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LOMA LINDA UNIVERSITY
School of Behavioral Health
in conjunction with the
Faculty of Graduate Studies

Heart-focused Anxiety as a Predictor of Cardiac Rehabilitation Attendance

by

Angelyna M. Hinkle

A Thesis submitted in partial satisfaction of
the requirements for the degree
Doctor of Philosophy in Clinical Psychology

March 2014

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Each person whose signature appears below certifies that this thesis in his/her opinion is adequate, in scope and quality, as a thesis for the degree Doctor of Philosophy.

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ABBREVIATIONS

CR	Cardiac Rehabilitation
CAD	Coronary Artery Disease
PHQ-9	Patient Health Questionnaire 9
GAD-7	Generalized Anxiety Disorder 7
CAQ	Cardiac Anxiety Questionnaire

ABSTRACT OF THE THESIS

Heart-focused Anxiety as a Predictor of Cardiac Rehabilitation Attendance

by

Angelyna M. Hinkle

Doctor of Philosophy, Graduate Program in Clinical Psychology
Loma Linda University, March 2014
Dr. Holly E. R. Morrell, Chairperson

Cardiac disease is the leading cause of death and functional impairment in North America. Cardiac rehabilitation (CR) significantly improves health outcomes, yet adherence to treatment is a major obstacle for this population. Psychosocial factors such as depression have been identified as barriers to rehabilitation attendance, but evidence for anxiety as a potential barrier has been inconsistent. The aim of the current study was to test a more specific type of anxiety, heart-focused anxiety, as a predictor of CR attendance. Thirty-two participants between 39 and 87 years of age ($M = 63.66$, $SD = 12.54$, 53.1% female) were recruited from the Loma Linda University Medical Center CR program and heart clinic. Participants were given a psychological battery in which heart-focused anxiety, general anxiety, and depression were assessed. Two hierarchical binomial logistic regression models were run to test whether heart-focused anxiety predicted CR attendance above and beyond the influence of demographic variables, depression, and general anxiety. None of the predictors were statistically significant due to small sample size, therefore effect sizes were interpreted. In the first model, results indicated that there was a 35.7% increase in the odds of CR attendance for female participants ($OR = 1.357$, $p > .7$), a 32.9% increase in odds of attendance for every one-point increase in general anxiety ($OR = 1.329$, $p > .1$), and a 7.8% decrease in odds of

attendance with every one-point increase in overall cardiac anxiety ($OR = .922, p > .8$). In the second model, subscales of heart-focused anxiety were separated. Results indicated that the odds of attending CR increased by 60.7% for each one-point increase on the Fear subscale of the CAQ, increased by 34.3% for each one-point increase on the Avoidance subscale ($OR = 1.343, p > .7$), and decreased by 57.3% for every one-point increase on the Attention subscale ($OR = .427, p > .2$). Results suggest that patients with higher general anxiety, fear, and avoidance are more likely to attend CR (group 1), while those with higher levels of heart-focused anxiety and avoidance are less likely to attend CR (group 2). These findings suggest that patients in group 1 may benefit from standard interventions, such as increased educational counseling about their treatment and adherence, and patients in group 2 may benefit from interventions to reduce anxiety.

CHAPTER ONE

INTRODUCTION

Coronary Artery Disease

Coronary artery disease (CAD) is the leading cause of death in North America. As of 2008 in the United States, one person dies of cardiovascular disease every 39 seconds, which amounts to 224 deaths per day (Roger et al., 2011). While this is a 30.6% decline from 1998, CAD remains a significant burden. Each year, an estimated 785,000 Americans will have a new heart attack (Roger et al., 2011). Of the 45 million individuals with functional disabilities, CAD is among the top 15 causes of those disabilities (Roger et al., 2011).

Coronary artery disease also has serious psychosocial implications. Psychosocial factors, such as depression and anxiety, are among the nine modifiable risk factors that account for 90% of heart attacks worldwide (Gehi, 2005). Research shows that 15-20% of cardiac patients meet criteria for Major Depressive Disorder (Kent, 2009). Evidence also suggests that anxiety is a significant independent risk factor for cardiovascular disease and coronary heart disease (McCann et al., 2005; Roest, 2010). According to the World Health Organization (2004), anxiety disorders are the most prevalent in the world. However, little research exists on anxiety's direct role in CAD and its treatment. Identifying and modifying psychosocial risk factors is an important step in reducing the occurrence of cardiac related events.

Adherence to Treatment

Poor adherence to treatment recommendations is a rampant problem for the cardiac community. Adherence is defined as the extent to which a person's behaviors align with medical recommendations for treatment. Even if that treatment is a placebo, outcomes have been shown to be better than non-adherence (Horowitz, 1993). Non-adherence occurs when a patient forgets to take medication, refuses dietary changes, does not follow a prescribed exercise regimen, or engages in other behaviors inconsistent with physician recommendations (DiMatteo, 2000). The latter behaviors are directly related to adverse health outcomes (DiMatteo, 2000; Gehi, 2005). Adherence has a strong behavioral component and is largely in the hands of the patient, as evidenced by the fact that the very definition of adherence includes reliance on the patient's behavior (Horowitz, 1993).

In the cardiac community, treatment recommendations include medication, dietary restrictions and changes, exercise regimens, abstaining from smoking and alcohol, and overall lifestyle changes that require continued effort and self-control. More exercise, adherence to a Mediterranean diet, and less psychosocial stress have been shown to reduce risk of cardiac-related events (Roger et al., 2011). However, each of these requires a great deal of planning, consistency, and long-term commitment to remain effective, all of which may be overwhelming for a patient with a chronic disease.

Non-adherence to medication occurs in over 60% of the cardiac population (Kravitz, 1993). In 2005, fewer than 20% of adults who were being treated for coronary heart disease were at their low-density lipoprotein goals, indicating a lack of adherence to their treatment regimens (Roger et al., 2011). Not adhering to medical treatments leads to

poorer clinical outcomes, re-hospitalizations, and increased mortality overall (Baroletti, 2010).

A number of factors predict treatment non-adherence, and they fall into three broad domains: communication barriers, socioeconomic factors, and motivational factors (Baroletti, 2010). Communication barriers include low literacy, being elderly, substance abuse, mental illness, or English not being the primary language. Inability to effectively communicate with patients hinders their understanding of what their medication regimen is (Oates, 2009). Socioeconomic barriers include poor healthcare coverage, cost concerns, and poverty (Ho, 2009; Toh, 2010). Patients often do not take medication because of their inability to afford their medication. Motivation barriers include a lack of understanding about severity of the disease, a lack of perceived need for medication, or a fear of adverse side effects. Inadequate understanding of the condition by the patient leads to poor maintenance of that condition. Also, patients are less likely to take a medication if a noticeable, beneficial effect is absent. It is possible that each of these barriers to treatment adherence can be alleviated through more education or training of both health care staff and patients.

For cardiac patients, adherence to a modified diet can mean healthier, longer lives. Individuals between 70-90 years old who remained on a Mediterranean-style diet had 65-73% lower mortality rates attributed to coronary heart disease, cardiovascular disease, and cancer compared to those not on the diet (Roger et al., 2011). Common recommendations for diet include daily sodium and fluid restrictions, which also have been shown to be the recommendations with the highest rates of non-adherence (van der Wal, 2003). However, adherence to dietary restrictions is typically less than optimal, as

the American Heart Association reports that only 19% of hypertensive adults between 1994 and 2000 were adherent to diet recommendations (Roger et al., 2011). Furthermore, adherence to sodium restrictions varies from 50% to 88%, while the lowest reported adherence rate for fluid restriction is 23% (van der Wal, 2003). Often patients are mistakenly under the impression that they must increase their amount of fluids, which may be a consequence of the aforementioned communication barriers (van der Wal, 2003).

Cardiac patients also have difficulty following physical activity recommendations. Exercise guidelines for adults indicate that about 150 minutes of vigorous activity per week reduces the risk of cardiovascular disease and reduces all cause mortality in those who already have chronic conditions, such as myocardial infarction and angina, by 27% (Roger et al., 2011). Despite the benefits of physical activity, physical *inactivity* accounts for over 12% of heart attacks in both men and women worldwide when other factors such as smoking, diabetes, hypertension, obesity and abnormal lipids are accounted for (Yusif, 2004). The monetary cost of physical inactivity is monumental as well. The World Health Organization estimated that up to 35% of total health care costs associated with cardiovascular disease can be attributed to physical inactivity (Oldridge, 2008). However, patients who have experienced a cardiac event are often not compliant with physical activity recommendations. In a study of heart failure patients, 30% indicated they stopped exercise after being diagnosed with heart failure (van der Wal, 2005). The American Heart Association also reported up to 58% of cardiac patients do not adhere to physical activity recommendations (Roger et al., 2011).

Psychosocial factors have also been shown to effect adherence rates among cardiac patients (Gehi, 2005; Horowitz, 1993; Luyster, 2009). Depression is associated with medication non-compliance in outpatients with coronary heart disease (Gehi, 2005). Gehi (2005) assessed 940 patients with stable coronary heart disease for depression. Of those patients, 204 (22%) had major depression. Those with higher levels of depression reported not taking medication as prescribed, forgetting medication, and deciding to skip doses compared to 5% of the 736 non-depressed patients (Gehi, 2005). A meta-analysis of studies evaluating adherence from 1968 to 1998 found that depressed patients are three times more likely to be non-compliant with treatment recommendations (DiMatteo, 2000). In another study, 204 patients were given the Beck Depression Inventory three to five days following an acute myocardial infarction and interviewed again four months later (Ziegelstien, 2000). Patients shown to have mild to moderate or major depression were less likely to adhere to lifestyle changes following myocardial infarction. These studies suggest more attention should be given to identifying and treating depression among cardiac patients to improve medical adherence.

While depression and anxiety are often comorbid, there is little known about the direct relationship between anxiety and treatment adherence in the cardiac population. It is theorized that anxiety, along with depression, may affect adherence by impairing focus, energy, motivation, and willingness to engage in treatment (DiMatteo, 2000). As mentioned previously, anxiety is an independent risk factor for coronary heart disease (Roest, 2010). Studies on anxiety and adherence to treatments for CAD in general suggest a link between the two. For example, anxiety is associated with dietary non-compliance in patients with heart failure who are being treated with an implantable

cardioverter defibrillator (Luyster, 2009). Conversely, general anxiety about health may improve adherence due to a fear of negative outcomes (DiMatteo, 2000). While there are a few limited studies on the relationship between anxiety and adherence to cardiac treatment, more research is needed to clarify the nature of this relationship.

Cardiac Rehabilitation

Cardiac rehabilitation, also called secondary prevention, is a comprehensive treatment for individuals who have experienced a cardiac event. It is typically a three-month program consisting of exercise and educational classes offered to those who have experienced cardiac surgery or related events. In the American Heart Association and American Association of Cardiovascular and Pulmonary Rehabilitation's review of necessary program components, the following core components are identified: patient assessment, nutritional counseling, risk management, psychosocial interventions, and physical intervention and counseling (Balady, 2007). Patient assessment includes obtaining medical history, performing a physical examination, and assessing current health status and medication use. At this point, staff document the evaluation and communicate with the patient the plans and goals of treatment. The patient is given a treatment plan, outcome report, and discharge plan outlining the progress of treatment throughout the program.

During nutritional counseling, staff evaluate the patient's current dietary status, including caloric intake and daily amounts of saturated fats, trans fats, sodium, and other nutrients. Dietary habits are also evaluated for amounts of fruits, vegetables, grains, snacks, and even alcohol and tobacco. Targeted areas are identified and the patient is

given specific modification recommendations. Patients are given a plan to modify behavior and attend nutritional education classes throughout treatment. Weight management includes evaluating the patient's current height, weight, and waist circumference to calculate body mass index. Short and long term goals are identified and discussed combining diet, exercise, and behavioral programs.

Risk management involves evaluating and managing blood pressure, lipids, diabetes, tobacco use, and psychosocial risks. Information in each of these domains is obtained at the beginning of the program and adherence to current treatment, including medication, diet, and exercise, is discussed. Blood pressure is measured at each session. Lipid levels are obtained at the beginning of the program by a lab after patient fasting. Abnormal levels of either blood pressure and/or lipids are treated with lifestyle changes and possibly drug therapy. If patients are identified as diabetic or having symptoms related to the condition, glucose and hemoglobin levels are measured prior to any exercise and the patient is educated about behavioral changes and medication adherence. Lastly, if there is a history of or current tobacco use, readiness to quit smoking is assessed and, optimally, more counseling or group therapy sessions are added to treatment to aid in tobacco cessation.

Psychosocial risks, such as depression, anxiety, anger, and social support are assessed at the beginning of treatment. History of mental illness and use of psychotropic medications are accounted for. If there is a presence of such distress, education and counseling sessions are offered. Support and resources are made available throughout treatment to the patients. During treatment, educational classes include self-help strategies for patients to use at home. If clinically significant distress is present, referrals

to appropriate mental health professionals are made. In the absence of clinically significant symptoms or substance abuse problems, the patient is considered emotionally healthy; this is the goal of rehabilitation.

Physical exercise and counseling begins by assessing current physical functioning. Individual needs for age and ability are determined and a target exercise program is created. Patients are encouraged to spend 30-60 minutes a day in moderate-intensity physical activity for at least five days a week. Sessions completed at cardiac rehabilitation are three to five days a week if aerobic training is recommended or two to three days a week for resistance training related to the symptoms. Each session includes warm-ups, cool downs, and flexibility exercises. Patients are educated about safety during exercise, especially regarding their symptoms.

Benefits of Cardiac Rehabilitation

The benefits of cardiac rehabilitation are well documented. A meta-analysis of ten clinical trials of exercise programs following a myocardial infarction involving 2202 rehabilitation patients and 2145 control patients revealed a 24% reduction of all-cause mortality and a 25% reduction in cardiovascular mortality among participants in the exercise programs (Oldridge, 1988). More recently, BMI, plasma lipids, indexes of obesity, and exercise capacity were assessed in 274 patients before and after a cardiac rehabilitation program (Lavie et al., 1993). Significant improvements following the program in exercise capacity, BMI, obesity indexes, and lipid levels were observed. Exercise capacity showed a 34% increase, while body fat decreased by 6% overall.

Cardiac rehabilitation programs also produce significant long-term improvements in health. The long-term effects of cardiac rehabilitation programs following a myocardial infarction were assessed in 92 sibling pairs in which one of the siblings attended rehabilitation and the other did not (Baessler, 2001). At the time of the myocardial infarction, both groups had similar risk factors. The siblings were reassessed on average five and one-half years following the original event. Overall, the siblings that attended a rehabilitation program had significantly lower blood pressure, lipid levels, and smoking prevalence. Individuals in the rehabilitation group were more likely to use antihypertensive medication to control blood pressure than individuals in the non-rehabilitation group. Overall, there were significantly fewer siblings that attended rehabilitation that presented with two or more modifiable risk factors at the five year follow-up. Additionally, in a national study of Medicare beneficiaries, patients that attended the recommended number of rehabilitation sessions (36) had lower risk of death and myocardial infarction four years following their program (Hammill, 2009). Attending fewer sessions was associated with lowered risks, but not as low as attending all 36 sessions.

Cardiac rehabilitation also has been shown to reduce the severity and symptoms of depression (Grace, 2002a; Milani, 2007; Tielemans, 2010). In an influential study assessing rehabilitation's effect on depression, patients who completed cardiac rehabilitation had 74% lower mortality rates than the control group (Milani, 2007). In this study, 522 coronary patients who completed a cardiac rehabilitation program and 179 patients in a control group were tested for depression at baseline and again at the completion of the program. There was a 17% prevalence rate of depressive symptoms in

the rehabilitation group and 26% in the control group. At the end of the program, the prevalence rate of depression decreased to 6% in the rehabilitation group. Follow-up data for the control group were not obtained; however, the depressed patients who completed rehabilitation also had a lower mortality rate (8%) compared to those in the control group (30%). The authors noted that only minimal amounts of exercise were needed to obtain significant reductions in depressive symptoms and mortality.

It is evident that anxiety also accompanies cardiovascular disease (Moser et al., 1996). However, very little research is available that studies cardiac rehabilitation's direct effect on anxiety. The research that is available indicates that changes in levels of anxiety are consistent with the course of depression, in that cardiac rehabilitation may reduce anxiety as it does depression. In a study of 500 patients, a notable improvement in anxiety symptoms was found after the completion of cardiac rehabilitation (Lavie & Milani, 2004). Since anxiety is a known independent risk factor for CAD (Roest, 2010), research on its effect, course, and treatment in CAD should be conducted in more depth.

Predictors of Participation in Cardiac Rehabilitation

Despite the confirmed benefits of cardiac rehabilitation, only about one-third of patients attend a program following a myocardial infarction (Daly, 2002). A further understanding of why patients who need cardiac rehabilitation are not attending is necessary to provide more patients with the treatment they need. Previous research indicates that major predictors of attending rehabilitation include doctor referral, gender, belief that CAD is outside of one's control, belief that lifestyle does not contribute to the

condition, and depression (Grace, 2002a; Lloyd & Jackson, 1999; Lane, 2001; Daly, 2002). Each of these factors is further explored below.

One of the strongest predictors of cardiac rehabilitation attendance is referral by a doctor (Ades et al., 1992). While adherence to cardiac treatment regimens remains less than optimal, most patients at least need the urging of their doctor to begin a treatment in the first place, yet less than one-third of patients are being referred by their physicians (Grace, 2002b; Taylor, 1998). In a study of referral and attendance, 28% of patients were referred by a physician to rehabilitation within six months of a myocardial infarction (Grace, 2002b). Ultimately, 38.8% were referred for attendance via multiple possible referral sources from physicians, other staff, family, or other patients. Sixty-three percent of those who did not receive a referral were not given a reason for the lack of referral. Of the 149 who were given a referral by their physician, approximately 59% attended and utilized services in rehabilitation. Physician referral is therefore a potentially powerful tool in promoting rehabilitation attendance.

Another major predictor of rehabilitation attendance is gender. Men are far more likely to get referrals to and attend rehabilitation than women (Allen, 2004; Daly, 2002; Grace, 2002b). Of all patients being referred to and attending rehabilitation, on average only about 20% of them are female (Grace, 2002a). In addition to the fact that they are less likely to be referred to cardiac rehabilitation, women may be less likely to attend cardiac rehabilitation because they are typically older at the time of onset, they are less likely to engage in regular exercise than men, and they are more likely to find exercise painful and tiring (Grace, 2002b; Roger et al., 2012). Women are also more likely to suffer from risk factors associated with mortality in cardiac populations, such as

depression and anxiety (Grace, 2002a). CAD appears to have a worse disease course in women, but this can be avoided. It is estimated that if high cholesterol, smoking, and hypertension are controlled, 64% of all coronary heart disease-related deaths in women could be avoided, while this is true for only 45% of male deaths (Roger et al., 2012). These are factors that cardiac rehabilitation has proven to help regulate (Baessler, 2001).

Just as depression and anxiety are risk factors for CAD, some studies suggest that they may be significant predictors of cardiac rehabilitation attendance (Lane, 2001). A previous study examined 263 patients following a myocardial infarction for predictors of rehabilitation attendance, including depression and anxiety (Lane, 2001). It was found that higher levels of depression and anxiety significantly predicted non-attendance. Another hospital-based study did not find current depression to be a significant predictor of attendance; however, history of depression was a significant predictor of choosing to attend rehabilitation (Ades, 1992). Anxiety has not been studied as much as depression, but anxiety levels are lower for those entering rehabilitation (Daly, 2002). It is conceivable that those who are not attending may have higher levels of anxiety (Daly, 2002). However, more studies on anxiety as a predictor of cardiac rehabilitation attendance are vital, given the link between anxiety and CAD.

Heart-Focused Anxiety

Heart-focused anxiety is a relatively new term used to describe the fear of cardiac-related stimuli and sensations because of their perceived negative consequences (Eifert, Zvolensky et al., 1999b). It comprises three factors: fears about heart sensations, heart-focused attention and monitoring, and avoidance of behaviors thought to cause a

heart event, such as a heart attack. Heart-focused anxiety is different from general anxiety because it is specific to the heart. Many studies, including those previously mentioned, have used general anxiety measures to assess for anxiety in cardiac patients. These measures may reveal anxiety, but do not help to determine the source of that anxiety. Heart-focused anxiety is specific to heart related events, sensations, and functioning (Eifert, Zvolensky et al., 1999b). This type of anxiety is most common in patients who have experienced a cardiac event and are more concerned for their health, as well as individuals with a family or personal history of CAD, or those with little risk who are still overly concerned about the well-being of their heart.

Heart-focused anxiety is considered a symptom of anxiety rather than an anxiety disorder, and therefore is not included in the International Classification of Diseases nor the Diagnostic and Statistical Manual of Mental Disorders. As a result, patients displaying heart-focused anxiety are often given a diagnosis of panic disorder (Fisher, 2011). In previous research examining panic disorder in cardiac populations, psychological distress increased with the prevalence of panic disorder with agoraphobia. One such study assessed 441 walk-in emergency room patients complaining of chest pain (Fleet, 1998). Fifty-seven percent ($n = 250$) of those patients were diagnosed with non-cardiac chest pain at the time of their visit. Of those 250 patients, 30% had a history of coronary artery disease. Further, of those with coronary artery disease, 34% met criteria for panic disorder and displayed more distress than patients with coronary artery disease and no panic disorder or patients without coronary artery disease. The patients with coronary artery disease and panic disorder had similar distress to patients with panic disorder and no coronary artery disease, indicating that both groups are afflicted by similar

psychological conditions that are not attributable to a cardiac condition. Results from this study indicate that patients who have a history of coronary artery disease and report symptoms not related to their medical condition, but rather to their panic disorder, report more distress. This research was conducted prior to heart-focused anxiety being introduced in the literature, but demonstrates that those with panic disorder have more distress and this distress is causing them to utilize medical services for symptoms they perceive to be related to their medical condition, when in fact they are not.

It is important that heart-focused anxiety, as commonly measured by the Cardiac Anxiety Questionnaire (Eifert, 1999a), is differentiated from panic disorder. Research has shown that cardioprotective beliefs and cardiac distress and panic explain 62% of the variance for avoiding physical activity and work, and 57% of the variance for emergency department utilization (Aikens, 1999). This study shows that those with fear related to their heart are avoiding daily activities and using more unnecessary medical resources to ease their anxiety. As such, it is possible that heart-focused anxiety may cause patients to avoid cardiac rehabilitation because it involves exercise.

More recent research suggests that an earlier diagnosis of heart-focused anxiety may be beneficial to cardiac patients. Zvolensky et al. (2008) suggest that an earlier diagnosis of heart-focused anxiety can lead to a decrease in functional impairment and an increase in quality of life. In this analysis, the authors point out that there are patients with non-cardiac chest pain that may have a specific fear and sensitivity related to their heart and possible negative consequences, but do not have this same fear for other bodily sensations. They do not experience the cognitive symptoms of panic, like fear of dying, and therefore do not meet the panic disorder criteria. The authors use the term

cardiophobia to address this fear, detailing that heart-focused anxiety is a persistent catastrophizing of symptoms relating to the heart.

Heart-focused anxiety has similarities with depression and anxiety, which, as previously mentioned, are highly correlated with CAD. Like depression and anxiety, predictors of heart-focused anxiety include lower socioeconomic status, support, and age (Fischer, 2011). A previous study examined heart-focused anxiety in a community sample of 2,396 individuals and found that there was a positive linear relationship of Cardiac Anxiety Questionnaire scores with age and a negative linear relationship with income (Fischer, 2011). The study also found that those in a relationship generally displayed less heart-focused and anxiety. The association between heart-focused anxiety and relationship status is thought to be accounted for by the increase in emotional support. Also, those with a higher education reported lower scores, possibly due to stronger cognitive skills and/or more knowledge to make better healthcare decisions.

When compared to those without a diagnosis of CAD, those with a cardiac diagnosis experience significantly higher mean scores for heart-focused attention and fear/worry factors (Marker, 2008). Since depression, anxiety, and heart-focused anxiety have similar predictors, it is logical to assume they would have similar consequences on the course of CAD. A study examining heart-focused anxiety in relation to anxiety and depression found the avoidance and fear factors to be independently related to general anxiety and depression (Hamang, 2011), and patients with higher levels of general anxiety were at higher risk for CAD. As previously noted, patients with CAD and depression and anxiety have poorer treatment adherence and poorer outcomes in cardiac

rehabilitation, so it is possible that those with heart-focused anxiety will have similar, or perhaps even worse, outcomes given the specificity of heart-focused anxiety.

Heart-Focused Anxiety as Possible Predictor of Participation in Cardiac Rehabilitation

Given that anxiety is an inconsistent predictor of cardiac rehabilitation attendance at best, heart-focused anxiety may be a more accurate predictor of attendance to cardiac rehabilitation because it is a more specific form of anxiety. If general anxiety measures are not specific enough, they may not be capturing the root of a cardiac patient's distress. This potential lack of sensitivity in measures of general anxiety may explain why associations between CAD and anxiety are so variable in the literature.

In addition, the three distinct factors that comprise heart-focused anxiety (avoidance, fear, and attention) may be differentially related to participation in cardiac rehabilitation. Avoidance and fear have been shown to be independently related to physical health (Hamang, 2011). Thus, individuals with higher levels of avoidance and fear may be less likely to engage in cardiac rehabilitation because these patients may view physical activity as likely to bring on a cardiac event. Paying undue attention to the heart as a result of heart-focused anxiety may produce similar outcomes because patients who are more preoccupied on their heart may be fearful of placing too much stress on it.

Even though a patient's perceived health does not directly predict his or her health-related behaviors (Heo, 2008), it does predict 13% of their heart-focused anxiety (Yartz, 2005), which in turn may affect his or her decision to engage in physical activity. In an examination of patients recently diagnosed with heart failure, over 30% of those

patients reported that they stopped exercise after receiving their diagnosis (Van der Wal, 2005). Heart-focused anxiety could play a role in this decision if there is an increase in fear and avoidant behaviors. As Zvolneskey et al. (2008) pointed out, just as identifying depression is helpful, identifying and treating increases in heart-focused anxiety early on may improve rehabilitation results by increasing attendance rates.

The Current Study

Coronary artery disease is the leading cause of death in North America. Cardiac rehabilitation significantly improves health following a cardiac event, yet participation in these programs remains low. Anxiety is a potential barrier to treatment for CAD, especially in light of the fact that anxiety disorders are the most prevalent class of psychological disorders in the world and anxiety is a significant independent predictor of CAD. However, there are few studies on the relationship between anxiety and cardiac treatment, and those that exist have produced equivocal results. One reason for these mixed results may be that previous studies have measured general anxiety rather than heart-focused anxiety, which is a type of anxiety that is specific to heart related events, sensations, and functioning.

Therefore, the overarching aim of the current study is to test predictors of cardiac rehabilitation attendance, including heart-focused anxiety, in a sample of patients who recently experienced a cardiac event and were referred to a cardiac rehabilitation program. More specifically, the goals of the present study are to (1) identify whether heart-focused anxiety is a significant predictor of choosing to attend cardiac rehabilitation above and beyond previously identified predictors of cardiac treatment adherence

(physician referral, gender, general anxiety, and depressed mood), (2) determine if heart-focused anxiety is a better predictor of attendance than general anxiety, and (3) determine whether the avoidance, fear, and attention factors of heart-focused anxiety are significant individual predictors of cardiac rehabilitation attendance. We hypothesize that the higher levels of heart-focused anxiety, the less likely patients will attend cardiac rehabilitation. We also hypothesize that heart-focused anxiety will be a better predictor of cardiac rehabilitation attendance than all other potential predictors, including general anxiety. Lastly, we hypothesize that higher levels of avoidance, fear, and/or attention will be associated with a smaller likelihood that patients will attend cardiac rehabilitation. Specifically, we hypothesize that avoidance will be a stronger predictor than both fear and attention in predicting rehabilitation attendance.

If it is found that heart-focused anxiety is a significant predictor of cardiac rehabilitation attendance, it could be used as a better predictor than general anxiety. Since, as previously mentioned, the literature on anxiety in the cardiac population is variable, assessing heart-focused anxiety could be a better tool when measuring meaningful anxiety levels in this population. In addition, if we are able to identify patients who are less likely to engage in cardiac rehabilitation due to high levels of heart-focused anxiety, we may be able to develop treatments to reduce their anxiety and therefore increase their likelihood of participating in and reaping the benefits from completing a cardiac rehabilitation program.

CHAPTER TWO

METHOD

Participants

This study included 32 participants ages 39-87 ($M = 63.66$, $SD = 12.54$; 53.1% female) who were recruited from the Loma Linda University Medical center, and who were offered the opportunity to participate in cardiac rehabilitation after receiving a diagnosis of cardiovascular disease. Participant demographic data are presented in Table 1. Eighteen participants who chose to participate in cardiac rehabilitation were referred by their physicians to the CR program at Loma Linda University Medical Center. Fourteen participants who chose not to participate in CR attended monthly appointments at the heart clinic to monitor the course of their disease.

Table 1

Demographic Characteristics of Sample

	<i>CR Patients (n = 18)</i>		<i>Heart Clinic Patients (n = 14)</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age (years)	61.89	10.73	65.92	14.64
	N	%	N	%
Gender				
Male	7	38.9	8	57.1
Female	11	61.1	6	42.9
Ethnicity				
Caucasian	11	61.1	10	71.4
African-American	2	11.1	2	14.3
Hispanic	3	16.7	1	7.1
Asian	1	5.6	0	0
Other	1	5.6	1	7.1

Materials

Demographics

Demographic predictors included gender, age, education, and ethnicity. Education was determined by number of years of education.

Depression

Depression was measured using the Patient Health Questionnaire 9 (PHQ-9) (see Appendix A), which is designed to assess depression in medical populations such as that of the current study (Kroenke et al., 2001). Participants responded to the question: “Over the last 2 weeks, how often have you been bothered by any of the following problems?” on a scale of 0 (“Not at All”) to 3 (“Nearly every day”) regarding items such as “Little interest or pleasure in doing things” or “Thoughts that you would be better off dead, or of hurting yourself in some way.” The PHQ-9 is a reliable measure ($\alpha = 0.89$) with adequate specificity (88%) and sensitivity (88%) in detecting depression (Kroenke et al., 2001).

Anxiety

Anxiety was measured using the Generalized Anxiety Disorder 7 (GAD-7) questionnaire (see Appendix B), which has also been designed for medical populations (Spitzer et al., 2006). Participants responded to the question: “Over the last 2 weeks, how often have you been bothered by any of the following problems?” on a scale of 0 (“Not at All”) to 3 (“Nearly every day”) regarding items such as “Worrying too much about different things” or “Becoming easily annoyed or irritable.” The GAD-7 is reliable ($\alpha = .92$) with adequate specificity (82%) and sensitivity (89%) (Spitzer et al., 2006).

Heart-focused Anxiety

Heart-focused Anxiety was measured using the Cardiac Anxiety Questionnaire (CAQ). The CAQ (see Appendix C) is an 18-item questionnaire comprising three subscales (fear, avoidance, and attention) that are used to evaluate the more specific symptom of heart-focused anxiety in clinical populations (Eifert et al., 1999a). Participants respond to each item on a Likert scale of 0 (“Never”) to 4 (“Always”) regarding items such as “I avoid exercise or other physical work.” The entire CAQ has high internal consistency reliability ($\alpha = 0.83$), as does each of the three subscales (fear, $\alpha = 0.83$; avoidance, $\alpha = 0.82$; and attention, $\alpha = 0.69$) (Eifert et al., 1999a). The CAQ was found to have a high correlation with the Anxiety Sensitivity Index, thus demonstrating good convergent validity ($r = 0.69$).

Cardiac Rehabilitation Attendance

The outcome variable of attendance was measured as a dichotomous variable where 0 = attended cardiac rehabilitation and 1 = did not attend cardiac rehabilitation.

Procedure

This study utilized a prospective design. Patients with a cardiac diagnosis receiving medical treatment from LLUMC and were referred to cardiac rehabilitation were recruited to participate. Those who chose not to attend CR instead attended monthly check-up appointments at the heart clinic (treatment group). Patients attending cardiac rehabilitation have signed waivers allowing data collected from initial neuropsychological and psychosocial evaluations to be used for research purposes, thus

providing consent. These patients were evaluated within the first week of their program to establish baseline scores on all study measures. For participants in the treatment group, contact information of possible candidates who are patients at the heart clinic was provided to the researchers by the clinic staff. These patients were contacted by phone to offer participation. For patients who express interest in participating in the current study, an appointment was made for them to complete a psychological and neuropsychological assessment at their next appointment. Participants were required to provide written informed consent prior to participation.

While all participants completed a full psychological and neuropsychological battery as part of their treatment, only demographic data and scores on the psychological measures described above (anxiety, depression, and cardiac anxiety) were used for the present study. In addition, only pre-treatment data was used in the case of cardiac rehabilitation patients to avoid any interference by the benefits of cardiac rehabilitation.

CHAPTER THREE

RESULTS

Hypotheses were tested using two hierarchical binomial logistic regression models. Assumptions of logistic regression were tested prior to analysis. Adequacy of expected frequencies was examined for all categorical variables, including gender, rehabilitation attendance, ethnicity, and level of education completed. In each cell, frequencies are expected to be greater than 1, with less than 20% of the cells with an expected frequency of less than 5. Frequencies were in the expected range for gender and rehabilitation but these assumptions were violated for ethnicity and education. Linearity of the logit was tested using the Box-Tidwell approach (Tabachnick & Fidell, 2013); no substantial violations of this assumption were found. Multicollinearity was tested by running a linear regression model with all independent variables. VIF and Tolerance values were in the expected ranges, indicating no problems with multicollinearity. Standardized residuals for each participant were examined, revealing only one participant who was just outside of the expected range (>2 or <-2), and it was decided to keep the participant in the data analysis due to the small sample size. Logistic regression models initially included education and ethnicity as predictors; however, these variables were removed because their parameters were unstable, most likely due to inadequate expected frequencies (Tabachnick & Fidell, 2013). Descriptive statistics (Table 2) and correlations (Table 3) among variables of interest were computed.

Table 2

Means and Standard Deviations of Independent Variables

	<i>CR Patients (n = 18)</i>		<i>Heart Clinic Patients (n = 14)</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Depression (PHQ9)	9.889	7.380	6.214	5.309
General Anxiety (GAD7)	7.056	7.344	2.857	2.713
Total Cardiac Anxiety (CAQ)	1.849	.673	1.651	1.201
Fear	1.917	.865	1.598	1.302
Avoidance	1.867	.549	1.743	1.236
Attention	1.722	.879	1.643	1.325

Table 3

Correlations among Independent Variables

	Gender	Age	PHQ9	GAD7	CAQ	Fear	Avoidance	Attention
Gender	1							
Age	-.204	1						
PHQ9	.277	-.175	1					
GAD7	.295	-.156	.913**	1				
CAQ	.148	.075	.331	.375*	1			
Fear	.136	-.007	.308	.343	.949**	1		
Avoidance	.027	.234	.234	.243	.842**	.704**	1	
Attention	.219	.048	.341	.417*	.892**	.767**	.659**	1

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

The first hierarchical binomial linear regression analysis was conducted to determine which independent variables (gender, age, depression, anxiety, and heart-

focused anxiety) significantly predicted cardiac rehabilitation attendance (attended or did not attend). Gender, age, and depression (PHQ-9 score) were added in the first step, general anxiety (GAD-7 score) in the second, and overall heart-focused anxiety (total CAQ score) in the final step, as it is the variable of interest. The results are shown in Table 4. None of the independent variables were statistically significant predictors of CR attendance. Given that statistical power was likely to be very low because of small sample size, effect sizes are reported and examined for indications of practical significance.

Odds ratios suggested that there was a 35.7% increase in the odds of CR attendance if the participant was female ($OR = 1.357, p > .7$), a 1.6% decrease in the odds of CR attendance with every one-point increase in age ($OR = .984, p > .6$), and an 11.6% decrease in the odds of CR attendance with every one-point increase in depression score ($OR = .884, p > .4$). As hypothesized, the odds of attending CR decreased by 7.8% with every one-point increase in overall cardiac anxiety ($OR = .922, p > .8$). However, contrary to our hypothesis, general anxiety may have a stronger relationship with CR attendance than cardiac anxiety. The odds of attending CR increased by 32.9% for every one-point increase in general anxiety ($OR = 1.329, p > .1$).

The second hierarchical binomial linear regression analysis was conducted to test the strength of gender, age, depression, anxiety, and the three subscales of the CAQ (Fear, Avoidance, and Attention) as predictors of cardiac rehabilitation attendance. Gender, age, and depression were added in the first step, general anxiety in the second, and the three CAQ subscales in the final step. Results are shown in Table 4. Again, none

of the independent variables were statistically significant predictors of CR attendance. Thus, effect sizes are reported and examined for indications of practical significance.

In this model, odds ratios suggested that there was a 67.9% increase in the odds of CR attendance if the participant was female ($OR = 1.679, p > .5$), a 1.6% decrease in the odds of CR attendance with every one-point increase in age ($OR = .984, p > .6$), and a 14.6% decrease in the odds of CR attendance with every one-point increase in depression score ($OR = .854, p > .3$). There was a 39.4% increase in the odds of CR attendance with every one-point increase in general anxiety score ($OR = 1.394, p > .1$). Contrary to our hypothesis, the odds of attending CR increased as scores on the Fear and Avoidance subscales of the CAQ increased. Specifically, for each one-point increase on the Fear subscale of the CAQ, the odds of attending CR increased by 60.7% ($OR = 1.607, p > .5$). For every one-point increase on the Avoidance subscale of the CAQ, the odds of attending CR increased by 34.3% ($OR = 1.343, p > .7$). However, as hypothesized, the odds of attending CR decreased by 57.3% for every one-point increase on the Attention subscale ($OR = .427, p > .2$).

Table 4

Results of Hierarchical Logistic Regression Analyses Predicting Cardiac Rehabilitation Attendance

Predictor	Model 1						Model 2					
	<i>b</i>	<i>SE</i>	<i>OR</i>	<i>p</i>	95% CI		<i>b</i>	<i>SE</i>	<i>OR</i>	<i>p</i>	95% CI	
					<i>Lower</i>	<i>Upper</i>					<i>Lower</i>	<i>Upper</i>
Gender	.305	.815	1.357	.708	.275	6.701	.518	.863	1.679	.549	.309	9.120
Age	-.016	.032	.984	.614	.924	1.047	-.016	.034	.984	.639	.920	1.052
Depression	-.123	.154	.884	.422	.654	1.195	-.158	.162	.854	.330	.622	1.173
General Anxiety	.284	.207	1.329	.169	.886	1.992	.332	.217	1.394	.126	.911	2.134
Cardiac Anxiety	-.081	.454	.922	.858	.379	2.243	-	-	-	-	-	-
Fear	-	-	-	-	-	-	.474	.661	1.607	.473	.440	5.865
Avoidance	-	-	-	-	-	-	.295	.677	1.343	.663	.356	5.060
Attention	-	-	-	-	-	-	-.851	.660	.427	.197	.117	1.557

CHAPTER FOUR

DISCUSSION

None of the results of the current study was statistically significant. One major cause of the lack of significance is likely to be the small sample size of the study. However, we submit that the results are worth further interpretation in light of their effect sizes. In recent years, the use of null hypothesis significance testing and its usefulness in interpreting study results has come under scrutiny because it is dependent on sample size. Experts recommend using effect sizes to better interpret results and to provide more clinically relevant information (Nickerson, 2000; Rodgers, 2010). Therefore, while the current study did not produce any statistically significant results at the $p < 0.05$ level, the effect sizes of the variables will be discussed in relation to practical significance.

Contrary to previous literature, in this study, women had between 36% and 68% greater odds of attending cardiac rehabilitation than men in both models. Those odds nearly doubled in the second model, which included the three CAQ subscales separately. While it is unclear why accounting for the subscales separately had this effect, it may point to an interaction between gender and all or some of the subscales, such that the relationship between one or more of the subscales and CR attendance differs for males and females. Previous research indicates that men are more likely to receive referrals to cardiac rehabilitation and are more likely to attend because they are younger and healthier at the time of onset (Grace, 2002a; Roger, 2011). However, studies show that men and women differ in their adherence to medical treatment recommendations in that women are more likely to utilize health care, both preventative and treatment related (Pinkhasov et al., 2010), which could explain why women were more likely to attend CR

in this study. Research demonstrates a gender disparity in the referral process for cardiac rehabilitation, in which women are 26% less likely to be referred to CR than men ($OR = 0.74$), and 27% less likely to attend CR than men ($OR = 0.73$) (Colbert et al., 2013). Poor understanding of their condition and treatment is a barrier to adherence (Daniels et al., 2012). Based on the literature that states that women are more likely to utilize healthcare in general, the results of the current study may suggest that this sample of women may have been more knowledgeable about their condition and when referred, were more likely to attend CR. Further exploration of the relationship between gender and attendance is warranted.

The effect of age of participants on CR attendance was small enough to be of little practical significance, and remained consistent in both models. Past research has found variable results with regard to the strength of age as a predictor of adherence. Studies have found that age is a significant predictor of medication treatment adherence, with those ages 55-64 being the most adherent, followed by ages 65-74 (Chapman et al., 2005). In a review of recent literature examining predictors of CR adherence, it was found that older age is associated with reduced adherence, particularly for female patients (Jackson et al., 2004). A review of interventions for treatment adherence found old age, marital status, and social support to be significant predictors of treatment adherence (Vermeire, 2000). Marital status and social support are identified as factors that assist patients in getting to and from appointments as well as providing reminders about health and self-care at home. While it is unclear why age had such a small effect on CR attendance, given that age has been a significant predictor of adherence in past research, it is possible social support plays a role and may need to be considered in future research.

It is possible that with old age and more reliance on others for transportation and self-care needs, social support may be acting as a mediator for age and CR attendance.

Depression had similar predictive value in both models, with higher scores indicative of decreased odds of attending cardiac rehabilitation. Effect sizes indicated an 11 to 14% decrease in the odds of attending CR with every one-point increase in depression score. Depression has been well researched as a barrier to medical adherence and treatment (Gehi, 2005; DiMatteo, 2000; Ziegelstien, 2000), and therefore these results are expected. Higher levels of depression are associated with poorer medication adherence and increased risk of being non-compliant with medical treatment (DiMatteo, 2000). A history of depression is also known to be associated with lower odds of choosing to attend CR (Lane, 2001)

Higher levels of general anxiety were associated with greater odds of cardiac rehabilitation attendance, increasing chances of attendance by 32% to 39% for each one-point increase in anxiety scores. As previously reported, the relationship between anxiety and CAD has been variable in previous research. It has been theorized that, similar to depression, an increase in anxiety will impair treatment adherence, and therefore rehabilitation attendance (Roest, 2010). These results do not support that claim. For this sample, the presence of anxiety could have increased the participants' concern for their health and motivated them to seek treatment for fear of negative outcomes, much as DiMatteo (2000) suggested. In contrast, those with low anxiety may feel more complacent about their health and be less likely to follow through with services if they do not feel they need them.

For this sample, cardiac anxiety did not have a large effect (7.8%) on the odds of rehabilitation attendance; however, the trend suggests that an increase in cardiac anxiety is associated with a decrease in the odds of attendance, as hypothesized. However, the results were less consistent when the three subscales (Fear, Avoidance, and Attention) were examined separately. Contrary to the hypothesis, for every one-point increase on the Fear subscale, the odds of attending cardiac rehabilitation increased by 60.7%. Similarly, a one-point increase on the Avoidance subscale was associated with a 34.3% increase in the odds of attendance. Previous research has indicated that both avoidance and fear are independently associated with physical health (Hamang, 2011). Thus, it was hypothesized that those with higher fear and/or avoidance scores would be less likely to engage in rehabilitation on the basis that patients with greater fear of having a cardiac related event might be more likely to avoid activities that are perceived to cause an event, such as the rigorous physical activity that is a required component of the CR program. However, the current findings may be due to mechanisms similar to those proposed to explain the relationship between general anxiety and CR attendance, in which increased worry actually may encourage patients to engage in recommended treatments due to a fear of negative health outcomes. Finally, increased Attention scores were associated with a 57.3% decrease in odds of attendance. These findings support the hypothesis that undue attention to the heart may cause participants to be fearful of engaging in activities, such as physical exercise, in which they fear may cause a heart-related event.

Contrary to the hypothesis, general anxiety (32.9%) demonstrated a stronger relationship with CR attendance than cardiac anxiety (7.8%). However, when examined separately, the Fear (60.7%), Avoidance (34.3%), and Attention (57.3%) subscales each

had a larger effect on CR attendance than general anxiety. General anxiety may be a stronger predictor than overall cardiac anxiety because the three types of anxiety being assessed in overall cardiac anxiety may be confounding each other. Specifically, combining CAQ subscales into one total score may obscure any relationship between cardiac anxiety and CR attendance because the relationships between the Fear and Avoidance subscales and CR are in the opposite direction of the relationship between the Attention subscale and CR. This finding suggests that it may be best to examine the CAQ subscales separately when assessing cardiac anxiety.

Implications

Using the effect sizes from the current analyses as a guide, the results of this study can be used to facilitate future research, and may provide clinicians with preliminary insight into potential predictors of CR attendance among their patients. While previous literature has not been clear about the relationship between general anxiety and adherence in the cardiac population, the results here suggest that an increase in general anxiety, fear, and avoidance may actually increase adherence in relation to CR attendance. Clinically, these findings suggest that those who are not endorsing general anxiety symptoms or those specific to their heart in relation to fear and avoidance may be less likely to attend rehabilitation. Future research may benefit from identifying what other barriers to treatment adherence those with low general anxiety are experiencing.

Possible interventions for patients low in general, fear-related, and avoidance-related anxiety may include improved physician communication to increase adherence (Haskard Zolnieriek & DiMatteo, 2009), as well as more follow-up reminders because

may not experience enough anxiety to alert them to be mindful of their treatments. As previously reported, patients with high general anxiety may attend to their medical needs because of a fear of negative outcomes (DiMatteo, 2000), so it may be reasonable to believe that those with low anxiety are not as fearful of negative outcomes, and therefore have a tendency to forgo treatment. According research on interventions to improve patient adherence to treatment, the most effective strategies in improving patient adherence involve educating the patient about his or her treatment and better communication from physicians, as there is more buy-in from patients when they are included in the decision-making (Vermeire, 2001). Along with increased communication and reminders about adherence, it is recommended that patients receive counseling about the importance of adherence and enlist the support of family and friends, especially for patients with long-term regimens and chronic illnesses (Haynes et al., 2002).

The findings also suggest that those experiencing higher levels of overall cardiac anxiety and higher attention levels are less likely to attend CR. These patients may benefit from interventions that could include psychoeducation and/or short-term therapeutic interventions to identify and alleviate anxiety, such as CBT or relaxation skills. Further research should be done with a larger sample to determine if this relationship is consistently observed in other samples. If so, measures of cardiac anxiety may be used to identify patients who can benefit from additional education or brief psychological interventions, such as relaxation and positive coping skills training, to increase the likelihood of treatment adherence.

Findings such as these indicate that there may be a need to reevaluate how anxiety is being assessed in clinical practice. Anxiety may need to be assessed differently,

focusing on more specific anxiety symptoms that may be predictive of non-adherence, such as heart-focused attention, which refers to undue attention to the heart that leads to increased monitoring. Further research can be done to better understand the relationship for patient targeting and educational purposes. For example, future research that aims to elucidate what attitudes these patients may hold toward treatment adherence may help us to identify belief systems that can be targeted to improve adherence rates. Lastly, it is important that future studies are used to investigate whether there is an interaction between gender and the three CAQ subscales, given that our results suggest this possibility, but we were unable to test it due to low statistical power.

Limitations

The current study should be interpreted in light of several limitations. Statistical power was substantially reduced by our small sample size, thus limiting our ability to identify truly significant effects. Future studies should utilize a larger sample to improve statistical power and the generalizability of results. In addition, the sample was primarily Caucasian and married, and did not include measures of social support. Future studies should include more diversity to account for possible effects of ethnic/racial differences, and should measure social support. The cross-sectional and observational nature of the study prevents the authors from making causal inferences about the findings, but does allow us to identify important associations among variables that may warrant further investigation. This study may also be limited by a self-selection bias. Patients volunteered to participate in this study, which may imply that they are willing to participate in treatment and be less likely to be experiencing distressing psychosocial symptoms.

Finally, participants in the treatment group were still attending monthly doctor appointments, which could indicate some level of adherence to treatment, which may have skewed results. Future studies designed to investigate the difference between adherers and non-adherers could benefit from including a wait-list control group.

Conclusion

In summary, if replicated with a larger sample, the findings of this study could help to identify potential patients who are more likely to attend CR and those who are at greater risk of declining to attend CR, which is one of the most strongly recommended treatments for those suffering from cardiac related events. This study raises additional questions about the relationship between gender and cardiac anxiety, such as what effect gender has on the experience and expression of anxiety in males and females and how that affects their adherence to treatment, as well as the role of general anxiety in the cardiac population. Future research may also benefit from examining knowledge of condition to determine if this affects the relationship between adherence and gender. Future research can focus on these areas to assist in identifying at-risk patients. Currently, treatment within cardiac rehabilitation is one-size-fits all and the results of this study could help to guide clinicians to offer more individual, specific treatment interventions that involves identifying and assisting patients experiencing specific anxieties that are barriers to treatment to improve adherence to not only the program, but to medical treatment in general. Improving our ability to identify patients who may be at risk for non-adherence may inform the development of more effective interventions to increase

rates of adherence, and thus ultimately improve overall quality of life and medical outcomes for cardiac patients.

REFERENCES

- Ades, P. A., Waldmann, M. L., McCann, & W. J., Weaver, S. O. (1992). Predictors of cardiac rehabilitation participation in older coronary patients. *Archives of Internal Medicine*, *152*(5), 1033-1035.
- Aikens, J. E., Michael, E., Levin, T., & Lowry, E. (1999). The role cardioprotective avoidance beliefs in noncardiac chest pain and associated emergency department utilization. *Journal of clinical Psychology in Medical Settings*, *6*(4), 317-332.
- Allen, J., Benz Scott, L., Stewart, K. J., & Young, D. R. (2004). Disparities in women's referral to and enrollment in outpatient cardiac rehabilitation. *Journal of General Internal Medicine*, *19*, 747-753.
- Baessler, A. (2001). Long-term effects of in-hospital cardiac rehabilitation on the cardiac risk profile. A case-control study in pairs of siblings with myocardial infarction. *European Heart Journal*, *22*(13), 1111-1118.
- Balady, G. J., Williams, M. A., Ades, P. A., Bittner, V., Comoss, P., Foody, J. M., Franklin, B., et al. (2007). Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: A scientific statement from the American Heart Association exercise, cardiac rehabilitation, and prevention committee, the Council on Clinical Cardiology; the Councils on Cardiovascular Nursing, Epidemiology and Prevention, and Nutrition, Physical Activity, and Metabolism; and the American Association of Cardiovascular and Pulmonary Rehabilitation. *Circulation*, *115*(20), 2675-2682.
- Baroletti, S., & Dell'Orfano, H. (2010). Medication adherence in cardiovascular disease. *Circulation* *121*(12), 1455-1458.
- Chapman, R., Benner, J., Petrilla, A., Tierce, J., Collins, R., Battleman, D., & Schwartz, S. (2005). Predictors of adherence with antihypertensive and lipid-lowering therapy. *Archives of Internal Medicine*, *165*(10).
- Colbert, J., Martin, B., Hauer, T., Haykowsky, M., Austford, L., Arena, R., Knudtson, M., et al. (2013). Cardiac rehabilitation referral and attendance in women: A high-risk population with two strikes against it. *Journal of the American College of Cardiology*, *61*(10), E1414.
- Cooper, A., Lloyd, G., Weinman, J., & Jackson, G. (1999). Why patients do not attend cardiac rehabilitation: Role of intentions and illness beliefs. *Heart*, *82*, 234-236.
- Daniels, K. M., Arena, R., Lavie, C. J., & Forman, D. E. (2012). Cardiac rehabilitation for women across the lifespan. *The American Journal of Medicine*, *125*(9), 937.e1- 937.e7

- Daly, J., Sindone, A. P., Thompson, D. R., Hancock, K., Chang, E., & Davidson, P. (2002). Barriers to participation in and adherence to cardiac rehabilitation programs: A critical literature review. *Progress in Cardiovascular Nursing, 17*(1), 8-17.
- DiMatteo, M. R., Lepper, H. S., & Croghan, T. W. (2000). Depression is a risk factor for noncompliance with medical treatment. *Archives of Internal Medicine, 160*, 2101-2107.
- Eifert, G. H., & Forsyth, J. P. (1996). Heart-focused and general illness fears in relation to parental medical history and separation experiences. *Behavior Research and Therapy, 34*(9), 735-739.
- Eifert, G. H., Thompson, R. N., Zvolensky, M. J., Edwards, K., Frazer, N. L., Haddad, J. W., & Davig, J. (1999a). The cardiac anxiety questionnaire: Development and preliminary validity. *Behavior Research and Therapy, 38*, 1039-1053.
- Eifert, G. H., Zvolensky, M. J., Sorrell, J. T., Hopko, D. R., & Lejuez, C. W. (1999b). Predictors of self-reported anxiety and panic symptoms: An evaluation of anxiety sensitivity, suffocation fear, heart-aocused anxiety, and breath-holding duration. *Journal of Psychopathology and Behavioral Assessment, 21*(4), 293-305.
- Fischer, D., Kindermann, I., Karbach, J., Herzberg, P. Y., Ukena, C., Barth, C., Lenski, M., et al. (2011). Heart-focused anxiety in the general population. *Clinical Research in Cardiology, 101*(2), 109-116.
- Fleet, R. P., Dupuis, G., Marchand, A., Kaczorowski, J., Burelle, D., Arsenault, A., & Beitman, B. D. (1998). Panic disorder in coronary artery disease patients with noncardiac chest pain. *Journal of Psychosomatic Research, 44*(1), 81-90.
- Gehi, A. (2005). Depression and medication adherence in outpatients with coronary heart disease: Findings from the heart and soul study. *Archives of Internal Medicine, 165*(21), 2508-2513.
- Grace, S. L., Abbey, S. E., Shnek, Z. M., Irvine, J., Franche, R., & Stewart, D. E. (2002a). Cardiac rehabilitation I: Review of psychosocial factors. *General Hospital Psychiatry, 24*(3), 121-126.
- Grace, S. L., Abbey, S. E., Shnek, Z. M., Irvine, J., Franche, R., & Stewart, D. E. (2002b). Cardiac rehabilitation II: Referral and participation. *General Hospital Psychiatry, 24*, 127-134.
- Grace, S. L., Gravely-Witte, S., Kayaniyil, S., Brual, J., Suskin, N., & Stewart, D. E. (2009). A multisite examination of sex differences in cardiac rehabilitation barriers by participation status. *Journal of Women's Health, 18*(2), 209-216.

- Hamang, A., Eide, G. E., Rokne, B., Nordin, K., & Øyen, N. (2011). General anxiety, depression, and physical health in relation to symptoms of heart-focused anxiety—a cross sectional study among patients living with the risk of serious arrhythmias and sudden cardiac death. *Health and Quality of Life Outcomes*, *9*(1), 100-109.
- Hammill, B. G., Curtis, L. H., Schulman, K. A., & Whellan, D. J. (2009). Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly medicare beneficiaries. *Circulation*, *121*(1), 63-70.
- Haskard Zolnierak, K. B., & DiMatteo, M. R. (2009). Physician communication and patient adherence to treatment: A meta-analysis. *Medical Care*, *47*(8), 826-834
- Haynes, R. B., McDonald, H., & Garg, A. (2002). Helping patients follow prescribed treatment. *Journal of the American Medical Association*, *288*(22), 2880-2883.
- Heo, S., Moser, D. K., Lennie, T. A., Riegel, B., & Chung, M. L. (2008). Gender differences in and factors related to self-care behaviors: A cross-sectional, correlational study of patients with heart failure. *International Journal of Nursing Studies*, *45*(12), 1807-1815.
- Ho, P. M., Bryson, C. L., & Rumsfeld, J. S. (2009). Medication adherence: Its importance in cardiovascular outcomes. *Circulation*, *119*(23), 3028-3035.
- Horwitz, R. I., & Horwitz, S. M. (1993). Adherence to treatment and health outcomes. *Archives of Internal Medicine*, *153*, 1863-1868.
- Jackson, L., Leclerc, J., Erskine, Y., & Linden, W. (2004). Getting the most out of cardiac rehabilitation: A review of the referral and adherence predictors. *Heart*, *91*, 10-14.
- Kravitz, R., Hays, R., Sherbourne, C., DiMatteo, R., Rogers, W., Ordway, L., & Greenfield, S. (1993). Recall of recommendations and adherence to advice among patients with chronic medical conditions. *Archives of Internal Medicine*, *153*, 1869-1878.
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). PHQ-9: The validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*(9), 606-613.
- Lavie, C. (2004). Prevalence of anxiety in coronary patients with improvement following cardiac rehabilitation and exercise training. *The American Journal of Cardiology*, *93*(3), 336-339.

- Lavie, C. J., Milani, R., & Littman, A. B. (1993). Benefits of cardiac rehabilitation and exercise training in secondary coronary prevention in the elderly. *Journal of the American College of Cardiology*, 22(3), 678-683.
- Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks, CA: SAGE Publications, Inc.
- Luyster, F. S., Hughes, J. W., & Hunstad, J. (2009). Depression and anxiety symptoms are associated with reduced dietary adherence in heart failure patients treated with an implantable cardioverter defibrillator. *Journal of Cardiovascular Nursing*, 24(1), 10-17.
- Marker, C. D., Carmin, C. N., & Ownby, R. L. (2008). Cardiac anxiety in people with and without coronary atherosclerosis. *Depression and Anxiety*, 25(10), 824-831.
- McCann, U. D., Fauerbach, J. A., & Thombs, B. D. (2005). Anxiety and cardiac disease. *Primary Psychiatry*, 12(3), 47-50.
- McGee, H. M., Hevey, D., & Horgan, J. H. (1999). Psychosocial outcome assessments for use in cardiac rehabilitation service evaluation: A 10-year systematic review. *Social Science & Medicine*, 48, 1373-1393.
- Milani, R. V., & Lavie, C. J. (2007). Impact of cardiac rehabilitation on depression and its associated mortality. *The American Journal of Medicine*, 120(9), 799-806.
- Moser, D. K., & Dracup, K. (1996). Is anxiety early after myocardial infarction associated with subsequent ischemic and arrhythmic events? *Psychosomatic Medicine*, 58, 395-401.
- Nickerson, R. S. (2000). Null hypothesis significance testing: A review of an old and continuing controversy. *Psychological Methods*, 5(2), 241-301.
- Oates, D. J., & Paasche-Orlow, M. K. (2009). Health literacy: Communication strategies to improve patient comprehension of cardiovascular health. *Circulation*, 119(7), 1049-1051.
- Oldridge, N. B. (2008). Economic burden of physical inactivity: Healthcare costs associated with cardiovascular disease. *European Journal of Cardiovascular Prevention & Rehabilitation*, 15(2), 130-139.
- Oldridge, N. B., Guyatt, G. H., Fischer, M. E., & Rimm, A. A. (1988). Cardiac rehabilitation after myocardial infarction. *Journal of the American Medical Association*, 260(7), 945-950.
- Petrie, K. J., Jago, L. A., & Devcich, D. A. (2007). The role of illness perceptions in patients with medical conditions. *Current Opinion in Psychiatry*, 20, 163-167.

- Pinkhasov, R. M., Wong, J., Kashanian, J., Lee, M., Samadi, D. B., Pinkhasov, M. M., & Shabsigh, R. (2010). Are men shortchanged on health? Perspective on health care utilization and health risk behavior in men and women in the United States. *International Journal of Clinical Practice*, *64*(4), 475-487.
- Roest, A. M., Martens, E. J., de Jonge, P., & Denollet, J. (2010). Anxiety and risk of incident coronary heart disease. *Journal of the American College of Cardiology*, *56*(1), 38-46.
- Rodgers, J. L. (2010). The epistemology of mathematical and statistical modeling: A quiet methodological revolution. *The American Psychologist*, *65*(1), 1-12.
- Roger, V. L., Go, A. S., Lloyd-Jones, D. M., Benjamin, E., Berry, J. D., Borden, W. B., Bravata, D. M., et al. (2011). Heart disease and stroke statistics--2012 update: A report from the American Heart Association. *Circulation*, *125*(1), e2-e220.
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder. *Archives of Internal Medicine*, *166*, 1092-1097.
- Tabachnick, B. G. & Fidell, L. S. (2013). Using multivariate statistics. 6th ed. Boston: Allyn and Bacon
- Tielemans, W. (2010). Promoting the importance of cardiac rehabilitation. *Kai Kiaki Nursing New Zealand*, *16*(2), 18-20.
- Toh, C. T., Jackson, B., Gascard, D. J., Manning, A. R., & Tuck, E. J. (2010). Barriers to medication adherence in chronic heart failure patients during home visits. *Journal of Pharmacy Practice and Research*, *40*(1), 27-30.
- van der Wal, M., Jaarsma, T., & van Veldhuisen, D. J. (2005). Non-compliance in patients with heart failure; How can we manage it? *European Journal of Heart Failure*, *7*(1), 5-17.
- Vermeire, E., Hearnshaw, H., Van Royen, P., & Denekens, J. (2001). Patient adherence to treatment: Three decades of research. A comprehensive review. *Journal of Clinical Pharmacy and Therapeutics*, *26*(5), 331-342.
- Yartz, A. R., Zvolensky, M. J., Gregor, K., Feldner, M. T., & Leen-Feldner, E. W. (2005). Health perception is a unique predictor of anxiety symptoms in non-clinical participants. *Cognitive Behaviour Therapy*, *34*(2), 65-74.
- Yusuf, S., Hawken, S., Ôunpuu, S., Dans, T., Avezum, A., Lanas, F., McQueen, M., et al. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): Case-control study. *The Lancet*, *364*(9438), 937-952.

Ziegelstein, R. C., Fauerbach, J. A., Stevens, S. S., Romanelli, J., Richter, D. P., & Bush, D. E. (2000). Patients with depression are less likely to follow recommendations to reduce cardiac risk during recovery from a myocardial infarction. *Archives of Internal Medicine*, *160*, 1818-1823.

Zvolensky, M. J., Feldner, M. T., Eifert, G. H., Vujanovic, A. A., & Solomon, S. E., (2008). Cardiophobia: A critical analysis. *Transcultural Psychiatry*, *45*(2), 230-252.

APPENDIX A

PATIENT HEALTH QUESTIONNAIRE 9

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
	0	1	2	3
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself, or that you are a failure, or have let your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or television.	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed, or the opposite - being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3
10. If you checked off <i>any</i> problems, how <i>difficult</i> have these problems made it for you to do your work, take care of things at home, or get along with other people?	0	1	2	3

APPENDIX B

GENERALIZED ANXIETY DISORDER 7

Over the <i>last 2 weeks</i> , how often have you been bothered by any of the following problems? (circle the best answer)	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3
	Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
8. If you checked off <i>any</i> problems, how <i>difficult</i> have these problems made it for you to do your work, take care of things at home, or get along with other people?	0	1	2	3

APPENDIX C

CARDIAC ANXIETY QUESTIONNAIRE

Please rate each item by circling the answer (number) that best applies to you:

	Never	Rarely	Sometimes	Often	Always
1. I pay attention to my heart beat	0	1	2	3	4
2. I avoid physical exertion	0	1	2	3	4
3. My racing heart wakes me up at night	0	1	2	3	4
4. Chest pain/discomfort wakes me up at night	0	1	2	3	4
5. I take it easy as much as possible	0	1	2	3	4
6. I check my pulse	0	1	2	3	4
7. I avoid exercise or other physical work	0	1	2	3	4
8. I can feel my heart in my chest	0	1	2	3	4
9. I avoid activities that make my heart beat faster	0	1	2	3	4
10. If tests come out normal, I still worry about my heart	0	1	2	3	4
11. I feel safe being around a hospital, physician or other medical facility	0	1	2	3	4
12. I avoid activities that make me sweat	0	1	2	3	4
13. I worry that doctors do not believe my symptoms are real	0	1	2	3	4
When I have chest discomfort or when my heart is beating fast:					
14. I worry that I may have a heart attack	0	1	2	3	4
15. I have difficulty concentrating on anything else	0	1	2	3	4
16. I get frightened	0	1	2	3	4
17. I like to be checked out by a doctor	0	1	2	3	4
18. I tell my family or friends	0	1	2	3	4