THE IMPACT OF A CARDIAC REHABILITATION PROGRAM AND GENDER ON DEPRESSIVE SYMPTOMS IN CARDIAC PATIENTS

A Thesis Submitted to the
Faculty of Graduate Studies and Research
In Fulfillment of the Requirements for the Degree of
Master of Science in Kinesiology and Health Studies

by

Natalie Kym Marshall-Prain

Regina, Saskatchewan

March, 2014

© 2014: N. K. Marshall-Prain
UNIVERSITY OF REGINA
FACULTY OF GRADUATE STUDIES AND RESEARCH
SUPERVISORY AND EXAMINING COMMITTEE

*Natalie Kym Marshall-Prain, candidate for the degree of Master of Science in Kinesiology & Health Studies, has presented a thesis titled, *The Impact of a Cardiac Rehabilitation Program and Gender on Depressive Symptoms in Cardiac Patients*, in an oral examination held on March 18, 2014. The following committee members have found the thesis acceptable in form and content, and that the candidate demonstrated satisfactory knowledge of the subject material.

External Examiner: Dr. Mary Hampton, Luther College

Supervisor: Dr. Kim D. Dorsch, Faculty of Kinesiology & Health Studies

Committee Member: **Dr. Patrick Neary, Faculty of Kinesiology & Health Studies

Committee Member: Dr. James Daschuk, Faculty of Kinesiology & Health Studies

Committee Member: Dr. Harold A. Riemer, Faculty of Kinesiology & Health Studies

Chair of Defense: Dr. Dongyan Blachford, Faculty of Graduate Studies & Research

*via Video-Conference
**Not present at defense
ABSTRACT

A cardiac event affects the physical and psychological well being of individuals. Among the psychological consequences, researchers have found that a cardiac event can lead to high levels of depressive symptoms in both males and females (Milani, Lavie, & Cassidy, 1996). To date, research has confirmed the beneficial effects of a cardiac rehabilitation (CR) program on depressive symptoms (Casey, Hughes, Waechter, Josephson, & Rosneck, 2008; Zellweger, Osterwalder, Langewitz, & Pfisterer, 2004); however, there has been a limited focus on how males and females differ in their depressive symptoms both prior to commencing and after completing a CR program. Previous research has shown that patients with heart disease and co-morbid depressive symptoms have a high risk for subsequent major cardiac events and potentially fatal cardiac consequences (Irwin, Artin, & Oxman, 1999). This can place a significant economic burden on society, lead to treatment drop-out and program non-compliance, and reduce the overall well-being of the patient (Tylee & Gandhi, 2005). However, understanding the impact of a CR program on depressive symptoms may reduce these health risks. Therefore, the purpose of this study was to examine the effect of a CR program on depressive symptoms in male and female heart disease patients after a cardiac event. The study used secondary data based on the treatment of a twelve-week, physician supervised, community-based CR program. Responses from 272 participants (178 men and 94 women) who completed the center for epidemiological studies depression (CES-D) scale questionnaire were collected twice over the course of the rehabilitation program (at baseline and twelve weeks). Although previous research has shown that females have an increased susceptibility to depressive symptoms in both the cardiac and general population (Lindwall, Stain-Malmgren, Andersson, Aberg-Wistedt, &
Schenck-Gustafsson, 2007), the female participants in this study did not score higher than males for depressive symptoms at the start or at the completion of the CR program. Moreover, male and female participants did not possess a high score for depressive symptoms at the start of the CR program or after completing the program; despite preceding studies that indicate a high score for depressive symptoms at the commencement of a CR program and an overall improvement in depressive symptoms over the course of a CR program (Milani & Lavie, 2007; Shepherd & While, 2012). It is also worth noting that only 35% of the sample were women. In order to understand some of reasons why the participants in this study did not show signs of depressive symptoms, there needs to be additional questions that address barriers to participation in cardiac rehabilitation as part of the questionnaires that are already in place. Moreover, to ensure that attendance in cardiac rehabilitation is effective and immediate, there needs to be more efficient strategies that allow for continued contact between the health care provider and the cardiac patient.
ACKNOWLEDGEMENTS

I would like to express my deep appreciation to Dr. Kim Dorsch for her support and encouragement throughout my Master of Science degree program. Her enthusiasm in wanting to make a positive change in the area of cardiac rehabilitation was a great source of inspiration for my pursuit in this area of research.

I would also like to thank Dr. Harold Riemer, Dr. Patrick Neary, Dr. James Daschuk and Dr. Mary Hampton for their contributions as thesis committee members.

I would like to thank the staff at the cardiac rehabilitation center for their overwhelming support in assisting me with my data collection and to all the patients who volunteered their time to make my study possible.

Finally I would like to thank my partner, Eric, for his patience and understanding throughout this process, my colleague Sebastian for his assistance with my project, and to my family for their continued belief in my ability and dedication.

I also want to recognize the funding that I have received through the Faculty of Graduate Studies and Research at the University of Regina.
TABLE OF CONTENTS

ABSTRACT .................................................................................................................. i

ACKNOWLEDGEMENT ............................................................................................. iii

TABLE OF CONTENTS ............................................................................................ iv

LIST OF TABLES ......................................................................................................... vi

INTRODUCTION

Depression .................................................................................................................. 1
Depression and Coronary Heart Disease ................................................................. 1
Utilisation of Healthcare Services ........................................................................... 4
Treatment .................................................................................................................. 5
Measurement of Depressive Symptoms .................................................................. 6
Cardiac Rehabilitation ............................................................................................... 7
Gender ....................................................................................................................... 9
Purpose and hypotheses ............................................................................................ 11

METHOD

Study Design ............................................................................................................... 12
Cardiac Rehabilitation Protocol .............................................................................. 12
Frequency ................................................................................................................ 13
Intensity .................................................................................................................... 13
Time ......................................................................................................................... 14
Type ......................................................................................................................... 14
Participants ............................................................................................................. 14

Participant Characteristics .................................................................................... 15

Instrument

*Center for epidemiological studies depression scale*

iv
RESULTS

The Effect of Time on Depressive Symptoms .........................20
The Effect of Gender on Depressive Symptoms .....................21

DISCUSSION ..............................................................................23

Limitations ..............................................................................26
Lack of a control group ..........................................................26
Selection bias ...........................................................................26
Changes in patient’s physical or mental health status ..............26
Use of secondary data ..............................................................27
Data collection .........................................................................27

CONCLUSION .............................................................................28

REFERENCES ............................................................................29

LIST OF APPENDICES

A. Informed Consent for Cardiac Rehabilitation .......................36
B. Ethics Approval .....................................................................41
C. Center for Epidemiological Studies - Depression (CES-D) Scale ..42
D. Borg RPE Scale .....................................................................44
LIST OF TABLES

Table 1. Subject Characteristics ................................................................. 16

Table 2. Reliability of the CES-D by Subscale ........................................ 19

Table 3. Mean Total and Subscale Scores at Time Point 1 and
          Time Point 3 .......................................................................................... 21

Table 4. Tests of Within and Between-Subject Effects for CES-D Total and
          Subscales ............................................................................................... 22

Table 5. Mean Scores of CABG Patients for the Positive Affect Factor of the
          CES-D 22 .................................................................................................. 23
Introduction

Depression

Depression is highly prevalent in western societies. According to the World Health Organisation (2012) “depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration” (¶1). Due to the severe health implications that are sometimes associated with heart disease it is common for depressive symptoms to develop as an individual adjusts to life after a severe health threat such as a cardiac event; it is considered a normal part of coping. As part of the recovery process, the period of sadness can be long and intense and interfere with a variety of personal and social activities. If depressive symptoms go unrecognised and untreated they tend to reoccur in both the general and cardiac populations. This emphasises the need to continue screening for depressive symptoms so that referral for psychiatric treatment can be encouraged. It is also important that both men and women are actively referred to participate in rehabilitation programs and that these programs are tailored to meet the individual needs of the patients.

Throughout the literature there is an interchange between depression and depressive symptoms. Some researchers will use the word depression without noting whether patients have been diagnosed by a psychiatrist using the diagnostic and statistical manual of mental disorders (DSM-IV) criteria. I will use the term depression throughout this paper unless the author has explicitly stated otherwise, however, the purpose of my study will focus on the level of depressive symptoms in cardiac patients after a cardiac event measured by a standardised psychometric scale: the centre for epidemiological studies depression scale (CES-D; Radloff, 1977).
Depression and Coronary Heart Disease

Coronary heart disease (CHD) is a life threatening illness and is also exceedingly common in western culture. CHD is defined as a narrowing of the small blood vessels that supply blood and oxygen to the heart (Sanjuan, Ruiz, & Perez, 2010). It is caused by the build-up of plaque in the arteries to the heart and has a tendency to affect both men and women with increasing age (Zellweger, Osterwalder, Langewitz, & Pfisterer, 2004). CHD remains the most common cause of death worldwide and was estimated to be responsible for 7.2 million deaths on a global scale in 2004 (Shepherd & While, 2012).

Of all of the psychological consequences studied in cardiovascular disorders depression is the most common and the best supported by epidemiological evidence (Ziegelstein, Thombs, Coyne, & De Jonge, 2009). Numerous studies over the years have reported that individuals with heart disease are more likely to experience depression than those without heart disease (Caulin-Glaser, Maciejewski, Snow, LaLonde, & Mazure, 2007). Coupled with having heart disease, patients with depression are associated with having poorer physical and emotional functioning, greater cardiac symptom burden and health limitations, and lower general well-being (Shepherd & While, 2012). According to Lavie, Milani, Cassidy, and Gilliland (1999) depression after a cardiac event runs a long-term course with over 95% remaining depressed at six months and 70% remaining depressed at one year. This emphasises the importance of assessing patients directly after a cardiac event to allow for early identification of depressive symptoms and to refer patients immediately to a formal CR program and/or a mental health professional.

Depression is thought to be common in coronary patients as part of the transitory adjustment to the reaction to heart disease. However, if it is left untreated it
tends to persist in this patient population (Lesperance & Frasure-Smith, 2000). Data 
from the World Health Survey indicated that co-morbid depression incrementally 
worsens health compared with depression alone, any major chronic disease alone, 
and any combination of chronic diseases without depression (Yohannes, Willgoss, 
Baldwin, & Connolly, 2009). With this in mind, it is apparent that patients with heart 
disease who are displaying depressive symptoms face a more difficult course of 
recovery, which can pose obstacles to rehabilitation and exacerbate their illness. This 
highlights the need to continue screening for depressive symptoms (as part of a CR 
program) by assessing it directly or by identifying individuals who present a high risk 
for developing such symptoms.

While depression has been shown to negatively affect morbidity there also 
exists a strong association between depression and cardiac mortality in patients with 
established heart disease (Zellweger et al., 2004). According to Barth, Schumacher, 
and Herrmann-Lingen (2004) the risk of mortality is at least two times higher in the 
short and medium term for patients suffering from co-morbid clinical depression and 
heart disease. The effect of depression on mortality is not just a short-term risk factor; 
some degree of depression affects at least 30% of hospitalised patients with heart 
disease and is associated with increased risks for mortality and depression over the 
first year subsequent to hospital discharge (Lesperance & Frasure-Smith, 2000). Not 
only does this impose a significant economic burden on society it also stresses the 
need to screen for depressive symptoms at the first instance following a cardiac 
event.

Depression increases the risk of mortality for patients with heart disease and 
for those who have experienced a myocardial infarction (MI), coronary artery bypass 
graft (CABG) surgery, stroke, and chronic heart failure (CHF; Casey et al., 2008).
Patients with co-morbid CHF and depressive disorders have a two-three times higher mortality and are associated with a higher incidence of cardiac events such as an MI or cardiac arrest (Norra, Skobel, Arndt, & Schauerte, 2008). Medical costs were also found to be 26% higher in patients with CHF who had been prescribed antidepressants (Yohannes et al., 2009). Unfortunately, the rates for recognising depression in CHF patients are quite poor. Research by Holzapfel et al. (2008) attributes this to an overlap of symptoms of the two disorders; CHF and depression are both characterised by fatigue, loss of energy, poor appetite, sleep disturbances, and concentration deficits. The features that discriminate depressed patients with and without co-morbid physical illness are the cognitive-emotional symptoms such as hopelessness and feelings of guilt (Holzapfel et al., 2008).

Given this complex interaction between depression and heart disease it is important that health professionals are able to recognise the hidden and sometimes subtle signs of depressive symptoms so that patients can be treated and carefully monitored throughout the rehabilitation process.

**Utilisation of healthcare services.** The global disease burden (GDB) study found that on a worldwide basis, major depression ranks 3rd as a cause of early death and disability and ranks 2nd in industrialised countries, just after CHD (Wang et al., 2010). In addition to the increased risk of fatal cardiac consequences associated with post-MI depression there is also an increase in health care costs linked to readmission and outpatient contact (Ketterer et al., 2010). Individuals with heart disease and co-morbid depression have an average of two to three times more medical visits prior to admission and also use more inpatient medical services following discharge (Norra et al., 2008). It is essential that a positive screening result for depressive symptoms be followed up with an accurate diagnosis and psychiatric treatment. In this instance not
only would the quality of life for patients with depressive symptoms and heart
disease be improved, but also the associated medical costs for increased physician
and emergency room visits could be reduced.

**Treatment.** Identification and treatment of depression is especially important
in patients following a cardiac event (Milani et al., 1996). According to Carney,
Freedland, Rich, and Jaffe (1995) less than 25% of patients with major depression are
diagnosed as depressed by their cardiologists and only about half of these patients
receive adequate treatment. The occurrence of increased cardiac symptoms in
patients with depression indicates the need to screen for depressive symptoms so that
treatment can be initiated as soon as possible, both to reduce the risk of relapse and to
decrease the high risk of mortality in this patient group. Patients with co-morbid
depression and heart disease have been shown to benefit from CR programs through
the improvement of coping skills and self-image, and by providing emotional support
and improving quality of life (Zellweger et al., 2004). Participation in CR is also
associated with lower rates of all-cause mortality and potentially fatal cardiac
consequences (Casey et al., 2008). With this being the case, greater emphasis is
needed to ensure that patients with depressive symptoms are referred to and attend
formal CR programs immediately following a cardiac event.

There are some current guidelines in existence that suggest the ideal time to
commence participation in CR. In 2000, the “National Service Framework for
Coronary Heart Disease” was published in the United Kingdom and recommended
that patients should initiate rehabilitation four weeks after an acute cardiac event
(United Kingdom Department of Health, 2000). In 2002, the “Heart Foundation Best
Practice Evidence-Based Guideline: Assessment and Management of Cardiovascular
Risk” in New Zealand recommended that patients should ideally begin CR within
one-two weeks following hospital discharge (New Zealand Guidelines Group, 2002).
Similarly, in 2004 the “Recommended Framework for Cardiac Rehabilitation” in
Australia suggested that rehabilitation should commence immediately upon discharge
from the hospital (National Heart Foundation of Australia and Australian Cardiac
Rehabilitation Association, 2004). Overall, the national guidelines on CR enrollment
suggest that participation should begin one to four weeks following hospital
discharge (Pack et al., 2012).

Measurement of depressive symptoms. Since depressive symptoms are
found very commonly in cardiac patients it is important to be able to measure them
reliably. Self-report scales are the least open to observer bias, easy to use, and require
only limited guidance and experience for the person who is administering the test
(Hare & Davis, 1996). There are some existing self-report depression scales used
commonly in the general population and in clinical settings; the profile of mood
states (POMS; McNair, Lorr, & Droppleman, 1971), the hospital anxiety and
depression scale (HADS; Zigmund & Snaith, 2007), the Zung self-rating depression
scale (Zung, Richards, & Short, 1965), the Beck depression Inventory (BDI; Beck,
Ward, Mendelson, Mock, & Erbaugh, 1961), and the Beck depression Inventory II
(BDI-II; Beck, Steer, & Brown, 1993). Most of these questionnaires have correlated
well with an interview assessment, however, as separate scales they do not include a
sizeable amount of somatic symptoms that are commonly experienced by patients
with depression (Hare & Davis, 1996). It is therefore worth noting that the CES-D
measures both the psychological and somatic components of depressive symptoms
(Schroevers, Sanderman, von Sonderen, & Ranchor, 2000).

The depression that is experienced by cardiac patients coincides with an
adjustment disorder or a reaction to either real or perceived loss of health,
independence, social responsibility, and/or employment or financial security
(Zellweger et al., 2004). Among the psychological symptoms of depression such as
low mood, loss of interest, poor concentration, and anxiety, there are also somatic
symptoms of depression that include changes in appetite and libido, lack of energy,
sleep disturbance, non-painful somatic symptoms (e.g., dizziness and palpitations),
and general aches and pains (e.g., headache, backache, or musculoskeletal aches;
Tylee & Gandhi, 2005). Somatic symptoms are more commonly reported in women
and elderly patients with depression and lead to an increased utilisation of health care
services (Dowrick, Katona, Peveler, & Lloyd, 2005). Furthermore, research has
shown that the severity of somatic symptoms can minimise a patient’s willingness to
comply with treatment, making the primary care physician’s role in the awareness of
somatic symptoms extremely important (Tylee & Gandhi, 2005).

The high incidence of depression and its sizable effect on the quality of life of
cardiac patients is well documented and stresses the need to use rating scales such as
the CES-D to measure depressive symptoms reliably and identify appropriate patients
for treatment (Irwin, Artin, & Oxman, 1999).

**Cardiac Rehabilitation**

According to the Canadian Association of Cardiac Rehabilitation (CACR; 2013) *cardiac rehabilitation* refers to “the enhancement and maintenance of
cardiovascular health through individualised programs designed to optimise physical,
psychological, social, vocational, and emotional status. This process includes the
facilitation and delivery of secondary prevention through risk factor identification
and modification in an effort to prevent disease progression and recurrence of cardiac
events” (¶ 1). Coronary patients who experience depressive symptoms after a cardiac
event are associated with non-adherence to risk factor modifications. They are less
likely to adopt lifestyle changes aimed at reducing the risk of subsequent cardiac events, and have poor patient compliance to formal CR programs. Several studies have also shown that dropout rates from CR programs are higher in patients with depression than in patients without depression (Zellweger et al., 2004). For example, a study by Casey and colleagues (2008) revealed that cardiac patients with elevated levels of depressive symptomology were 2.2 times less likely to complete CR compared to patients without depression. The relationship between depression and non-compliance in the coronary patient stresses the importance of recognising psychologically distressed patients entering CR. This would involve implementing interventions aimed at targeting patients with depressive symptoms and improving adherence in the first few weeks of the rehabilitation program. Patients who show depressive symptoms should be given extra attention to ensure that they comply and adhere to rehabilitation or be referred to psychiatric treatment if necessary.

In addition to measuring depressive symptoms at the start of rehabilitation programs it is also beneficial to evaluate depressive symptoms at the completion of the program. According to Ades, Waldmann, McCann, and Weaver (1992) the most important effects of CR fall within the psychological realm. The aspect of socialisation and emotional bonding with other patients who are at various stages of recovery has been shown to have a positive effect on depression and related behaviour (Milani & Lavie, 2007a). Moreover, research has demonstrated that patients who participate in and complete CR programs receive better medical care, have less severe cardiac pathology and are less depressed, and are therefore more prepared and motivated to make positive lifestyle changes (Shepherd & While, 2012). Conducting a formal evaluation of the psychological state of patients after completing a CR program will corroborate current evidence that a CR program leads
to a significant improvement in scores for depressive symptoms. This will demonstrate the need for physicians to rigorously refer male and female cardiac patients to a formal rehabilitation program immediately following their cardiac event, and encourage health care providers to tailor rehabilitation programs to meet the individual needs of the patient so that the long-term benefits can be received.

**Gender**

It has been well established that women with heart disease have a unique and hazardous group of risk factors (older age, hypertension, and diabetes) but very little is known about the characteristics of female heart disease patients who experience depressive symptoms after a cardiac event (Grace, Abbey, Pinto, Shnek, Irvine, & Stewart 2005). This is somewhat disturbing given that the prevalence of depression is at least twice as high among women as men with heart disease, with depressed women being particularly vulnerable to sudden cardiac death (Lindwall, Stain-Malmgren, Andersson, Aberg-Wistedt, & Schenck-Gustafsson, 2007). In fact, research by Lavie et al. (1999) found that depression in women considerably affects prognosis following cardiac events more so than men, which leads to an increased risk of major cardiac events and death. Since women have a rate of depression two times that of men in the cardiac population, it is alarming that more depressed men, and fewer depressed women are referred to participate in CR (Grace, Racco, Chessex, Rivera, & Oh, 2010). The higher scores for depression in women with heart disease highlights the need to identify depressive symptoms immediately following a cardiac event in order to enhance adherence to CR treatment.

According to Cooper, Jackson, Weinman, and Horne (2002) in the US and Canada only approximately 15-30% of eligible patients participate in CR, with the rate for women being much lower at approximately 11-20%. Other researchers have
shown that the percentage of women in CR is 20% lower than what would be expected (Grace et al., 2010). Some researchers have suggested that the reasons for low participation by women are centered on a lower fitness level, older age, greater disease severity, and social isolation (Jackson, Leclerc, Erskine, & Linden, 2004). Others have identified the strength of the physician’s recommendation to be the strongest predictor of attendance and that men are referred almost twice as often as women (Lieberman, Meana, & Stewart, 1998). Despite all of these factors there is no evidence to suggest that women are less likely to benefit from CR than men, and the fact that women often present with lower physical fitness indicates that they have a greater potential to benefit from rehabilitation (Lavie & Milani, 1997b).

A study by Grace et al. (2010) explored the idea that the low rates of enrollment in CR by women had something to do with the structure of the rehabilitation program itself and whether they are equally appealing to both sexes. Women report sometimes being the only woman in a group of men, most of whom are younger than themselves, which makes them self-conscious and hinders their involvement in the program (Grace et al., 2010). Women also report perceiving these programs as male-oriented and failing to meet their care preferences (Grace et al., 2005). At the time of a cardiac event the circumstances for women are much different than men. For example, women are likely to be older and potentially widowed, they have greater care giving responsibilities, fewer social supports, and are likely to suffer from a co-morbid condition such as arthritis or osteoporosis (Lieberman et al., 1998). In addition, symptoms of depression are more common in women and are negatively associated with measures of cardiovascular health. With this in mind, meeting the needs of women in the CR setting is a critical factor in the recovery process.
It is unfortunate that CR programs are an underused resource, especially by women. It is not clear why women are not using these services given that rehabilitation has shown to decrease mortality and morbidity, increase confidence, improve physical conditioning, and increase quality of life (Milani et al., 1996). Although some researchers have attempted to identify the incentives that influence participation rates in CR they are largely speculative. Apart from a very limited number of studies, there are few reports that describe the outcomes and explore the factors that may be barriers to CR participation among women, and the underlying reasons why women are less likely to complete CR are not well documented. In fact, there is very limited gender comparison literature identifying the barriers for participation and completion of CR for women. If healthcare providers are able to gain a clearer understanding of the barriers to participation and completion of CR programs then they can tailor the treatment to address specific patient concerns and ultimately improve their quality of life.

**Purpose and Hypotheses**

The purpose of this study was to document the effect of a CR program on depressive symptoms in males and females after a cardiac event. Based on the literature I hypothesised that there would be a positive effect on depressive symptoms for cardiac patients who participated in a CR program, and that females would have higher scores for depressive symptoms than males both prior to commencing a CR program and after completing a CR program.
Method

Study Design

This was a descriptive study using a non-experimental pre-test/post-test design. The study used secondary data based on the treatment of a twelve-week, physician supervised, community-based CR program at a local cardiac rehabilitation exercise program. Data were collected twice over the course of the rehabilitation program (at baseline and twelve weeks) and were analysed in order to determine the effect of a CR program on depressive symptoms in both males and females. At each data collection period participants completed a questionnaire that is specifically designed to test for depressive symptoms. As part of the inclusion criteria all 272 participants completed questionnaires at baseline and twelve-weeks between 2011-2013. The primary dependent variable that will be assessed from the secondary data is the level of depressive symptoms. The two independent variables that will be assessed are gender (males and females) and time (baseline and twelve-weeks).

Cardiac Rehabilitation Protocol

Each new patient entering the CR program goes through an initial intake that consists of gathering detailed history about cardiovascular health, exploring risk factor education, and initiating program development. Programs are individually designed to account for varied functional abilities and current musculoskeletal conditions. Exercise programs are monitored under the supervision of a physician, registered nurse, American College of Sports Medicine (ACSM) exercise specialists, Canadian Society for Exercise Physiologists (CSEP) certified exercise physiologists and exercise leaders. The program consists of 36 exercise sessions that include a warm-up, cool-down, and exercise program with the ideal attendance rate set at two to three times per week.
**Frequency.** According to the ACSM guidelines for frequency of exercise, it is most beneficial for a cardiac population in an outpatient rehabilitation program to complete three to five sessions per week (ACSM, 2000). Participants in the CR program are requested to attend their exercise program three times per week for a period of twelve weeks for a total of 36 exercise sessions. If patients are unable to attend a scheduled exercise session, they are encouraged to do aerobic exercise at home that elevates their heart rate (HR) into their target range. In order to meet the minimum requirement of three sessions per week each aerobic activity needs to be performed continuously for fifteen to twenty minutes.

**Intensity.** The standard procedure for prescribing HR for aerobic activity involves using the heart rate reserve (HRR) method. This method takes into account maximal heart rate, resting heart rate, and intensity ranges. The recommended aerobic intensity for patients in the CR program is a training range of 40%-70% of their HRR.

\[
HRR = (\text{max HR - resting HR}) \times (40\%, 70\%) + \text{resting HR}
\]

For those patients who do not perform a stress test at baseline into the program their maximum target HR is calculated using their resting HR plus 30 beats per minute (ACSM, 2000). In addition, an alternate method of measuring intensity is used for patients who take beta blockers. Beta blockers are medications that work to reduce resting and maximal HR and therefore drastically alter HRR and exercise prescription. For individuals who are taking beta blockers, aerobic intensity is prescribed based on Borg’s rating of perceived exertion (RPE) scale (Borg & Linderholm, 1967; Appendix D). The scale is comprised of 15 points where a rating of 6 means no exertion and a rating of 20 means maximal exertion. Patients are
encouraged to achieve a rating between 11 (fairly light) and 14 (hard). HR or RPE values are entered into the patient’s attendance booklet after each exercise.

With regard to resistance training the intensity is set for the individual to achieve failure after completion of the tenth repetition of the first set. Participants are instructed to gradually build on repetitions until they reach a plateau of fifteen repetitions on the first set. After the participant maintains a consistency of fifteen repetitions a 10% increase will be added to the resistance machines and the individual will start at ten repetitions.

**Time.** In order to obtain improvements in functional outcomes, the ACSM recommends that each exercise session lasts fifteen to twenty minutes in duration (ASCM, 2000). For participants in the specific CR program involved in this study, each exercise session is comprised of a ten to fifteen minute warm-up and cool-down with approximately 30 minutes of aerobic exercise in-between.

**Type.** The ASCM guidelines recommend that aerobic exercise be the dominant mode of exercise for a cardiac population (ASCM, 2000). This recommendation is implemented in this specific CR program in combination with circuit weight training.

**Participants**

Based on the secondary data collected for this study, the CES-D questionnaire responses of 272 male and female CHD patients who were referred by their physician to participate in the specified CR program were analysed. No data on the race and/or ethnicity of the participants was collected. Patients were admitted to the rehabilitation program based on physician referral following hospitalisation for a heart attack (MI), angina, chronic heart failure (CHF), coronary artery bypass surgery (CABG), angioplasty, heart valve repair or replacement, cardiomyopathy, chronic obstructive
pulmonary disease (COPD), heart transplant, stroke, cardiac arrest, dysrhythmia, transient ischemic attack (TIA), aneurysm, or dyspnea. Participation in the rehabilitation program is on a voluntary basis and informed consent was obtained from all participants prior to commencing the program (Appendix A). This study complies with the University of Regina’s ethical guidelines for secondary analysis of research involving human participants and has written approval from the University of Regina Research Ethics Review Board (Appendix B).

**Participant characteristics.** As can be seen in Table 1, the mean age of the participants was 67 ± 13 years with 178 of the subjects being male (65%). The average amount of days it took participants to complete the program was 135 ± 54 days. The most common entry diagnoses of the 272 patients were 93 angioplasties, 90 myocardial infarctions, and 56 coronary artery bypass grafts. The cardiac conditions and clinical characteristics can be seen in Table 1.
### Table 1

**Participant characteristics**

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>272</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>178</td>
</tr>
<tr>
<td>Women</td>
<td>94</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>67</td>
</tr>
<tr>
<td>SD</td>
<td>13.2</td>
</tr>
<tr>
<td><strong>Days to complete program</strong></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>135</td>
</tr>
<tr>
<td><strong>Cardiac condition</strong></td>
<td></td>
</tr>
<tr>
<td>Angioplasty</td>
<td>93</td>
</tr>
<tr>
<td>Myocardial Infarction (MI)</td>
<td>90</td>
</tr>
<tr>
<td>Coronary Artery Bypass Graft (CABG)</td>
<td>56</td>
</tr>
<tr>
<td>Dysrhythmia</td>
<td>51</td>
</tr>
<tr>
<td>Angina</td>
<td>38</td>
</tr>
<tr>
<td>Valve Replacement</td>
<td>30</td>
</tr>
<tr>
<td>Ejection Fraction (EF) Flow</td>
<td>14</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>14</td>
</tr>
<tr>
<td>Chronic Heart Failure (CHF)</td>
<td>13</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease (COPD)</td>
<td>11</td>
</tr>
<tr>
<td>Stroke</td>
<td>11</td>
</tr>
<tr>
<td>Pacemaker</td>
<td>11</td>
</tr>
<tr>
<td>Transient Ischemic Attack (TIA)</td>
<td>10</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>10</td>
</tr>
<tr>
<td>Sudden Cardiac Arrest</td>
<td>8</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>8</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>4</td>
</tr>
<tr>
<td>Heart Transplant</td>
<td>0</td>
</tr>
<tr>
<td>Claudication</td>
<td>0</td>
</tr>
<tr>
<td><strong>Clinical characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>162</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>147</td>
</tr>
<tr>
<td>Family History</td>
<td>108</td>
</tr>
<tr>
<td>Smoker</td>
<td>101</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>50</td>
</tr>
<tr>
<td>Type 2 Diabetes</td>
<td>43</td>
</tr>
<tr>
<td>Obesity</td>
<td>23</td>
</tr>
<tr>
<td>Stress/Depression</td>
<td>21</td>
</tr>
<tr>
<td>Cancer</td>
<td>19</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>11</td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>6</td>
</tr>
<tr>
<td>Insulin Dependent</td>
<td>4</td>
</tr>
<tr>
<td>Type 1 Diabetes</td>
<td>2</td>
</tr>
</tbody>
</table>
Instrument

Center for epidemiological studies depression scale. The CES-D (Radloff, 1977; see Appendix C) is a self-report scale designed to measure both the psychological and somatic symptoms of depression. The scale was purposively designed to identify depressive symptoms in the general population (Radloff, 1977). The CES-D has become a standard measure of depressive symptomology in elderly persons. In fact, of all the self-report scales the CES-D is the most widely studied depression scale and is very commonly used for the evaluation of depressive disorders both in the general population and in medically ill older adults (Wise, Harris, & Carter, 2006). The scale was influenced by items in five other depression scales: the Zung self-rating depression scale (Zung et al., 1965), the Beck depression Inventory (BDI; Beck et al., 1961), the Minnesota multiphasic personality Inventory (MMPI; McKinley & Hathaway, 1943), the Raskin self-report depression scale (Raskin, Chultebbrandt, Reating, & McKeon, 1970), and the Gardner symptom checklist (Gardner, 1968 as cited in Ensel, 1986). According to Radloff (1977) the scale has high internal consistency, acceptable test-retest stability, excellent concurrent validity by both clinical and self-report criteria, and substantial evidence of construct validity.

The CES-D measures current levels of depressive symptomology with emphasis on the affective component; depressed mood (Radloff, 1977). The major components of depressive symptomology that are identified in the questionnaire include depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance (Radloff, 1977). The instrument is comprised of a 20-item self-report measure that asks participants to describe how they have felt during the past week. Each response
is scored from 1-7 on a scale of frequency of occurrence of the symptom: (1-2) “never”, (3-5) “occasionally (50% of the time)”, (6-7) “always”. The possible range of scores is 20-140 with the scoring of positive items (4, 8, 12 and 16) being reversed (thus score 7 becomes score 1, score 6 becomes score 2, etc.). Higher scores indicate more depressive symptoms weighted by frequency of occurrence during the past week (Radloff, 1977).

In her original factor analysis of the 20-item scale Radloff (1977) used a 4-factor structure comprising of 16 items. Although the scale is said to have construct validity and excellent concurrent validity by clinical and self-report criteria, it was suggested by Radloff (1977) that all 20 items are related to symptoms of depression and are best calculated as a single score, as opposed to dividing the items into separate factors. In a subsequent study on adolescents and young adults, Radloff (1991) used a 4-factor structure comprising of 17 items and found a high internal consistency of reliability for the samples. For the purpose of this study, Radloff’s 20-item 4-factor structure with all items included in the analysis was used. The four subscales include (a) depressed affect (blues, depressed, failure, fearful, lonely, cry sad), (b) positive affect (good, hopeful, happy, enjoy), (c) somatic complaints (bothered, appetite, mind, effort, sleep, talk, get going), and (d) interpersonal relationships (unfriendly, dislike).

Chronbach’s alpha for the CES-D total scores of elderly samples has been reported between 0.86 and 0.89 demonstrating a high degree of internal consistency with older adults (Radloff, 1977). As indicated in Table 2, internal consistency was calculated separately across the four sub-scales of the CES-D at time point one and time point three. According to Nunnally (1978) reliabilities of 0.70 or higher are sufficient for research purposes. The alpha values for depressed affect and somatic
complaints are in accordance with Nunnally’s suggestion of 0.70. However, both positive affect and interpersonal relationships fell below the recommended alpha value, possibility due to an insufficient number of items in each factor (two in interpersonal relationships and four in positive affect).

Table 2

*Reliability of the CES-D by sub-scale*

<table>
<thead>
<tr>
<th></th>
<th>Time Point 1*</th>
<th>Time Point 3*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed Affect</td>
<td>0.84</td>
<td>0.84</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>0.60</td>
<td>0.67</td>
</tr>
<tr>
<td>Somatic Complaints</td>
<td>0.78</td>
<td>0.79</td>
</tr>
<tr>
<td>Interpersonal Relations</td>
<td>0.76</td>
<td>0.60</td>
</tr>
</tbody>
</table>

*Chronbach’s Alpha*

**Statistical Analyses**

A repeated-measures 2 (gender) x 2 (time) factorial ANOVA was used to analyse the results of this study. Depressive symptoms were assessed by making comparisons between males and females prior to commencing a CR program, and males and females after completing a CR program. The overall interaction between gender and CR on depressive symptoms was then measured. Chronbach’s alpha was assessed to examine the internal consistency and reliability of the CES-D. Statistical analyses were carried out using SPSS 18 for Windows (SPSS Inc., Chicago, IL, USA). Significance was set at $p<0.05$ in all calculations.
Results

The mean age of the participants in this study was 67 years. The mean scores for the 20-item CES-D (± SD) at each time point were: time point one (males) = 2.1 ± 0.8 and time point three (males) = 2.1 ± 0.8, time point one (females) = 2.1 ± 0.7 and time point three (females) 2.0 ± 0.7. The mean scores for each sub-scale of the CES-D at time point one and time point three are depicted in Table 3. As mentioned previously, a score of 1-2 on the 7-point Likert scale indicates “never” for frequency of occurrence of the symptom.

The Effect of Time on Depressive Symptoms

The first hypothesis stated that there would be a positive effect on depressive symptoms for cardiac patients who participated in a CR program. To test this hypothesis a two-way repeated measures factorial ANOVA was performed to examine the differences between scores for depressive symptoms at time point one and time point three. The overall ANOVA revealed that scores for depressive symptoms are not significantly different between time point one and time point three for any of the sub-scales of the CES-D; depressed factor $F = .006, p > .05$, positive factor $F = .076, p > .05$, somatic factor $F = .268, p > .05$, interpersonal factor $F = .581, p > .05$, nor the scale used in its entirety (i.e., 20 items) $F = .033, p > .05$. 
Table 3

Mean total and sub-scale scores at time point 1 and time point 3

<table>
<thead>
<tr>
<th>Scale</th>
<th>Time Point 1*</th>
<th>Time Point 3*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>CES-D Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.1 (0.8)</td>
<td>2.1 (0.8)</td>
</tr>
<tr>
<td>Women</td>
<td>2.1 (0.7)</td>
<td>2.0 (0.7)</td>
</tr>
<tr>
<td>Depressed Affect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.7 (0.8)</td>
<td>1.8 (0.9)</td>
</tr>
<tr>
<td>Women</td>
<td>1.8 (0.9)</td>
<td>1.7 (0.8)</td>
</tr>
<tr>
<td>Positive Affect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.5 (1.0)</td>
<td>2.5 (1.1)</td>
</tr>
<tr>
<td>Women</td>
<td>2.5 (1.1)</td>
<td>2.5 (1.1)</td>
</tr>
<tr>
<td>Somatic Complaints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.3 (1.0)</td>
<td>2.3 (0.9)</td>
</tr>
<tr>
<td>Women</td>
<td>2.2 (1.0)</td>
<td>2.2 (1.0)</td>
</tr>
<tr>
<td>Interpersonal Relationships</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.5 (1.0)</td>
<td>1.6 (1.0)</td>
</tr>
<tr>
<td>Women</td>
<td>1.5 (1.0)</td>
<td>1.5 (0.8)</td>
</tr>
</tbody>
</table>

* Values expressed as mean on a 7-point Likert scale (SD).

The Effect of Gender on Depressive Symptoms

The second hypothesis stated that females would have higher scores for depressive symptoms than males both prior to commencing a CR program and after completing a CR program. To test this hypothesis a two-way repeated measures factorial ANOVA was performed to examine the differences between males and females on scores for depressive symptoms. No significant differences were found in scores for depressive symptoms between males and females at time point one or time point three for any of the sub-scales of the CES-D; depressed factor $F = .025, p > .05$, positive factor $F = .070, p > .05$, somatic factor $F = .514, p > .05$, interpersonal factor $F = 1.168, p > .05$, nor the scale used in its entirety (i.e., 20 items) $F = .192, p > .05$.

Interaction terms were added to the repeated measures factorial ANOVA to determine if there was an interaction effect between the independent variables (time and gender) and the dependent variable (depressive symptoms). The results in table 4
indicate that there were no significant interaction effects among the variables ($p > .05$).

It is worth noting that in order to ensure that there were no differences in scores for depressive symptoms among males and females with differing cardiac events, a repeated measures factorial ANOVA was performed on males and females with Angioplasty, males and females with MI, and males and females with CABG. These conditions were chosen for separate analysis because they comprised the highest number of participants at 93, 90, and 56 respectively. While there were no significant differences among patients with Angioplasty and MI ($p > .05$), there was a significant interaction effect on the Positive Affect factor of the CES-D in patients with CABG ($p < .05$).

Table 4

*Tests of within and between-subject effects for CES-D total and sub-scales*

<table>
<thead>
<tr>
<th></th>
<th>$p$</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES-D Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.86</td>
<td>.03</td>
</tr>
<tr>
<td>Gender</td>
<td>.66</td>
<td>.19</td>
</tr>
<tr>
<td>Time X Gender</td>
<td>.80</td>
<td>.07</td>
</tr>
<tr>
<td>Depressed Affect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.94</td>
<td>.01</td>
</tr>
<tr>
<td>Gender</td>
<td>.87</td>
<td>.03</td>
</tr>
<tr>
<td>Time X Gender</td>
<td>.38</td>
<td>.78</td>
</tr>
<tr>
<td>Positive Affect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.78</td>
<td>.08</td>
</tr>
<tr>
<td>Gender</td>
<td>.80</td>
<td>.07</td>
</tr>
<tr>
<td>Time X Gender</td>
<td>.91</td>
<td>.01</td>
</tr>
<tr>
<td>Somatic Complaints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.61</td>
<td>.27</td>
</tr>
<tr>
<td>Gender</td>
<td>.47</td>
<td>.51</td>
</tr>
<tr>
<td>Time X Gender</td>
<td>.72</td>
<td>.13</td>
</tr>
<tr>
<td>Interpersonal Relationships</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.45</td>
<td>.58</td>
</tr>
<tr>
<td>Gender</td>
<td>.28</td>
<td>1.17</td>
</tr>
<tr>
<td>Time X Gender</td>
<td>.56</td>
<td>.36</td>
</tr>
</tbody>
</table>
Table 5

*Mean scores of CAGB patients for the positive affect factor of the CES-D*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Time Point 1*</th>
<th>Time Point 3*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Positive Affect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.6 (1.2)</td>
<td>2.4 (1.1)</td>
</tr>
<tr>
<td>Women</td>
<td>2.3 (0.8)</td>
<td>3.3 (1.3)</td>
</tr>
</tbody>
</table>

* Values expressed as mean (SD).

**Discussion**

As previously stated the purpose of this study was to document the effect of a CR program on depressive symptoms in males and females after a cardiac event. Although it was hypothesised that there would be a positive effect on depressive symptoms for cardiac patients who participated in a CR program, the participants who entered the specific CR program involved in this study had low levels of depressive symptoms upon initiation, and remained low with no significant decrease over the course of the program. The second hypothesis that females would have higher scores for depressive symptoms than males both prior to commencing a CR program and after completing a CR program was also not supported, with males and females showing no difference in their level of depressive symptoms prior to, or at the completion of the CR program. Finally, it is obvious that men still dominate the CR setting with women representing only 35% of the sample.

Although previous studies have shown that a high level of depressive symptoms exists in patients at the commencement of a CR program, the participants in the CR program for this study (both male and female) had relatively low scores for depressive symptoms on entry into the program. A possible explanation for this finding could be that the length of time between hospital discharge and participation in the rehabilitation program was considerably long, allowing for depressive symptoms to improve before treatment had begun. This information, however, was...
not part of the data collected for secondary analysis. The reasons for this time-lag are likely multi-factorial and some have been discussed previously with regard to lack of patient referral, lack of follow-up following hospital discharge, the rigid structure of CR programs that focus primarily on physical exercises, and the potential intimidation of male dominated programs (Lieberman et al., 2008). Patient-level factors that could affect time to participation include concerns about exercising after a cardiac event, social isolation, and care-giving responsibilities (Sanderson & Bittner, 2005).

The guidelines mentioned in the introduction with regard to commencement in rehabilitation indicate a start date of one to four weeks following hospital discharge (Pack et al., 2012). Despite these guidelines it is possible that participants at the program involved in this study are not utilising the CR services in a timely manner. A potential solution for this could be to make an early appointment for CR following discharge from the hospital, this way the appointment is a lot easier to organise and remember before other demands become a distraction to participation (Pack et al., 2012). If cardiac patients are to receive the full benefits of CR there needs to be a stringent follow-up by health-care providers on patients as they are discharged from the hospital to allow for early appointments to CR. There also needs to be equal access to CR facilities for all cardiac patients in order to help reduce barriers to participation.

Research has shown that females have higher scores for depressive symptoms both prior to a CR program and at the completion of a CR program, however in the case of this study both males and females scored within one standard deviation of each other on all four factors of the CES-D. One explanation for this that has been mentioned previously is that neither male nor female participants had high scores for
depressive symptoms at time point one so there wasn’t a lot of room for improvement over the course of the program. Another potential reason why this study refuted these previous findings could be due to the relatively small population of women in the sample; of the 272 participants only 35% were female.

According to Bittner, Sanderson, Breland, and Green (1999) the comprehensive practice guidelines for CR were published by the agency for health care policy and research (AHCPR) in 1995. The guidelines suggest that all patients with MI, those who have undergone coronary revascularisation, and those with stable angina pectoris should be considered for participation in CR programs (Bittner et al., 1999). Despite these recommendations in clinical practice guidelines CR programs are underutilised by women, as indicated in the female sample for this study of 35%.

A possible explanation for the lack of involvement of women in the CR program could revolve around the structure of the exercise program itself. The traditional CR program is comprised of aerobic exercise and resistance training three days per week for twelve weeks. In accordance with this traditional program Beckie and Beckstead (2010) conducted a gender-tailored randomised control trial where female participants exercised exclusively with women. The intervention included classes conducted by psychologists that focused on gender-based practice guidelines, relaxation sessions, and social support resulting in a four-session increase in program attendance (Beckie & Beckstead, 2010). In order to help close the gender gap on attendance at cardiac rehabilitation there needs to be more rigorous physician referral for women to participate in CR programs and perhaps individualised rehabilitative approaches for women after a cardiac event. If health professionals give women the opportunity to voice their preferences on the aspects of CR that are most beneficial to
them, it is hypothesised that they will be more engaged and motivated to engage in the recovery process.

Limitations

As stated above, the lack of significant differences in depressive symptoms both between genders and pre to post CR programming is somewhat surprising given the vast amount of literature to suggest otherwise. Thus, it is imperative to discuss some of the limitations that apply to this study.

Lack of a control group. The participants from this study were drawn from patients who have completed a CR program over the past three years. In order to have a control group comprised of individuals with similar heart conditions for this study, either (a) treatment to patients who had been referred for participation would have to be refused, or (b) individuals with a heart condition who were not referred for participation would have to be contacted. As the first option is unethical and the second option was not within the scope of this study no control group was available. The lack of a control group inhibits the ability to make absolute conclusions that the CR program was responsible for the changes observed over the course of the study.

Selection bias. The participants that were chosen for this study were cardiac patients who willingly took part in the CR program after their physician had referred them. It is possible that these patients may differ from patients who chose not to participate with regard to mental and physical health status, degree of depressive symptoms, approach to physical activity, and attitudes towards recovery and behaviour change.

Changes in patients’ physical or mental health status. Over the course of the rehabilitation program it is possible that the patients’ physical and/or mental health status changed and negatively (or positively) affected their health status
attitude. This may have influenced the questionnaire responses over one or more of the measurement periods.

**Use of secondary data.** As a result of using secondary data I had no control over the cardiac conditions of my sample. A large majority of research on depression and heart disease has focused on one specific heart condition, for example patients with MI or CHF. It is possible that I will not be able to generalise my results given that my sample has a combination of sixteen different heart conditions. It is also important to note that once diagnosed, CHF patients have an average life expectancy of five years and quality of life is generally poor because of an increase in depressive symptoms. Out of my sample of 272 participants only thirteen of them had CHF making it difficult to reliably determine if there was a significant difference in their depressive symptoms over time.

**Data collection.** Currently, the questionnaires that are administered to patients at the specific CR program are in paper form. They are given to the patients at their first appointment to the program, half way through the program, and at the conclusion of the program. The questionnaires are returned at the patients’ discretion and then filed away; there is no evaluation or assessment of the questionnaire once it is returned nor is it scored. Not only does this significantly decrease the power of the sample but it also doesn’t allow for immediate referral for psychiatric evaluation (if needed).
Conclusion

This study has demonstrated that men still dominate the CR setting. Contrary to the majority of published literature, the study has also shown that participants entering this CR program have fairly low levels of depressive symptoms and that males and females do not differ in their level of depressive symptoms prior to, or at the completion of a CR program. In order to provide cardiac patients with the full benefits of rehabilitation programs, additional questions that focus on barriers to participation need to be addressed as part of the questionnaires that are already in place. Moreover, better strategies to ensure continuing contact between the health care provider and the cardiac patient are needed to ensure that attendance in CR programs is effective and immediate.
References


Canadian Association of Cardiac Rehabilitation. (CACR; 2013). Cardiac rehabilitation. Retrieved from http://www.cacr.ca/about/definitions.cfm


APPENDIX A – Informed consent for cardiac rehabilitation

INFORMED CONSENT FOR EXERCISE REHABILITATION

1. Purpose and Explanation of Procedure
To improve my physical capacity and generally aid in my medical treatment for heart or chronic disease, I hereby consent to enter a cardiac rehabilitation and/or chronic disease and/or risk reduction program that may include cardiovascular monitoring, physical exercise, dietary counseling, stress reduction, and health education activities. The levels of exercise that I will perform will be based on the condition of my heart and circulation at the time of entry to the program. I will be given explicit instructions regarding the amount and kind of exercise I should do. Organized exercise sessions will be available on a regularly scheduled basis. The exercise specialist in consultation with the exercise program director and/or physician, and depending on my progress, may adjust my exercise sessions for continued improvement and safety. I understand that I am expected to attend regularly and to follow physician and staff instructions with regard to any medications that may have been prescribed, exercise, diet, stress management, and smoking cessation. If I am taking prescribed medications, I have already informed the program staff and further agree to inform them promptly of any changes my doctor or I have made with regard to use of these.

I have been informed that in the course of my participation in exercise, I will be asked to complete the activities unless such symptoms as fatigue, shortness of breath, chest discomfort, or similar occurrences appear. At that point, I have been advised that it is my complete right to stop exercise and that it is my obligation to inform the program personnel of my symptoms. I recognize and hereby state that I have been advised that I should immediately upon experiencing any such symptoms inform the program personnel of my symptoms.

2. Monitoring
I understand that during the performance of exercise, I will report to the nurse for a pre-exercise blood pressure and ECG every two weeks, or as needed. I will also monitor my own pulse rate as instructed, before, during and after each session. I
also understand that the staff may reduce or stop my exercise program when
findings indicate that this should be done for my safety and benefit.

3. Risks and Discomforts
There exists the possibility during exercise of certain changes occurring during the
exercise sessions. These include abnormal blood pressure, fainting, disorders of
heart rhythm, and in rare instances heart attack, stroke, or even death. Every effort
will be made to minimize the risks by proper staff assessment of my medical
condition before designing my program. Thereafter, all observations made by the
staff will be used to carefully control my exercise effort. I have also been informed
that emergency equipment and personnel are readily available to deal with unusual
situations should occur. I understand that there is a risk of injury, heart attack,
stroke, or even death as a result of my exercise, but knowing those risks, it is my
desire to participate as herein indicated.

4. Benefits to Be Expected
I understand that participation in the rehabilitation program may or may not benefit
me in any way. The results obtained may help in evaluation in what types of
activities I may engage in safely during my daily life. No assurance can be given
that the rehabilitation program will increase my functional capacity although
widespread evidence indicated that improvement is usually achieved.

5. Confidentiality and Use of Information
I have been informed that the information obtained from the rehabilitation program
will be treated as privileged and confidential as described in the Health Insurance
Portability and Accountability Act of 1996. It will not be released or revealed to
any person except my referring physician or specialist without my express written
consent, I do, however, agree to have my data and use of any information for
research and statistical purposes with my right to privacy retained. Any other
information obtained, however, will be used only by the program staff in the course
of prescribing exercise for me, planning my rehabilitation program, or advising my
relevant care provider(s) including professional, and administrative staff within the
Allied Health Centre on a “need to know” basis.
I also understand that it is my responsibility to take care in not leaving my information book unattended while at my session and that it is my right to take my book home after my exercise session, and bring it back for each session. I understand that if I choose to leave my book at the [redacted] I am assuming the risk of my personal information being potentially exposed in extreme case such as theft.

6. Responsibility of the Participant

Information I possess about my health status or previous experiences of heart-related symptoms (e.g. shortness of breath with low-level activity, pain, pressure, tightness, heaviness in the chest, neck, jaw, back, and/or arms) with physical effort may affect the safety of my exercise session. My prompt reporting of these and any other unusual feelings with effort during exercise session itself is very important. I am responsible for fully disclosing my medical history, as well as symptoms that may occur during the sessions.

To gain expected benefits, I must give priority to regular attendance and adherence to prescribed amounts of intensity, duration, frequency, progression, and type of activity.

To achieve the best possible preventative health care:  

**DO NOT:**

Withhold any information pertinent to symptoms from the Exercise Consultant, Nurse, Physician, Exercise Program Director, or other professional personnel in the [redacted].

- A  Exceed my target heart rate.
- B  Exercise when I do not feel well.
- C  Exercise within two hours of eating a large meal
- D  Exercise after drinking alcoholic beverages.
- E  Use extremely hot water during showering after exercise (stay out of sauna, steam bath, and similar extreme temperatures).

**DO:**

- A  Report any unusual symptoms, which I experience before, during, or after exercise, after my scheduled session.
B Only perform exercises/activities prescribed by my consultant(s), and only in the correct technique that has been previously demonstrated by my consultant(s). I accept responsibility for myself for all other exercises I choose to perform, and understand that they will be performed at my own risk.

C Understand that I may stop or delay any further participation in the activity I desire and that the activity may be terminated by the Exercise Consultant based on any symptoms of distress, abnormal response or safety concern.

D Understand that I may ask any questions or request further explanation or information about the procedures and program at any time before, during and/or after the physical activity.

E Understand that the use of the facility, preceding or following the allotted length of time for the service being provided will not be monitored by or under the responsibility of a consultant and will be performed at my own risk. I will inform my Exercise Consultant if I plan to use other facilities at the site. At that time I must accept responsibility for myself, and exercise at my own risk.

Any questions about the rehabilitation program are welcome. If you have any doubts or questions, please ask us for further explanation.

7. Attendance and Refund Policy

Because the Program does not open until 8:00am on Monday, Wednesday and Friday and 2:30pm on Tuesday and Thursday, please do not arrive prior to 7:45am or 2:15pm on the day of your program.

All services and fees are NON-REFUNDABLE and cannot be extended. Your visits must be used up within one year from the date of purchase. Once the book is expired or you have used up all your sessions, you have the option of purchasing more sessions providing there is room in the program. You may be asked to attend the continuing program at a different time.
8. Inquiries and Freedom of Consent

I further understand that there are remote risks over than those previously described that may be associated with this program. Despite the fact that a complete accounting of all remote risks is not entirely possible, I am satisfied with the review of these risks that was provided to me, and it is still my desire to participate.

I acknowledge that I have read this document in its entirety or that it has been read to me and I understand the Rehabilitation Program in which I will be engaged. I accept the rules and regulations set forth. I consent to participate in this Program.

9. Privacy Pledge

Patient ___________________________ Date ______________

Witness’s Signature ___________________________ Date ______________

Program Staff Signature ___________________________ Date ______________

Appendix B – Ethics Approval

OFFICE FOR RESEARCH, INNOVATION AND PARTNERSHIP
MEMORANDUM

DATE: November 8, 2012
TO: Natalie Kym Marshall-Prain
    1956 Garnet Street
    Regina, SK S4T 2Z4
FROM: Dr. Larena Hoeber
      Chair, Research Ethics Board
Re: The Impact of a Cardiac Rehabilitation Program and Gender on Depression in Cardiac Patients (File # 2751213)

Please be advised that the University of Regina Research Ethics Board has reviewed your proposal and found it to be:

☐ 1. APPROVED AS SUBMITTED. Only applicants with this designation have ethical approval to proceed with their research as described in their applications. For research lasting more than one year (Section 1F), ETHICAL APPROVAL MUST BE RENEWED BY SUBMITTING A BRIEF STATUS REPORT EVERY TWELVE MONTHS. Approval will be revoked unless a satisfactory status report is received. Any substantive changes in methodology or instrumentation must also be approved prior to their implementation.

☐ 2. ACCEPTABLE SUBJECT TO MINOR CHANGES AND PRECAUTIONS (SEE ATTACHED). Changes must be submitted to the REB and approved prior to beginning research. Please submit a supplementary memo addressing the concerns to the Chair of the REB. **Do not submit a new application.** Once changes are deemed acceptable, ethical approval will be granted.

☐ 3. ACCEPTABLE SUBJECT TO CHANGES AND PRECAUTIONS (SEE ATTACHED). Changes must be submitted to the REB and approved prior to beginning research. Please submit a supplementary memo addressing the concerns to the Chair of the REB. **Do not submit a new application.** Once changes are deemed acceptable, ethical approval will be granted.

☐ 4. UNACCEPTABLE AS SUBMITTED. The proposal requires substantial additions or redesign. Please contact the Chair of the REB for advice on how the project proposal might be revised.

Dr. Larena Hoeber

cc: Dr. Kim Dorsch – Kinesiology and Health Studies

**supplementary memo should be forwarded to the Chair of the Research Ethics Board at the Office for Research, Innovation and Partnership (Research and Innovation Centre, Room 109) or by e-mail to research.ethics@uregina.ca**
Appendix C – CES-D Scale Questionnaire

SECTION TWO

This section asks about how you are feeling. DURING THE PAST WEEK, how often did you feel each of the following? Please CIRCLE a number from 1 (Never) to 7 (Always) to indicate how you feel.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never</th>
<th>Occasionally (50% of the time)</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was bothered by things that usually don’t bother me.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I did not feel like eating; my appetite was poor.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt that I could not shake off the blues even with help from my family or friends.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt that I was just as good as other people.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I had trouble keeping my mind on what I was doing.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt depressed.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt that everything I did was an effort.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt hopeful about the future.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I thought my life had been a failure.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt fearful.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>My sleep was restless.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td>Never</td>
<td>Occasionally (60% of the time)</td>
<td>Always</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------</td>
<td>---------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>I was happy.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I talked less than usual.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt lonely.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>People were unfriendly.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I enjoyed life.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I had crying spells.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt sad.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I felt that people disliked me.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I could not get 'going'.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix D – Borg RPE Scale

6  No exertion at all

7  Extremely light (7.5)

8  

9  Very light

10 

11  Light

12 

13  Somewhat hard

14 

15  Hard (heavy)

16 

17  Very hard

18 

19  Extremely hard

20  Maximal exertion