervention. Social cognitive theory has been used in many other empirical studies and has proven to be an important predictor of exercise behaviour in various populations (Bandura, 1997; McAuley & Blissmer, 2000). Through the use of a theory, firm

hypotheses can be generated and eventual findings can be interpreted in light of the theory's predictions. In this case, explanation of the findings (e.g., why the intervention worked or did not) was possible on a number of levels. A strong theoretical basis is also a positive feature of the present study because it provided a structure around which to design and create the intervention material in a manner that should have affected participants' cognitions.

Another strength of the study that should be mentioned is the potential for integrating this intervention into cardiac rehabilitation. The intervention was designed to stand alone (i.e., without interventionist supervision), in that it can be given to English-speaking cardiac rehabilitation graduates who may have little or no experience with resistance training who should be able to successfully complete all exercises at home in a safe and correct manner. When compared to other interventions that might require a great deal of time and person-power to execute, this intervention was inexpensive and, based on the findings, was successful in targeting important behavioural determinants of resistance training during transition from supervised to home-based cardiac rehabilitation.

Future Directions

This study represents a starting point for future research in the area of resistance training adherence during transition from supervised to home-based cardiac rehabilitation. However, more research is needed to replicate and build on these findings.

One future step for this research should be to examine adherence rates to resistance training for longer follow-up periods. This endeavour would be worthwhile seeing that past research has found adherence to aerobic forms of exercise decline after

cardiac rehabilitation (Bethell, 1999; Bock et al., 2003; Moore et al., 2006). Future research needs to address adherence to resistance training and examine the rates of drop off, as adherence to resistance exercise may actually be worse than aerobic exercise.

This is the first study to examine adherence to upper-body resistance training after rehabilitation in the cardiac population. The findings will hopefully open a door of interest to more research examining upper-and lower-body resistance training adherence over longer periods to determine the need for interventions to assist patients in adhering to resistance training during their transition from supervised cardiac rehabilitation to home-based programs. Although adherence to resistance training for the intervention group was very exciting the question remains, "did they have strength gains?" One important future research direction in this area is to examine objective changes in strength through follow-up. Such a study will allow researchers to determine if participants are gaining physical benefits from engaging in resistance training.

Conclusion

The findings from the present investigation lend support for the use of a motivationally-enhanced manual and Thera-Bands® to increase self-efficacy and outcome expectations for, and adherence to, resistance training in the cardiac population. The health benefits from resistance training are important for cardiac participants and should be maintained long-term along with aerobic forms of exercise (McCartney, 1998). Given the prevalence of cardiovascular illness, there is a pressing need for more research to be conducted on increasing adherence to both resistance and aerobic training (Lowensteyn, Grace, Stone & Arthur, 2004). Based on verbal and written feedback,

participation in the present study had a positive impact on participants in both the control and intervention group, and this thesis will conclude with a letter written to the student investigator by a control group participant illustrating the impact research can have on individual lives.

Jennifer, May 2, 2006

I worked 29 years for the Ministry of Correctional Services hoping to achieve what you have already accomplished in your young career – having at least one person be grateful for your positive influence on his/her life.

Thank you for involving me in your study. It gave me more exposure to beneficial gym activities, gave me a purpose to attend the gym and also provided me the motivation to keep going. The positive results thus far have encouraged me to continue with the gym sessions and strength training as a lifestyle.

Thank you, and best wishes for continued success.

Study Participant - DG

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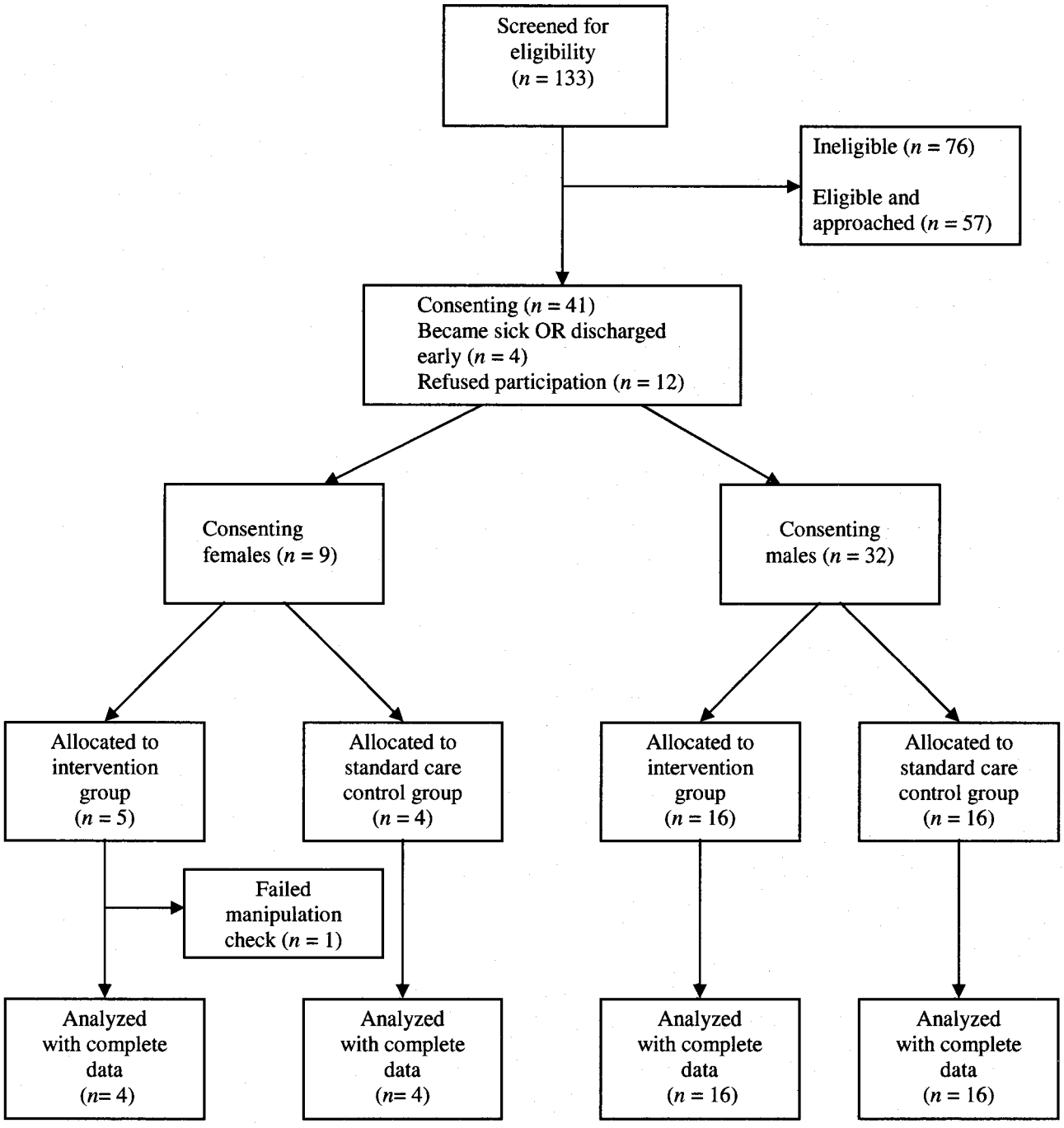
Appendix A

Flow of participants throughout study.


Screened for eligibility (n = 133)
Ineligible (n = 76)
Eligible and approached (n = 57)
Consenting (n = 41)
Became sick OR discharged early (n = 4)
Refused participation (n = 12)
Consenting females (n = 9)
Consenting males (n = 32)
Allocated to intervention group (n = 5)
Allocated to standard care control group (n = 4)
Allocated to intervention group (n = 16)
Allocated to standard care control group (n = 16)
Failed manipulation check (n = 1)
Analyzed with complete data (n= 4)
Analyzed with complete data (n= 4)
Analyzed with complete data (n = 16)
Analyzed with complete data (n = 16)

Appendix B

Appendix B1: Strength Training Manual for Cardiac Patients – Female

Appendix B2: Strength Training Manual for Cardiac Patients – Male

Appendix B1

Strength Training Manual for Cardiac Patients

Developed for graduates of the Cardiac Health and Rehabilitation Centre

Thank you to all of the MacTurtles from McMaster University's Cardiac Rehabilitation Program for being the models for this manual.

Without your help this manual could not have been developed. Your help is greatly appreciated.

Sincerely,

Jennifer Millen

2

At this time you may be involved in an aerobic training program and doing activities such as walking, swimming or biking. We know that these activities are heart healthy.

Research now tells us that strength training is also good for your heart! A kinesiologist created this manual for you. It was designed to help you do strength training safely on your own at home.

- The manual explains and shows:
  - All of your major muscle groups in your upper body
  - Simple, basic techniques for strength training

3

"It is about being ...lucky enough to
have arms and legs
that can surge with energy,
be waved by the sun,
and slice through wind and water.
Moving your body is about physically
connecting with the fundamental joy
and gratitude of being alive!"

Anonymous

4

Table of Contents

5

Why do I need to strength train?

Strength training is known to have many health benefits, these include:

- ✓ Help you lose and control your weight
- ✓ Increase the rate your body burns calories, this is called your metabolism. Your metabolism increases during and after strength training.
- ✓ Reduce your blood pressure
- ✓ Decrease your risk for diabetes
- ✓ Improve your blood fat levels
- ✓ Help keep your bones strong and decrease your risk for osteoporosis and broken bones
- ✓ Keep your joints loose and flexible
- ✓ Improve your posture
- ✓ Improve your strength and endurance
- ✓ Improve your confidence levels

6

Is strength training safe for me?

Research shows that your risks for:

- increased heart rate or arrhythmia
- increased blood pressure
- angina
- ischemia (lack of blood flow and oxygen to the heart)
- low blood pressure

are lower when you strength train compared to when you aerobic train.

Your kinesiologist will design a program that will safely meet your needs. Remember to follow the safety guidelines on page 8.

7

Safety Guidelines

Please follow these guidelines to make your strength training workout safe and enjoyable for you.

- Be aware of your surroundings such as equipment around you or other obstacles that could cause you to fall.
- Working out with a partner can be helpful, motivating and fun!
- Stay away from exercises that cause too much discomfort!

Normal Discomfort	Too Much Discomfort
• You can feel your muscles working • Your muscles may feel tired or a slight burning may develop • You may have some soreness the next day but this should go away • Stretching after exercising will help to reduce the soreness	• Pain in your muscles or joints while exercising If this happens, stop exercising right away. Ask yourself what you might be doing wrong: - Analyze what might be wrong: • What is my technique? • What position am I using? • How much resistance am I using? - Make appropriate adjustments before resuming exercises • If the pain does not go away call your doctor.

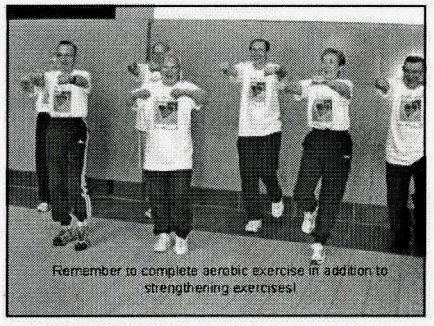
8

FITT Formula

This is a recommendation for what you should be doing for strength training.

F	**Frequency**	3 times per week, performing strength training exercises on alternate days (rest day between same muscle group)
I	**Intensity**	Perform repetitions at individually set amount of resistance
T	**Type**	Slow controlled dynamic movements (muscle shortens and lengthens through the movement)
T	**Time**	Depends on the number of muscle groups being exercised per session

9



A Strength Training Session

1. Warm-up 5 to 10 minutes of walking or marching on the spot	2. Training Using the elastic Thera-Bands® as shown in this manual
4. Stretching Stretch your muscles that were used in your strength training session	3. Cool-Down 5 to 10 minutes of walking or marching on the spot to slow down

11

Progression Guidelines

How to get started:

- Begin with your elastic Thera-Bands®.
- Learn the range of motion and technique first, then add more resistance when you feel comfortable.
- Remember the shorter or less band you are stretching the harder it will be, the longer or more band you are stretching the easier it will be.

How to choose proper band:

- If you can not complete 10 repetitions in a row then the resistance is too heavy.
- If you can complete 15 repetitions in a row easily, then the resistance is too light.

How to progress:

- After exercising with a specific band, you will get stronger and the resistance may feel too light/easy. The following are some suggestions for progression:
  - Increase the number of repetitions to 15.
  - Increase the number of sets (2, 3 sets of 10 to 15 repetitions).
  - Decrease the amount of band you are stretching, or change bands to a higher resistance.

Keep track of progression:

- Keep a log book of your strength training sessions. It's fun to see your progression and a good reminder of what you have been working on.

Don't rush your progression, take it slowly!!!

12

Proper Breathing

Proper breathing during strength training is very important!
Holding your breath can increase your blood pressure.

To avoid this, follow these guidelines:

1) Easy part of the movement (such as lowering) = Inhale (breathe in slowly).

2) Difficult part of the movement (such as lifting) = Exhale (breathe out slowly).

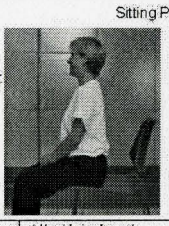
"Keep Your Core Tight"

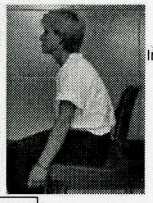
Always have a 'tight core' when performing any strength training:

- Pull belly button in towards spine
- Keep spine in a neutral position
- Keep shoulders away from ears
- Chest up
- Continue to hold this 'tight core' throughout the exercise while breathing properly

Sitting Posture

Correct





Incorrect

Correct
- ✓ Head facing forward
- ✓ Shoulders down (away from ears)
- ✓ Tight core
- ✓ Neutral Spine
- ✓ Both feet flat on the floor
- ✓ Toes facing forward

Tip!
When beginning exercises, check for proper posture in a mirror

14

Standing Posture

Correct

- ✓ Head facing forward
- ✓ Shoulders down (away from ears)
- ✓ Arm relaxed by your sides, palms facing legs
- ✓ Tight core
- ✓ Neutral spine
- ✓ Knees slightly bent
- ✓ Toes facing forward
- ✓ Keep feet shoulder width apart

Incorrect

15

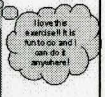
Biceps

- **When do I use these muscles?**
  - Opening a can or jar
  - Lifting objects such as a bag of potatoes, laundry basket, grocery bags, child, pet, pot on the stove
  - Dressing (such as pulling on socks, pants)
  - Turning door knobs, screwdrivers etc.
  - Swinging a hammer

16

1. Biceps Curls

Band Colour:



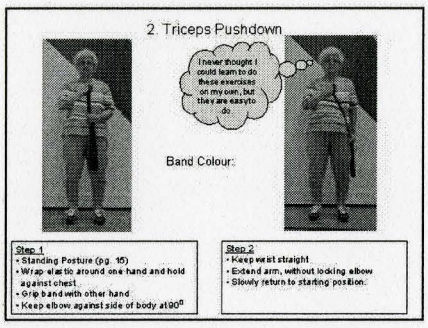
Step 1
- Standing posture (see pg. 15).
- Step on one end of the Thera-Band®
- Grab the other end with your hand
- Inhale

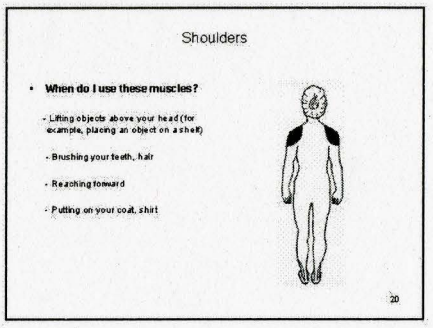
Step 2
- Bend arm, turning palm towards ceiling
- Keep elbow by side, keep wrist straight
- Exhale slowly while starting to curl

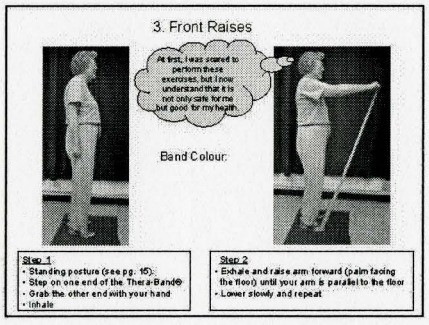
Triceps

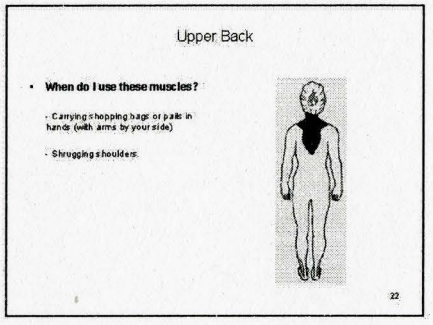
- **When do I use these muscles?**
  - Pushing yourself out of a chair or out of the bathtub
  - Undressing such as pushing off your pants
  - Placing things on shelves

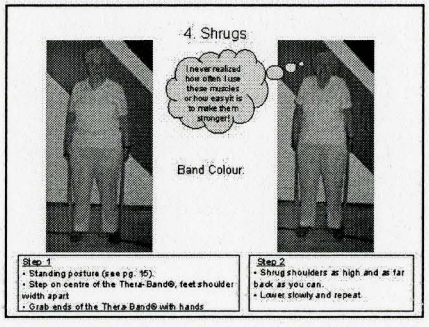
18

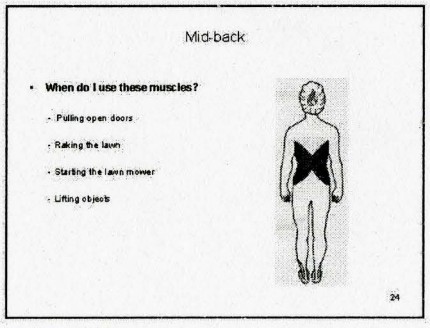

2. Triceps Pushdown
I never thought I could learn to do these exercises on my own, but they are easy to do.
Band Colour:
Step 1
• Standing Posture (pg. 15)
• Wrap elastic around one hand and hold against chest.
• Grip band with other hand.
• Keep elbow against side of body at 90°
Step 2
• Keep wrist straight.
• Extend arm, without locking elbow.
• Slowly return to starting position.

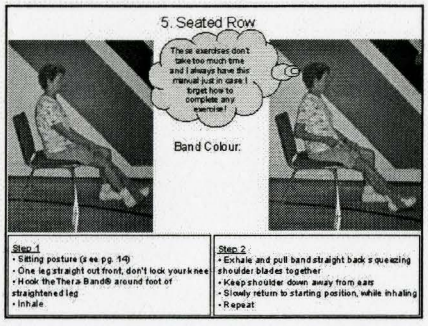

Shoulders
When do I use these muscles?
- Lifting objects above your head (for example, placing an object on a shelf)
- Brushing your teeth, hair
- Reaching forward
- Putting on your coat, shirt
20

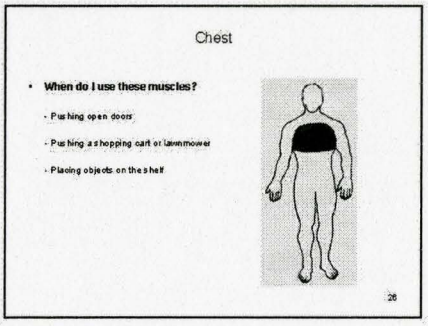

3. Front Raises
At first, I was scared to perform these exercises, but I now understand that it is not only safe for me but good for my health.
Band Colour:
Step 1
• Standing posture (see pg. 15).
• Step on one end of the Thera-Band®
• Grab the other end with your hand
• Inhale
Step 2
• Exhale and raise arm forward (palm facing the floor) until your arm is parallel to the floor
• Lower slowly and repeat

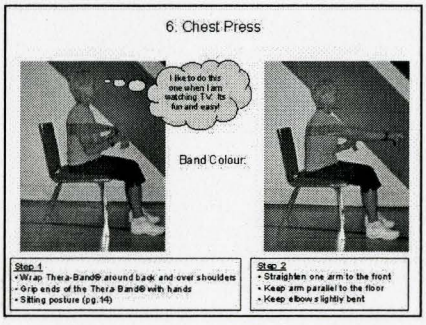

Upper Back
When do I use these muscles?
- Carrying shopping bags or pails in hands (with arms by your side)
- Shrugging shoulders
22

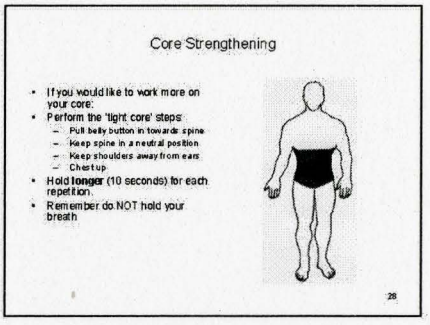

4. Shrugs
I never realized how often I use these muscles or how easy it is to make them stronger!
Band Colour:
Step 1
• Standing posture (see pg. 15).
• Step on centre of the Thera-Band®, feet shoulder width apart
• Grab ends of the Thera-Band® with hands
Step 2
• Shrug shoulders as high and as far back as you can.
• Lower slowly and repeat

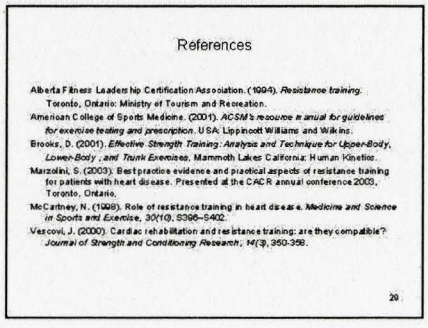

Mid-back
When do I use these muscles?
- Pulling open doors
- Raking the lawn
- Starting the lawn mower
- Lifting objects
24


5. Seated Row
These exercises don't take too much time and I always have this manual just in case I forget how to complete any exercise!
Band Colour:
Step 1
• Sitting posture (see pg. 14)
• One leg straight out front, don't lock your knee
• Hook the Thera-Band® around foot of straightened leg
• Inhale
Step 2
• Exhale and pull band straight back squeezing shoulder blades together
• Keep shoulder down away from ears
• Slowly return to starting position, while inhaling
• Repeat


Chest
When do I use these muscles?
Pushing open doors
Pushing a shopping cart or lawnmower
Placing objects on the shelf
26


6. Chest Press
I like to do this one when I am watching TV. Its fun and easy!
Band Colour:
Step 1
• Wrap Thera-Band® around back and over shoulders
• Grip ends of the Thera-Band® with hands
• Sitting posture (pg.14)
Step 2
• Straighten one arm to the front
• Keep arm parallel to the floor
• Keep elbows lightly bent


Core Strengthening
If you would like to work more on your core:
Perform the 'light core' steps:
Pull belly button in towards spine
Keep spine in a neutral position
Keep shoulders away from ears
Chest up
Hold longer (10 seconds) for each repetition.
Remember do NOT hold your breath
28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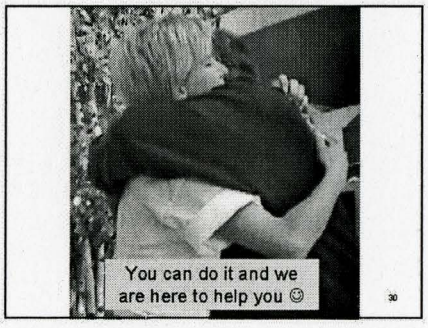

You can do it and we are here to help you ☺
30

Appendix B2

Strength Training Manual for Cardiac Patients

Developed for graduates of the Cardiac Health and Rehabilitation Centre

Thank you to all of the MacTurtles from McMaster University's cardiac rehabilitation program for being the models for this manual.

Without your help this manual could not have been developed. Your help is greatly appreciated.

Sincerely,

Jennifer Millen

2

At this time you may be involved in an aerobic training program and doing activities such as walking, swimming or biking. We know that these activities are heart healthy.

Research now tells us that strength training is also good for your heart! A kinesiologist created this manual for you. It was designed to help you do strength training safely on your own at home.

- The manual explains and shows:
  - All of your major muscle groups in your upper body
  - Simple, basic techniques for strength training

3

"It is about being…lucky enough to have arms and legs that can surge with energy, be warmed by the sun, and slice through wind and water. Moving your body is about physically connecting with the fundamental joy and gratitude of being alive!"

Anonymous

4

Table of Contents

5

Why do I need to strength train?

Strength training is known to have many health benefits, these include:

- ✓ Help you lose and control your weight
- ✓ Increase the rate your body burns calories, this is called your metabolism. Your metabolism increases during and after strength training.
- ✓ Reduce your blood pressure
- ✓ Decrease your risk for diabetes
- ✓ Improve your blood fat levels
- ✓ Help keep your bones strong and decrease your risk for osteoporosis and broken bones
- ✓ Keep your joints loose and flexible
- ✓ Improve your posture
- ✓ Improve your strength and endurance
- ✓ Improve your confidence levels

6

Is strength training safe for me?

Research shows that your risks for:

- increased heart rate or arrhythmia
- increased blood pressure
- angina
- ischemia (lack of blood flow and oxygen to the heart)
- low blood pressure

are lower when you strength train compared to when you aerobic train.

Your kinesiologist will design a program that will safely meet your needs. Remember to follow the safety guidelines on page 8.

7

Safety Guidelines

Please follow these guidelines to make your strength training workout safe and enjoyable for you.

- Be aware of your surroundings such as equipment around you or other obstacles that could cause you to fall.
- Working out with a partner can be helpful, motivating and fun!
- Stay away from exercises that cause too much discomfort!

Normal Discomfort	Too Much Discomfort
• You can feel your muscles working • Your muscles may feel tired or a slight burning may develop • You may have some soreness the next day but this should go away • Stretching after exercising will help to reduce the soreness	• Pain in your muscles or joints while exercising If this happens, stop exercising right away. Ask yourself what you might be doing wrong. • Analyze what might be wrong: • What is my technique? • What position am I using? • How much resistance am I using? • Make appropriate adjustments before resuming exercises • If the pain does not go away call your doctor.

8

FITT Formula

This is a recommendation for what you should be doing for strength training.

F	**Frequency**	3 times per week, performing strength training exercises on alternate days (rest day between same muscle group)
I	**Intensity**	Perform repetitions at individually set amount of resistance
T	**Type**	Slow controlled dynamic movements (muscle shortens and lengthens through the movement)
T	**Time**	Depends on the number of muscle groups being exercized per session

9

A Strength Training Session

1. Warm-up 5 to 10 minutes of walking or marching on the spot	2. Training Using the elastic Thera-Bands® as shown in this manual
4. Stretching Stretch your muscles that were used in your strength training session	3. Cool-Downs 5 to 10 minutes of walking or marching on the spot to slow down

11

Progression Guidelines

How to get started:

- Begin with your elastic Thera-Bands®.
- Learn the range of motion and technique first, then add more resistance when you feel comfortable.
- Remember the shorter or less band you are stretching the harder it will be, the longer or more band you are stretching the easier it will be.

How to choose proper band:

- If you can not complete 10 repetitions in a row then the resistance is too heavy.
- If you can complete 15 repetitions in a row easily, then the resistance is too light.

How to progress:

- After exercising with a specific band, you will get stronger and the resistance may feel too light/easy. The following are some suggestions for progression:
  - Increase the number of repetitions to 15.
  - Increase the number of sets (2, 3 sets of 10 to 15 repetitions).
  - Decrease the amount of band you are stretching, or change bands to a higher resistance.

Keep track of progression:

- Keep a log book of your strength training sessions. It's fun to see your progression and a good reminder of what you have been working on.

Don't rush your progression, take it slowly!!!

12

Proper Breathing

Proper breathing during strength training is very important!
Holding your breath can increase your blood pressure.

To avoid this, follow these guidelines:

1) Easy part of the movement (such as lowering) = Inhale (breathe in slowly).

2) Difficult part of the movement (such as lifting) = Exhale (breathe out slowly).

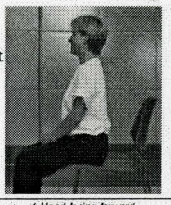
"Keep Your Core Tight"

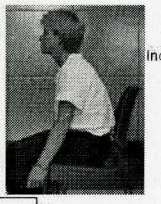
Always have a 'tight core' when performing any strength training:

- Pull belly button in towards spine
- Keep spine in a neutral position
- Keep shoulders away from ears
- Chest up
- Continue to hold this 'tight core' throughout the exercise while breathing properly

Sitting Posture

Correct





Incorrect

Correct
- ✓ Head facing forward
- ✓ Shoulders down (away from ears)
- ✓ Tight core
- ✓ Neutral Spine
- ✓ Both feet flat on the floor
- ✓ Toes facing forward

Tip!
When beginning exercises, check for proper posture in a mirror

14

Standing Posture

Correct

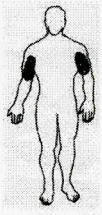
- ✓ Head facing forward
- ✓ Shoulders down (away from ears)
- ✓ Arm relaxed by your sides, palms facing legs
- ✓ Tight core
- ✓ Neutral spine
- ✓ Knees slightly bent
- ✓ Toes facing forward
- ✓ Keep feet shoulder width apart

Incorrect

15

1. Front of the arms

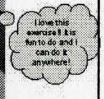
- **When do I use these muscles?**
  - Opening a can or jar
  - Lifting objects such as a bag of potatoes, laundry basket, grocery bags, child, pet, pot on the stove
  - Dressing (such as pulling on socks, pants)
  - Turning door knobs, screwdrivers etc.
  - Swinging a hammer



16

1. Biceps Curls

Band Colour:



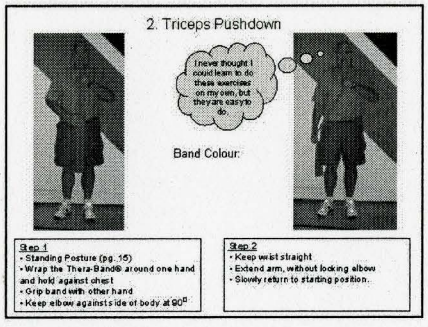
Step 1
- Standing posture (see pg. 15).
- Step on one end of the Thera-Band®
- Grab the other end with your hand
- Inhale

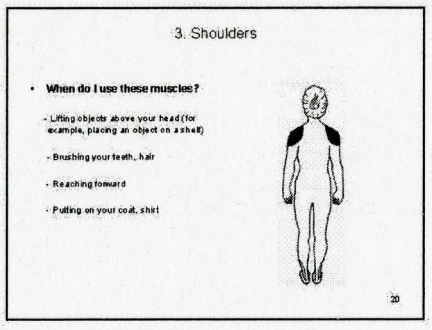
Step 2
- Bend arm, turning palm towards ceiling
- Keep elbow by side, keep wrist straight
- Exhale slowly while starting to curl

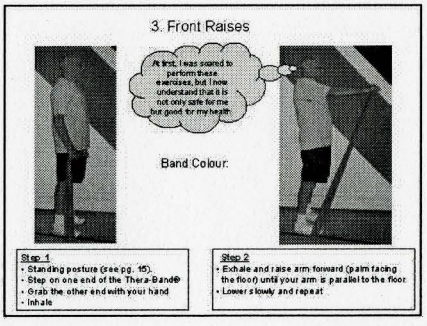
2. Back of the arms

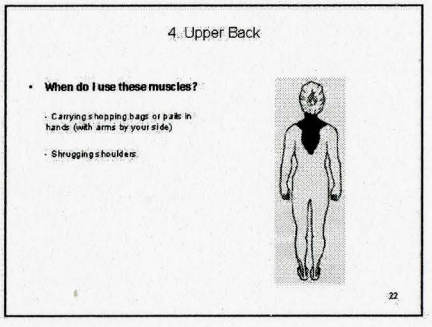
- **When do I use these muscles?**
  - Pushing yourself out of a chair or out of the bathtub
  - Undressing such as pushing off your pants
  - Placing things on shelves

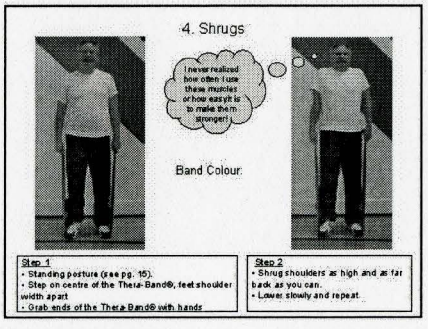
18

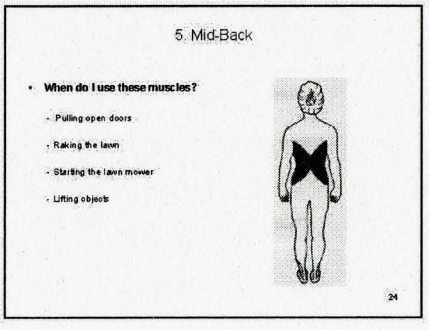

2. Triceps Pushdown
I never thought I could learn to do these exercises on my own, but they are easy to do.
Band Colour:
Step 1
• Standing Posture (pg. 15)
• Wrap the Thera-Band® around one hand and hold against chest
• Grip band with other hand
• Keep elbow against side of body at 90°
Step 2
• Keep wrist straight
• Extend arm, without locking elbow
• Slowly return to starting position.

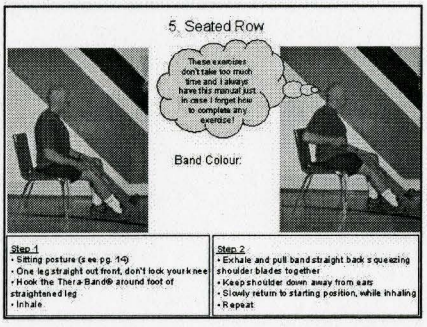

3. Shoulders
• When do I use these muscles?
- Lifting objects above your head (for example, placing an object on a shelf)
- Brushing your teeth, hair
- Reaching forward
- Putting on your coat, shirt
20

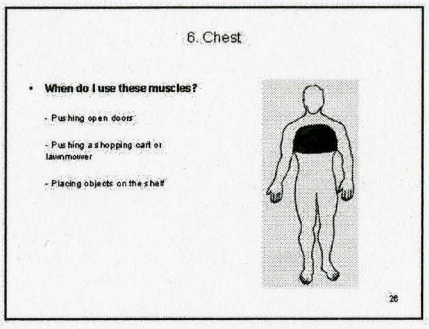

3. Front Raises
At first, I was scared to perform these exercises, but I now understand that it is not only safe for me but good for my health.
Band Colour:
Step 1
• Standing posture (see pg. 15).
• Step on one end of the Thera-Band®
• Grab the other end with your hand
• Inhale
Step 2
• Exhale and raise arm forward (palm facing the floor) until your arm is parallel to the floor
• Lower slowly and repeat

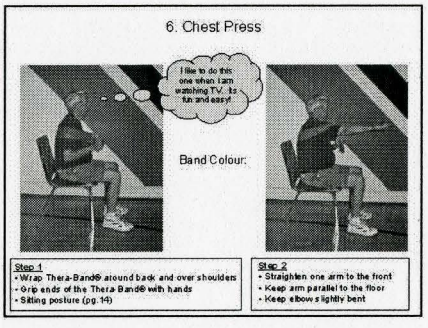

4. Upper Back
• When do I use these muscles?
- Carrying shopping bags or pails in hands (with arms by your side)
- Shrugging shoulders
22

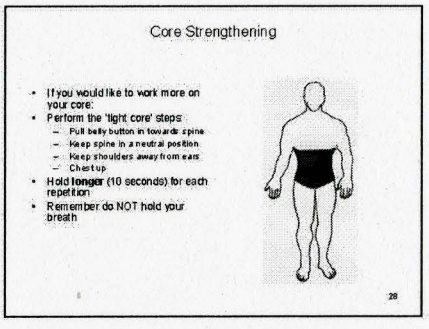

4. Shrugs
I never realized how often I use these muscles or how easy it is to make them stronger!
Band Colour:
Step 1
• Standing posture (see pg. 15).
• Step on centre of the Thera-Band®, feet shoulder width apart
• Grab ends of the Thera-Band® with hands
Step 2
• Shrug shoulders as high and as far back as you can.
• Lower slowly and repeat

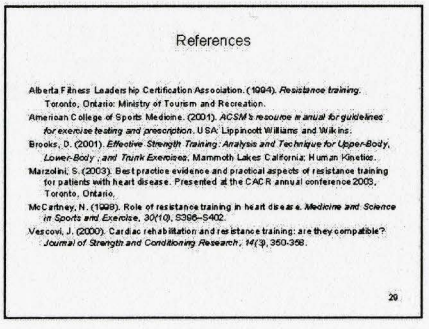

5. Mid-Back
• When do I use these muscles?
- Pulling open doors
- Raking the lawn
- Starting the lawn mower
- Lifting objects
24


5. Seated Row
These exercises don't take too much time and I always have this manual just in case I forget how to complete any exercise!
Band Colour:
Step 1
• Sitting posture (see pg. 14)
• One leg straight out front, don't lock your knee
• Hook the Thera-Band® around foot of straightened leg
• Inhale
Step 2
• Exhale and pull band straight back squeezing shoulder blades together
• Keep shoulder down away from ears
• Slowly return to starting position, while inhaling
• Repeat


6. Chest
When do I use these muscles?
- Pushing open doors
- Pushing a shopping cart or lawnmower
- Placing objects on the shelf
26


6. Chest Press
I like to do this one when I am watching TV... its fun and easy!
Band Colour:
Step 1
• Wrap Thera-Band® around back and over shoulders
• Grip ends of the Thera-Band® with hands
• Sitting posture (pg.14)
Step 2
• Straighten one arm to the front
• Keep arm parallel to the floor
• Keep elbow slightly bent


Core Strengthening
If you would like to work more on your core:
Perform the 'tight core' steps:
– Pull belly button in towards spine
– Keep spine in a neutral position
– Keep shoulders away from ears
– Chest up
Hold longer (10 seconds) for each repetition
Remember do NOT hold your breath
28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McCartney, N. (1999). Role of resistance training in heart disease. Medicine and Science in Sports and Exercise, 30(10), S396-S402.
Vercovi, J. (2000). Cardiac rehabilitation and resistance training: are they compatible? Journal of Strength and Conditioning Research, 14(3), 360-368.
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You can do it and we are here to help you ☺
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Appendix C

Demographic Questionnaire

General Information

1. **Name:** _____

2. **Gender (check √ one):** Female Male

3. **Age:** _____ years

4. **Marital Status (check √ one):**

Married Separated Widow(ed) Single

Divorced Not married, living with partner

5. **Ethnicity (check √ one):**

White	Chinese	Black
Filipino	Latin American	Southeast Asian
South Asian	West Asian	Arab
North American Indian, Metis, or Inuit		Other

6. **Current Occupation:** _____

7. **Smoker (check √ one):** Yes No

8. **Education Level (check √ one):**

Grade 8	Completed college
Some high school	Some university
Completed high school	Completed university
Some college	Masters or PhD

10. **Do you have any other health problems?** (For example - arthritis, cancer, circulation problems etc...).

If yes, could you please provide a bit of information on each?

_____

_____

_____

_____

_____

11. **You will be contacted by phone for reminders of appointments**

- Phone Number: _(_____)_____
- Best time to call: AM PM

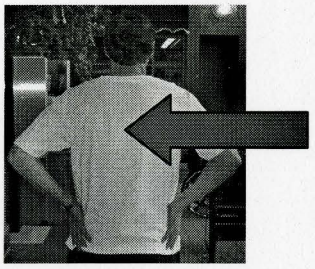
12. **Have you been in this program in the past?** Yes No

If yes, when? _____

_____

Appendix D

Resistance Training Self-Efficacy Questionnaires



BACK

I would like you to think about how you feel on an average day at this point in time with regards to completing exercises (with weights or an elastic Thera-Band®) to strengthen the **muscles of your back (see picture above).**

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

Use the numbers (0-10) from the scale above to rate **your** confidence in **your** ability to perform strengthening exercises (with weights or an elastic Thera-Band®) for **your back muscles on your own at home…**

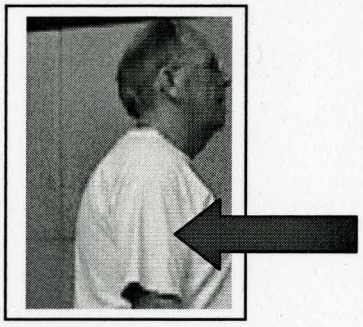
My confidence

a) My confidence to do this exercise using proper body position (back straight, tight core etc.) is… _____

b) My confidence to do this exercise using the appropriate amount of resistance for myself (not too heavy and not too light) is… _____

c) My confidence to do this exercise using proper breathing for each repetition is… _____

d) My confidence to do this exercise using the correct movement targeting the back muscles is… _____



BICEPS

I would like you to think about how you feel on an average day at this point in time with regards to completing exercises (with weights or an elastic Thera-Band®) to strengthen the **muscles at the front of your arms above your elbows (BICEPS, see picture above).**

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

Use the numbers (0-10) from the scale above to rate **your** confidence in **your** ability to perform strengthening exercises (with weights or an elastic Thera-Band®) for **your bicep muscles on your own at home**...

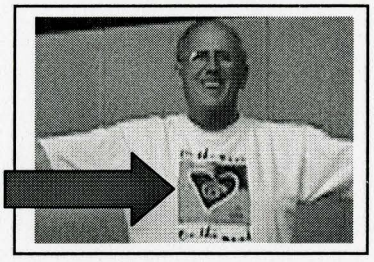
My confidence

a) My confidence to do this exercise using proper body position (back straight, tight core etc.) is... _____

b) My confidence to do this exercise using the appropriate amount of resistance for myself (not too heavy and not too light) is... _____

c) My confidence to do this exercise using proper breathing for each repetition is... _____

d) My confidence to do this exercise using the correct movement targeting the biceps muscles is... _____



CHEST

I would like you to think about how you feel on an average day at this point in time with regards to completing exercises (with weights or an elastic Thera-Band®) to strengthen the **muscles of your chest (see picture above).**

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

Use the numbers (0-10) from the scale above to rate **your** confidence in **your** ability to perform strengthening exercises (with weights or an elastic Thera-Band®) for **your chest muscles on your own at home…**

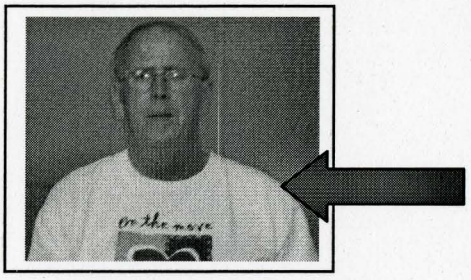
My confidence

a) My confidence to do this exercise using proper body position (back straight, tight core etc.) is… _____

b) My confidence to do this exercise using the appropriate amount of resistance for myself (not too heavy and not too light) is… _____

c) My confidence to do this exercise using proper breathing for each repetition is… _____

d) My confidence to do this exercise using the correct movement targeting the chest muscles is… _____



SHOULDERS

I would like you to think about how you feel on an average day at this point in time with regards to completing exercises (with weights or an elastic Thera-Band®) to strengthen the **muscles of your shoulders (see picture above).**

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

Use the numbers (0-10) from the scale above to rate **your** confidence in **your** ability to perform strengthening exercises (with weights or an elastic Thera-Band®) for **your shoulder muscles on your own at home…**

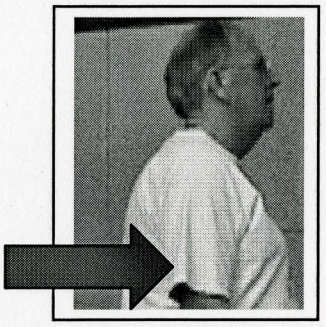
My confidence

a) My confidence to do this exercise using proper body position (back straight, tight core etc.) is… _____

b) My confidence to do this exercise using the appropriate amount of resistance for myself (not too heavy and not too light) is… _____

c) My confidence to do this exercise using proper breathing for each repetition is… _____

d) My confidence to do this exercise using the correct movement targeting the shoulder muscles is… _____



TRICEPS

I would like you to think about how you feel on an average day at this point in time with regards to completing exercises (with weights or an elastic Thera-Band®) to strengthen the **muscles at the back of your arms above your elbows (TRICEPS, see picture above).**

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

Use the numbers (0-10) from the scale above to rate **your** confidence in **your** ability to perform strengthening exercises (with weights or an elastic Thera-Band®) for **your triceps muscles on your own at home…**

My confidence

a) My confidence to do this exercise using proper body position (back straight, tight core etc.) is… _____

b) My confidence to do this exercise using the appropriate amount of resistance for myself (not too heavy and not too light) is… _____

c) My confidence to do this exercise using proper breathing for each repetition is… _____

d) My confidence to do this exercise using the correct movement targeting the triceps muscles is… _____

Appendix E

Appendix E1: Activities of Daily Living Self-Efficacy Questionnaire – Females

Appendix E2: Activities of Daily Living Self-Efficacy Questionnaire – Males

Appendix E1

On a scale from 0 – 10, how confident are you that you can:

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

_____ 1. Carry a light weight (less than 5 lbs) at your side for 3 minutes without difficulty?

_____ 2. Carry a moderate weight (10 lbs) at your side for 3 minutes without difficulty?

_____ 3. Using both hands, lift a 10 lb weight (such as laundry detergent) **to** shoulder height and place it on a shelf without difficulty?

_____ 4. Using both hands, lift a 5 lb weight (such as one photo album) **to** shoulder height and place it on a shelf without difficulty?

_____ 5. Using both hands, lift a 10 lb weight (such as laundry detergent) **above** shoulder height and place it on a shelf without difficulty?

_____ 6. Using both hands, lift a 5 lb weight (such as one photo album) **above** shoulder height and place it on a shelf without difficulty?

_____ 7. Push a large, heavy entrance door open without difficulty?

_____ 8. Push a heavy shopping cart without difficult?

_____ 9. Push a large dining chair clear from a dining table without difficulty?

_____ 10. Pull a large, heavy entrance door open without difficulty?

_____ 11. Sweep the floor without difficulty?

_____ 12. Vacuum the carpet without difficulty?

_____ 13. Open a **new** jar (of pickles, mustard, jam) without difficulty?

_____ 14. Carry a basket of laundry without difficulty?

_____ 15. Open a jar (of pickles, mustard, jam) **that you closed** without difficulty?

Appendix E2

On a scale from 0 – 10, how confident are you that you can:

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Somewhat confident					Completely confident

_____ 1. Carry a light weight (less than 5 lbs) at your side for 3 minutes without difficulty?

_____ 2. Carry a moderate weight (10 lbs) at your side for 3 minutes without difficulty?

_____ 3. Using both hands, lift a 20 lb weight (such as laundry detergent) **to** shoulder height and place it on a shelf without difficulty?

_____ 4. Using both hands, lift a 10 lb weight (such as one photo album) **to** shoulder height and place it on a shelf without difficulty?

_____ 5. Using both hands, lift a 20 lb weight (such as laundry detergent) **above** shoulder height and place it on a shelf without difficulty?

_____ 6. Using both hands, lift a 10 lb weight (such as one photo album) **above** shoulder height and place it on a shelf without difficulty?

_____ 7. Push a large, heavy entrance door open without difficulty?

_____ 8. Push a heavy shopping cart without difficult?

_____ 9. Push a large dining chair clear from a dining table without difficulty?

_____ 10. Pull a large, heavy entrance door open without difficulty?

_____ 11. Sweep the floor without difficulty?

_____ 12. Vacuum the carpet without difficulty?

_____ 13. Open a **new** jar (of pickles, mustard, jam) without difficulty?

_____ 14. Carry a basket of laundry without difficulty?

_____ 15. Open a jar (of pickles, mustard, jam) **that you closed** without difficulty?

Appendix F

Appendix F1: Activities of Daily Living Likelihood Baseline Questionnaire - Females

Appendix F2: Activities of Daily Living Likelihood Baseline Questionnaire - Males

Appendix F3: Activities of Daily Living Likelihood Time 1&2 Questionnaire - Females

Appendix F4: Activities of Daily Living Likelihood Time 1&2 Questionnaire - Males

Appendix F1

On a scale from 0 – 10, how **likely** are you to perform the following behaviours in the **next week?**

0	1	2	3	4	5	6	7	8	9	10
Not at all Likely					Somewhat Likely					Completely Likely

_____ 1. Carry a light weight (less than 5 lbs) at your side for 3 minutes without difficulty?

_____ 2. Carry a moderate weight (10 lbs) at your side for 3 minutes without difficulty?

_____ 3. Using both hands, lift a 10 lb weight (such as laundry detergent) **to** shoulder height and place it on a shelf without difficulty?

_____ 4. Using both hands, lift a 5 lb weight (such as one photo album) **to** shoulder height and place it on a shelf without difficulty?

_____ 5. Using both hands, lift a 10 lb weight (such as laundry detergent) **above** shoulder height and place it on a shelf without difficulty?

_____ 6. Using both hands, lift a 5 lb weight (such as one photo album) **above** shoulder height and place it on a shelf without difficulty?

_____ 7. Push a large, heavy entrance door open without difficulty?

_____ 8. Push a heavy shopping cart without difficult?

_____ 9. Push a large dining chair clear from a dining table without difficulty?

_____ 10. Pull a large, heavy entrance door open without difficulty?

_____ 11. Sweep the floor without difficulty?

_____ 12. Vacuum the carpet without difficulty?

_____ 13. Open a **new** jar (of pickles, mustard, jam) without difficulty?

_____ 14. Carry a basket of laundry without difficulty?

_____ 15. Open a jar (of pickles, mustard, jam) **that you closed** without difficulty?

Appendix F2

On a scale from 0 – 10, how **likely** are you to perform the following behaviours in the **next week?**

0	1	2	3	4	5	6	7	8	9	10
Not at all Likely					Somewhat Likely					Completely Likely

_____ 1. Carry a light weight (less than 5 lbs) at your side for 3 minutes without difficulty?

_____ 2. Carry a moderate weight (10 lbs) at your side for 3 minutes without difficulty?

_____ 3. Using both hands, lift a 20 lb weight (such as laundry detergent) **to** shoulder height and place it on a shelf without difficulty?

_____ 4. Using both hands, lift a 10 lb weight (such as one photo album) **to** shoulder height and place it on a shelf without difficulty?

_____ 5. Using both hands, lift a 20 lb weight (such as laundry detergent) **above** shoulder height and place it on a shelf without difficulty?

_____ 6. Using both hands, lift a 10 lb weight (such as one photo album) **above** shoulder height and place it on a shelf without difficulty?

_____ 7. Push a large, heavy entrance door open without difficulty?

_____ 8. Push a heavy shopping cart without difficult?

_____ 9. Push a large dining chair clear from a dining table without difficulty?

_____ 10. Pull a large, heavy entrance door open without difficulty?

_____ 11. Sweep the floor without difficulty?

_____ 12. Vacuum the carpet without difficulty?

_____ 13. Open a **new** jar (of pickles, mustard, jam) without difficulty?

_____ 14. Carry a basket of laundry without difficulty?

_____ 15. Open a jar (of pickles, mustard, jam) **that you closed** without difficulty?

Appendix F3

On a scale from 0 – 10, how **likely** are you to perform the following behaviours in the **next four weeks?**

0	1	2	3	4	5	6	7	8	9	10
Not at all Likely					Somewhat Likely				Completely Likely	

_____ 1. Carry a light weight (less than 5 lbs) at your side for 3 minutes without difficulty?

_____ 2. Carry a moderate weight (10 lbs) at your side for 3 minutes without difficulty?

_____ 3. Using both hands, lift a 10 lb weight (such as laundry detergent) **to** shoulder height and place it on a shelf without difficulty?

_____ 4. Using both hands, lift a 5 lb weight (such as one photo album) **to** shoulder height and place it on a shelf without difficulty?

_____ 5. Using both hands, lift a 10 lb weight (such as laundry detergent) **above** shoulder height and place it on a shelf without difficulty?

_____ 6. Using both hands, lift a 5 lb weight (such as one photo album) **above** shoulder height and place it on a shelf without difficulty?

_____ 7. Push a large, heavy entrance door open without difficulty?

_____ 8. Push a heavy shopping cart without difficult?

_____ 9. Push a large dining chair clear from a dining table without difficulty?

_____ 10. Pull a large, heavy entrance door open without difficulty?

_____ 11. Sweep the floor without difficulty?

_____ 12. Vacuum the carpet without difficulty?

_____ 13. Open a **new** jar (of pickles, mustard, jam) without difficulty?

_____ 14. Carry a basket of laundry without difficulty?

_____ 15. Open a jar (of pickles, mustard, jam) **that you closed** without difficulty?

Appendix F4

On a scale from 0 – 10, how **likely** are you to perform the following behaviours in the **next four weeks?**

0	1	2	3	4	5	6	7	8	9	10
Not at all Likely					Somewhat Likely					Completely Likely

_____ 1. Carry a light weight (less than 5 lbs) at your side for 3 minutes without difficulty?

_____ 2. Carry a moderate weight (10 lbs) at your side for 3 minutes without difficulty?

_____ 3. Using both hands, lift a 20 lb weight (such as laundry detergent) **to** shoulder height and place it on a shelf without difficulty?

_____ 4. Using both hands, lift a 10 lb weight (such as one photo album) **to** shoulder height and place it on a shelf without difficulty?

_____ 5. Using both hands, lift a 20 lb weight (such as laundry detergent) **above** shoulder height and place it on a shelf without difficulty?

_____ 6. Using both hands, lift a 10 lb weight (such as one photo album) **above** shoulder height and place it on a shelf without difficulty?

_____ 7. Push a large, heavy entrance door open without difficulty?

_____ 8. Push a heavy shopping cart without difficult?

_____ 9. Push a large dining chair clear from a dining table without difficulty?

_____ 10. Pull a large, heavy entrance door open without difficulty?

_____ 11. Sweep the floor without difficulty?

_____ 12. Vacuum the carpet without difficulty?

_____ 13. Open a **new** jar (of pickles, mustard, jam) without difficulty?

_____ 14. Carry a basket of laundry without difficulty?

_____ 15. Open a jar (of pickles, mustard, jam) **that you closed** without difficulty?

Appendix G

Appendix G1: Outcome Expectations and Value - Baseline Questionnaire

Appendix G2: Outcome Expectations and Value - Time 1 & 2 Questionnaire

Appendix G1

Intervention Group Questionnaire Introduction: Completion of your cardiac rehabilitation program is fast approaching and you will be starting to exercise on your own. To assist you in continuing to strength train at home, you have been given some material. As part of this study you have been asked to strength train with an elastic Thera-Band® over the next week. The following is a list of statements asking you how likely certain outcomes are for you and how important these outcomes are to you. Please answer each question and remember there are no right or wrong answers.

Standard Care Control Group Questionnaire Introduction: Completion of your cardiac rehabilitation program is fast approaching and you will be starting to exercise on your own. Try thinking about doing strength training on your own for the next week, the following is a list of statements asking you how likely certain outcomes are for you and how important these outcomes are to you. Please answer each question and remember there are no right or wrong answers.

1a) Over the next week, do you think it is likely that **you will be able to make efficient use of your time** when strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

1b) How important is it to you that you use your exercise time efficiently when strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

2a) Over the next week, do you think it is likely that **you will develop a good understanding of what your body/muscles should feel like <u>during</u>** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

2b) How important is it to you to understand what your body/muscles should feel like during strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

3a) Over the next week, do you think it is likely that **you will develop a good understanding of what your body/muscles should feel like <u>after</u>** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

3b) How important is it to you to understand what your body/muscles should feel like after strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

4a) Over the next week, do you think it is likely that **you will be afraid of having a heart complication** when strength training at home**?**

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

4b) How important is it to you to not be afraid of having a heart complication when strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

5a) Over the next week, do you think it is likely that **you will hurt yourself** when strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

5b) How important is it to you not to hurt yourself when strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

6a) Over the next week, do you think it is likely that **you will enjoy** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

6b) How important is it to you to enjoy strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

7a) Over the next week, do you think it is likely that **you will have fun** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

7b) How important is it to you to have fun during strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

8a) Over the next week, do you think it is likely that **you will like** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

8b) How important is it to you to like strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

9a) Over the next week, do you think it is likely that **you will maintain your current weight** by strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

9b) How important is it to you to maintain your current weight?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

10a) Over the next week, do you think it is likely that **you will lose weight** by strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

10b) How important is it to you to lose weight?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

11a) Over the next week, do you think it is likely that **you will maintain your current blood pressure** by strength training at home**?**

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

11b) How important is it to you to maintain your current blood pressure?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

12a) Over the next week, do you think it is likely that **you will have a reduction in blood pressure** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

12b) How important is it to you to lower your blood pressure?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

13a) Over the next week, do you think it is likely that **opening a heavy door with one hand will become easier** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

13b) How important is it to you that opening heavy doors becomes easier?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

14a) Over the next week, do you think it is likely that **opening a sealed jar will become easier** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

14b) How important is it to you that opening sealed jars becomes easier?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

15a) Over the next week, do you think it is likely that **lifting a moderately heavy object (10 lbs) will become easier** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

15b) How important is it to you that lifting moderately heavy objects (10 lbs) becomes easier?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

16a) Over the next week, do you think it is likely that **you will maintain your current sitting posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

16b) How important is it to you to maintain your current sitting posture?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

17a) Over the next week, do you think it is likely that **you will achieve better sitting posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

17b) How important is better sitting posture to you?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

18a) Over the next week, do you think it is likely that **you will maintain your current standing posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

18b) How important is it to you to maintain your current standing posture?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

19a) Over the next week, do you think it is likely that **you will achieve better standing posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

19b) How important is better standing posture to you?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

20a) Over the next week, do you think it is likely that **you will maintain your current strength** by strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

20b) How important is it to you to maintain your current strength?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

21a) Over the next week, do you think it is likely that **you will become stronger** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

21b) How important is it to you to become stronger?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

Appendix G2

Intervention Group Questionnaire Introduction: Completion of your cardiac rehabilitation program is fast approaching and you will be starting to exercise on your own. To assist you in continuing to strength train at home, you have been given some material. As part of this study you have been asked to strength train with an elastic Thera-Band® over the next 4 weeks. The following is a list of statements asking you how likely certain outcomes are for you and how important these outcomes are to you. Please answer each question and remember there are no right or wrong answers.

Standard Care Control Group Questionnaire Introduction: Completion of your cardiac rehabilitation program is fast approaching and you will be starting to exercise on your own. Try thinking about doing strength training on your own for the next 4 weeks, the following is a list of statements asking you how likely certain outcomes are for you and how important these outcomes are to you. Please answer each question and remember there are no right or wrong answers.

1a) Over the next 4 weeks, do you think it is likely that **you will be able to make efficient use of your time** when strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

1b) How important is it to you that you use your exercise time efficiently when strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

2a) Over the next 4 weeks, do you think it is likely that **you will develop a good understanding of what your body/muscles should feel like <u>during</u>** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

2b) How important is it to you to understand what your body/muscles should feel like during strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

3a) Over the next 4 weeks, do you think it is likely that **you will develop a good understanding of what your body/muscles should feel like <u>after</u>** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

3b) How important is it to you to understand what your body/muscles should feel like after strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

4a) Over the next 4 weeks, do you think it is likely that **you will be afraid of having a heart complication** when strength training at home**?**

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

4b) How important is it to you to not be afraid of having a heart complication when strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

5a) Over the next 4 weeks, do you think it is likely that **you will hurt yourself** when strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

5b) How important is it to you not to hurt yourself when strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

6a) Over the next 4 weeks, do you think it is likely that **you will enjoy** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at	all likely				Somewhat Likely				Completely	Likely

6b) How important is it to you to enjoy strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

7a) Over the next 4 weeks, do you think it is likely that **you will have fun** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at	all likely				Somewhat Likely				Completely	Likely

7b) How important is it to you to have fun during strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

8a) Over the next 4 weeks, do you think it is likely that **you will like** strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at	all likely				Somewhat Likely				Completely	Likely

8b) How important is it to you to like strength training at home?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

9a) Over the next 4 weeks, do you think it is likely that **you will maintain your current weight** by strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

9b) How important is it to you to maintain your current weight?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

10a) Over the next 4 weeks, do you think it is likely that **you will lose weight** by strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

10b) How important is it to you to lose weight?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

11a) Over the next 4 weeks, do you think it is likely that **you will maintain your current blood pressure** by strength training at home**?**

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

11b) How important is it to you to maintain your current blood pressure?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

12a) Over the next 4 weeks, do you think it is likely that **you will have a reduction in blood pressure** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

12b) How important is it to you to lower your blood pressure?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

13a) Over the next 4 weeks, do you think it is likely that **opening a heavy door with one hand will become easier** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

13b) How important is it to you that opening heavy doors becomes easier?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

14a) Over the next 4 weeks, do you think it is likely that **opening a sealed jar will become easier** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

14b) How important is it to you that opening sealed jars becomes easier?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

15a) Over the next 4 weeks, do you think it is likely that **lifting a moderately heavy object (10 lbs) will become easier** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

15b) How important is it to you that lifting moderately heavy objects (10 lbs) becomes easier?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

16a) Over the next 4 weeks, do you think it is likely that **you will maintain your current sitting posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

16b) How important is it to you to maintain your current sitting posture?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

17a) Over the next 4 weeks, do you think it is likely that **you will achieve better sitting posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

17b) How important is better sitting posture to you?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

18a) Over the next 4 weeks, do you think it is likely that **you will maintain your current standing posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely				Completely Likely	

18b) How important is it to you to maintain your current standing posture?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

19a) Over the next 4 weeks, do you think it is likely that **you will achieve better standing posture** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

19b) How important is better standing posture to you?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

20a) Over the next 4 weeks, do you think it is likely that **you will maintain your current strength** by strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

20b) How important is it to you to maintain your current strength?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

21a) Over the next 4 weeks, do you think it is likely that **you will become stronger** from strength training at home?

0	1	2	3	4	5	6	7	8	9	10
Not at all likely					Somewhat Likely					Completely Likely

21b) How important is it to you to become stronger?

1	2	3	4	5	6	7	8	9
Not at all Important				Somewhat Important				Very Important

Appendix H

Resistance Training Logbook Template

Here is your logbook! It will help you keep track of the strength training you complete at home.

How do I fill out my logbook?
Step 1: Find today in your logbook.
Step 2: The exercises are broken up into SETS (one set of biceps curls = 10 - 15 repetitions of that exercise), check off the boxes once you have completed a set. You can complete up to 3 sets of each exercise.
Step 3: Fill in the box on the left with the number of minutes you spent strength training that day.

EXAMPLE LOGBOOK

	Exercise	Set 1	Set 2	Set 3
January 18, 2006 **How many minutes of strength training did you complete today?** *25 minutes*	**1. Biceps Curls**	☑	☐	☐
	2. Triceps Pushdown	☑	☐	☐
	3. Front Raises	☑	☐	☐
	4. Shrugs	☑	☑	☐
	5. Seated Row	☑	☐	☐
	6. Chest Press	☑	☑	☐

	Exercise	Set 1	Set 2	Set 3
_____ How many minutes of strength training did you complete today? *minutes*	1. Biceps Curls	☐	☐	☐
	2. Triceps Pushdown	☐	☐	☐
	3. Front Raises	☐	☐	☐
	4. Shrugs	☐	☐	☐
	5. Seated Row	☐	☐	☐
	6. Chest Press	☐	☐	☐

	Exercise	Set 1	Set 2	Set 3
_____ How many minutes of strength training did you complete today? *minutes*	1. Biceps Curls	☐	☐	☐
	2. Triceps Pushdown	☐	☐	☐
	3. Front Raises	☐	☐	☐
	4. Shrugs	☐	☐	☐
	5. Seated Row	☐	☐	☐
	6. Chest Press	☐	☐	☐

Appendix I

Consent Form

Letter of Information and Consent to Participate in Research
Strength training beliefs of cardiac rehabilitation graduates

You are being invited to participate in a research study carried out by Jennifer Millen (Graduate student in the Department of Kinesiology, McMaster University)
If you have any questions or concerns about the study, please feel free to contact her supervisor Dr. Bray (905) 525-9140x26472 or Jennifer at (905) 525-9140x27624.

WHY IS THIS RESEARCH BEING DONE?

We are interested in your thoughts about strength training at home and the effects of instructional materials on these thoughts and behaviours.

WHAT IS THE PURPOSE OF THE STUDY?

The purpose of the study is to look at the effects of different approaches to providing information on strength training at home after completion of a cardiac rehabilitation program.

WHAT WILL MY RESPONSIBLITIES BE IF I TAKE PART IN THIS STUDY?

For this study you will be asked to fill out a survey about your thoughts about strength training on **three** occasions. The first 2 surveys will be filled out before or after the exercise classes you currently attend at the hospital. You will be asked to return to the Hamilton General Hospital Cardiac Health and Rehabilitation Center to fill out the third survey in about one month's time. Before the first survey you will be asked to either use an elastic theraband™ for strength training at home or to do strength training at home as you normally would otherwise.

- If you are placed in the strength training group you will be given an elastic theraband™ and a manual and asked to keep track of the strength training you do for the next **five** weeks. You will also be contacted six months later for a 5-minute telephone interview to answer a few questions about your strength training habits.
- If you are placed in the NON-strength training group you will be asked to fill out three surveys and keep track of your strength training for **five** weeks. After six months you will be contacted by phone about your strength training habits. At that time you will have the option to receive an exercise manual and theraband™ so you can train with them at home if you wish.

WHAT ARE THE POTENTIAL RISKS AND DISCOMFORTS

There are no serious risks associated with taking part in this study. You might find completing the surveys mentally and/or physically tiring. You may take as many breaks as needed. Furthermore, if you are placed in the strength training group you may find some mild muscle discomfort due to training; however this should not differ from that which you have experienced when doing strength training at your exercise sessions at the hospital. If you do have any discomfort you feel may not be normal you should stop

training immediately and contact your physician – s/he will have been told you are involved in this study. If you have any questions regarding your training, you may contact either the student investigator at (905) 525-9140 ext.27624 or the kinesiologists at the hospital at (905) 577-8033.

WHAT ARE THE POTENTIAL BENEFITS TO ME AND/OR TO SOCIETY?
Doing strength training has many benefits for people in cardiac rehabilitation. The study will help us learn if using instructional manuals and therabands™ have any advantages over the usual care people receive when they complete a cardiac rehabilitation program. This study may also help researchers and cardiac rehabilitation program designers to learn more about how to recommend strength training when discharging their patients to home-based exercise.

WILL THERE BE ANY COST?
Taking part in this research project will not involve any extra costs to you or your health care insurer.

WILL I BE PAID TO PARTICIPATE IN THE STUDY?
You will not be paid for taking part in this study. Although not all participants will receive them at the same time, everyone will be able to keep an exercise manual and elastic theraband™ so they can train at home.

WHAT INFORMATION WILL BE KEPT PRIVATE?
Any information that is obtained during this study that can be identified with you will be kept private. This information will only be released with your permission or as required by law. Do not write your name on any part of the survey. The code letters and numbers you write on the front page of each form will be used to match surveys from each time point. That code information will be removed from the data and replaced with a number.

Any information obtained during the testing is private. This information will be kept in a locked filing cabinet in Dr. Bray's research laboratory for a period of five years. Only the student investigator and her supervisor will have access to this information. Your identity will **never** be revealed in any reports of this study.

It is possible that a member of the Hamilton Health Sciences or McMaster University Research Ethics Board may access your research data in order to monitor this study. Records that identify you by name or initials will not be allowed to leave the hospital. You or your legal representative permits such access by signing this consent form.

CAN PARTICIPATION IN THE STUDY END EARLY?
You can decide whether to take part in this study or not. If you volunteer for this study you are free to stop taking part at any time without penalty. You can choose to remove your data from the study at any time. You may also refuse to answer any questions you don't want to answer while remaining in the study. The researcher may remove you from

this study if it becomes necessary (e.g., if you are having difficulty answering the questions or completing the training).

RIGHTS OF RESEARCH PARTICIPANTS
You may remove your consent and stop taking part in this study at any time without penalty. You are not waiving any legal claims, rights or remedies because you are taking part in this research study. This study has been reviewed and received ethics clearance through the McMaster Research Ethics Board (MREB). **If you have any questions about your rights for taking part in research, you may contact: Hamilton Health Sciences Patient Relations Specialist at 905-521-2100, ext. 75240.**

SIGNATURE OF RESEARCH PARTICIPANT/LEGAL REPRESENTATIVE
I understand the information provided for the study ***"Strength training beliefs of cardiac rehabilitation graduates"*** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I will receive a signed copy of this form.

_____
Name of Participant

_____
Name of Legal Representative (if applicable)

_____ _____
Signature of Participant or Legal Representative Date

SIGNATURE OF INVESTIGATOR
In my judgement, the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

_____ _____
Signature of Investigator Date

Appendix J

Appointment Reminder Card

McMaster University

Appointment Reminder

Date: _____

Time: _____

Place: _____

Don't forget your Exercise Logbooks

Jennifer Millen: (905) 525-9140 ext. 24694

Appendix K

Thera-Band® Care Information

Thera-Band® Care and Pre-Cautions

1. How should you clean and care for your Thera-Band® elastic bands?

Immerse the band or tube in fresh clean water in a sink or under a running faucet. Rub a small amount of mild hand soap over the wet band or tube and then rinse in fresh water. Lay flat to dry, or drape the band or tube over the back of a chair or similar object and allow to thoroughly dry. Once dry, rub a small amount of talcum, baby powder, corn starch, or similar powder over the surface of the band or tube to prevent sticking.

Keep in a cool, dark environment, this should help the bands last for many years. Exposure to temperature extremes, chlorine, and sunlight will decrease the life of the bands.

With normal daily use, the bands should last for many months. However, they won't last forever. They may break if stretched beyond 500% or if they are used with small tears or abrasions. Always inspect the band or tubing before use. Be aware that jewellery, fingernails, and other sharp objects may cause small tears or abrasions. Always protect the eyes during exercise with elastic bands.

2. How long can you stretch the Thera-Bands®?

Don't stretch beyond 300% elongation. The bands are more susceptible to breaking with greater than 500% elongation (for example, stretching a 1 foot piece to 6 feet), and the resistance increases sharply after 500%.

Appendix L

Study Debriefing Script

Debriefing Telephone Script

Hello *__participant's name__*. This is Jenn Millen calling from McMaster University regarding the study you are participating in, I was wondering if I could ask you a few more questions regarding your exercise in the past week?

Administer PASE QUESTIONNIARE

After completion of questionnaire:

I would like to thank you for the time and commitment you put into my study. The purpose of the study was to see if giving an instructional manual and Thera-Bands® would help your confidence to strength train on your own after you completed the cardiac rehabilitation program. As you know there were two groups in which you were randomly assigned to one of them: the experimental group or the control group.

Experimental Group: You have completed the study and I hope you will continue to use the materials given to you to continue getting the benefits from strength training.

Control Group: You have completed the study and you now have the option of receiving the same materials as the other group. Are you interesting in meeting to receive and review these materials?

If yes: a meeting will be made that suits both the investigator and participant
If no: participant will be thanked again for their time

What do we think we may find from this study? Those individuals that received the instructional materials and bands will be more confident to strength train and to complete daily activities. Furthermore, they will strength train more often then the control group.

If we do find these results, what could it mean? As patients leave cardiac rehabilitation, offering them a strength training manual and equipment can help them to stay confident and continue to gain the benefits from strength training in the comfort of their home.

Thanks again I really appreciate your help for my study.

Jenn Millen