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# Heart-focused Anxiety and Cardiac Treatment Adherence

Angelyna M. Lowe

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

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Heart-focused Anxiety and Cardiac Treatment Adherence

by

Angelyna M. Lowe

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

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September 2016

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

\_\_\_\_\_, Chairperson  
Holly E.R. Morrell, Assistant Professor of Psychology

\_\_\_\_\_  
Adam Arechiga, Professor of Psychology

\_\_\_\_\_  
Sylvia Herbozo, Associate Professor of Psychology

\_\_\_\_\_  
Linda Houston-Feenstra, Director of Cardiac Rehabilitation

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## ABBREVIATIONS

CAD	Coronary Artery Disease
LDL	Low-Density Lipid Cholesterol
HDL	High-Density Lipid Cholesterol
mg/dL	Milligram per Deciliter
BP	Blood Pressure
GAD-7	Generalized Anxiety Disorder 7
STAI-Trait	State Trait Anxiety Inventory - Trait
PDSS-SR	Panic Disorder Severity Scale –Self Report
CAQ	Cardiac Anxiety Questionnaire
CES-D	Center for Epidemiologic Studies-Depression
CADE-Q	Coronary Artery Disease Education Questionnaire
PSS	Perceived Stress Scale
MSPSS	Multidimensional Scale of Perceived Social Support

## ABSTRACT OF THE DISSERTATION

Heart-focused Anxiety and Cardiac Treatment Adherence

by

Angelyna M. Lowe

Doctor of Philosophy, Graduate Program in Clinical Psychology  
Loma Linda University, September 2016  
Dr. Holly E. R. Morrell, Chairperson

Cardiac disease is the leading cause of death and functional impairment in North America. Treatment adherence in general is a major obstacle for the cardiac population. Anxiety is a potential barrier to treatment adherence, yet results of previous studies are equivocal, possibly due to anxiety being measured too generally. Heart-focused anxiety was measured in the current study to determine if it is a better predictor of treatment adherence than general anxiety, after controlling for other known predictors of adherence. Sixty-five participants between 29 and 96 years of age ( $M = 69.24$ ,  $SD = 14.18$ ; 56.9% female) were recruited from the Loma Linda University Medical Center. Participants were given a questionnaire to complete, either by mail or online, in which demographic characteristics, treatment adherence, general anxiety, heart-focused anxiety, and other known predictors of treatment adherence were measured. Two hierarchical multiple linear regression models were run to test whether the subscales of heart-focused anxiety predicted lifestyle and medication adherence, respectively, above and beyond the influence of demographic variables, other known predictors, and general anxiety. Three hierarchical binomial logistic regression models were run to test whether heart-focused anxiety predicted healthy LDL, HDL and blood pressure levels above and beyond the influence of demographic variables, other known predictors, and general anxiety. None of

the CAQ subscales significantly predicted adherence, but effect sizes were large enough to warrant interpretation. In general, fear-related anxiety increased odds of non-adherence, while avoidance and attention produced mixed results. Knowledge and positive coping significantly predicted lifestyle recommendation adherence, gender (being male) and positive coping significantly predicted unhealthy LDL cholesterol levels, and being unmarried significantly predicted lower blood pressure. Results suggest that patients with more fear-related anxiety are more likely to be non-adherent to recommended treatments. In general, the CAQ subscales were stronger predictors of treatment adherence than general anxiety, indicating that they may be better determinants of treatment adherence than general anxiety alone. Results also indicated that those with more knowledge and who use positive coping are more likely to be adherent to lifestyle recommendations, men and those with less positive coping skills are more likely to have high LDL cholesterol, and unmarried individuals are less likely to have high blood pressure. Targeting these individuals to offer specific interventions may improve treatment adherence through increased education, patient-physician communication, and psychological interventions aimed at reducing fear and anxiety.

# **CHAPTER ONE**

## **INTRODUCTION**

### **Coronary Artery Disease**

Every year since 1900, except 1918, coronary artery disease (CAD) has been the leading cause of death in North America (Go et al., 2013). As of 2009 in the United States, one person dies of cardiovascular disease every 40 seconds, which amounts to over 2150 deaths per day (Go et al., 2013). While this is a 32.7% 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 in the United States is associated with more health care costs than another other disease, costing over an estimated \$297 billion (Roger et al., 2011). This estimate includes medications, doctor visits, hospital services, physician services, as well as indirect costs such as lost productivity due to death.

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 such as anxiety is an important step in reducing the occurrence of cardiac related events.

### **Recommended Lifestyle Changes/Treatments**

While specific treatments vary, in general there are common recommended lifestyle changes and treatments for the cardiac population. Cardiac patients are encouraged to adhere to a healthier, reduced salt, Mediterranean-style diet because it has been shown to reduce mortality by 65-73% (Roger et al., 2011). It is suggested that patients engage in 150 minutes of vigorous activity a week, which is shown to reduce mortality by 27% in cardiac patients (Go et al., 2013; Roger et al., 2011). Patients are also expected to adhere to medical treatments, including surgical treatments and, more commonly, medication regimens, yet over 60% of this population has been reportedly non-adherent to medication, significantly increasing their risk for a cardiac event (Kravitz, 1993).

One of the most strongly recommended treatments for patients with CAD is cardiac rehabilitation. Cardiac rehabilitation is a three-month treatment program that consists of patient assessment, nutritional counseling, risk management, psychosocial interventions, and physical intervention and counseling (Balady, 2007). Patients usually attend rehabilitation following a cardiac event to strengthen their heart and encourage a new healthier lifestyle. Patients attend the program three to five days a week, and their medical and psychosocial progress is monitored throughout treatment. Cardiac rehabilitation has been shown to account for a 24% reduction of all-cause mortality and a 25% reduction in cardiovascular mortality (Oldridge, 1988). Significant improvements

following a cardiac rehabilitation program in exercise capacity, BMI, obesity indexes, and lipid levels have also been observed, in which exercise capacity showed a 34% increase, while body fat decreased by 6% overall (Lavie et al., 1993). Despite these benefits, only about one-third of patients attend rehabilitation following a cardiac event (Daly, 2002).

### **Adherence**

Non-adherence to cardiac treatment plans leads to worse outcomes for cardiac patients (Gehi, 2005). Adherence is defined as the extent to which a person's behaviors align with medical recommendations for treatment that are agreed upon by both physician and patient (Horowitz, 1993). Even outcomes of adherence to a placebo treatment 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). These 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).

Traditionally, medical professionals speak in terms of whether or not a patient is compliant with their prescribed treatment. Compliance to treatment generally has a negative connotation, as medical non-compliance is defined as the refusal to comply with treatment recommendations (Vermeire et al., 2001). This definition implies that patients are only in line with their medical treatment if they accept and agree to the terms their

physicians prescribe. Much of the research on compliance focuses on how often the patient obeys his or her physician, and ignores the role of decision-making on the part of the patient. More recently, adherence has become the preferred term because of its emphasis on the patient's involvement in his or her care (Vermeire et al., 2001). This term removes the paternal role of the physician and creates a sense of partnership between the doctor and patient. In order for this type of relationship to work, patients must be active participants in their health care and behave in a way that moves them toward their health goals.

Currently, adherence in the cardiac population is measured in a variety of ways. A higher number of cancelled or no-show appointments are indicative of non-adherence (Morisky, 2008). When in the healthy normal range (systolic pressure at or below 140 mm Hg and diastolic pressure at or below 90 mm Hg), blood pressure indicates that patients are compliant with their treatment (Morisky, 2008). Abnormal lipid levels, specifically cholesterol, are a risk factor for a myocardial infarction; therefore, when within normal limits, lipid levels can indicate adherence to medication (Yusuf et al., 2004). Cholesterol is commonly assessed with two values, low-density lipoprotein cholesterol (LDL) and high-density lipoprotein cholesterol (HDL). LDL cholesterol is known as the "bad" cholesterol, and contributes to plaque build-up in arteries. HDL is known as the "good" cholesterol and removes the LDL from the arteries, and protects the heart against heart attacks and stroke (AHA, 2014). Lastly, measuring medication-taking behaviors through self-report measures is used to determine a patient's adherence to treatment (Morisky, 2008). Self-report measures have been shown to provide the most accurate information when assessing medication adherence, above and beyond clinical interviews (Garber et

al., 2004). Adherence to diet and exercise is generally assessed by asking patients to recall their most recent behaviors and determining if they are in accordance with the American Heart Association's recommendations (Chiuve et al., 2011; Lichtenstein et al., 2006).

As previously mentioned, CAD is one of the leading causes of death, yet has nine identified modifiable risk factors (Roger et al., 2011). This indicates that many of the risk factors that contribute to CAD can be reduced through active patient participation in treatment. Not only would individual patient health improve with increased adherence, but overall health care cost and use of resources have the potential to be substantially reduced if fewer resources are utilized. However, adherence to treatment is often low in this population.

For cardiac patients, adherence to various aspects of treatments is typically very poor. 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). Adherence to dietary restrictions is also usually poor, 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). Lastly, the American Heart Association also reported that 64.5% of cardiac patients do not engage in any moderate or vigorous physical activity (Go et al., 2013).

Not adhering to medical treatments leads to poorer clinical outcomes, re-hospitalizations, and increased mortality overall (Baroletti, 2010). In a review of literature regarding non-adherence and non-compliance in heart failure patients, non-adherence to medication and diet was the most commonly cited cause of worsening heart

failure (van der Wal, 2005). In 21-64% of patients, non-adherence was the largest factor for worsening heart failure and hospitalizations. Research also indicates that patients who fill only some or none of their discharge prescriptions have 44-80% higher mortality rates at one-year follow-up (Jackevicius et al., 2008). Another study found that patients who were non-compliant with their medication regimens had higher readmission rates, more hospitalization days and lower ejection fractions at a six-year follow-up than those who were compliant (Miura et al., 2001).

### **Factors that Influence Adherence**

#### *Gender*

In general, women are more likely to utilize both preventative and treatment health care resources (Pinkhasov et al., 2010). However, research on gender and adherence in the cardiac population has produced variable results depending on the type of treatment being evaluated. In a study that assessed adherence to a sodium-restricted diet in heart failure patients, women were significantly more adherent to the recommendations, as evidenced by a urine sample (Chung et al., 2006). In this particular study, women were more knowledgeable of the effects of sodium, which may account for their increased adherence. In contrast, another study assessing patient adherence to antihypertensive medication at diagnosis and at a six month follow-up found that there were significantly more women in the low adherence group at baseline, and that women were less likely to be in the high adherence category following the study (Mazzaglia et al., 2009). Men are also far more likely to attend cardiac rehabilitation than women, as women only represent 20% of the rehabilitation population (Allen, 2004; Daly, 2002;

Grace, 2002). However, this finding is largely impacted by the fact that men are more likely to receive referrals to cardiac rehabilitation and are more likely to attend because they are typically younger and healthier at the time of onset (Grace, 2002; Roger, 2011). A recent study examining 500 physicians' knowledge and attitudes regarding gender and cardiovascular disease revealed that less than 20% of physicians were aware that more women die from CVD each year than men (Mosca et al., 2014). These physicians were then less likely to recommended appropriate treatments to women because of the perceived lower risk.

### *Age*

Most studies seem to indicate that older age may be associated with poorer adherence. Chapman et al. (2005) found that age is a significant predictor of medication adherence, with those ages 55-64 being the most adherent, followed by ages 65-74 (Chapman et al., 2005). In a study examining patient adherence to antihypertensive medication, older age was associated with a decreased likelihood of being a high adherer to medication six months following a cardiac diagnosis (Mazzaglia et al., 2009). For long-term adherence to secondary treatments, including aspirin, beta-blockers, and lipid-lowering agents, and a combination of these therapies, older age was consistently associated with an 8-23% decrease in adherence to recommended treatments (Newby et al., 2006). The American Heart Association found adherence to physical activity recommendations decreased with age from 55.8% in adults 18-44 years old to 27.4% for those over 75 years of age (Go et al., 2013). Furthermore, old age has also been identified as a barrier to participation in cardiac rehabilitation (Jackson et al., 2004).

The negative relationship between age and adherence may be due to several things. It is possible that those older in age may find it more difficult to implement the substantial lifestyle changes that are asked of heart patients, such as increasing exercise and changing their diet. Adherence in older age may also be affected by social support, as more assistance from family members or friends may be necessary to follow through with treatment recommendations such as diet change, medication reminders, or transportation to appointments. Given that age may affect adherence, it is an important variable to include in any study examining adherence to cardiac treatment.

### *Social Support*

In general, higher levels of social support facilitate healthy behaviors and increase adherence to medical treatment recommendations (Uchino, 2007). For the cardiac community, it has been found that higher levels of social support are associated with reduced mortality and there is increasing evidence that poor social support is a risk factor for CAD (Barth et al., 2010; Lett et. al, 2005; Uchino, 2007). One study examined the effects of social support on the self-care behaviors of patients and found that higher levels of social support were associated with increased self-care behaviors, including self-weighing, medication and diet adherence (Sayers et. al, 2008). It was also found that spouses were more involved in patient care and support than other loved ones or friends. In regard to cardiac rehabilitation, a review of studies determining predictors of rehabilitation participation found that better social support was not only a positive predictor of attendance, but also of long term behavioral change (Jackson et al., 2004). It may be important to evaluate patients' level of social support to know if they face any

barriers to treatment, as well as the extent to which they actively utilize the resources they have in others to help support positive behaviors.

### ***Knowledge***

Knowledge is referring to patient understanding of the risks, course, and treatment of cardiac disease. In a study assessing knowledge, researchers asked patients to complete questionnaires that evaluated their level of knowledge regarding risk factors and lifestyle changes (Alm-Roijer et al., 2004). Better knowledge about the disease was shown to improve patient adherence to lifestyle changes and medication regimens following a cardiac event (Alm-Roijer et al., 2004). A review of recent studies on patient compliance and adherence to medical treatment and lifestyle changes found that knowledge of condition was significantly correlated with adherence to self-care behaviors such as diet (van der Wal et al., 2005). Assessing patients' knowledge of their treatment may be a good indicator of their ability to understand and adhere to treatment recommendations, and thus should be incorporated into studies of adherence.

### ***Medication Complexity***

For chronic conditions such as cardiac disease, medication regimens can become cumbersome as the number of medications and dosages increase. Research indicates that greater medication complexity is associated with poorer adherence among cardiac patients. Iskedjian et al. (2002) conducted a meta-analysis of studies examining dose-frequency and adherence rates in hypertensive patients. It was found that medications that required multiple daily doses were associated with higher rates of non-adherence than

regimens requiring once or twice-daily doses. A study examining the validity of a medication adherence measure in over 1300 outpatients found that increased medication complexity was associated with a 45% reduction of being in the high-adherer group (Morisky et al., 2008). Therefore, it is important to include medication complexity in studies of adherence, as it may have critical implications for improving adherence among cardiac patients.

### *Stress*

Stress comes in various forms such as work, marital, and financial, and research has indicated that chronic stress can result in adverse cardiac events (Rozanski et al., 2005). Psychological stress in particular has been shown to have an adverse effect in patients with CAD (Krantz et al., 2000). Patients experiencing high levels of stress have an increased risk of a cardiac event, including myocardial infarctions and increased mortality (Krantz et al., 2000). While little literature is available on the effects of stress and adherence to treatment, there is evidence that increased stress reduces treatment adherence for cardiac patients. For example, patients who report high levels of stress are more likely to be non-adherent to their medication regimens (Morisky et al., 2008). Thus, it may be important to assess for stress level as a possible barrier to treatment adherence.

### *Coping*

A chronic illness such as cardiac disease presents psychological challenges to patients and may test how they handle and manage their stress and condition. How patients cope with stress may help to predict how adherent they are to their treatment

regimens. One way in which patients cope with stress is through the use of optimism (Shepperd et al., 1996). A study that examined optimism and health behavior change in cardiac rehabilitation patients found higher levels of optimism were associated with greater success in behavior changes and meeting goals such as weight loss, lower body fat and lower saturated fat levels (Shepperd et al., 1996). Holahan et al. (1997) developed a model that highlighted coping skills, particularly approach-style coping, as an important variable in patients' adjustment to their cardiac disease and their overall functioning over the next four years. Holahan et al.'s (1997) study showed that approach coping is negatively correlated with depressive symptoms. Furthermore, Holahan et al. (1997) found that depressive symptoms are associated with poorer outcomes and adherence, and increased mortality in cardiac patients. It has also been found that those who are in denial about their condition experience less hospitalization time initially, but are poorer adherers to exercise regimens and experience more hospitalizations during the following year than those who do not deny their condition (Taylor et al., 2007). Identifying patients with few or poor coping skills is important, as they may find adjusting to the lifestyle changes of managing heart disease difficult, therefore increasing their susceptibility to nonadherence.

### *Depression*

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 than non-depressed patients (DiMatteo, 2000). Depression is also 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 diagnosed with major 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). 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 with mild to moderate or major depression were less likely to adhere to lifestyle changes following myocardial infarction. Lane (2001) examined 263 patients following a myocardial infarction for predictors of rehabilitation attendance, including depression and anxiety. It was found that higher levels of depression significantly predicted non-attendance in cardiac rehabilitation. 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). These studies suggest more attention should be given to identifying and treating depression among cardiac patients as depression can have a negative effect on patient adherence.

### *Anxiety*

It is theorized that anxiety, along with depression, may affect adherence by impairing focus, energy, motivation, and willingness to engage in treatment (DiMatteo, 2000). Studies on anxiety and adherence to treatments for CAD in general suggest a link between the two, although the direction of the relationship remains unclear. 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 studies on the relationship between anxiety and adherence are limited, given that preliminary evidence suggests anxiety has an effect on treatment adherence, this relationship should be further studied.

### **Relationships among Predictors**

While each of these aforementioned predictors has an independent effect on adherence, research indicates that they also have relationships with each other. For instance, gender has been shown to be correlated with knowledge of the disease; in particular, women display less knowledge (Kayaniyil et al., 2009). Female gender is also associated with persistent depression and anxiety symptoms in cardiac patients (Doering et al., 2010). Social support may also have a complex relationship with other predictors of treatment adherence in the cardiac population. Uchino's (2006) model depicts social support having a bidirectional relationship with health behaviors and adherence, as well as psychological processes such as depression, anxiety, and appraisal. In this model, the psychological and behavioral aspects directly affect biological functioning, such as immune and cardiovascular processes (Uchino, 2006). Furthermore, stress has been found to be associated with negative coping style, low social support, younger age and female gender (Rozanski, 2005). One study found that type of stress and coping style had an effect on depressive symptoms (Rayburn et al., 2005). In that study, uncontrollable stressors of impoverished women predicted use of avoidant coping styles, which led to depressive symptoms (Rayburn et al., 2005). This type of effect of stress and coping on

psychosocial symptoms may also be present in the cardiac population. It is important to acknowledge the effect these variables may have on each other when understanding how they predict or effect overall treatment adherence.

### **Anxiety and CAD**

Anxiety disorders and symptoms are prevalent in the cardiac population. In a large study examining the prevalence of depressive and anxiety disorders in over 129,000 patients with cardiac disease age 45 and older, 16.6% had a lifetime diagnosis of anxiety disorders, compared to just 10% in those without cardiac disease, with the rate being almost twice as high for women (21.5%) as men (12.5%) (Fan et al., 2008). Coronary heart disease is also more prevalent among individuals who suffer from anxiety disorders. In a study assessing the prevalence of coronary heart disease in those with anxiety disorders, there was a three-fold increase of coronary heart disease in patients with a current anxiety diagnosis compared to those without an anxiety diagnosis (Vogelzangs et al., 2010). While the association between cardiac disease and anxiety has been demonstrated, studies of the mechanisms of the relationship have not provided consistent results.

While the exact nature of the mechanisms underlying the relationship between cardiac disease and anxiety remains unclear, and while the literature is sparse, there is evidence to suggest a relationship between anxiety and clinical behaviors, such as maintaining a healthy diet, cigarette smoking, and physical inactivity in the cardiac population. For example, in past literature, anxiety has been linked to decreased physical activity and increased exercise intolerance due to uncomfortable symptoms (Taylor et al.,

1987). However, it was found that although patients with panic symptoms have a generally higher heart rate, they were able to tolerate the same amount of exercise as controls (Taylor et al., 1987). These findings suggest that exercise intolerance reported by patients may be more psychological than physical in nature. A more recent study by Bonnet et al. (2005) found anxiety to be significantly correlated with physical inactivity in both men and women, and with unhealthy smoking and dietary behaviors in men. In addition, a global unhealthy behavior score was created combining poor diet, smoking, and physical inactivity and it was found that as anxiety increased, unhealthy behaviors significantly increased (Bonnet et al., 2005).

Research has produced conflicting results regarding anxiety's effect on cardiac patient outcomes. For instance, one study examining adverse clinical outcomes in over 500 patients following hospital admission for a cardiac event assessed acute anxiety symptoms at baseline, one-year, and five-year follow-up (Kornerup, 2010). No association between anxiety and adverse outcomes was observed, including myocardial infarction, mortality, or stroke, when other factors such as physical activity, family history, medications, and smoking and alcohol behaviors, were accounted for. However, another longitudinal study that examined persistent, rather than incidental, comorbid anxiety and depressive symptoms in cardiac patients found that persistent symptoms significantly predicted mortality at 12-month follow-up (Doering et al., 2010). A meta-analysis conducted on anxiety measurement in cardiac patients identified four studies that found anxiety to be a predictor of negative outcomes, while three studies found no association between anxiety and negative outcomes (Moser, 2007). Of note is the difference in anxiety measurements, such as assessing general versus specific anxiety,

which is common in the literature and may account for much of the variability found in current literature on anxiety's relationship with heart disease.

Anxiety is measured in various ways, depending on the aims of study. In general, it appears that anxiety is assessed using self-report measures such as the Brief Symptom Inventory (Doering et al., 2010), Hospital Anxiety and Depression Scale (Kornerup, 2011), and General Anxiety Disorder 7 (Spitzer et al., 2006), which each measure general anxiety symptoms. Other studies have used criteria such as current or past anxiety disorder diagnosis (e.g., panic disorder or specific phobias) as an indicator of the presence of anxiety (Januzzi et al., 2000). Anxiety may be measured as acute or chronic, which may have different effects on experience and outcome. To the author's knowledge, there are no known studies that examine the difference between the effects of acute or chronic anxiety on cardiac outcomes. It is possible that those who experience acute anxiety in response to their cardiac event that then reduces over time may have better outcomes than those who experience a more chronic, general anxiety. Consistent with this hypothesis, a study measuring chronic anxiety, or anxiety experienced persistently over time, found anxiety to increase the risk of death in patients with heart disease (Doering et al., 2010).

According to past research, cardiac symptoms and anxiety in cardiac patients have been mistaken for panic disorder (Jeejeebhoy et al., 2000). Panic-like anxiety has been shown to be an independent risk factor for cardiovascular death (Fleet, 1998). Therefore, it is important to understand how panic disorder is presenting in this population and how it can be treated early on, since untreated panic disorder can increase the risk of morbidity and mortality (Jeejeebhoy et al., 2000). Patients without CAD have presented with and

reported experiencing cardiac symptoms, but show no evidence of the disease.

Jeejeebhoy et al. (2000) highlights that, of the 13 symptoms of a panic attack in the Diagnostic and Statistical Manual of Disorders, 4<sup>th</sup> Edition, only four are necessary for a diagnosis. (There are no significant changes to these criteria in the DSM-V.) There are four cardiovascular symptoms listed, which means that an individual could be diagnosed with panic disorder purely based on cardiac symptoms. However, the fear of and/or attention to cardiac symptoms may not actually be related to panic disorder; it may be better accounted for by what is known as heart-focused (or cardiac) 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 assess anxiety, but do not help to determine the source of that anxiety, perhaps because they are too general in scope. 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, individuals with a family or personal history of CAD, and those with little risk who are still overly concerned about the well-being of their heart (Eifert, Zvolensky et al., 1999b). In an analysis by Zvolensky et al. (2008), 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, such as 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 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 because the symptoms are similar (Fisher, 2011). Patients with panic disorder and coronary artery disease who report symptoms related to panic disorder report more distress (Fleet, 1996). This distress leads them to utilize medical services for symptoms they perceive to be related to their medical condition, when in fact they are not (Fleet, 1996). As they are listed in the DSM-IV, some of the possible cardiovascular symptoms (i.e., pounding or accelerated heart rate, chest pain or discomfort) and psychological symptoms (i.e., fear of losing control or going crazy, fear of dying) could possibly be a byproduct of chronic heart-focused anxiety, and specifically increased attention to heart sensations and fear. It is possible that these patients are experiencing panic related anxiety symptoms that are specific to their heart and would be better served by an earlier diagnosis of heart-focused anxiety.

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, cardiac distress, and panic explain 62% of the variance in avoiding physical activity and work, and 57% of the variance in emergency

department utilization (Aikens, 1999). Aikens' (1999) 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 positive health behaviors, such as exercise, because of fear of a cardiac event. The Cardiac Anxiety Questionnaire may be a useful tool for tailoring clinical assessment in high-volume settings (Zvolensky, 2008). If individuals high in cardiac anxiety can be identified and treated, it could lead to an increase of healthy behaviors and a reduction of unnecessary medical resource utilization. In fact, more recent research suggests that an earlier diagnosis of heart-focused anxiety may be beneficial to cardiac patients through a decrease in functional impairment and an increase in quality of life (Zvolensky, 2008).

Heart-focused anxiety has similarities with depression and anxiety, which are highly correlated with CAD (Gehi, 2005; McCann et al., 2005). Similar to general anxiety, predictors of heart-focused anxiety include social 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 between Cardiac Anxiety Questionnaire scores and age, as well as relationship status (Fischer, 2011). The study also found that those in a relationship generally displayed less heart-focused anxiety. The association between heart-focused anxiety and relationship status is thought to be accounted for by an increase in emotional support for those with close relationships. Also, those with a higher education report lower cardiac anxiety scores, possibly due to stronger cognitive skills and/or more knowledge to make better healthcare decisions (Fischer, 2011).

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 anxiety and heart-focused anxiety are predicted by similar factors, they may also have similar effects 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. Since patients with CAD and depression and anxiety have poorer treatment adherence (Bonnet et al., 2005; Gehi, 2005; Lane, 2001), it is possible that those with heart-focused anxiety will have similar, or perhaps even worse, outcomes given the specificity of heart-focused anxiety.

### **Preliminary Research**

The author conducted a preliminary study that examined whether heart-focused anxiety and its subscales were significant predictors of cardiac rehabilitation attendance (a proxy for adherence), above and beyond known predictors, especially general anxiety. While the results were not significant, the interpretation of effect sizes revealed that patients with higher general anxiety and higher levels of fear and avoidance may be more likely to attend cardiac rehabilitation, while those with higher levels of general heart-focused anxiety and attention may be less likely to attend cardiac rehabilitation. Most notably, the subscales of heart-focused anxiety each had larger effects on attendance than general anxiety did, indicating a possible stronger relationship between recommended treatment adherence and heart-focused anxiety than with general anxiety. That study had

several limitations, including small sample size, limited assessment of predictors of adherence, and highly restricted measurement of adherence. Those limitations will be addressed in the current study to better understand the relationship among the aforementioned variables, specifically the role of different forms of anxiety, with adherence in the cardiac population. Unlike in the previous study, the current study will examine factors that lead to adherence to cardiac treatments in general, not just adherence to cardiac rehabilitation attendance. A greater number of theoretically known predictors of treatment adherence will be included in the present study to control for their effect on treatment adherence. In addition, the current study will involve a larger sample size to increase statistical power.

### **The Current Study**

Coronary artery disease is the leading cause of death in North America. 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 (McCann et al., 2005; Roest, 2010; World Health Organization, 2004). However, there are few studies on the relationship between anxiety and adherence to 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.

The overarching aim of the current study is to test predictors of treatment adherence, including heart-focused anxiety, in a sample of patients who have a history of

CAD. More specifically, the goals of the current study are to (1) identify whether heart-focused anxiety is a significant predictor of adherence, as measured by blood pressure levels and adherence to medication, dietary restrictions, and exercise recommendations; (2) determine if heart-focused anxiety is a better predictor of adherence than general anxiety; and (3) determine if heart-focused anxiety is a better predictor of treatment adherence above and beyond previously reported identified predictors of adherence (i.e., gender, age, knowledge, stress, social support, depression, and coping style). We hypothesize that higher levels of heart-focused anxiety will be a significant predictor of treatment adherence. Specifically, it is hypothesized that higher levels of heart-focused anxiety will negatively impact adherence to exercise recommendations due to fear of inducing a heart-related event. However, it is hypothesized that higher levels of heart-focused anxiety may actually improve adherence to diet and medication regimens due to the desire to avoid negative health consequences. We also hypothesize that heart-focused anxiety will be a better predictor of adherence to treatment than general anxiety. Lastly, we hypothesize that heart-focused anxiety will be a better predictor than other known predictors of treatment adherence.

If it is found that heart-focused anxiety is a significant predictor of treatment adherence, then it may be warranted to utilize measures of heart-focused anxiety in clinical settings instead of measures of general anxiety. Moreover, assessing for heart-focused anxiety may better capture the experience of anxiety for the cardiac population, given that the current literature is variable in describing how anxiety presents for cardiac patients. Specific interventions could target individuals who report higher levels of cardiac anxiety to help reduce that anxiety, which could lead to improved adherence.

## CHAPTER TWO

### METHOD

#### Participants

This study included participants ages 29-96 ( $M = 69.24$ ,  $SD = 14.18$ ; 56.9% female) who were recruited from the Loma Linda University Medical center, had a diagnosis of cardiac disease, and received or were offered treatment during 2013 for their heart condition. Participant demographic data are presented in Table 1. Participants were excluded if they had a cognitive disorder, such as any neurocognitive disorder, determined by medical chart review, or if they were unable to read and write in English. Eight hundred eighty-nine possible participants were contacted, 222 people agreed to participate, and 65 actually participated.

Table 1. *Demographic Characteristics of Sample*

	<i>Patients (n = 65)</i>	
	<i>M</i>	<i>SD</i>
Age (years)	68.84	14.18
	<i>N</i>	<i>%</i>
Gender		
Male	28	43.1
Female	37	56.9
Ethnicity		
Caucasian	51	78.5
Hispanic	8	12.3
African-American	5	7.7
Other	1	1.5

## **Materials**

### ***Demographics***

Potential demographic predictors included gender, age, ethnicity, education, and current height and weight. Education was determined by number of years of education. All demographic data were self-reported.

### ***Anxiety***

Anxiety was measured using the Generalized Anxiety Disorder 7 (GAD-7) questionnaire (see Appendix A), 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.” A score of 1-5 indicates mild anxiety, 6-10 indicates moderate anxiety, and 11-15 indicates severe anxiety. The GAD-7 is reliable ( $\alpha = .92$ ), with adequate specificity (82%) and sensitivity (89%; Spitzer et al., 2006). Reliability for the present study is  $\alpha = .92$ .

The State-Trait Anxiety Inventory – Trait version (STAI-Trait; Spielberg, 1970) was used to measure trait anxiety, which is defined as a general propensity to experience anxiety. It includes 20 items that participants respond to on a Likert scale ranging from 1 (“Almost Never”) to 4 (“Almost Always”). Some items include “I am a steady person,” “I feel nervous and restless,” and “I worry too much over something that doesn’t really matter” (see Appendix B). Higher scores indicate higher levels of trait anxiety. The Trait

Anxiety scale is widely used and has a high reliability of  $\alpha = .92$  (Ramanaiah, 1983). Reliability for the present study is  $\alpha = .93$ .

### ***Panic Disorder***

Panic disorder was assessed using the Panic Disorder Severity Scale-Self Report (PDSS-SR; Houck et al., 2002; see Appendix C). This seven-item measure has been adapted from the Panic Disorder Severity Scale, which was a clinical interview to assess for panic disorder severity and has been used in clinical and research settings. Items ask respondents about the frequency, duration, intensity of panic attacks, as well as other features relevant to the disorder. Clinical scores in non-agoraphobic patients included: 0-1 = "normal," 2-5 = "borderline," 6-9 = "slightly ill," 10-13 = "moderately ill," and 14 and above = "markedly ill" (Furukawa et al., 2009). The PDSS-SR has demonstrated high reliability ( $\alpha = .917$ ) as compared to the original clinical interview, which also demonstrated high reliability ( $\alpha = .923$ ) (Houck et al., 2002). Reliability for the present study is  $\alpha = .93$ .

### ***Heart-focused Anxiety***

Heart-focused Anxiety was measured using the Cardiac Anxiety Questionnaire (CAQ). The CAQ (see Appendix D) 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 responded to each item on a Likert scale of 0 ("Never") to 4 ("Always") regarding items such as "I avoid exercise or other physical work." Higher scores indicate

higher levels of HFA. The entire CAQ has good 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 ( $r = 0.69$ ; Eifert et al., 1999a). Reliability for the present study is  $\alpha = .89$ .

### ***Depression***

Depression was measured using the Center for Epidemiologic Studies-Depression (CES-D) scale (Radloff, 1977; see Appendix E). This scale is a 20-item self-report measure designed to assess depression severity in the general population and has also been used in clinical populations. Participants responded to items such as “I was bothered by things that don’t usually bother me” and “I felt fearful,” regarding the past week. Responses range from “Rarely or none of the time (less than 1 day)” to “Most or all of the time (5-7 days).” A cut-off score of 16 indicates significant symptomatology. Previous research has demonstrated high internal consistency ( $\alpha = 0.87$ ; Pennix et al., 2001), as well as high specificity (88%) and sensitivity (100%; Beekman et al., 1997). Reliability for the present study is  $\alpha = .94$ .

### ***Knowledge***

Knowledge was measured using the Coronary Artery Disease Education Questionnaire (CADE-Q; de Milo Ghisi et al., 2013; see Appendix F). This 19-item measure assesses patient knowledge in four domains: pathophysiology, risk factors, diagnosis and treatment, and exercise. Items ask questions about CAD and

recommendations and offer four responses, each demonstrating a different level of knowledge. For example, one item asks “Which of the following dietary components best describes a nutritional plan for persons with CAD?” Possible responses to this item include: “(a) A diet with reduced salt, low fat and rich in fiber,” “(b) A diet based on whole grains, vegetables, fish, extra virgin olive oil and nuts,” “(c) An unrestricted diet, because diet is not a relevant factor,” and “(d) I don’t know”. Higher scores indicate higher levels of knowledge. The measure has a good internal consistency ( $\alpha = 0.81$ ; de Milo Ghisi et al., 2013). Reliability for the present study is  $\alpha = .78$ .

### *Stress*

Psychosocial stress was measured using the Perceived Stress Scale (PSS; see Appendix G), which measures patients’ perceived levels of stress (Cohen et al., 1983). This ten-item scale measures how stressful one perceives his or her life to be, and is highly correlated with stressful life events, depression, physical symptoms, anxiety, and use of primary care services (Cohen et al., 1983). Participants responded to items such as “In the past month, how often have you found that you could not cope with all the things you had to do?” Responses range from 0 (“Never”) to 4 (“Very often”). A score of 0-13 indicates low stress, 14-26 indicates moderate stress, and 27-40 indicates high perceived stress. This measure has demonstrated acceptable internal consistency ( $\alpha = 0.78$ ; Cohen & Williamson, 1988). Reliability for the present study is  $\alpha = .78$ .

### *Social Support*

Perceived support was measured using the Multidimensional Scale of Perceived

Social Support (Zimet et al., 1998; Appendix H). The subscales assess levels of support from friends, family, and significant others. Participants responded to 12 items such as “I can talk about my problems with my friends” and “I have a special person who is a real source of comfort to me.” Responses range on a seven-point scale from “Very strongly disagree” (1) to “Very strongly agree” (7). Higher scores indicate higher levels of perceived social support. The scale reliability ranges from  $\alpha = 0.84$  to  $\alpha = 0.92$  for differing participant groups, such as high school students, pregnant women receiving care, and medical residents (Zimet et al., 1990). Reliability for the present study is  $\alpha = .93$ .

### *Coping*

Coping was measured using the Brief COPE (Carver, 1997; see Appendix I). This 28-item measure includes 14 scales assessing coping styles, including Active Coping, Planning, Positive Reframing, Acceptance, Humor, Religion, Using Emotional Support, Using Instrumental Support, Self-Distraction, Denial, Venting, Substance Use, Behavioral Disengagement, and Self-Blame (Carver, 1997). Items such as “I have been taking action to make the situation better” are responded to on a scale of 0 (“I haven’t been doing this at all”) to 3 (“I’ve been doing this a lot”). Examined separately, each scale has demonstrated adequate internal reliability of  $\alpha$ s = 0.64 to 0.90, except Venting ( $\alpha = 0.50$ ), Denial ( $\alpha = 0.54$ ), and Acceptance ( $\alpha = 0.57$ ).

To reduce the number of variables used in this study, the 14 subscales were combined into two separate overarching subscales: Negative Coping and Positive Coping. Carver (1997) noted that the subscales can be used in various ways, and

identified that the BRIEF COPE represents general adaptive and problematic coping styles. Thus, we combined the subscales to represent both Positive Coping, which included Active Coping, Planning, Positive Reframing, Acceptance, Humor, Religion, Using Emotional Support, Using Instrumental Support; and Negative Coping, which included Self-Distraction, Denial, Venting, Substance Use, Behavioral Disengagement, and Self-Blame. Higher scores indicate more usage of a particular coping style. Reliability for the present study for Positive Coping is  $\alpha = .84$  and for Negative Coping is  $\alpha = .64$ .

### *Medication Complexity*

Medication complexity measurement was modeled after a two-item index that asks participants how many medications they take daily for their cardiac condition, and how many times a day they should be taken (Morisky, 2008). In this study, participants were asked to list all of their current medications, what they believe each one is for, and how often each day they are prescribed to take each one. Complexity was measured by taking a total sum of the number of medications taken daily. Since each medication has different dosage schedules, the sum of total daily medications represents the minimum complexity of medication burden (see Appendix J).

### *Adherence*

Medication adherence was measured using the Medication Adherence Measure (Morisky, 2008; Appendix K). This eight-item self-report scale measures a participant's adherence to his or her hypertension medication. Participants respond "yes or no" to

items such as “Do you sometimes forget to take your high blood pressure medication?” or “When you travel or leave home, do you sometimes forget to bring along your medications?” This scale has been shown to be reliable ( $\alpha = 0.83$ ) and valid in a clinical cardiac outpatient population (Morisky, 2008). Sensitivity (93%) was adequate; however, specificity (53%) was not. Reliability for the present study is  $\alpha = .67$ .

Most recent blood pressure readings, LDL, and HDL were obtained from either patient medical records or self-reported from the patient only if the information was not available in medical records. Their values were identified as non-adherent if found to be outside of the healthy normal limits (0 = within normal range, 1 = high or uncontrolled). Blood pressure is considered not controlled if systolic pressure is at or above 140 mm Hg and/or diastolic pressure is at or above 90 mm Hg. LDL is considered normal if less than 100 mg/dL and high if above 100 mg/dL. HDL is considered normal if over 60 mg/dL and unhealthy if under 60 mg/dL (0 = normal, 1 = low or unhealthy).

Adherence to dietary and exercise recommendations was assessed using a ten-item scale created by the author for this study using the American Heart Association’s recommended lifestyle changes for those with cardiovascular disease (Lichtenstein et al., 2006). These items ask about the frequency and type of exercise engaged in each week, as well as adherence to dietary suggestions (see Appendix L). To represent adherence to diet and exercise recommendations, items were coded as followed (1) or not followed (0) and summed so a higher score represents a higher level of adherence.

## **Procedure**

Patients who had previously received treatment for a cardiac diagnosis at the

Loma Linda University Medical Center were recruited to participate. The cardiac rehabilitation staff provided contact information for the patients. Patients were contacted via phone and asked to participate in the study by completing a psychosocial questionnaire by mail or online. The mailed questionnaire included an explanatory letter and consent forms, for both participation and consent for research personnel to access medical records, to be signed and returned with the completed questionnaire. Participants were provided a self-addressed stamped envelope to return the questionnaire, and the opportunity to be included in a raffle drawing for one of three \$50 Amazon gift cards as incentive for participating in the study. To increase questionnaire return rate, up to three follow-up phone calls were conducted as a reminder starting two weeks after the questionnaire was mailed. Additional survey packages were mailed upon request.

Any participants who opted to complete the questionnaire online were sent an email with a confidential link to the survey, available through Qualtrics. The consent forms were presented first; participants continued to the questionnaire only if they provide informed consent. Participants were contacted by phone and/or email two weeks after the initial email was sent if they had not completed the questionnaire. Those who completed the survey online or by mail were automatically be entered in a drawing for the gift card upon completion of the questionnaire. The drawing will take place after collection of the questionnaires is complete (data collection is ongoing to obtain a larger sample size).

The questionnaire included a demographic survey and all of the measures listed above. Following the receipt of completed surveys, patient medical records were

reviewed for recent blood pressure, LDL, and HDL readings. Patients were contacted via phone to obtain any missing questionnaire data, such as blank or skipped items.

## CHAPTER THREE

### RESULTS

Hypotheses were tested in five separate regression models predicting five different measures of treatment adherence: lifestyle adherence, medication adherence, LDL, HDL, and blood pressure. Hierarchical multiple linear regression models were used to test hypotheses for lifestyle and medication adherence. Hierarchical binomial logistic regression models were used to test hypotheses for LDL, HDL, and blood pressure adherence.

Due to the large number of potential covariates and independent variables in this study, bivariate correlations among all variables and outcome measures, using a cutoff score of  $r = .3$ , in combination with theory, research, logic and power analyses were used to determine which predictors to include. All variables that were significantly correlated, or non-significantly correlated at  $r \geq .3$ , with each outcome measure were included in the respective models. General anxiety and CAQ Fear, Avoidance, and Attention subscales were included in all models regardless of correlation because they were the primary variables of interest for this study. Assumptions of both multiple linear regression and hierarchical binomial logistic regression were tested prior to analysis and are explained below for each model separately. Descriptive statistics and correlations among the variables of interest are presented in Tables 2 and 3, respectively.

Table 2. Means and Standard Deviations of Predictor Variables

	<i>M</i>	<i>SD</i>
General Anxiety (GAD7)	3.83	4.45
STAI-Trait	36.94	11.46
Panic	0.34	0.59
Total Cardiac Anxiety (CAQ)	1.48	0.74
Fear	1.45	0.75
Avoidance	1.76	1.11
Attention	1.23	0.88
Depression (PHQ9)	12.12	12.61
Knowledge	35.26	10.14
Stress	10.85	6.09
Social Support	65.74	15.83
Positive Coping	38.66	11.74
Negative Coping	18.73	5.34
Total Meds	9.21	5.15

Table 3. *Correlations among Predictor Variables*

	GAD7	STAI-Trait	Panic	CAQ	Fear	Avoidance	Attention	PHQ9	Knowledge
GAD7	1								
STAI-Trait	.763**	1							
Panic	.481**	.57**	1						
CAQ	.541**	.41**	.522**	1					
Fear	.511**	.43**	.527**	.887**	1				
Avoidance	.328**	.178	.236	.77**	.47**	1			
Attention	.52**	.42**	.558**	.826**	.711**	.412**	1		
PHQ9	.715**	.823**	.722**	.526**	.554**	.299*	.559**	1	
Knowledge	-.046	-.096	.084	.109	.127	.116	.004	.003	1
Stress	.705**	.771**	.645**	.448**	.505**	.196	.413**	.793**	.03
Social Support	-.309**	-.541**	-.426**	-.155	-.152	-.063	-.176	-.512**	.008
Positive Coping	.72	-.115	.208	.233	.202	.124	.274*	.041	.199
Negative Coping	.496**	.516**	.53**	.428**	.412**	.238	.431**	.534**	.052
Total Meds	.106	-.057	.008	.316*	.118	.415**	.256*	-.02	-.006

\* $p < .05$ . \*\* $p < .001$ .

Table 3. *Correlations among Predictor Variables (continued)*

	Stress	Social Support	Positive Coping	Negative Coping	Total Meds
GAD7					
STAI-Trait					
Panic					
CAQ					
Fear					
Avoidance					
Attention					
PHQ9					
Knowledge					
Stress	1				
Social Support	-.446**	1			
Positive Coping	.07	.133	1		
Negative Coping	.573**	-.173	.329**	1	
Total Meds	-.084	.027	.224	.014	1

\* $p < .05$ . \*\* $p < .001$ .

### **Model 1: Lifestyle Adherence**

A hierarchical multiple linear regression analysis was conducted to test medication complexity, knowledge, positive coping, general anxiety, fear, avoidance, and attention as predictors of lifestyle adherence, which was measured by the ten-item scale created for this study (See Appendix L). Total medications, knowledge (CADE-Q), and positive coping (BRIEF COPE subscale score) were added in the first step of the analysis; general anxiety (GAD-7 score) in the second; and CAQ fear, avoidance, and attention in the final step, as the variables of primary interest. Fifty-nine participants provided data on the variables used in this analysis. Prior to analysis, we tested for outliers, multicollinearity, and the assumptions of linear regression. There were no problems with outliers or multicollinearity, and only the assumption of homoscedasticity was violated. We corrected for this violation by applying a square-root transformation to our outcome variable, lifestyle adherence, and re-running the regression model predicting this transformed variable. Using the methods outlined in Cohen, Cohen, Aiken, and West (2003), we determined that we had 99% power to detect a significant effect of  $R^2 = .327$  at  $\alpha = .05$  and with seven predictors. Power analyses for individual predictors indicated that we had 99% power to detect both moderate and large effect sizes of .25 and .64, respectively, and greater than 40% power to detect a small effect size of at least .04 (Cohen et al., 2003; Ferguson, 2009). The results of the final regression model are shown in Table 4.

Table 4. Results of Hierarchical Linear Regression Analyses Predicting Lifestyle Recommendation Adherence

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>sr</i> <sup>2</sup>	95% CI	
						<i>Lower</i>	<i>Upper</i>
Total Medications	.015	.011	1.44	.156	.027	-.006	.037
Knowledge	.011	.005	2.241	.029	.066	.001	.022
Positive Coping	.011	.004	2.628	.011	.091	.003	.02
General Anxiety	-.001	.013	-.085	.932	.0001	-.027	.025
Fear	-.053	.1	-.534	.595	.004	-.254	.147
Avoidance	.004	.05	.076	.94	.00008	-.097	.105
Attention	.087	.086	1.011	.317	.013	-.086	.261

The overall model fit was  $R^2_{adj} = .235$ ,  $F(7,51) = 3.54$ ,  $p < .05$ , indicating that the optimal linear combination of all predictors accounted for 23.5% of the variance in lifestyle adherence. Knowledge score significantly and independently predicted lifestyle adherence, such that as knowledge score increased by one point, lifestyle adherence increased by .011 units, 95% CI[.001, .022],  $p < .05$ ,  $sr^2 = .066$ . Positive coping also significantly predicted lifestyle adherence, such that as positive coping increased by one point, lifestyle adherence increased by .011 units, 95% CI[.003, .02],  $p < .05$ ,  $sr^2 = .091$ . Total medications (95% CI[-.006, .037],  $p > .1$ ,  $sr^2 = .027$ ), general anxiety (95% CI[-.027, .025],  $p > .9$ ,  $sr^2 = .0001$ ), CAQ fear (95% CI[-.254, .147],  $p > .5$ ,  $sr^2 = .004$ ), CAQ avoidance (95% CI[-.097, .105],  $p > .9$ ,  $sr^2 = .00008$ ) and CAQ attention (95% CI[-.086, .261],  $p > .3$ ,  $sr^2 = .013$ ) did not significantly predict lifestyle adherence.

## **Model 2: Medication Adherence**

A hierarchical multiple linear regression analysis was conducted to test panic, depression, negative coping, general anxiety, fear, avoidance, and attention as predictors of medication adherence, as measured by the Medication Adherence Measure (Morisky, 2008). Panic (PDSS-R score), depression (CESD score), and negative coping (BRIEF COPE subscale score) were added in the first step of the analysis; general anxiety (GAD-7 score) in the second; and CAQ fear, avoidance, and attention in the final step, as the variables of primary interest. Sixty participants provided data on the variables used in this analysis. Prior to analysis, we tested for outliers, multicollinearity, and the assumptions of linear regression. There were no problems multicollinearity. However, there were four potential outliers and the assumptions of normality and homoscedasticity were violated. The outliers were kept in the analyses due to small sample size. Attempts to transform the model using square root, log, and inverse transformations of the medication adherence variable were unsuccessful in correcting violations of assumptions, so the original model with the untransformed outcome variable was used. Using the methods outlined in Cohen, Cohen, Aiken, and West (2003), we determined that we had 87% power to detect a significant effect of  $R^2 = .136$  at  $\alpha = .05$  and with seven predictors. Power analyses for individual predictors indicated that we had > 95% and 99% power to detect moderate and large effect sizes of .25 and .64, respectively, and approximately 40% power to detect a small effect size of at least .04 (Cohen et al., 2003; Ferguson, 2009). The results of the final regression model are shown in Table 5.

Table 5. Results of Hierarchical Linear Regression Analyses Predicting Medication Adherence

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>sr</i> <sup>2</sup>	95% CI	
						<i>Lower</i>	<i>Upper</i>
Panic	-.077	.462	-.167	.868	.0004	-1.003	.849
Depression	-.024	.026	-.923	.36	.014	-.075	.028
Negative Coping	-.061	.043	-1.404	.166	.033	-.148	.026
General Anxiety	.079	.06	1.314	.195	.029	-.042	.2
Fear	-.207	.389	-.532	.597	.005	-.987	.574
Avoidance	.041	.196	.207	.837	.0007	-.352	.433
Attention	-.031	.341	-.09	.929	.0001	-.716	.654

The overall model fit was  $R^2_{adj} = .02$ ,  $F(7,52) = 1.168$ ,  $p > .05$ , indicating that the optimal linear combination of all the predictors only accounted for 2% of the variance in medication adherence. Panic (95% CI[-1.003, .849],  $p > .8$ ,  $sr^2 = .0004$ ), depression (95% CI[.075, .028],  $p > .3$ ,  $sr^2 = .014$ ), negative coping (95% CI[-.148, .026],  $p > .1$ ,  $sr^2 = .033$ ), general anxiety (95% CI[-.042, .2],  $p > .1$ ,  $sr^2 = .029$ ), CAQ fear (95% CI[-.987, .574],  $p > .5$ ,  $sr^2 = .005$ ), CAQ avoidance (95% CI[-.352, .433],  $p > .8$ ,  $sr^2 = .0007$ ) and CAQ attention (95% CI[-.716, .654],  $p > .9$ ,  $sr^2 = .0001$ ) did not significantly predict lifestyle adherence.

### Model 3: LDL Adherence

A hierarchical binomial logistic regression analysis was conducted to test gender,

positive coping, general anxiety, CAQ fear, CAQ avoidance, and CAQ attention as predictors of LDL adherence (0 = normal, 1 = high). Forty participants provided data on the variables used in this analysis. Gender and positive coping were added in the first step of the analysis; general anxiety (GAD-7 score) in the second; and CAQ fear, avoidance, and attention in the final step, as the variables of primary interest. Prior to analysis, we tested for outliers, multicollinearity, and the assumptions of logistic regression. No violations of multicollinearity or the assumptions of logistic regression were detected. Two potential outliers were identified, but we decided to keep the participants in the data analysis due to the small sample size. Using G\*Power 3.1 (Faul et al., 2009), power was excellent at 0.96. The results of the analysis are shown in Table 6.

Table 6. *Results of Hierarchal Logistic Regression Analyses Predicting LDL Cholesterol Non-Adherence*

Predictor	<i>b</i>	<i>SE</i>	<i>OR</i>	<i>p</i>	95% CI	
					<i>Lower</i>	<i>Upper</i>
Gender	1.799	.83	1.188	.03	1.188	30.725
Positive Coping	.101	.044	1.106	.022	1.014	1.206
General Anxiety	.123	.115	1.13	.287	.902	1.417
Fear	1.305	1.114	3.686	.242	.415	32.734
Avoidance	.06	.429	1.061	.89	.458	2.458
Attention	-1.601	.962	.202	.096	.031	1.328

*Note.* The reference group for this model is patients with low (healthy) LDL.

A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between those with normal and high LDL,  $\chi^2(6) = 14.43, p < .05$ . In the final model, odds ratios indicated that there was a 504% increase in the odds of having high or unhealthy LDL if the participant was male ( $OR = 6.042, 95\% CI[1.188, 30.725], p < .05$ ), and an 10.6% increase in the odds of having high LDL with every one-point increase in positive coping ( $OR = 1.106, 95\% CI[1.014, 1.206], p < .05$ ). The following relationships were not statistically significant, but the effect sizes (ORs) were large enough to warrant interpretation. There was a 13% increase in the odds of having high LDL with every one-point increase in general anxiety ( $OR = 1.13, 95\% CI[.902, 1.417], p > .2$ ). The odds of having high LDL increased by 26% with every one-point increase on the Fear subscale of the CAQ ( $OR = 3.686, 95\% CI[.415, 32.734], p > .2$ ). The odds of having high LDL increased by 6% with every one-point increase on the Avoidance subscale of the CAQ ( $OR = .1061, 95\% CI[.458, 2.458], p > .8$ ). Lastly, the odds of having high LDL decreased by 79% with every one-point increase on the Attention subscale of the CAQ ( $OR = .202, 95\% CI[.031, 1.328], p > .09$ ).

#### **Model 4: HDL Adherence**

A hierarchical binomial logistic regression analysis was conducted to test negative coping, general anxiety, CAQ fear, CAQ avoidance, and CAQ attention as predictors of HDL adherence (0 = normal, 1 = low). Thirty-eight participants provided data on the variables used in this analysis. Negative coping was added in the first step of the analysis; general anxiety (GAD-7 score) in the second; and CAQ fear, avoidance, and attention in the final step, as the variables of primary interest. Prior to analysis, we tested for outliers,

multicollinearity, and the assumptions of logistic regression. No violations of multicollinearity or the assumptions of logistic regression were detected. One extreme outlier was identified and removed from the analysis. Using G\*Power 3.1 (Faul et al., 2009), power was excellent at 0.99. Results of the analysis are shown in Table 7.

Table 7. Results of Hierarchical Logistic Regression Analyses Predicting HDL Cholesterol Non-Adherence

Predictor	<i>b</i>	<i>SE</i>	<i>OR</i>	<i>p</i>	95% CI	
					<i>Lower</i>	<i>Upper</i>
Negative Coping	-.059	.099	.943	.55	.777	1.144
General Anxiety	-.065	.148	.937	.659	.701	.1252
Fear	.852	1.223	2.344	.486	.213	25.733
Avoidance	.631	.528	1.879	.232	.668	5.289
Attention	.009	1.025	1.009	.993	.135	7.527

Note. The reference group for this model is patients with high (healthy) HDL.

A test of the full model against a constant only model was not statistically significant, indicating that the predictors as a set did not reliably distinguish between those with normal and low HDL,  $\chi^2(5) = 4.38, p > .05$ . The Attention subscale of the CAQ was not a statistically or clinically significant predictor of HDL ( $OR = 1.009, 95\% CI[.135, 7.527], p > .9$ ). None of the other predictors was statistically significant, but their effect sizes (ORs) were large enough to warrant interpretation. In the final model, odds ratios suggested that there was a 5.7% decrease in the odds of having low HDL with every one-point increase in negative coping ( $OR = .943, 95\% CI[.777, 1.144], p > .5$ ).

There was a 6.3% decrease in the odds of having low HDL with every one-point increase in general anxiety ( $OR = .937$ , 95% CI[.701, 1.252],  $p > .6$ ). The odds of having low HDL increased by 134% with every one-point increase on the Fear subscale of the CAQ ( $OR = 2.344$ , 95% CI[.213, .25.733],  $p > .4$ ). The odds of having low HDL increased by 88% with every one-point increase on the Avoidance subscale of the CAQ ( $OR = 1.879$ , 95% CI[.668, 5.289],  $p > .2$ ).

### **Model 5: Blood Pressure Adherence**

A hierarchical binomial logistic regression analysis was conducted to test marital status, general anxiety, CAQ fear, CAQ avoidance, and CAQ attention as predictors of blood pressure (0 = normal, 1 = high). Sixty-one participants provided data on the variables used in this analysis. Marital status added in the first step of the analysis; general anxiety (GAD-7 score) in the second; and CAQ fear, avoidance, and attention in the final step, as the variables of primary interest. Prior to analysis, we tested for outliers, multicollinearity, and the assumptions of logistic regression. No violations of multicollinearity or the assumptions of logistic regression were detected. One potential outlier was identified, but we decided to keep the participant in the data analysis due to the small sample size. Using G\*Power 3.1 (Faul et al., 2009), power was excellent at 0.89. Results of the analysis are shown in Table 8.

Table 8. *Results of Hierarchical Logistic Regression Analyses Predicting Blood Pressure Non-Adherence*

Predictor	<i>b</i>	<i>SE</i>	<i>OR</i>	<i>p</i>	95% CI	
					<i>Lower</i>	<i>Upper</i>
Marital Status	-1.482	.62	.227	.017	.067	.767
General Anxiety	-.013	.08	.987	.868	.843	1.155
Fear	.477	.606	1.611	.432	.491	5.286
Avoidance	-.478	.303	.62	.115	.343	1.123
Attention	.087	.488	1.091	.858	.419	2.842

*Note:* The reference group for this model is patients with normal BP.

A test of the full model against a constant only model was not statistically significant, indicating that the predictors as a set did not reliably distinguish between those with normal and high BP,  $\chi^2(5) = 9.183, p > .05$ . In the final model, odds ratios indicated that there was a 77% decrease in the odds of having high BP if the participant was not married ( $OR = .227, 95\% CI [.067, .767], p < .05$ ). General anxiety was not a statistically or clinically significant predictor of BP ( $OR = .987, 95\% CI [.843, 1.155], p > .8$ ). None of the other predictors was statistically significant, but their effect sizes (ORs) were large enough to warrant interpretation. The odds of having high BP increased by 61% with every one-point increase on the Fear subscale of the CAQ ( $OR = 1.611, 95\% CI [.491, 5.286], p > .4$ ). The odds of having high BP decreased by 38% with every one-point increase on the Avoidance subscale of the CAQ ( $OR = .62, 95\% CI [.343, 1.123], p > .1$ ). The odds of having high BP increased by 9% with every one-point increase on the Attention subscale of the CAQ ( $OR = 1.091, 95\% CI [.419, 2.842], p > .8$ ).

## **CHAPTER FOUR**

### **DISCUSSION**

The purpose of the present study was to determine if heart-focused anxiety is a predictor of various forms of treatment adherence, and subsequently if it is a better predictor of adherence than general anxiety and other known predictors of treatment adherence. The results of each model predicting the five types of treatment adherence measures, including lifestyle recommendations, medication, LDL, HDL, and blood pressure, are discussed below.

#### **Adherence to Lifestyle Recommendations**

In this analysis, greater cardiac knowledge had a significant effect on increasing adherence to lifestyle recommendations. As previously reported, studies have found that more knowledge of the course and treatment of cardiac disease has a positive impact on adherence to recommended changes in diet and exercise (Alm-Roijer et al., 2004; van der Wal et al., 2005). Those with more knowledge about cardiac disease may feel more equipped to take care of themselves according to recommended guidelines. This model also showed that higher Positive Coping scores were associated with increased adherence to lifestyle recommendations. Positive coping includes coping styles such as planning, humor, acceptance, positive reframing, and active coping that lend well to making positive health changes to improve the course of the disease (de Ridder et al., 2009; Shepperd et al., 1996). Medication complexity, general anxiety, and the fear, avoidance, and attention subscales of the CAQ had no significant effect on adherence to lifestyle recommendations. While the variables were not each significant, the model as a whole

explained 23.5% of the variance of lifestyle adherence, suggesting that the combination of factors is more predictive than individual factors. Knowledge and positive coping accounted for 15.7% of the variance, and the other non-significant variables contributed another 7.8% of the variance of lifestyle recommendation adherence.

Despite our small sample size, low power is an unlikely explanation for our null results. Power analyses for individual predictors indicated that we had 99% power to detect moderate and large effect sizes of .25 and .64, respectively, and greater than 40% power to detect a small effect size of at least .04 (Cohen et al., 2003). Effect sizes for all non-significant predictors were below the recommended minimum effect size of .04, suggesting that these predictors were both statistically and clinically non-significant (Ferguson, 2009). It is plausible that engaging in lifestyle choices is determined by other personal factors, such as knowledge seeking and active, solution-focused problem solving skills, as this model indicates. For example, in the current study knowledge was significantly and positively correlated with acceptance coping ( $r = .313, p < .05$ ), which is a subscale of positive coping. This finding suggests that greater knowledge may improve positive coping, and together both may lead to better lifestyle adherence. Increased knowledge of CAD may also serve to reduce anxious thoughts and feelings about health (Khatib et al., 2014).

### **Adherence to Prescribed Medications**

In this model, panic, depression, and negative coping style each had no effect on participants' adherence to their prescribed medications and together they only explained 2% of the variance in medication adherence, which is inconsistent with prior research.

Research indicates that people with more negative emotional states, such as panic or depression, are more likely to use negative coping styles (Smedema et al., 2010). Consequently, positive coping styles such as action and planning coping, have been shown to have a positive impact on medication adherence (Lourenco, et al., 2013). Previous studies also indicate that higher levels of depression are associated with decreased medication adherence (DiMatteo, 2000). It was also found that, contrary to hypotheses, general anxiety and heart-focused anxiety had no impact on medication adherence. Higher levels of anxiety, both heart-focused and general, were expected to improve adherence to medications due to desire to avoid negative health consequences (DiMatteo, 2000).

Despite our small sample size, low power is an unlikely explanation for our null results. Power analyses for individual predictors indicated that we had > 95% and 99% power to detect moderate and large effect sizes of .25 and .64, respectively, and approximately 40% power to detect a small effect size of at least .04 (Cohen et al., 2003). Effect sizes for all predictors were below the recommended minimum effect size of .04, suggesting that the predictors were both statistically and clinically non-significant (Ferguson, 2009). As previously mentioned, both the medication adherence measure and negative coping scale had poor reliability, which could potentially explain the lack of significance. It is possible the lack of significant results in this model is due to violations of the assumptions of the analysis, which are discussed below. It is also possible that depression, general anxiety, panic, negative coping, and heart-focused anxiety did not have effects on medication adherence because there are other more specific and important predictors we did not include in the analysis. For example, research has shown that the

strongest predictor of medication adherence is the patient's understanding of the causes and effects of hypertension (Marshall et al., 2012). When patients are unaware of how hypertension functions, they are more likely to take their medication at a variable schedule. Fear of side effects of medications also plays a role in patients discontinuing their use of their medications (Marshall et al., 2012).

### **LDL**

In this study, men had 504% greater odds of having high or unhealthy LDL levels than women. LDL is considered the “bad” cholesterol, and is elevated by a diet high in saturated and trans fats (American Heart Association, 2016). Reducing LDL requires adherence to lifestyle recommendations, which is considered preventative treatment. Studies have shown that men and women utilize healthcare differently, and specifically that women are more adherent to recommendations and preventative treatments than men (Chung et al., 2006; Pinkhasov et al., 2010), which could explain this finding.

Results of this model also indicate that every one-point increase in positive coping increased the odds of having unhealthy LDL by 10%. It is unclear why positive coping would have a negative effect on LDL cholesterol adherence, but given that this coping measure combines various types of coping, it could be that one of these types is driving this negative affect. Folkman and Moskowitz (2000) discuss the relationship among stress, positive emotion, and coping, especially in relation to chronic illness. The authors raise questions about the benefit and possible cost of positive coping style. For instance, problem-focused coping has been shown to only be effective if there is also a sense of control. While an individual may endorse using problem-focused or planning coping, if

he or she feels a lack of control over his or her illness, this type of coping may actually lead to feelings of hopelessness.

Other questions are raised about how these positive coping styles interact in a chronic illness situation in which there may not be change. For many with a chronic illness, despite following all treatment recommendations, they may have to accept the fact that they will never be completely free of their condition. This realization may have an effect on the use of coping styles that is not yet known. The answer to questions such as these may offer insight as to why seemingly positive strategies contribute to negative health outcomes. Alternatively, while most research equates positive coping with positive outcomes, it is possible that these positive coping skills may act as barriers to receiving new recommendations from health care professionals, if the patient believes she or he already utilizes positive skills and does not need additional advice. Consistent with this explanation, one study showed that those who already had the greatest amount of engagement in their healthcare showed the least improvement, which could speak to their sense of self-efficacy and possible non-reliance on health-care professionals (Hibbard & Greene, 2012).

General and heart-focused anxiety were not significant predictors of LDL cholesterol levels. However, recent research has indicated that interpreting effect sizes produces more clinically relevant information than null hypothesis testing alone due to the reliance of the latter on sample size (Nickerson, 2000; Rodgers, 2010). Therefore, the effect sizes of these variables will be discussed regarding practical or clinical significance. The effect size for general anxiety indicated that the odds of having unhealthy LDL increased by 13% for every one-point increase in general anxiety.

Previous research indicates that those with mood disorders, anxiety and/or depression, and those under stress are more likely to suffer from metabolic issues, such high LDL, due to poor diet choices (Davison & Kaplan, 2012), which may account for the present findings.

For every one-point increase in the CAQ fear subscale, the odds of having unhealthy LDL increased by 26%. While there is no current research that explains this finding, it is possible that fear of adverse cardiac events could increase hopelessness and lead to poorer engagement in methods that might control LDL levels, such as weight loss and exercise. For every one-point increase in the CAQ avoidance subscale, the odds of having unhealthy LDL increased by 6%. Avoidance of activities that may cause a heart-related event, such as exercise, would actually increase LDL levels; exercise is one of the recommendations to improve cholesterol according to the American Heart Association. It is also possible that avoidance of certain behaviors may generalize to avoidance of others, such as healthy eating, which is another recommendation to control LDL.

For every one-point increase in the CAQ attention subscale, the odds of having unhealthy LDL decreased by 79%. It is feasible that increased attention to the heart and its sensations would make an individual more likely to regularly monitor outcome measures, such as cholesterol, to keep them in a healthy range. Research confirms that patients who are more engaged in their healthcare, including active monitoring, and are not just simply compliant have more positive health outcomes (Hibbard & Greene, 2012). Both fear and attention had a greater impact on LDL levels than general anxiety, indicating that these subscales of heart-focused anxiety are better at explaining adherence to LDL levels than general anxiety alone.

## **HDL**

None of the predictors of this model was statistically significant; however, their effect sizes will be discussed in relation to practical or clinical significance. In this model, for every one-point increase in negative coping, there was a 5.7% decrease in the odds of having low or unhealthy HDL levels. Contrary to research that states negative coping styles are associated with poorer health outcomes, this finding indicates that negative coping actually leads to better HDL levels. There does not appear to be a clear answer in the literature regarding the positive effect of coping; however, one possible explanation could be that self-distraction, a subscale of negative coping, may include behaviors that are beneficial to health outcomes. For example, patients may be encouraged to take a walk, garden, or use exercise as a positive way to distract, improve mood, and reduce stress. If patients are using strategies such as these, the physical exercise would have a positive effect on their cholesterol.

For every one-point increase in general anxiety, there was a 56.3% decrease in the odds of having low or unhealthy HDL levels. Previous research has found that increases in anxiety are associated with reduced HDL levels, which creates increased risk of cardiovascular disease (van Reedt Dortland et al., 2013). As a reminder, HDL is a good form of cholesterol that removes LDL, the “bad” cholesterol, from the blood stream. Increasing HDL involves adding healthy fats into the diet, along with exercising and removing unhealthy fats. It is possible that for participants in this study, as previously mentioned, increased general anxiety may promote positive health behaviors, such as proper diet and exercise, for fear of having a future cardiac event (DiMatteo, 2000).

The odds of having low or unhealthy HDL increased by 134% and 88% for every one-point increase in the fear and avoidance subscales of the CAQ, respectively.

Theoretically, fear of a cardiac event could be followed by avoidance of activities that are believed to lead to a cardiac event, such as exercise or physical work. Avoidance of activities thought to cause a cardiac event could impact HDL, given that exercise is an activity commonly avoided by those with high avoidance scores, and exercise is shown to increase HDL (Pattyn et al., 2012).

For every one-point increase in CAQ attention, there was a 1% increase in the odds of having low or unhealthy HDL levels. This effect is both statistically and clinically non-significant. Attention may not have an effect on HDL cholesterol because it assesses an individual's preoccupation with his or her heart and its sensations. HDL is tested by blood draws and therefore would not be something patients would be able to readily monitor by attending to sensations such as their pulse. Both the fear and avoidance subscales of heart-focused anxiety had a larger effect on HDL than general anxiety alone, but the attention subscale did not.

### **Blood Pressure**

In this model, marital status had a significant impact on blood pressure. Participants who identified as not married had a 77% decrease in the chances of having high BP than their married counterparts. Research has indicated that the health benefits of marriage mostly apply to men, showing that in patients with a chronic illness, married men are subject to more social influence and control of critical health behaviors, such as diet, from their spouses than married women and unmarried individuals (August &

Sorkin, 2010). While this sample is mostly female by a slight margin, gender effects could help to explain this finding. No other variables were statistically significant predictors of blood pressure; however, effect sizes will be discussed in terms of practical and clinical significance. For every one-point increase in general anxiety, the odds of having high blood pressure increased by 1%, making it both statistically and clinically non-significant. In a review of studies examining the effect of general anxiety and cardiovascular health, it was found that general anxiety had no significant relationship with markers of CAD, such as blood pressure, in patients with established diagnoses (Tully et al., 2013). The authors found that the prevalence of general anxiety in the cardiac population was less significant than other psychological factors, such as depression, and that factors such as worry may be more predictive of development of CAD.

For every one-point increase in CAQ fear, the odds of having high blood pressure increased by 61%. Fear of a cardiac event may be elevating the odds of high blood pressure due to the very nature of anxiety. It is possible that a specific fear, in this case fear of a heart-related event, is modulated by areas in the brain that produce a stronger stress response in the body, including higher blood pressure, and is therefore more intense than generalized anxiety (McEwen, 2004). This could account for fear's large effect size in determining blood pressure. For every one-point increase in CAQ avoidance, the odds of having high blood pressure decreased by 38%. One possible explanation is that avoidance of activities thought to induce a cardiac event may be limited to avoiding physical activity, but it does not account for other behaviors that may be seen as likely to prevent a future cardiac event, such as taking medications to control

blood pressure. For every one-point increase in CAQ attention, the odds of having high blood pressure increased by 9%. Increased attention to the heart and its sensations may make an individual more attuned to his or her heart rate and cause anxiety and fear about those sensations, thus increasing blood pressure (Player & Peterson, 2011).

As hypothesized, heart-focused fear, avoidance, and attention were stronger predictors of blood pressure levels than general anxiety. This could be due to the biological processes that link anxiety to CAD, such as increased activation of the sympathetic nervous system, which involves increased heart rate, constricted blood vessels and increased blood pressure (Thurston et al., 2013). Given that heart-focused anxiety is a more specific measure of anxiety, it is possibly a more tangible measure of anxiety for the cardiac population. As a result of this greater specificity, when elicited, heart-focused anxiety may produce a stronger biological response in the body than general anxiety alone.

### **Implications**

Based the effect sizes from the present analyses, the practical and clinical significance our findings may add to the clinical understanding of anxiety and cardiac disease, and can be used to facilitate future research. Previous research has demonstrated that the effect of anxiety on cardiac disease is variable. In this study, heart-focused anxiety did not significantly predict the adherence measures in this study, possibly due to the limitations discussed below. However, in many instances, fear, avoidance, and/or attention subscales of heart-focused anxiety did have greater predictive power on the adherence measures than general anxiety when taking effect sizes into account. What this

implies is that heart-focused anxiety, and specifically the CAQ measure, may be a better predictor of treatment adherence and thus outcomes, than general anxiety alone.

Clinically, these findings may be used to encourage health care professionals to ask more pointed and specific questions about their cardiac patients' anxiety, especially in relation to their disease, and to ask how their anxiety may be impacting their ability to engage in treatment. The CAQ is a quick measure that is easily scored and can be used in a high-volume clinical environment to assess a patient's heart-focused anxiety. Future research can examine the present factors studied here, as well as differentiate among the various types of anxiety, such as general, panic, and trait, that were unable to be assessed in the present study. It may be most useful to examine all of these factors in a large study using a structural equation model approach (e.g., cross-lagged panel models) to test bidirectional relationships among these variables over time.

Across all models, fear-related anxiety was associated with increased odds of non-adherence. It may be useful to study the effects of including treatment for cardiac-related fear in behavioral interventions for cardiac patients, or as part of cardiac rehabilitation. Possible interventions for those experiencing fear related to their cardiac condition could include increased education about treatment and course of the disease, as well as psychological interventions such as Cognitive Behavioral Therapy for Anxiety, specifically in relation to their fear of a cardiac event. Relaxation training can also be utilized in behavioral interventions for reducing stress, heart rate, and blood pressure. Research has found that relaxation, and specifically mindfulness-based stress reduction, is an effective tool at reducing stress, cortisol levels, and blood pressure in patients with chronic illnesses (Carlson et al., 2007), and that the use of relaxation techniques is

associated with healthy lifestyle habits such as regular exercise (Lee & Yeo, 2013). As demonstrated here and in previous research, those with increased knowledge demonstrate higher levels of adherence to lifestyle recommendations (Alm-Roijer et al., 2004; van der Wal et al., 2005).

Attention to heart sensations and avoidance of activities thought to cause a cardiac event had variable effects on adherence measures, at times improving and at other times harming the chances of adherence. Avoidance of activities was shown to be harmful to LDL and HDL levels, while it was helpful for blood pressure adherence, and had no effect on lifestyle or medication adherence. Attention to heart sensations was harmful to HDL and blood pressure, beneficial to LDL levels, and had no effect on lifestyle or medication adherence. Future research should focus on attention and avoidance factors to determine if they are posing barriers to treatment, as well if they are correlated with other known barriers to treatment to develop more clear treatment recommendations for those experiencing increased attention and avoidance.

Regarding other known predictors, knowledge and positive coping significantly predicted improved adherence to lifestyle recommendations. Encouraging and training patients to use positive coping skills, as well as providing increased education are potentially useful interventions to promote adherence. Specifically, patients should be educated about the course of CAD and the known preventative and treatment measures, such as diet and exercise. Studies have shown that knowledge is the most influential factor in improving adherence (Khatib et al., 2014). Additionally, studies have found that patients often believe their blood pressure is only elevated during times of emotional stress, and educating them about the chronic nature of blood pressure elevation can

change how they treat hypertension and adherence to medications (Marshall et al., 2012). Being male and positive coping significantly predicted unhealthy LDL cholesterol levels, indicating that men may need more counseling about their cholesterol levels and what contributes to them, such as eating unhealthy versus healthy fats. It would also be beneficial for healthcare providers to talk more openly about their patients' understanding of their cholesterol and necessary medications, eliciting any misinformation and/or fears that can be discussed. Future studies could examine if developing a short measure to assess common barriers to treatment and then addressing these barriers in a clinical setting would improve treatment adherence and outcomes.

Lastly, being unmarried significantly predicted lower blood pressure, indicating there is may be an unidentified barrier to adherence for married patients, such as lack of spousal knowledge or unhealthy lifestyle choices of the spouse, or that marriage is related to higher blood pressure in this population via some other mechanism, such as increased relationship stress due to the CAD diagnosis and its treatment. More research in this area would help to clarify the role of marriage and CAD risk factors. Patients who are married may benefit from having their spouse present during appointments to determine if there are other factors inhibiting successful treatment adherence. Physicians can begin this discussion with their patients and make referrals to health psychologists to help patients involve their spouses in their care. Research has shown that when spouses are actively involved in care, patients are more adherent to treatment and have better health outcomes (Sayers et. al, 2008). Lifestyle changes are easier when a spouse is supporting change in diet and exercise, as well as reminding patients of medications and medical appointments.

## **Limitations**

The present study had several limitations that affect the interpretation of the results. The present study had a small sample size, and therefore we could not include all of the potential predictors that we originally proposed to test. Future studies with larger sample sizes are required to test all relevant predictors of treatment adherence in cardiac patients simultaneously. This may also allow for better generalizability of the results, as a larger sample would be more representative of the population. In addition, this study was cross-sectional in design, and thus casual inferences could not be made. In the future, it would be beneficial to use a longitudinal design to study the effects over time. Next, the sample was largely Caucasian. Future studies should include a more diverse sample to test for potential racial and/or ethnic differences in adherence to treatment recommendations and potential differences in which factors affect adherence. In addition, the models predicting lifestyle and medication adherence violated the statistical assumptions of normality and homoscedasticity. Transformations of the dependent variables were conducted to correct for these violations; however, the transformations did not correct for violations in the medication adherence model. Therefore, the results of this analysis are likely to be biased in that the regression coefficients and standard errors may be too small or too large, thus potentially invalidating the results of any hypothesis tests. Also, poor reliability for the negative coping and medication adherence variables could have contributed to any non-significant findings, including preliminary analyses used to decide which variables would be included in which analyses. Also of note, self-report data were collected from up to 72% of participants for blood pressure, 28% for LDL, and 29% for HDL, which may impact the findings as patients may underreport their readings,

since some studies show that people may have a tendency to underreport these numbers (Mengden et al., 1998). Finally, there may be self-selection bias limiting this study, because participants volunteered to enroll in the study, which may indicate these people may be different from those who declined to participate (e.g., they may be more likely to engage in treatment and therefore not as distressed by their condition).

### **Conclusion**

In summary, the findings of the present study could help identify predictors of cardiac treatment adherence, if replicated with a larger sample size. Heart-focused anxiety and its subscales may offer more specific information related to a patient's experience of the course of his or her cardiac disease. Given that most of the CAQ subscales had a larger impact on predicting treatment adherence than general anxiety, it is important to further study heart-focused anxiety as potential predictor of patient adherence and possibly treatment outcome. Future research can examine how various factors, such as gender, ethnicity, stress, panic disorder, social support, and coping, interact with each other and heart-focused anxiety to impact a patient's adherence. Such studies can lead to better identification of those at risk of non-adherence, as well as lead to clearer and timelier identification of psychological interventions, and improving patient quality of life and outcomes.

## 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 S., 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.
- Alm-Roijer, C., Stagmo, M., Uden, G., & Erhardt, L. (2004). Better knowledge improves adherence to lifestyle changes and medication in patients with coronary heart disease. *European Journal of Cardiovascular Nursing*, *3*, 321-330.
- American Heart Association (2014). About cholesterol. Retrieved from [http://www.heart.org/HEARTORG/Conditions/Cholesterol/AboutCholesterol/About-Cholesterol\\_UCM\\_001220\\_Article.jsp#.VwsUVIJOzvE](http://www.heart.org/HEARTORG/Conditions/Cholesterol/AboutCholesterol/About-Cholesterol_UCM_001220_Article.jsp#.VwsUVIJOzvE)
- August, K.J. & Sorkin, D.H. (2010). Marital status and gender differences in managing a chronic illness: The function of health-related social control. *Social Science Medicine*, *71*(10), 1831-1838
- 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.
- Barth, J., Schneider, S., & von Kanel, R. (2010). Lack of social support in the etiology and the prognosis of coronary heart disease: A systematic review and meta-analysis. *Psychosomatic Medicine*, *72*, 229-238.
- Bonnet, F., Irving, K., Terra, J., Nony, P., Berthezene, F., & Moulin, P. (2005). Anxiety and depression are associated with unhealthy lifestyle in patients at risk of cardiovascular disease. *Atherosclerosis*, *178*, 339-344.

- Carlson, L.E., Specia, M., Faris, P., & Patel, K.D. (2007). One year pre–post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain, Behavior, and Immunity* 21, 1038–1049.
- 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), 1147-1152.
- Chung, M., Moser, D., Lennie, T., Worrall-Carter, L., Bentley, B., Trupp, R., & Armentano, D. (2006). Gender differences in adherence to the sodium-restricted diet in patients with heart failure. *Journal of Cardiac Failure*, 12(8), 628-642.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*, third edition. Mahwah, NJ: Lawrence Erlbaum Associates.
- 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.
- Davison, K.M. & Kaplan, B.J. (2012). Food intake and blood cholesterol levels of community-based adults with mood disorders. *BMC Psychiatry*, 12(10), DOI: 10.1186/1471-244X-12-10
- de Ridder, D., Geenen, R., Kuijper, R., van Middendorp, H. (2009). Psychological adjustment to chronic disease. *The Lancet*, 372(9634), 246-255.
- 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.
- Doering, L., Moser, D., Riegel, B., McKinely, S., Davidson, P., Baker, H., Meischke, H. et al. (2010). Persistent comorbid symptoms of depression and anxiety predict mortality in heart disease. *International Journal of Cardiology*, 145(2), 188-192.
- Eiftert, 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.
- Eiftert, 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.

- Fan, A., Strine, T., Jiles, R., & Mokdad, A. (2008). Depression and anxiety associated with cardiovascular disease among persons aged 45 years and older in 38 states of the United States, 2006. *Preventative Medicine, 46*, 445-450.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149-1160.
- Ferguson, C. J. (2009). An effect size primer: A guide for clinicians and researchers. *Professional Psychology: Research and Practice, 40*(5), 532-538.
- 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., Dupuis, G., Marchand, A., Burelle, D., Arsenault, A., & Beitman, B. (1996). Panic disorder in emergency department chest pain patients: Prevalence, comorbidity, suicidal ideation, and physician recognition. *American Journal of Medicine, 101*, 371-380.
- Folkman, S. & Moskowitz, J. T. (2000). Stress, positive emotion, and coping. *Current Directions in Psychological Science, 9*(4), 115-118
- Furukawa, T., Shear, K., Barlow, D., Gorman, J., Woods, S., Money, R., et al. (2009). Evidence-based guidelines for interpretation of the Panic Disorder Severity Scale. *Depression & Anxiety, 26*(10), 922-929.
- Garber, M., Nau, D., Erickson, S., Aikens, J., & Lawrence, J. (2004). The concordance of self-report with other measures of medication adherence: A summary of the literature. *Medical Care, 42*(7), 649-652.
- 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.
- Go, A. S., Mozaffarian, D., Roger, V. L. Benjamin, E., Berry, J. D., Borden, W. B., Bravata, D. M., et al.(2013). Heart disease and stroke statistics--2013 update: A report from the American Heart Association. *Circulation, 127*(1), e6-e245.
- Grace, S. L., Abbey, S. E., Shnek, Z. M., Irvine, J., Franche, R., & Stewart, D. E (2002). Cardiac rehabilitation I: Review of psychosocial factors. *General Hospital Psychiatry, 24*(3), 121-126.
- 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.

Hibbard, J.H. & Greene, J. (2013). What the evidence shows about patient activation: Better health outcomes and care experiences; fewer data on costs. *Health Affairs*, 32(2), 207-214.

Holahan, C., Moos, R., Holahan, C., & Brennan, P. (1997). Social context, coping strategies, and depressive symptoms: An expanded model with cardiac patients. *Journal of Personality and Social Psychology*, 72(4), 918-928.

Horwitz, R. I., & Horwitz, S. M. (1993). Adherence to treatment and health outcomes. *Archives of Internal Medicine*, 153, 1863-1868.

Iskedjian, M., Einarson, T., MacKeigan, L., Shear, N., Addis, A., Mittmann, N., & Ilersich, A. (2002). Relationship between daily dose frequency and adherence to antihypertensive pharmacotherapy: Evidence from a meta-analysis. *Clinical Therapeutics*, 24(2), 302-316.

Jackevicius, C., Li, P., & Tu, J. (2008). Prevalence, predictors, and outcomes of primary nonadherence after acute myocardial infarction. *Circulation*, 117(1), 1028-1036.

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.

Januzzi, J., Stern, T., Pasternak, R., & DeSanctis, R. (2000). The influence of anxiety and depression on outcomes of patients with coronary artery disease. *Archives of Internal Medicine*, 160, 1913-1921.

Jeejeebhoy, F., Dorian, P., & Newman, D. (2000). Panic disorder and the heart: A cardiology perspective. *Journal of Psychosomatic Research*, 48, 393-403.

Kayaniyil, S., Ardern, C., Winstanley, J., Parsons, C., Brister, S., Oh, P., Stewart, D., et al. (2009). Degree and correlates of cardiac knowledge and awareness among cardiac inpatients. *Patient Education Counseling*, 75(1), 99-107.

Kent, L., & Shapiro, P. (2009). Depression and related psychological factors in heart disease. *Harvard Review of Psychiatry*, 17(6), 377-388.

Khatib, R., Schwalm, J., Yusuf, S., Haynes, R.B., McKee, M., & Khan, M. et al. (2014). Patient and healthcare provider barriers to hypertension awareness, treatment and follow up: A systematic review and meta-analysis of qualitative and quantitative studies. *PLoS ONE*, 9(1), e84238. doi: 10.1371/journal.pone.0084238

- 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.
- Lourenço, L., Rodrigues, R., Ciol, M.A., São-João, T., Cornélio, M., Dantas, R.A., & Gallani, C. (2013). A randomized controlled trial of the effectiveness of planning strategies in the adherence to medication for coronary artery disease. *Journal of Advanced Nursing*, *70*(7), 1616-1628.
- 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.
- Krantz, D., Sheps, D., Carney, R., & Natelson, B. (2000). Effects of mental stress in patients with coronary artery disease: Evidence and clinical implications. *Journal of American Medical Association*, *283*(14), 1800-1802.
- Kornerup, H., Zwisler, A., Prescott, E., & DANREHAB Group (2010). No association between anxiety and depression and adverse clinical outcomes among patients with cardiovascular disease: Findings from the DANREHAB trial. *Journal of Psychosomatic Research*, *71*, 207-214.
- Lane, D., Carroll, D., Ring, C., Beevers, D., & Lip, G. (2001). Predictors of cardiac rehabilitation after myocardial infarction. *Journal of Psychosomatic Research*, *51*(3), 497-501.
- Lee, E.O. & Yeo, Y. (2013). Relaxation practice for health in the United States. *Journal of Holistic Nursing*, *31*(2), 139-148.
- Lett, H., Blumenthal, J., Babyak, M., Strauman, T., Robins, C., & Sherwood, A. (2005). Social support and coronary heart disease: Epidemiological evidence and implications for treatment. *Psychosomatic Medicine*, *67*, 869-878.
- Lichtenstein, A., Appel, L., Brands, M., Carnethon, M., Daniels, S., Franch, H., Franklin, B. et al. (2006). Diet and lifestyle recommendations revision 2006: A scientific statement from the American Heart Association Nutrition Committee. *Circulation*, *114*, 82-96.
- 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.

- Marshall, I., Wolfe, C.D., & McKeivitt, C. (2012). Lay perspectives on hypertension and drug adherence: systematic review of qualitative research. *The BMJ*, 344:e3953
- Mazzaglia, G., Ambrosioni, E., Alacqua, M., Filippi, A., Sessa, E., Immordino, V., Borghi, C. et al. (2009). Adherence to antihypertensive medications and cardiovascular morbidity among newly diagnosed hypertensive patients. *Circulation*, 120, 1598-1605.
- McCann, U. D., Fauerbach, J. A., & Thombs, B. D. (2005). Anxiety and cardiac disease. *Primary Psychiatry*, 12(3), 47-50.
- McEwen, B.S. (2004). Protection and damage from acute and chronic stress. *Annals of New York Academy of Sciences*, 1032, 1-7.
- Mengden, T., Hernandez Medina, R., Beltran, B., Alvarez, E., Kraft, K., & Vetter, H. (1998). Reliability of reporting self-measured blood pressure values by hypertensive patients. *American Journal of Hypertension*, 11(12), 1413-1417.
- Miura, T., Kojima, R., Mizutani, M., Shiga, Y., Takatsu, F., & Suzuki, Y. (2001). Effect of digoxin noncompliance on hospitalization and mortality in patients with heart failure in long-term therapy: A prospective study. *European Journal of Clinical Pharmacology*, 57, 77-83.
- Morisky, D., Ang, A., Krousel-Wood, M., & Ward, H. (2008). Predictive validity of a medication adherence measure in an outpatient setting. *Journal of Clinical Hypertension*, 10(5), 348-354.
- Mosca, L., Linfante, A., Benjamin, E., Berra, K., Hayes, S., Walsh, B., Fabunmi, R. et al. (2014). National study of physician awareness and adherence to cardiovascular disease prevention guidelines. *Circulation*, 111, 499-510.
- Moser, D. (2007). "The rust of life": Impact of anxiety on cardiac patients. *American Journal of Critical Care*, 16(14), 361-369.
- Newby, L., LaPointe, N., Chen, A., Kramer, J., Hammill, B., DeLong, E., Muhlaier, L. et al. (2006). Long-term adherence to evidence-based secondary prevention therapies in coronary artery disease. *Circulation*, 113, 203-212.
- 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.
- Pattyn, N., Cornelissen, V., Toghi Eshghi, S., & Vanhees, L. (2012). The effect of exercise on the cardiovascular risk factors constituting the metabolic syndrome. *Sports Medicine*, 42(2), 121-133.

- 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.
- Player, M.S. & Peterson, L.E. (2011). Anxiety Disorders, Hypertension, and Cardiovascular Risk: A Review. *The International Journal of Psychiatry in Medicine*, 41(4), 365-377.
- Rayburn, N., Wenzel, S., Elliott, M., Hambarsoomians, K., Marshall, G., & Tucker, J. (2005). Trauma, depression, coping, and mental health service seeking among impoverished women. *Journal of Consulting & Clinical Psychology*, 73(4), 667-77.
- 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.
- 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.
- Rozanski, A., Blumenthal, J., Davidson, K., Saab, P., & Kubzansky, L. (2005). The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice. *Journal of the American College of Cardiology Foundation*, 45(5), 637-651.
- Sayers, S., Riegel, B., Pawlowski, S., Coyne, J., & Samaha, F. (2008). Social support and self-care of patients with heart failure. *Annals of Behavioral Medicine*, 35, 70-79
- Shepperd, J., Maroto, J., & Pbert, L. (1996). Dispositional optimism as a predictor of health changes among cardiac patients. *Journal of Research in Personality*, 30, 517-534.
- Smedema, S. M., Catalano, D., & Ebener, D.J. (2010). The relationship of coping, self-worth, and subjective well-being: A structural equation model. *Rehabilitation Counseling Bulletin*, 53(3), 131-142.
- 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.
- Taylor, C., King, R., Ehlers, A., Margraf, J., Clark, D., Hayward, C., Roth, W. et al. (1987). Treadmill exercise test and ambulatory measures in panic attacks. *American Journal of Cardiology*, 60, 48J-52J.

- Taylor, S., & Stanton, A. (2007). Coping resources, coping processes, and mental health. *Annual Review of Clinical Psychology*, 3, 377-401.
- Thurston, R.C., Rewak, M., & Kubzansky, L.D. (2013). An anxious heart: Anxiety and the onset of cardiovascular disease. *Progress in Cardiovascular Diseases*, 55(6), 524-537.
- Tully, P.H., Cosh, S.M., & Baune, B.T. (2013). A review of the affects of worry and generalized anxiety disorder upon cardiovascular health and coronary heart disease. *Psychology, Health & Medicine*, 18(6), 627-644.
- Uchino, B. (2007). Social support and health: A review of physiological processes potentially underlying links of disease outcomes. *Journal of Behavioral Medicine*, 29(4), 377-387
- 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.
- van Reedt Dortland, A.K.B., Giltay, E.J., van Veen, T. Zitman, F., & Penninx, B. (2013). Longitudinal relationship of depressive and anxiety Symptoms With dyslipidemia and abdominal obesity. *Psychosomatic Medicine*, 75(1), 83-89.
- 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.
- Vogelzangs, N., Seldenrijk, A., Beekman, A., van Hout, H., de Jonge, P., & Penninx, B. (2010). Cardiovascular disease in persons with depressive and anxiety disorders. *Journal of Affective Disorders*, 125(1-3), 241-248.
- World Health Organization (2004). Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization world mental health surveys. *Journal of the American Medical Association*, 291(21), 2581-2590.
- 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

### 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
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 B**

**STAI- TRAIT INVENTORY**

	Almost Never	Sometimes	Often	Almost Always
A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you <i>generally</i> feel.				
21. I feel pleasant.....	1	2	3	4
22. I feel nervous and restless.....	1	2	3	4
23. I feel satisfied with myself.....	1	2	3	4
24. I wish I could be as happy as others seem to be.....	1	2	3	4
25. I feel like a failure.....	1	2	3	4
26. I feel rested.....	1	2	3	4
27. I am "calm, cool, and collected".....	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them....	1	2	3	4
29. I worry too much over something that doesn't really matter.....	1	2	3	4
30. I am happy.....	1	2	3	4
31. I have disturbing thoughts.....	1	2	3	4
32. I lack self-confidence.....	1	2	3	4
33. I feel secure.....	1	2	3	4
34. I make decisions easily.....	1	2	3	4
35. I feel inadequate.....	1	2	3	4
36. I am content.....	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me....	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind.....	1	2	3	4
39. I am a steady person.....	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests .....	1	2	3	4

## APPENDIX C

### PANIC DISORDER SEVERITY SCALE – SELF-REPORT FORM

Several of the following questions refer to panic attacks and limited symptom attacks. For this questionnaire we define a panic attack as a sudden rush of fear or discomfort accompanied by at least 4 of the symptoms listed below. In order to qualify as a sudden rush, the symptoms must peak within 10 minutes. Episodes like panic attacks but having fewer than 4 of the listed symptoms are called limited symptom attacks. Here are the symptoms to count:

- Rapid or pounding heartbeat
- Sweating
- Trembling or shaking
- Breathlessness
- Feeling of choking
- Chest pain or discomfort
- Nausea
- Dizziness or faintness
- Feelings of unreality
- Numbness or tingling
- Chills or hot flushes
- Fear of losing control or going crazy
- Fear of dying

1. How many panic and limited symptoms attacks did you have during the week?
  - 0 No panic or limited symptom episodes
  - 1 Mild: no full panic attacks and no more than 1 limited symptom attack/day
  - 2 Moderate: 1 or 2 full panic attacks and/or multiple limited symptom attacks/day
  - 3 Severe: more than 2 full attacks but not more than 1/day on average
  - 4 Extreme: full panic attacks occurred more than once a day, more days than not
  
2. If you had any panic attacks during the past week, how distressing (uncomfortable, frightening) were they while they were happening? (If you had more than one, give an average rating. If you didn't have any panic attacks but did have limited symptom attacks, answer for the limited symptom attacks.)
  - 0 Not at all distressing, or no panic or limited symptom attacks during the past week
  - 1 Mildly distressing (not too intense)
  - 2 Moderately distressing (intense, but still manageable)
  - 3 Severely distressing (very intense)
  - 4 Extremely distressing (extreme distress during all attacks)

3. During the past week, how much have you worried or felt anxious about when your next panic attack would occur or about fears related to the attacks (for example, that they could mean you have physical or mental health problems or could cause you social embarrassment)?

- 0 Not at all
- 1 Occasionally or only mildly
- 2 Frequently or moderately
- 3 Very often or to a very disturbing degree
- 4 Nearly constantly and to a disabling extent

4. During the past week were there any places or situations (e.g., public transportation, movie theaters, crowds, bridges, tunnels, shopping malls, being alone) you avoided, or felt afraid of (uncomfortable in, wanted to avoid or leave), because of fear of having a panic attack? Are there any other situations that you would have avoided or been afraid of if they had come up during the week, for the same reason? If yes to either question, please rate your level of fear and avoidance this past week.

- 0 None: no fear or avoidance
- 1 Mild: occasional fear and/or avoidance but I could usually confront or endure the situation. There was little or no modification of my lifestyle due to this.
- 2 Moderate: noticeable fear and/or avoidance but still manageable. I avoided some situations, but I could confront them with a companion. There was some modification of my lifestyle because of this, but my overall functioning was not impaired.
- 3 Severe: extensive avoidance. Substantial modification of my lifestyle was required to accommodate the avoidance making it difficult to manage usual activities.
- 4 Extreme: pervasive disabling fear and/or avoidance. Extensive modification in my lifestyle was required such that important tasks were not performed.

5. During the past week, were there any activities (e.g., physical exertion, sexual relations, taking a hot shower or bath, drinking coffee, watching an exciting or scary movie) that you avoided, or felt afraid of (uncomfortable doing, wanted to avoid or stop), because they caused physical sensations like those you feel during panic attacks or that you were afraid might trigger a panic attack? Are there any other activities that you would have avoided or been afraid of if they had come up during the week for that reason? If yes to either question, please rate your level of fear and avoidance of those activities this past week.

- 0 No fear or avoidance of situations or activities because of distressing physical sensations
- 1 Mild: occasional fear and/or avoidance, but usually I could confront or endure with little distress activities that cause physical sensations. There was little modification of my lifestyle due to this.
- 2 Moderate: noticeable avoidance but still manageable. There was definite, but limited, modification of my lifestyle such that my overall functioning was not impaired.
- 3 Severe: extensive avoidance. There was substantial modification of my

lifestyle or interference in my functioning.

- 4 Extreme: pervasive and disabling avoidance. There was extensive modification in my lifestyle due to this such that important tasks or activities were not performed.

6. During the past week, how much did the above symptoms altogether (panic and limited symptom attacks, worry about attacks, and fear of situations and activities because of attacks) interfere with your ability to work or carry out your responsibilities at home? (If your work or home responsibilities were less than usual this past week, answer how you think you would have done if the responsibilities had been usual.)

- 0 No interference with work or home responsibilities
- 1 Slight interference with work or home responsibilities, but I could do nearly everything I could if I didn't have these problems.
- 2 Significant interference with work or home responsibilities, but I still could manage to do the things I needed to do.
- 3 Substantial impairment in work or home responsibilities; there were many important things I couldn't do because of these problems.
- 4 Extreme, incapacitating impairment such that I was essentially unable to manage any work or home responsibilities.

7. During the past week, how much did panic and limited symptom attacks, worry about attacks and fear of situations and activities because of attacks interfere with your social life? (If you didn't have many opportunities to socialize this past week, answer how you think you would have done if you did have opportunities.)

- 0 No interference
- 1 Slight interference with social activities, but I could do nearly everything I could if I didn't have these problems.
- 2 Significant interference with social activities but I could manage to do most things if I made the effort.
- 3 Substantial impairment in social activities; there are many social things I couldn't do because of these problems.
- 4 Extreme, incapacitating impairment, such that there was hardly anything social could do.

## APPENDIX D

### 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
<b>When I have chest discomfort or when my heart is beating fast:</b>					
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

## APPENDIX E

### CENTER FOR EPIDEMIOLOGIC STUDIES DEPRESSION SCALE

For each statement, please place a mark in the column that best describes how you have been feeling *in the past week*.

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1 – 2 days)	Occasionally or a moderate amount of the time (3 – 4 days)	Most or all of the time (5 – 7 days)
1. I was bothered by things that usually don't bother me.				
2. I did not feel like eating; my appetite was poor.				
3. I felt that I could not shake off the blues, even with the help from family or friends.				
4. I felt that I was just as good as other people.				
5. I had trouble keeping my mind on what I was doing.				
6. I felt depressed.				
7. I felt that everything I did was an effort.				
8. I felt hopeful about the future.				
9. I thought my life had been a failure.				
10. I felt fearful.				
11. My sleep was restless.				
12. I was happy.				
13. I talked less than usual.				
14. I felt lonely.				
15. People were unfriendly.				
16. I enjoyed life.				
17. I had crying spells.				
18. I felt sad.				
19. I felt that people dislike me.				
20. I could not get "going".				

## APPENDIX F

### CADE-Q KNOWLEDGE

1. Coronary Artery Disease (CAD) is:
  - A disease of the arteries of the heart which occurs in older age in people with high cholesterol and who smoke.
  - A disease of the arteries of the heart that starts silently at a young age, is influenced by poor life style habits, has a genetic component, and involves inflammation in the arteries.
  - A disease of the heart's arteries related to older age and that leads to memory Impairment.
  - I don't know.
2. Which factors have the most influence on the risk of heart attack?
  - Drinking small amounts of alcoholic beverages.
  - Environment factors (such as weather) and socioeconomic factors (such as monthly family income).
  - Smoking, high levels of blood cholesterol (dyslipidemia), and hypertension (high blood pressure).
  - I don't know.
3. Which description below is a typical symptom of CAD?
  - Headache after meals.
  - Chest pain or discomfort during physical activity.
  - Chest pain or discomfort, at rest or during physical activity, which can also be felt in the arm and/or back and/or neck.
  - I don't know.
4. Which of the following statements is most accurate regarding our understanding of CAD?
  - CAD is related to blockage of the arteries that supply blood to the heart caused by the formation of atherosclerotic plaques (fat deposit on the arteries' walls), that can cause angina (chest pain).
  - Acute Myocardial Infarction (MI or heart attack) is the only manifestation of CAD.
  - The presence of chest pain is suggestive of a diagnosis of CAD.
  - I don't know.
5. The best time of the day for people with coronary disease to carry out their prescribed exercise is:
  - In the afternoon or evening, because the early morning is the time of day with the highest risk of a heart attack.
  - Never, because exercise is considered too risky for people with CAD.
  - Any time, because the benefits of exercise outweigh the risks at any time of day.
  - I don't know.

6. Of the investigations listed below, which ones provide the most precise information about the diagnosis and prognosis of CAD?
- X-Ray and Magnetic Resonance Imaging of the chest.
  - Exercise Treadmill Test (Stress test) and cardiac catheterization (angiogram).
  - Electrocardiogram (EKG) at rest and a clinical history.
  - I don't know.
7. Which of the following statements about the management of blood cholesterol levels is most accurate?
- Physical exercise and diet are enough to lower cholesterol to target levels after a heart attack.
  - Physical exercise and diet should be followed regularly and when necessary, a medication such as a "statin" may be required
  - There is no treatment because high cholesterol levels are genetically inherited and can't be changed.
  - I don't know.
8. Which of the following statements about the use of "nitroglycerin" is most accurate?
- They are a class of medications that can be administered to improve coronary blood flow and can be given either continuously (such as in a tablet or patch) or used sublingually (under the tongue as a spray or small tablet) in situations of acute chest pain.
  - They are medications given only by the sublingual route in emergency situations to relieve chest pain.
  - They are medicines used to decrease blood pressure and bad cholesterol (LDL) in patients with cardiac problems.
  - I don't know.
9. Which of the following dietary components best describes a nutritional plan for persons with CAD?
- A diet with reduced salt, low fat and rich in fiber.
  - A diet based on whole grains, vegetables, fish, extra virgin olive oil and nuts.
  - An unrestricted diet, because diet is not a relevant factor.
  - I don't know.
10. Which values for LDL cholesterol and HDL cholesterol are the optimal targets persons with established CAD (values in mmol/litre)?
- LDL less than 2.0 and HDL greater than 1.2.
  - LDL 2.0 to 2.5 and HDL greater than 1.0.
  - LDL greater than 3.0 and HDL less than 1.0.
  - I don't know.

11. In which of the following situations would you avoid carrying out your regular physical exercise?
- If you had a recent heart attack (for example 8 weeks ago).
  - If you have a bad infection today (for example a really bad “flu”).
  - If your blood pressure is moderately elevated (for example 150/90).
  - I don’t know.
12. While walking, if you experience a new episode of severe chest discomfort that you think that is angina, you should:
- Drive your car directly to the hospital to seek medical care.
  - Try to relax, wait for the pain to improve, and then seek medical attention.
  - Stop your walk and sit, take a sublingual nitroglycerin, and seek medical care if the pain does not subside. Call your doctor to let him or her know what has happened.
  - I don’t know.
13. Based on your knowledge about exercise and CAD, choose the most appropriate statement below:
- Physical exercise should never be practiced by patients with coronary artery disease because of high risk of death.
  - Physical exercise is a fundamental part of the treatment plan, because it helps to control risk factors, prolongs survival and enhances quality of life.
  - Physical activity should be included in the treatment plan only when patients are fully recovered from their heart event.
  - I don’t know.
14. Guidelines for Physical Activity for people with coronary disease should be based upon which of the following:
- The exercise prescription should be individually devised based on an exercise stress test and respect the person’s abilities and disabilities.
  - Start at a low level to moderate level and build up gradually.
  - Be the same for all persons of the same gender and age, because these groups have the same physical ability and risk.
  - I don’t know.
15. Which of the following changes in the body resulting from regular physical exercise are most important to long term cardiac health?
- Blood vessel function improvement, growth of new blood vessels, and even a possible regression (shrinking) of atherosclerotic plaque.
  - Resting heart rate decrease, more forceful heart beat, and lipid profile improvement.
  - Blood Pressure increase, higher heart rates, and higher triglyceride levels.
  - I don’t know.
16. Which of the following statements best describes the pattern for exercise activity in persons recovering from a heart event:

- At any place, daily duration of about 30 minutes, which can be cumulative (10 min at morning, 10 min at noon and 10 min at night).
- In an appropriate setting, with periodic monitoring by qualified professionals, with the goal of achievement of self-sufficiency.
- In a hospital environment only.
- I don't know.

17. Which of the following statements is the most appropriate guidance around levels of blood pressure levels in persons with CAD:

- It doesn't matter whether blood pressure is normal or high because it does not have any long-term health effects.
- A value of less than 140 / 90 mmHg is considered normal.
- An optimal blood pressure is 120 / 80 mmHg.
- I don't know.

18. Which of the statements below regarding psychological stress is most correct?

- It is one of the important risk factors for AMI (Acute Myocardial Infarction or heart attack).
- Stress is related to the presence of anxiety and depression.
- It has no impact on heart disease, since atherosclerosis is a completely physical process and is not related to psychological factors.
- I don't know.

19. Which interventions can extend and improve a patient's quality of life for persons recovering from a cardiac event?

- Lifestyle changes + medical treatments + in some cases surgical intervention.
- Medication + in some cases surgical intervention.
- Prolonged bed rest.
- I don't know.

## APPENDIX G

### PERCEIVED STRESS SCALE

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

	Never	Rarely	Sometimes	Often	Always
1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and “stressed”?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

## APPENDIX H

### MULTIDIMENSIONAL SCALE OF PERCEIVED SOCIAL SUPPORT (ZIMET, DAHLEM, ZIMET & FARLEY, 1988)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully.

Indicate how you feel about each statement.  
Circle the "1" if you Very Strongly Disagree  
Circle the "2" if you Strongly Disagree  
Circle the "3" if you Mildly Disagree  
Circle the "4" if you are Neutral  
Circle the "5" if you Mildly Agree  
Circle the "6" if you Strongly Agree  
Circle the "7" if you Very Strongly Agree

1. There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2. There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
3. My family really tries to help me.	1	2	3	4	5	6	7
4. I get the emotional help and support I need from my family.	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me.	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8. I can talk about my problems with my family.	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7
11. My family is willing to help me make decisions.	1	2	3	4	5	6	7
12. I can talk about my problems with my friends.	1	2	3	4	5	6	7

## APPENDIX I

### BRIEF COPE

These items deal with ways you've been coping with the stress in your life since you found out you have a cardiac diagnosis. There are many ways to try to deal with problems. These items ask what you've been doing to cope with this one. Obviously, different people deal with things in different ways, but I'm interested in how you've tried to deal with it. Each item says something about a particular way of coping. I want to know to what extent you've been doing what the item says. How much or how frequently. Don't answer on the basis of whether it seems to be working or not—just whether or not you're doing it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

- 1 = I haven't been doing this at all
- 2 = I've been doing this a little bit
- 3 = I've been doing this a medium amount
- 4 = I've been doing this a lot

1. I've been turning to work or other activities to take my mind off things.	1	2	3	4
2. I've been concentrating my efforts on doing something about the situation I'm in.	1	2	3	4
3. I've been saying to myself "this isn't real."	1	2	3	4
4. I've been using alcohol or other drugs to make myself feel better.	1	2	3	4
5. I've been getting emotional support from others.	1	2	3	4
6. I've been giving up trying to deal with it.	1	2	3	4
7. I've been taking action to try to make the situation better.	1	2	3	4
8. I've been refusing to believe that it has happened.	1	2	3	4
9. I've been saying things to let my unpleasant feelings escape.	1	2	3	4
10. I've been getting help and advice from other people.	1	2	3	4
11. I've been using alcohol or other drugs to help me get through it.	1	2	3	4
12. I've been trying to see it in a different light, to make it seem more positive.	1	2	3	4
13. I've been criticizing myself.	1	2	3	4
14. I've been trying to come up with a strategy about what to do.	1	2	3	4

15. I've been getting comfort and understanding from someone.	1	2	3	4
16. I've been giving up the attempt to cope.	1	2	3	4
17. I've been looking for something good in what is happening.	1	2	3	4
18. I've been making jokes about it.	1	2	3	4
19. I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.	1	2	3	4
20. I've been accepting the reality of the fact that it has happened.	1	2	3	4
21. I've been expressing my negative feelings.	1	2	3	4
22. I've been trying to find comfort in my religion or spiritual beliefs.	1	2	3	4
23. I've been trying to get advice or help from other people about what to do.	1	2	3	4
24. I've been learning to live with it.	1	2	3	4
25. I've been thinking hard about what steps to take.	1	2	3	4
26. I've been blaming myself for things that happened.	1	2	3	4
27. I've been praying or meditating.	1	2	3	4
28. I've been making fun of the situation.	1	2	3	4

## APPENDIX J

### MEDICATION COMPLEXITY

Please fill out the chart below regarding your current medications. If you need to, take a moment to get your medications if they are nearby to help you fill it out. If you need more room, continue listing the medications on this page.

Drug name	What is it for? (If unsure, write "I don't know")	How often are you supposed to take this medicine?

## APPENDIX K

### MEDICATION ADHERENCE MEASURE

- |   |     |    |
|---|-----|----|
| 1. Do you sometimes forget to take your high blood pressure pills?  | Yes | No |
| 2. Over the past 2 weeks, were there any days when you did not take your high blood pressure medicine?  | Yes | No |
| 3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?                      | Yes | No |
| 4. When you travel or leave home, do you sometimes forget to bring along your medications?  | Yes | No |
| 5. Did you take your high blood pressure medicine yesterday?  | Yes | No |
| 6. When you feel like your blood pressure is under control, do you sometimes stop taking your medicine?   | Yes | No |
| 7. Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan? | Yes | No |
| 8. Do you have difficulty remembering to take all your blood pressure medication?   | Yes | No |

**APPENDIX L**

**LIFESTYLE ADHERENCE MEASURE**

1. Did your doctor provide recommendations for diet and exercise? Yes No  
If yes, what were those recommendations?

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2. Has a healthcare professional (for example, a doctor or nurse) ever told you that you need to quit smoking because of your heart problems?  
Yes No

3. On average, how many days per week did you engage in a total of 30 minutes or more of:

Mild exercise (i.e., walking leisurely, stretching): \_\_\_\_\_

Moderate exercise (i.e., walking briskly, biking less than 10 mph, water aerobics): \_\_\_\_\_

Vigorous exercise (i.e., jogging/running, aerobic dancing, swimming laps): \_\_\_\_\_

4. Do you keep track of how much salt you eat or drink? Yes No

5. Do you keep track of how much fat you eat? Yes No

6. Do you make an effort to reduce how much sugar you eat? Yes No

7. On average, how many alcoholic drinks do you consume **per day**? \_\_\_\_\_

8. On average, how many alcoholic drinks do you consumer **per week**? \_\_\_\_\_

9. On average, how many times **per week** do you eat fish? \_\_\_\_\_

10. On average, how many servings of fruits and vegetables do you eat **per day** (1 serving = ½ cup)? \_\_\_\_\_

11. On average, how many servings of whole grains do you eat **per day** (1 serving = ½ cup whole grain pasta, oatmeal, brown rice or other grain, or 1 slice of bread)?  
\_\_\_\_\_

12. When eating out at restaurants, do you try to choose foods that go along with your doctor's recommendations?

Yes No