An Investigation of Coping and Optimism on Health-Related Outcomes in Cardiac Rehabilitation

Victoria Bangieva

Rosalind Franklin University of Medicine and Science

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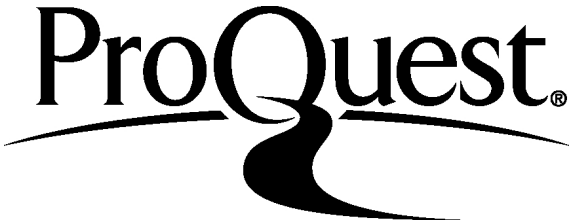

ROSALIND FRANKLIN UNIVERSITY

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REPORT OF FINAL EXAMINATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN CLINICAL PSYCHOLOGY

The Chair of the Examining Committee is asked to report the result to the Office of the Dean without delay

Candidate: Victoria Bangieva **Department**: Psychology

Title of Thesis as Accepted

An Investigation of Coping and Optimism on Health-Related Outcomes in Cardiac Rehabilitation

Examining Committee

Names of Committee Members	*Signatures of Committee Members*
Lawrence C. Perlmuter, Ph.D.	
John E. Calamari, Ph.D.	
Joseph Zander, Ph.D.	
Arthur Cantos, Ph.D.	
Dariush Takhtehchian, M.D.	

The candidate ☒ is ☐ is not recommended for degree.

Date of Examination: April 22, 2016

Signature
Lawrence C. Perlmuter, Ph.D., **Committee Chair**

Dean's Certificate:

Victoria Bangieva has been admitted to the degree of Doctor of Philosophy in Clinical Psychology.

James Carlson, PhD, MS, PA-C
Dean, College of Health Professions

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List of Abbreviations

AIDS – Acquired Immunodeficiency Syndrome

BMI – Body Mass Index

CABG – Coronary Artery Bypass Graft

CAD – Coronary Artery Disease

CESD – Center for Epidemiologic Studies Depression Scale

CHIP - Coping with Health Injuries and Problems

CHF – Chronic Heart Failure

COPE - Coping Orientation to Problems Experienced

DBP – Diastolic Blood Pressure

ECG – Electrocardiography

HIV – Human Immunodeficiency Virus

HS – High School

IRB – Institutional Review Board

IVF - In Vitro Fertilization

LOT - Life Orientation Test

LOT-R - Life Orientation Test Revised

METs – Metabolic Equivalents

MI – Myocardial Infarction

MMSE – Mini Mental Status Exam

NHANES - The National Health and Nutrition Examination Survey

POMS - Profile of Mood States

QLMI - Quality of Life After Myocardial Infarction

SBP – Systolic Blood Pressure

SES - Socioeconomic Status

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Abstract

Cardiovascular disease is the leading cause of death in the United States, resulting in significant economic and clinical burden. Thus, efforts are aimed at preventing, treating, and managing the disease in outpatient settings, such as Cardiac Rehabilitation (Rehab) programs. In this process, the impact of psychosocial factors in disease onset and progression has received attention. Studies established that coping strategies influence quality of life among Cardiac Rehab patients, and that optimism may be involved in this relationship. The present study sought to assess the relationship among four coping strategies (Distraction, Instrumental, Palliative, and Emotion-focused) and physiological outcomes (metabolic equivalent task (MET), blood pressure, and BMI) in Cardiac Rehab patients, and examine how varied levels of optimism impact this relationship through moderation analyses. A total of 120 Cardiac Rehab patients were recruited for this study. Results showed that Palliative coping has a deleterious effect on METs in Cardiac Rehab, while Instrumental coping is associated with improvements in METs. Also, optimism was especially important in the relationship between Palliative coping and weight-related outcomes, where as optimism increased the relationship between Palliative coping and weight gain was weakened. These results are novel in that they extend previously established relationships in coping to physiological outcomes. Also, the moderation model evaluated here provides evidence for the interrelatedness of coping and optimism in Cardiac Rehab patients. Consequently, this study has potentially considerable implications for cardiac patient care that may assist in improving assessment and treatment of cardiovascular disease patients.

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Introduction

Significance of Cardiovascular Disease

Cardiovascular disease refers to a class of diseases affecting the heart and blood vessels. It is the leading cause of death in the United States, accountable for one in every four deaths and affecting nearly five million people (Murphy, Xu, & Kochanek, 2013). Also, it has been estimated that there are approximately 700,000 newly diagnosed cases of cardiovascular disease annually (Mosalpuria et al., 2014). Cardiovascular disease is characterized by multiple hospitalizations, with treatment efforts focusing not only on reacting to cardiac events but also on preventing future relapses. As such, a one-year rate of hospital readmission has been estimated at over 50% and cardiovascular disease is the leading hospital discharge diagnosis with a 157% increase between 1979 and 2002 (Kosilborod et al., 2006).

Although causes of cardiovascular disease vary, atherosclerosis and hypertension are identified as most frequent (Kosilborod et al., 2006). The National Health and Nutrition Examination Survey (NHANES) 2005-2008 reported that about a third of adults residing in the United States have hypertension, with equal prevalence among men and women, and higher rates of hypertension among African Americans. Among the identified hypertensive adults 80% reported to knowing about their condition and only about half of those are adequately managing it (Luke, Dugas, Durazo-Arvizu, Cao, & Cooper, 2011).

Additionally, obesity has been associated with cardiovascular disease by increasing the risk of developing coronary artery disease, stroke, and heart failure, among other conditions. An estimated one third of the United States adults are obese, with a body mass index (BMI) over 30 (Roger et al., 2012). An energy imbalance, or a disproportion in food intake and work output, is often the cause of obesity and factors like low rates of physical exercise promote the risk for

developing the condition. However, according to the NHANES 2003-2006, only 33% of adults in the United States reported to engaging in minimal leisurely physical activity. Additionally, data from the NHANES points to an increase in caloric intake of 22% in women and 10% in men from 1979 to 2004. This increase in caloric consumption has been largely attributed to larger portion sizes, the increased popularity of commercially prepared meals, greater consumption of sugar sweetened beverages, and an increase in carbohydrates, among other dietary changes (Luke et al., 2011). In conjunction with the rise in obesity, the prevalence of diabetes mellitus has also increased significantly in the nation. Findings from the NHANES 2003-2006 reported that one third of the United States population is affected by metabolic syndrome disorders caused by obesity and insulin resistance, which includes an array of significant risk factors for cardiovascular disease (Roger et al., 2012).

Treatment of cardiovascular disease has improved significantly in the last few decades, with developments in drug therapies such as beta-blockers, aldosterone antagonists, and angiotensin-converting enzyme inhibitors. Additionally, innovations in cardiac device therapies, such as implantable defibrillators, resynchronization therapies, and internal monitoring devices, have advanced treatment of the disease (Bueno et al., 2010). As such, due to innovations in modern treatments increasing life expectancy and the aging of the population, cardiovascular disease largely affects the elderly. The incidence of heart disease in people over the age of 65 has been estimated as one in every 100 individuals (Bonow et al., 2005). Additionally, it was estimated that in 2008 about two thirds of all heart disease related deaths occurred in people over the age of 75 (Roger et al., 2012).

Accordingly, cardiovascular disease produces a significant economic burden on the nation's health-care system. Medicare distributes more funds on the treatment of cardiovascular

diseases than on any other health condition, a reported $39.2 billion in 2009 (Mosalpuria et al., 2014). Additionally, the disorder has been estimated to be responsible for nearly 15 million office visits and 6.5 million hospital days annually (Bonow et al., 2005). Further, it has been reported that every year nearly one million individuals experience a new cardiovascular event and half a million encounter a recurrent event (Roger et al., 2012). Consequently, outpatient management of cardiovascular disease has been proposed as the foundation for most efficacious clinical and economic outcomes (Bonow et al., 2005; Mosalpuria et al., 2014).

As the reported findings demonstrate cardiovascular disease is a significant national crisis affecting millions of people daily. Although the mortality rate in individuals with cardiovascular disease remains high, trends in disease related deaths have been on the decline recently, with a reported 2% change from 2009 to 2010 in the death rate (Murphy et al., 2013). Nevertheless, the burden of the disease is overwhelming and substantial efforts are applied towards prevention, treatment, and management of cardiovascular disease.

Cardiac Rehabilitation

Cardiac Rehabilitation (Rehab) programs were initially developed in the 1960s in accordance with the notion that exercise is beneficial in improving cardiovascular status. These early programs were conducted in inpatient settings and were usually implemented following a cardiac event that resulted in a prolonged hospitalization. Following discharge from the hospital, physical reconditioning was encouraged at home. However, concerns about safety and unsupervised exercise led to the development of outpatient Cardiac Rehab programs in the 1970s that focused solely on physical exercise and incorporated electrocardiographic (ECG) monitoring (Womack, 2003).

In the last 60 years knowledge and treatment of cardiovascular disease have improved immensely and so have interventions at Cardiac Rehab programs. At present, Cardiac Rehab is an intervention for individuals who have experienced a cardiac event, are at high risk in the progression of cardiovascular disease, or have undergone a surgical procedure. Providers refer patients to Cardiac Rehab programs, often following a cardiac related hospitalization or a myriad of conditions including a myocardial infarction, heart failure, stable angina, and following invasive surgical procedures such as angioplasty, heart valve repair, and coronary artery bypass grafting (Lewin & Doherty, 2013; Shen, Wachowiak, & Brooks, 2005).

There are several phases of Cardiac Rehab. Phase 1 begins while the individual is inpatient and involves non-strenuous, range of motion exercises, and self-care. The goal of intervention at this phase is to be able to return to activities following discharge from the hospital. Phase 2 is conducted in an outpatient setting and is the phase that receives the most attention in the literature. This phase is structured, medically supervised, and lasts over the course of three months for about 36 one-hour sessions. During each session individuals are encouraged to engage in various exercise routines while they are monitored by an ECG and are provided with educational information. Thus, intervention at this phase is aimed at improving cardiac status, health behaviors, and metabolic markers such as cholesterol levels, blood pressure, and oxygen reuptake. The final phase of Cardiac Rehab, Phase 3, begins after completion of the outpatient Phase 2 Cardiac Rehab program. This phase is a long-term maintenance program during which the individual is no longer monitored by an ECG, but is supervised by medical personal. An individual may remain in this phase for an undefined length of time, dependent upon individual goals and medical recommendations (Womack, 2003). From

this point on discussion of Cardiac Rehab will refer to Phase 2 of the program and is the focus of the present study.

Cardiac Rehab programs are multifaceted, attending to health behaviors as well as psychosocial factors. They aim to improve exercise capacity, provide education on cardiovascular disease, address mental health issues, such as depression and anxiety, and assist in returning to previously engaged activities, such as occupational status (Whitmarsh, Koutantji & Sidell, 2003). In the program, health education focuses on nutrition, disease-related information, and promotion of health supporting behaviors. Additionally, with literature demonstrating a deleterious effect of psychosocial risk factors on the development and progression of cardiovascular disease, Cardiac Rehab program guidelines strongly recommend psychosocial assessments of all participants, as well as access to behavioral interventions when necessary (Shen et al., 2005). Moreover, from an economic perspective, Cardiac Rehab programs are more cost effective than most other procedures or surgical treatments surpassed only by beta-blockers and aspirin (Fidan, Unal, Critchley, & Capewell, 2007).

Outcomes at Cardiac Rehab programs have been extensively studied by various world health organizations, including the American Heart Association and the American College of Cardiology. All entities agreed upon the benefits and improved health outcomes of Cardiac Rehab programs, which include improved functional capacity and quality of life in physical and emotional domains. Further, Cardiac Rehab programs have been reported to improve health behaviors and lower rates of depression and anxiety among attendees (Lewin & Doherty, 2013). A recent Cochrane review of Cardiac Rehab programs, which included 10,794 participants from 47 trials, showed a 26% improvement in relative survival for cardiac related mortality (Heran et al., 2011). Additionally, a meta-analysis of 34 randomized controlled trials by Lawler, Filion and

Eisenberg reported that Cardiac Rehab attendees had a significantly lower rate of re-infarction than non-attendees (2011). Further, better management of metabolic profiles, including cholesterol levels, blood pressure, and body weight, have been reported (Shen et al., 2005).

Benefits in health outcomes experienced by attendees of Cardiac Rehab programs may be attributed to several mechanisms including improvement of endothelial function and inflammatory status, enhanced diastolic function, improved electrical stability of the myocardium, and an overall reduction in cardiovascular disease risk factors (Vanhees et al., 2012). Although, a single factor responsible for the health outcomes observed has not yet been identified, it has been proposed that outcomes are likely attributed to the multifaceted nature of Cardiac Rehab programs that embody a healthcare system defined by a partnership between the participants and providers. In such a manner, the program provides education, resources, and empowers the individual who must fully engage in order to experience health benefits and an improvement in quality of life (Lewin & Doherty, 2013). Therefore, Cardiac Rehab programs have proven to be successful at restoring participants' cardiac status and quality of life.

Psychosocial Factors and Cardiac Health

The change from a biomedical to a biopsychosocial model stressed the importance of a holistic approach in the assessment and treatment of ailments. Addressing psychosocial factors of cardiac health has been proven important in the assessment, management, and treatment among individuals affected and at risk of developing cardiovascular disease (Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005). However, the affected individuals and those involved in their treatment often disregard these aspects contributing to the disease process (Glazer, Emery, Frid, & Banyasz, 2002). The significance of psychosocial factors on cardiac health was first recognized in the 1920s with the study of various aspects that may negatively

impact cardiac health (Srinivas & Reddy, 2013). Since, studies have identified numerous psychological, personality, social, and environmental factors that increase incidence of cardiovascular disease in healthy individuals and complicate treatment and management of the disease in affected individuals. Consequently, the combination of behavioral research methodologies and medical techniques in the study of cardiovascular disease has led to significant breakthroughs in this area (Krantz & McCeney, 2002).

Krantz and McCeney completed an exhaustive literature review of studies assessing the impact of psychosocial factors on coronary artery disease (CAD) and its' clinical manifestations, such as myocardial infarction and sudden cardiac arrest (2002). Coronary artery disease is the most common type of heart disease that characterizes a class of conditions believed to be caused by atherosclerosis, or plaque built up in the arteries (Krantz & McCeney, 2002). Atherosclerosis is a complex and slowly progressive disease involving several inflammatory, biochemical, and hemodynamic processes that are exacerbated by various risk factors (Ross, 1999). Sequelae of the disease process include angina, or chest pain caused by poor blood flow in the vessels of the heart, myocardial infarction, commonly known as heart attack, and cardiac arrest caused by arrhythmias, or interruptions in regular cardiac rhythms. Further, these symptoms and events are aggravated by physical and emotional exertions, such as exercise and stress (Krantz & McCeney, 2002).

In their review, Krantz and McCeney identified several significant psychosocial risk factors in the development and progression of CAD, such as acute and chronic stress, and socioeconomic status (SES) (2002). Stress has been identified as a significant risk factor for CAD due to its' impact on physiological functioning; stress affects endocrine, immunologic, and hemodynamic processes, thereby contributing to the development and progression of the disease.

These processes are indicated by an increase in blood pressure, release of catelcholamines and corticosteroids, increase in heart rate, and coronary vasoconstriction. In individuals with CAD these physiological processes may increase the likelihood of cardiac events (Krantz & Manuck, 1984). For example, studies utilized measures of cardiac function in demonstrating stress as an acute trigger of myocardial ischemia, indicated by an inadequate supply of blood to the heart, which is a clinical manifestation of CAD (Gottdiener et al., 1994). Additionally, chronic stress has been proposed to affect metabolic and endocrine risk factors in the progression of atherosclerosis (McEwen, 1998). Therefore, the direct impact of acute and chronic stress on physiological functioning lends credibility to the biological impact of psychosocial factors on cardiac health.

Socioeconomic status, characterized by an individual's access to economic resources, occupation, education, and social standing, have also been identified as risk factors for cardiac health. Several components of SES have been recognized as potential contributors to the association between low SES and cardiovascular disease, such as nutrition, living conditions, access to medical care, and risky behaviors (Krantz & McCeney, 2002). Although there is a strong association between low SES and cardiovascular disease, these components alone are responsible for only a small portion of that relationship. As an alternative, it is presumed that a higher level of chronic stress experienced among individuals of lower SES is largely responsible for the higher incidence of cardiac ailments in this group (Baum, Garofalo, & Yali, 1999). Therefore, as these findings suggest stress has been established as a prominent risk factor for onset and progression of cardiovascular disease.

In addition to environmental risk factors, emotional states and personality dispositions have been linked to cardiovascular disease. In this regard, anxiety has been identified as a risk

factor of cardiovascular disease and has been linked to poorer health outcomes in cardiovascular disease patients. However, the role of anxiety as an independent risk factor in the etiology of cardiovascular disease is less apparent than other psychological disorders, such as depression. For example, a meta-analysis conducted by Roest, Martens, Denollet, and de Jonge found that anxiety was associated with poorer health outcomes and higher rates of mortality among cardiovascular disease patients (2010). Yet, these relationships were not quite as strong as those between depression and negative cardiovascular outcomes (Roest et al., 2010). Additionally, a review paper analyzed 12 studies assessing the relationship between measurements of anxiety and cardiac events, such as myocardial infarction and cardiac death. The authors reported that five studies found a significant association, three studies found marginally significant associations, and four reported no relationships between levels of anxiety and cardiac related events (Grace, Abbey, Irvine, Shnek, & Stewart, 2004). Thus, as these findings demonstrate, data linking anxiety to cardiovascular disease is mixed. On the other hand, depression has been shown to be a prevalent and consistent cardiovascular disease risk factor.

Depression and Cardiac Health

Depressive disorders vary in severity from mild/subclinical to classic major depression. Depression is characterized by low and depressed mood that lasts for at least two consecutive weeks, and is accompanied by various other somatic symptoms. The lifetime prevalence rate of clinical depression is about 20% higher among individuals with cardiovascular disease than in the general population, which tends to increase especially after a myocardial infarction event (Frasure-Smith, Lesperance, & Talajic, 1995; Schleifer et al., 1989). Therefore, clinical depression is common and pervasive among cardiac patients. Additionally, it has been established that as many as 30% of all cardiovascular disease patients may experience some

symptoms of depression at some point and the likelihood of developing depressive symptoms does not increase with disease severity (Frasure-Smith et la., 1995). Further, depression has been associated with higher rates of morbidity and mortality in individuals with coronary heart disease. Moreover, clinical depression was associated with an increase in cardiac events and hospitalizations. Thus, depression is a serious concern among cardiac patients and has a deleterious impact on disease prognosis (Krantz & McCeney, 2002).

Additionally, a substantial number of studies have demonstrated that depression negatively impacts the disease process and health outcomes in individuals who already have cardiovascular disease. For example, it was found that patients diagnosed with a cardiovascular disease who also met the criteria for major depression were 2.5 times more likely to develop a cardiac-related complication in the next 12 months than non-depressed patients (Carney, Rich, Freedland, & Saini, 1988). Additionally, higher levels of depression were associated with an increased risk of angina, continued smoking habits, and inability to return to work in Cardiac Rehab participants (Ladwig, Breithardt, Budde, & Borggrefe, 1994). Therefore, depressive symptomatology has been identified as a significant psychosocial risk factor in cardiovascular disease patients.

In this regard, studies have demonstrated that depression negatively impacts adherence in the treatment of cardiovascular disease and attendance in Cardiac Rehab programs (Ades, Waldman, McCann, & Weaver, 1992; Glazer et al., 2002). For example, depressed individuals with coronary artery disease were less likely to adhere to an aspirin regimen to reduce their risk of myocardial infarction than non-depressed individuals (Carney, Freedland, Eisen, Rich, & Jaffe, 1995). Also, the impact of depression has been observed on the physiological level. A study conducted with participants of a Cardiac Rehab program found that higher levels of

baseline depression were negatively correlated with increases in aerobic capacity (Glazer et al., 2002). Consequently, due to significant deleterious effects of depression on cardiovascular disease patients, depression is routinely assessed and monitored in Cardiac Rehab programs (Whitmarsh, Koutantji & Sidell, 2003).

Coping

In the realm of psychosocial factors impacting cardiac health, coping styles and responses have received some attention in the last few decades. Coping was initially explored as a construct in the 1960s in conjunction with a growing interest in stress at that time. Lazarus and his colleagues are known as the forefathers of the coping construct and are credited with much of the earlier work in developing and studying this construct. Lazarus proposed that cognitive appraisals and coping responses are integral mediators in the perception of a stressful event and its immediate and long-term outcomes (Lazarus, 1993). Cognitive appraisal is a process by which an individual evaluates a specific life event and its' impact on well-being. In this process several aspects are considered, such as potential harm or benefits involved, and possible reactions to the event are evaluated. Therefore, coping is characterized as an individual's cognitive and behavioral effort in addressing internal and external stressors (Lazarus & Folkman, 1984).

Further, several key features of coping have been identified. Coping is process oriented, which implies that it targets an individuals cognitive and behavioral response to the stressful event and monitors changes in these facets through time. Also, coping is a contextual process and is influenced by independent appraisals of an event along with available resources. Thus, personal, as well as situational factors, impact the coping response. In addition, coping is an individuals' response to manage demands and it may be difficult to ascertain good or bad

universal coping strategies (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). For example, it has been demonstrated that denial and avoidance may be an adaptive means of coping in acute stage of an illness, such as post a myocardial infarction. However, these coping strategies become maladaptive when an individual attempts to adhere to longer-term lifestyle changes and decision-making (Agren, Ryden, Johnsson, & Nilsson-Ehle, 1993; Lazarus, 1993). Thus, coping through avoidance and denial, which is generally perceived as a maladaptive response, may be effective in certain acute situations where a relational meaning of the threat is reappraised (Lazarus, 1993).

According to Lazarus and Folkman's process-oriented coping model there are two types of coping; problem and emotion focused. Problem-focused coping involves exerting effort to address the situation directly in order to diminish the problem. For example, seeking medical advice, expressing interest in others' experiences with a similar situation, and engaging in overt behaviors to reduce the problem, are all means of problem-focused coping. Conversely, emotion-focused coping describes a manner of managing the emotional distress caused by a problem. For example, avoidance is often referred to as an emotion-focused coping technique in which an individual distances himself from the stressor in order to reduce the negative emotions associated with it (Lazarus & Folkman, 1984; Whitmarsh, et al., 2003). Additionally, although coping is characterized into these two distinct categories, some studies have suggested that individuals utilize both means of coping (Lazarus & Folkman, 1984). For example, Folkman and Lazarus found that 96% of college students endorsed both, problem and emotion focused coping, in managing a stressful examination (1985). Consequently, coping is an evolving and a dynamic process, and changes based on individual demands.

Since the constructs initial emergence in the 1960's, several measures of coping strategies have been developed. Given that coping involves a cognitive and a behavioral component, assessments of coping inquire about what the individual is thinking and doing in order to cope with a stressful event (Lazarus, 1993). Further, coping is studied as a trait and as a state concept. The evaluation of coping patterns across various situations and through time represents a personality disposition in coping behaviors. Meanwhile, contextual influences and variations in coping responses emphasize coping as a state concept (Lazarus & Folkman, 1984). As such, coping is conceptualized as intraindividual or interindividual. The intraindividual approach assesses a single individuals' coping across different situations and time points. Conversely, the interindividual approach obtains individuals' responses at one time point as a stable index of coping styles and compares the individuals responses to others in the group (Lazarus & Folkman, 1984; Lazarus, 1993). Therefore, the former is a state measure of coping, while the latter is a trait measure. Lazarus asserted that both concepts are important in the assessment of coping and dependent upon the research question and design (1993).

Coping with Health Problems: Construct and Measurement

As previously discussed coping is a contextual process that is dependent upon situational factors. Thus, as coping with health problems presents a unique situation, special attention has been given to this area of research. The study of coping with health problems first emerged in the 1980s and it was estimated that as much as 40% of all coping research published in the 1990s focused on the study of coping with health problems (Parker, 1996). During this period of advent in the field of coping with health problems, it became widely recognized that measures of general coping styles were not appropriate in assessing coping behaviors in medical populations,

which led to the development of health specific coping measures (Endler, Parker, & Summerfeldt, 1993).

One of these measures, which is widely used in the assessment of coping with health problems, is the Coping with Health Injuries and Problems (CHIP) scale. The CHIP scale is a 32-item self-report questionnaire that assesses how individuals cope with illness. It yields scores in four coping subscales, which are distraction, palliative, instrumental, and emotional preoccupation. These coping subscales were determined based on commonly reported behaviors of individuals coping with health problems (Endler, Parker, & Summerfeldt, 1998).

Further, these subscales capture four distinct coping reactions and conceptually represent the general constructs in the coping literature. The distraction coping subscale refers to the extent to which an individual uses actions and thoughts to avoid managing the illness. In this regard, the individual may cope by focusing on more pleasant activities and engaging in activities that are unrelated to the illness. These coping behaviors are reflective of avoidance coping, which has been widely studied in the general coping literature (Endler et al., 1998). As previously discussed, avoidance coping is effective in acute situations, but is a maladaptive way of coping with chronic problems (Lazarus, 1993).

The palliative coping subscale pertains to various efforts directed at relieving the discomfort of the illness. These coping efforts are aimed at self-care where an individual copes by getting rest, changing the surroundings to improve comfort, and conserving energy (Endler et al., 1998). These responses suggest a more passive approach to coping and have been deemed as maladaptive when dealing with health problems (Corace & Endler, 2003).

The instrumental coping subscale encompasses behaviors that are directly focused on managing the illness. These coping behaviors are action oriented and include such responses as

seeking more information about the illness, following doctor's advice, and taking medication on time (Endler et al., 1998). Such coping behaviors are categorized as active or problem-focused in the general coping literature and have been associated with favorable outcomes in medical populations (Endler et al., 1993).

Lastly, the emotional preoccupation coping subscale describes the extent to which an individual focuses on the emotional consequences of the illness. These coping behaviors include such responses as feeling angry and frustrated, wishing that the illness did not happen, and fantasizing about being healthy (Endler et al., 1998). These types of behaviors indicate self-preoccupation and fantasizing, and have been linked with rumination (Nolen-Hoeksema, Parker, & Larson, 1994). Additionally, emotional preoccupation coping is reflective of the emotion-focused paradigm in the general coping literature and has been established as a maladaptive coping response to illness (Endler et al., 1998).

Overall, distraction, palliative, instrumental, and emotional preoccupation coping measured by the CHIP encompass the various coping techniques utilized by individuals dealing with a health problem or illness. Further, these health specific subscales overlap conceptually with the various coping constructs in the general coping literature and have been validated in medical populations (Endler et al., 1998).

Coping and Cardiac Health

As research has demonstrated coping strategies play a significant role in an individuals' ability to manage negative life events and stressful situations. In response to perceived stressful situations individuals utilize various coping strategies that may be either adaptive or maladaptive to the situation (Lazarus, 1993). In this regard, coping has also been evaluated in cardiovascular disease patients and literature suggests that in this population coping is an evolving and a

dynamic process. Several studies have reported varied health outcomes of coping responses depending on the stage of recovery from a cardiac event. For example, denial/avoidance coping, characterized by minimization of illness severity, has been associated with rapid improvements in cardiac status directly following a cardiac event. However, this coping response has been linked with poor long-term treatment adherence and failure to make health behavior related changes. Thus, denial/avoidance coping may be an adaptive acute response to cardiac illness, but it is not effective towards long-term prognosis (Agren et al., 1993; Havik & Maeland, 1988; Levine et al., 1987).

Consequently, changes in coping strategies in the duration of the Cardiac Rehab program have been explored. Corace and Endler assessed coping at the onset and upon completion of the program using the CHIP scale (2003). In this study the authors were interested in the relationship between coping and health-related quality of life. It was reported that participants utilized instrumental coping, which is a problem-focused active approach, at higher frequency than any other coping response. Further, palliative and emotional preoccupation coping strategies were associated with worse quality of life at both time points. Thus, the authors concluded that passive coping responses (palliative and emotional preoccupation coping) were maladaptive in this group of Cardiac Rehab participants. Additionally, they found that the association between coping and quality of life did not change from the beginning to the end of the program. Therefore, the authors proposed that at this point of rehabilitation from their illness, while enrolled in an outpatient Cardiac Rehab program, coping strategies remain relatively stable in participants. In this manner, it is possible that participants employ trait-like, preferred coping styles while recovering from their illness. From a theoretical perspective coping is expected to change with a change in context. However, the authors attributed the consistency in coping responses to a lack

of contextual changes, particularly in threats and challenges encountered during this phase of rehabilitation (Corace & Endler, 2003).

A similar study that examined coping, among other psychosocial factors, on health-related quality of life reported different findings. Participants were assessed at onset and upon completion of the Cardiac Rehab program. The Coping Orientation to Problems Experienced (COPE) measure was used to assess coping styles, which is a general measure of coping reactions to stressful events. The Quality of Life After Myocardial Infarction (QLMI) scale was employed as an indicator of participants physical functioning and health-related quality of life. The QLMI is a valid and reliable measure that focuses on the physical and mental health functioning of cardiovascular disease patients after a cardiac event. The authors reported that active coping was not predictive of physical functioning in this sample of Cardiac Rehab patients. However, negative coping was associated with more reports of hostility, less social support, and more depressive symptoms. Thus, even though negative coping techniques significantly impacted psychosocial functioning, coping strategies were not predictive of health-related quality of life (Shen, McCreary, & Myers, 2004). The difference in these results from the ones reported by Corace and Endler may be attributed to the coping scale utilized (2003). The COPE scale assesses coping strategies generally when experiencing a stressful event, whereas the CHIP, which was utilized by Corace and Endler, focuses on coping with health-specific stressors and has been validated with cardiac populations (2003). Thus, it is possible that the CHIP is a more sensitive measure of coping in Cardiac Rehab patients in assessing the impact of coping on health-related outcomes.

Coping responses have also been assessed for their impact on attendance at Cardiac Rehab. Whitmarsh and colleagues applied the self-regulation model developed by Leventhal,

Meyer, and Nerenz to explore the relationship between coping and attendance in a Cardiac Rehab program (2003). According to the self-regulation model, an individual copes with an illness through two interrelated processes. One of these processes requires an individual to address the cognitive representation of the illness in order to cope with the threat that the illness represents, while the second involves a coping response to manage the emotions that are associated with the threat of the illness. The self-regulation model has been applied as a theoretical framework to the study of health behaviors and adherence to treatment (Leventhal, Meyer, & Nerenz, 1980). An emotional response following a cardiac event is common and may involve processing of the threat involved. Therefore, the authors proposed that attendance at a Cardiac Rehab program following a cardiac event is a means of adaptive coping to alleviate emotional symptoms and the threat of cardiovascular disease. Thus, attendance was viewed as a construct of an adaptive coping response (Whitmarsh et al., 2003).

The authors assessed coping strategies among attendees and non-attendees at a Cardiac Rehab program. It was postulated that because Cardiac Rehab programs are interventional at the core, individuals that attend treatment are employing a more active and problem-focused coping response to the illness than non-attendees. Participants' coping styles were assessed prior to the initiation of Cardiac Rehab using the COPE measure. Consequently, they found that attendees tended to utilize more problem and emotion focused coping than passive coping responses. Further, non-attendees less frequently utilized adaptive coping responses. As a result, the authors proposed that assessing coping styles prior to the initiation of Cardiac Rehab and intervening with motivational interviewing techniques might improve attendance in Cardiac Rehab (Whitmarsh et al., 2003).

As the presented findings demonstrate coping strategies have a significant impact on emotional functioning, health-related quality of life, and adherence with Cardiac Rehab program requirements (Corace & Endler, 2003; Shen et al., 2004; Whitmarsh et al., 2003). However, more studies examining the impact of coping strategies on physiological outcomes in this group are needed. Additionally, although studies have employed various measures of coping, the COPE and the CHIP mainly, the CHIP may be a better measure of assessing how Cardiac Rehab patients cope with their cardiac illness as it is a health-specific measure of coping and has been validated among Cardiac Rehab patients (Corace & Endler, 2003). The present study aims to fill these gaps in literature by examining the impact of coping on physiological outcomes and utilizing the CHIP in the assessment of coping strategies among Cardiac Rehab patients.

Optimism

Optimism is an attitude that reflects the extent to which an individual holds favorable expectations for their future and pessimism is a tendency indicative of lack of hope or confidence in the future (Carver, Scheier, & Segerstrom, 2010). The notion that optimism may be a trait that influences emotional states and behaviors was first introduced in 1985 by Charles Carver and Michael Scheier and is rooted in the expectancy-value model of motivation and behavior. The expectancy-value model, which was proposed by Martin Fishbein in the 1970s, suggests that behavior is a function of ones experiences and valued goals. As such, individuals behave in a way that will yield the largest combination of expected success and value (Scheier & Carver, 1985; Carver et al., 1993). In line with this theory, Carver and Scheier developed the Life Orientation Test (LOT), which is a self-report scale of dispositional optimism that is still commonly utilized today. The LOT measures optimism as positive versus negative expectations about the future and is explicitly interested in overt actions of individuals. Consequently, Carver

and Scheier expected that optimists would respond to setbacks with continued effort, whereas pessimists would be more likely to concede (Andersson, 1996).

Further, optimism is viewed as a stable and pervasive trait with a reported heritability estimated at 25% (Carver et al., 2010; Plomin et al., 1992). In addition to the genetic component, optimism among adults has been associated with supportive environments during childhood, both in terms of emotional support as well as availability of resources (Heinonen, 2006). Accordingly, test-retest correlational analyses have supported the trait-like nature of optimism, with reported correlations ranging between .58 to .79 of retesting optimism levels after up to three-years (Carver et al., 2010). Although optimism has been shown to remain relatively stable, some evidence points to differences in levels of optimism depending on situational aspects. For example, it has been reported that regardless of baseline optimism levels individuals tend to experience a decrease in optimism temporarily when they encounter a setback and when the outcome is important and beyond the individuals control (Sweeny, Carroll, & Shepperd, 2006). Thus, although optimism is generally a stable personality characteristic, it may vary to some degree contextually.

Since Carver and Scheier first introduced the construct of optimism in behavioral research, numerous studies have demonstrated that optimists and pessimists differ in how they manage hardship and the resources that they choose to utilize (Carver et al., 2010). These individual differences are important to consider as literature demonstrates associations between levels of optimism and risk for psychopathology. For example, a study assessing vulnerabilities for onset and recurrence of depressive disorders reported that optimism was inversely related to hopelessness, which in turn was a risk factor for depressive disorders (Alloy et al., 2006). Conversely, optimism has been correlated with increased resilience when individuals are faced

with adversity (Carver et al., 2010; Finlay-Jones & Brown, 1981). Consequently, as these findings suggest optimism equips individuals with certain cognitive dispositions and circumstantial resources that protect against onset and recurrence of psychological disorders.

Additionally, optimism is believed to directly influence mood when an individual confronts a stressful life event. It has been suggested that when a setback is encountered the range of experienced emotions, which may vary from enthusiasm to depression and anxiety, is dependent on levels of optimism. In this manner, individuals with higher levels of optimism endorse more positive feelings, while those with lower levels of optimism tend to experience more negative affective states, such as anger, depression, and anxiety when faced with a stressful life event (Carver et al., 2010).

Further, the impact of optimism on mood has been studied in various contexts and findings suggest that greater optimism is associated with less mood disturbances in response to various stressors. For example, a study with first year law students assessed the impact of optimism on changes in mood and the immune response. Students were assessed at two time points, two weeks prior to beginning their first semester of law school and again after 8 weeks of starting the semester. The authors found that students with higher levels of optimism had increases in helper T cells and natural killer cell cytotoxicity, which are important immunoregulatory cells involved in mediating infections, after 8 weeks of starting the semester. Also, the authors found that higher levels of optimism predicted better mood as reported on the Profile of Mood States (POMS) scale (Segerstrom, Taylor, Kemehy, & Fahey, 1998). Similar findings were observed in college students beginning their first semester of college. A study reported that greater optimism endorsed at the start of the first semester was associated with smaller increases in stress and depression at the end of the first semester (Brissette, Scheier, &

Carver, 2002). Therefore, as these results suggest optimists exhibit improved psychological well-being and better adjustment to new roles during a life transition.

Similar associations, between optimism and mood, have been observed in health-related contexts. In a study with newly diagnosed breast cancer patients, optimism and emotional distress was measured at several time points starting from at diagnosis and up to 12-month post breast cancer surgery. The authors reported that as optimism increased emotional distress measured by the POMS decreased at each time point while controlling for earlier distress. (Carver et al, 1993). Similar results were observed in head and neck cancer patients. Participants were assessed before treatment and three months after, and it was found that optimists endorsed higher quality of life before and after treatment (Allison, Guichard, & Gilain, 2000). Therefore, variations in dispositional optimism impacted the manner in which these patients adjusted to and coped with the diagnosis. Moreover, higher levels of optimism fostered a sense of resilience among these patients throughout the duration of the year.

Additionally, optimism has been studied in couples undergoing in vitro fertilization (IVF), a procedure that assists couples with fertility issues. Women and their husbands were assessed prior to IVF and two weeks after receiving results of a positive or negative pregnancy test. Participants' were queried about their optimism, distress, the impact of infertility on their lives, and expectancies for success of IVF. Of all of the predictor variables only optimism was associated with distress at two-week follow-up; participants reporting higher levels of optimism had lower distress scores after receiving a negative pregnancy test result (Litt, Tennen, Affleck, & Klock, 1992). Therefore, optimism was a protective factor for couples experiencing setbacks when undergoing IVF treatment.

Optimism and Cardiac Health

Optimism has also been examined in patients who experienced cardiac events. Several studies have investigated the relationship between optimism and subjective well-being among individuals who underwent coronary artery bypass surgery. One study measured levels of optimism and life satisfaction one month before surgery and at 8-month follow-up. Individuals with higher levels of optimism reported fewer symptoms of psychological distress prior to surgery and endorsed higher life satisfaction at 8-month follow-up (Fitzgerald, Tennen, Affleck, & Pransky, 1993). A similar study assessing beneficial aspects of dispositional optimism during recovery from coronary artery bypass surgery found that the impact of optimism on higher quality of life persisted even 5 years after surgery (Scheier et al., 1989). Therefore, as these findings suggest dispositional optimism contributed to more optimistic views about surgery and also generally higher life satisfaction. Further, dispositional optimism persisted even several years after undergoing surgery, which is consistent with findings from other studies endorsing a trait-like nature of optimism (Carver et al., 2010; Plomin et al., 1992).

Further, optimism has been assessed in the treatment of ischemic heart disease, which is a disease characterized by reduced blood supply to the heart caused by hardening of the arteries. In a study of individuals diagnosed with ischemic heart disease dispositional optimism, learned helplessness, self-efficacy, and cognitive distortions were assessed after a one-month discharge from inpatient following a cardiac event, and at one-year follow-up. The authors were interested in the predictive value of these factors on depressive symptoms. They found that optimism was the only variable inversely associated with depressive symptoms at both time points, one-month post discharge and at one-year follow-up. Thus, the authors suggested that optimism is a significant and stable predictor of emotional distress among individuals with cardiovascular disease (Shnek, Irvine, Stewart, & Abbey, 2001).

In addition to associations with higher quality of life and lower emotional distress, the impact of dispositional optimism has been examined on physiological outcomes. A study was conducted with a sample of Cardiac Rehab patients who were administered various psychosocial assessments at initiation of the program, including the LOT, and participants were asked to develop individualized health goals for the program. The participants were closely monitored by medical personal throughout the duration of the program and information regarding their physiological data was gathered upon completion of the program. The authors reported that higher optimism was associated with decreases in body fat, saturated fat, and global coronary risk. Also, participants with higher optimism levels experienced an increase in aerobic capacity after completing Cardiac Rehab. These findings persisted even after negative affect, number of health changes, and magnitude of their goals were controlled for (Shepperd, Maroto, & Pbert, 1996). These results provide further evidence for the significant impact of optimism during recovery among high-risk cardiovascular disease patients.

As these findings suggest people's beliefs and expectations of the future impact their mood, health behaviors, and physiological outcomes when confronted with heart disease or a cardiac event. In this manner, higher levels of dispositional optimism prime individuals to continue to exert effort towards obtaining the desired outcome. For example, some people may attempt to change their health behaviors and adhere with their treatment regimen, whereas others may not have the intrinsic resources to persevere at times of adversity. Thus, optimism is a significant and consistent contributor of emotional and physiological outcomes among cardiovascular disease patients and impacts adjustment to the chronic health condition (Carver et al., 2010).

Coping and Optimism

A meta-analysis conducted by Rasmussen, Scheier, and Greenhouse examined the strength of the relationship between dispositional optimism and health-related outcomes (2009). The authors examined 84 published studies that presented findings on the predictive value of optimism on physical outcomes in various disorders, such as HIV/AIDS, cancer, cardiovascular disease, and diabetes mellitus. The authors reported that all examined studies provide support for the predictive value of optimism on health-related outcomes with an average effect size of 0.17. Given this stable and pervasive finding in the literature, the authors suggested that future studies should focus on assessing related constructs that would assist in teasing apart associations and provide information about the interrelatedness of constructs. Specifically, they call for studies that examine various pathways of the impact of optimism on health-related outcomes (Rasmussen et al., 2009).

A related construct of optimism is coping. As previously discussed, optimists experience less distress than pessimists when experiencing a setback. However, these differences are not only found in their hopeful demeanor, but also in variability in coping. Behavioral tendencies have been associated with the ways in which optimists and pessimists cope. Specifically, individuals who are hopeful and confident in being successful, continue to exert effort towards reaching their goals even when under distress or transition. However, those that are apprehensive about future success attempt to escape hardship, avoid dealing with the issue head-on, and at times lack the motivation to take an active role in problem solving (Carver et al., 2010).

Furthermore, it has been proposed that optimism impacts individuals' appraisals and behaviors, and hence is probable in effecting coping behaviors and adjustment to a newly diagnosed chronic disease. In this tradition, several studies have reported that those with higher optimism scores tend to engage in more problem-focused coping strategies, whereas those with

lower optimism scores utilize more emotion-focused coping strategies (Nes & Segelstrom, 2006).

Accordingly, several studies have examined direct and indirect contributions of optimism and coping on emotional and physical well being in cardiac patients. For example, a study previously discussed that assessed coping strategies among Cardiac Rehab patients, also assessed coping as a mediator in the relationship between optimism and quality of life. They found that emotional preoccupation coping partially mediated the relationship between higher optimism and better quality of life at the initiation of the study. Also, they reported that instrumental coping partially mediated the relationship between higher optimism and better quality of life upon completion of Cardiac Rehab. Thus, coping behaviors utilized by optimistic Cardiac Rehab patients impact their perceived quality of life (Corace & Endler, 2003).

Additionally, another study with Cardiac Rehab patients evaluated mediated involvement of coping and optimism, among other psychosocial variables, in Cardiac Rehab patients. This study reported that optimistic individuals engaged in less maladaptive coping strategies, which resulted in better physical functioning (Shen et al., 2004). Consequently, these findings provide support for the interrelatedness of coping and optimism in Cardiac Rehab patients and possible pathways through which they are involved. However, both of the discussed studies assessed these relationships on subjective, self-reported quality of life outcome measures. Thus, indirect associations of these constructs on objective health-related physiological outcomes have yet to be explored (Corace & Endler, 2003; Shen et al., 2004).

Nevertheless, these findings garner support for optimism as an especially valuable resource for coping with cardiac disease. A meta-analysis of 50 published studies conducted by Nes and Segerstrom examined the impact of dispositional optimism on coping (2006). The

authors reported that optimism was positively correlated with approach and problem-focused coping and negatively correlated with avoidance and emotion-focused coping (Nes & Segerstrom, 2006). These findings are consistent with the theoretical groundwork of dispositional optimism, which suggests that hopeful and positive expectations of the future will result in active involvement and effort rather than withdrawal and evasion (Scheier & Carver, 1985; Nes & Segerstrom, 2006).

Consequently, individuals with higher optimism levels tend to implement more action-oriented, adaptive coping strategies when confronted with a stressful situation. Further, these coping responses observed among optimists lead to better emotional and physiological outcomes, as evidenced in literature (Carver et al., 2010; Nes & Segerstrom, 2006). Studies with Cardiac Rehab patients have also investigated the interrelatedness of these variables. However, these studies focused on subjective, self-report outcome measures and only conducted analyses examining coping as a mediator in the relationship between optimism and health outcomes (Corace & Endler, 2003; Shen et al., 2004). Therefore, research with objective outcomes measures, evaluating different pathways of the relationship between optimism and coping on health-related outcomes is needed in Cardiac Rehab patients.

Summary

Evidently, research has established that psychosocial factors have a significant impact on cardiovascular disease onset and progression. Accordingly, coping strategies influence emotional functioning, health-related quality of life, and adherence with Cardiac Rehab program, as has been demonstrated in literature (Corace & Endler, 2003; Shen et al., 2004; Whitmarsh et al., 2003). Despite these significant findings, additional studies examining the impact of coping

strategies on physiological outcomes in Cardiac Rehab patients are needed in order to better serve this high-risk group.

Studies on the impact of psychosocial variables on Cardiac Rehab outcomes have also included optimism. Independently, optimism has been shown to be a significant predictor of health related outcomes and emotional well being among Cardiac Rehab patients (Carver et al., 2010; Shepperd et al., 1996). However, because optimism impacts individuals' appraisals and behaviors it has been proposed to effect coping behaviors and adjustment to cardiovascular disease. In this regard, coping has been shown to mediate the relationship between optimism and quality of life, emotional well-being, and distress (Carver et al., 2010; Corace & Endler, 2003; Shen et al., 2004; Nes & Segerstrom, 2006).

The present study aims to expand on these findings with Cardiac Rehab patients. The goal of this study is twofold. First, the study seeks to assess the impact of coping strategies on health-related physiological outcomes among participants in a Cardiac Rehab program. Second, the impact of varied levels of optimism will be assessed in this relationship through moderation analyses. Further, given the high prevalence of depression in this group, which may be correlated with the psychosocial constructs of interest, depression will be controlled for in the analyses. Consequently, this study has several theoretical and clinical implications. Improving our knowledge in this area will enhance our understanding of the interrelatedness of the optimism and coping constructs. Additionally, these findings may better equip providers of Cardiac Rehab programs to screen for and address coping factors that may be adversely contributing to patients' outcomes in the program. Knowledge in this realm would allow providers and staff to intervene with coping skills training and motivational interviewing towards producing favorable health outcomes. Also, this study will likely elucidate psychosocial protective factors that are associated

with improved health outcomes in Cardiac Rehab patients. Overall, this study has potentially considerable implications for cardiac patient care and may reveal some modifiable psychosocial factors towards improving assessment and treatment of cardiovascular disease patients.

Hypotheses and Specific Aims

Specific Aim I. Determine the impact of four coping strategies, as measured by the CHIP, on health outcomes following completion of Cardiac Rehab.

Hypothesis I. Distraction coping, indicative of avoidant coping behaviors, will be associated with poorer health outcomes.

Hypothesis II. Palliative coping, indicative of passive coping behaviors, will be associated with poorer health outcomes.

Hypothesis III. Instrumental coping, indicative of problem-focused coping behaviors, will be associated with improvements in health outcomes.

Hypothesis IV. Emotional preoccupation coping, indicative of emotion-focused coping behaviors, will be associated with poorer health outcomes.

Specific Aim II. Assess how varied levels of optimism impact the relationship between coping and health outcomes through moderation analyses.

Hypothesis V. The interaction of optimism and distraction coping will be significant in predicting health outcomes; with lower levels of optimism moderating the relationship between distraction coping and health outcomes.

Hypothesis VI. The interaction of optimism and palliative coping will be significant in predicting health outcomes; with lower levels of optimism moderating the relationship between palliative coping and health outcomes.

Hypothesis VII. The interaction of optimism and instrumental coping will be significant in predicting health outcomes; with higher levels of optimism moderating the relationship between instrumental coping and health outcomes.

Hypothesis VIII. The interaction of optimism and emotional preoccupation coping will be significant in predicting health outcomes; with lower levels of optimism moderating the relationship between emotional preoccupation coping and health outcomes.

Methods

Participants

Study participants were recruited from the Phase II Cardiac Rehabilitation program at Advocate Lutheran General Hospital in Park Ridge, IL. Individuals are referred to Phase II of Cardiac Rehab by their physicians following discharge from an inpatient stay, at which time participants are engaged in Phase I of Cardiac Rehab. During Phase II, individuals are engaged in outpatient treatment that involves physical exercise aimed at improving their cardiac status and educational sessions intended to expand their knowledge about the disease, nutrition, and psychosocial risk factors, among other topics. The outpatient program involves 36 sessions, where participants attend three weekly sessions over a three-month period. During their involvement in the program participants are supervised and monitored by medical staff. Participants were considered eligible for the study if they were English-speaking adults (18 years of age or older) and have been medically cleared by their physicians to attend the Cardiac Rehab program at Advocate Lutheran General Hospital. Exclusionary criteria for participation included current alcohol or drug abuse/dependence, cognitive impairment (Mini Mental Status Exam score of 24 or less), mental retardation, diagnosis of a psychotic disorder, or an additional

medical diagnosis that was considered primary to patient's cardiovascular disease, such as cancer.

Demographic information on study participants is presented in Table 1. The sample consisted of 120 (87 males, 33 females) participants with an average age of 64.38 years old. Participants were predominantly Caucasian (n=95), but other ethnicities represented in the sample included Asian/Pacific Islander, Hispanic, and African American. Further, about half of the participants obtained higher educational degrees with the average years of education at 14.33. Additionally, most of the participants were married (n=82) and living either with their partner or family (n=97). Due to the older age of study participants, about half of the participants were retired at the time of data collection. Also, almost all participants identified with a religious denomination (n=115) (Table 1). Overall, these participant demographics are representative of the residents of the northwest Chicago suburbs that make up the patient population of Advocate Lutheran General Hospital (Hendrick, 2004).

Demographic health information is presented in Table 2. As indicated in literature, participants were referred to the program for a variety of conditions that required cardiac rehabilitation (Lewin & Doherty, 2013). Although Cardiac Rehab typically lasts 36 sessions, participants of this study attended the program for an average 33.02 sessions and 107 participants graduated the program, whereas 12 participants dropped out of Cardiac Rehab completing less than 24 sessions, and one participant passed away. Lastly, based on the average BMI, participants of this study were overweight and borderline obese (M=29.17, SD=6.67) (Table 2). Overall, these health demographics are representative of Cardiac Rehab patients broadly (Lewin & Doherty, 2013; Shen, Wachowiak, & Brooks, 2005).

Measures

Demographic Questionnaire

A self-report questionnaire was used in obtaining the following demographic information: age, gender, ethnicity, educational status, occupational status, marital status, living arrangements, religious affiliation, and current and past alcohol and drug use.

Mini Mental Status Exam (MMSE)

The Mini Mental Status Exam (MMSE) was used to determine cognitive impairment among participants in Cardiac Rehab. The MMSE is a screening instrument used to assess cognitive impairment and dementia. It is a commonly administered measure in clinical settings due to its' ease in application and indication of cognitive impairments. The test was originally developed in 1975 and minor modifications have been made to subsequent publications. The MMSE is a brief 30-point questionnaire and requires about 10 minutes to administer. It assesses functioning in orientation, memory, language, motor skills, comprehension, and arithmetic. Scores on the MMSE range from 0 to 30 with higher scores indicative of better cognitive functioning. Scores of 25 and greater represent intact cognitive functioning. Scores below 25 indicate mild (21-24), moderate (10-20), and severe (<9) cognitive impairment (Folstein, Folstein, & McHugh, 1975). The MMSE has been reported to have good discriminant validity among the questions (Lopez, Charter, Mostafavi, Nibut, & Smith, 2005). The MMSE has adequate construct validity, criterion validity, and test-retest reliability, and has been deemed appropriate as a brief screening measure in quantifying cognitive impairment (Tombaugh & McIntyre, 1992).

Center for Epidemiological Studies Depression (CESD) Scale

The CESD was used to assess for depression among Cardiac Rehab participants. The CESD is self-report questionnaire that measures symptoms of depression experienced in the last

week. The measure contains 20 items that map onto 6 scales reflective of the major dimensions of depressive disorder: depressed mood, feelings of guilt and worthlessness, feelings of hopelessness and helplessness, psychomotor retardation, sleep disturbance, and changes in appetite. The scale items were selected from previously validated measures of depression, such as the Beck Depression Inventory, the Zung Self-Rating Depression Scale, and the Raskin Scale. The CESD was developed for use in epidemiological research of depression in the general population. The CESD requires respondents to indicate frequency of every symptom-specific item scale. The respondents have four choices ranging from "rarely or none of the time" to "most or all of the time". The CESD is then scored accordingly with a score of 0-3 for each item. Scores on the CESD range from 0 to 60, with higher scores indicative of more depressive symptomatology. Scores of 14 or less indicate no clinically significant symptoms of depression. However, scores between 15 and 21 are indicative of mild depressive symptoms, while scores 21 and over are identified as symptoms of major depression (Radloff, 1977).

The CESD is a commonly utilized measure and has adequate validity and reliability. Internal consistency for the overall scale was reported at Cronbachs alpha of 0.88. Also, internal consistency for the four factors ranged from 0.67 to 0.88 (Thombs, Hudson, Schleir, Taillefer, & Baron, 2008). Test-retest reliability has been reported as adequate, ranging from 0.45 to 0.70 (Radloff, 1977).

Coping with Health Injuries and Problems (CHIP) Scale

The CHIP was used to assess coping among Cardiac Rehab respondents. The CHIP is a self-report measure that assesses an individuals coping with their illness. It is a multi-dimensional coping measure containing 32 items that inquire about various coping behaviors. The respondent answers by selecting a number from one to five, in a Likert scale fashion, with

one indicating "not at all" and five indicating "very much". The items map on to four subscales, with 8 items of the measure pertaining to each subscale (Endler & Parker, 2000).

As previously mentioned, the four subscales are: distraction, palliative, instrumental, and emotional preoccupation. The distraction coping subscale refers to the extent to which the respondent uses actions and thoughts to avoid preoccupation with the illness, which is reflective of avoidant coping behaviors. The palliative coping subscale pertains to various self-directed efforts to alleviate the unpleasantness of the illness, suggesting a more passive approach to coping. The instrumental coping subscale refers to engaging in various task-oriented behaviors in order to deal with the illness directly. Such coping behaviors are categorized as active or problem-focused. Lastly, the emotional preoccupation coping subscale describes the extent to which an individual focuses on the emotional consequences of the illness and is indicative of self-preoccupation and fantasizing, which is reflective of the emotion-focused paradigm (Endler, Parker & Summerfeldt, 1998). Standardized T-scores are determined for each subscale, with higher scores indicative of higher levels of the coping behavior and lower scores suggestive of lower levels of the coping behavior. In this manner, the authors suggest the following guidelines for interpreting the subscale T-scores: scores that are 44 and lower are below average, scores that are between 45 and 55 are average, and scores that are 56 and over are above average (Endler & Parker, 2000).

The CHIP has good reliability of the four subscales, which has been reported to be between .63 to .84 among men and women (Endler et al., 1998; Hadjistavropoulos, Asmundson & Norton, 1999). Also, the CHIP has good construct validity among patients with chronic health conditions (Endler et al., 1998). Lastly, it has been utilized in studies with Cardiac Rehab patients and has been validated in this group (Corace & Endler, 2003).

Life Orientation Test Revised (LOT-R) Scale

The LOT-R was used to assess optimism among Cardiac Rehab patients. The LOT-R is a successor of the LOT, which was developed to assess an individual's dispositional optimism. The correlation between the LOT and the LOT-R has been reported at 0.95 (Scheier, Carver, & Bridges, 1994). The LOT-R is a brief measure that is easy to use and administer, and it is commonly utilized in behavioral and clinical studies. The LOT-R consists of 10 items and the respondent is asked to provide an answer ranging from 0-4 in a Likert scale fashion with 0 indicating "strongly disagree" and 4 indicating "strongly agree". There are no cut-offs in scores, it is used as a continues dimension of variability. Scores range from 0 to 24, and higher scores indicate a more optimistic outlook. The LOT-R has adequate internal consistency, Chronbach alpha ranging from 0.69 to 0.72. The scale also has good test-retest reliability, reported at 0.72, and strong criterion validity as it was significantly negatively correlated with hopelessness and depression (Hirsch, Britton, & Conner, 2010).

Physiological Outcomes

Health-related physiological markers serve as outcomes in this study. From the time of enrollment in Cardiac Rehab to completion of the program several physiological markers are expected to change. Previous studies with Cardiac Rehab patients have reported changes in metabolic profiles including cholesterol levels, blood pressure, and body weight (Shen et al., 2005). The changes have been attributed to engagement in the program, whereby physical exercise and implemented health behavior changes improve various biological functions such as endothelial function and inflammatory status, improved electrical stability of the myocardium, and an overall improvement in cardiac status (Vanhees et al., 2012). Therefore, physiological

markers of interest in this study consist of metabolic equivalents (METs), blood pressure (systolic and diastolic), and body mass index (BMI).

The MET is a physiological measure of energy expenditure during physical activity and is based on the amount of oxygen consumption. A single MET is defined as the amount of oxygen an individual consumes per unit of body weight during one minute at rest. Further, one MET is defined as the ratio of metabolic rate (rate of energy consumption) during a specific physical activity (e.g. walking) to a reference rate set by convention to 3.5 ml $O_2 \cdot kg^{-1} \cdot min^{-1}$ or 1 kilocalorie (kcal) per kg of body weight per hour. METs range in value from 0.9 to 23 depending on the activity. In this manner, light intensity physical activities are identified by less than three METs, moderate intensity activities range from three to six METs, and vigorous activity as more than six METs (Brooks, Fahey, & White, 1995). Also, concurrent validity of MET values, using both an exercise machine and a portable metabolic unit, ranged from .85 to .97 and test-retest reliability of MET values has been established to range from .85 to .91 (Mendelsohn, Connelly, Overend, & Petrella, 2008). Participant METs were measured by an ECG during their sessions and recorded by study personal following their completion of Cardiac Rehab. Given that higher METs are indicative of an individuals' ability to perform more physically demanding tasks, METs were expected to increase from the start of Cardiac Rehab to completion of the program.

Additionally, blood pressure was an outcome of interest. Participants' blood pressure (systolic and diastolic) was measured using a digital blood pressure monitor at the start of each session. Systolic and diastolic measures were used as independent outcome variables in this study. The American Heart Association defines normal blood pressure as less than 120 mmHg systolic and less than 80 mmHg diastolic. Further, individuals with cardiovascular disease typically have elevated blood pressure, which is a common risk factor for cardiovascular disease

development and progression (Vasan et al., 2001). Thus, blood pressure is expected to decrease from the start of Cardiac Rehab to completion, as patients work on increasing their exercise capacity and engage in improving various health behaviors aimed at improving their cardiac status.

Lastly, participants' weight and height were recorded at the start of each session. These values were used to calculate participants' BMI, which is a measure of body fat based on weight and height. The BMI is used to classify people into categories such as, underweight (BMI < 18.5), normal weight (BMI: 18.5 – 25), overweight (BMI: 25 – 30), and obese (BMI > 30). Although BMI has some limitations, it was a preferred outcome measure in this study as it is a more inclusive measure than weight alone. Further, in Cardiac Rehab participants engage in exercise and work on improving their diet, which would result in weight loss and ultimately enhance their cardiac status. Therefore, participants are expected to lose weight upon completion of Cardiac Rehab, which would result in a decrease in BMI.

Data regarding these metabolic markers was collected at initiation of Cardiac Rehab and upon completion of the program from participants' medical charts. The absolute differences were calculated by subtracting initial values from final values to create outcome variables of interest, which were utilized in the final analyses.

Procedure

A total of 154 patients of Cardiac Rehab were approached regarding study participation from the Cardiac Rehabilitation program at Lutheran General Hospital in Park Ridge, IL. All individuals enrolled into the program were considered for participation in the study. Participants were approached during their session at Cardiac Rehab and a brief introduction of the study was provided. Next, participants were administered an informed consent document by a graduate-

level student explaining the study procedures and obtaining access to participants' medical records. The Institutional Review Boards (IRBs) of Rosalind Franklin University of Medicine and Science and Advocate Lutheran General Hospital approved the informed consent documents. Ultimately, 120 participants were consented for the study and 34 of the patients were not consented, which was due either to their disinterest in participating in the study or they were not English-speaking.

Following the consent process and participants' agreement to be enrolled in the study, screening procedures for the exclusionary criteria were conducted. Participants were administered a MMSE to assess cognitive functioning and chart review was completed to identify any factors that meet exclusionary criteria. Participants were told of their eligibility to be included in the study and were reminded of their ability to withdraw from the study at any time without penalty or loss of benefits. Upon completion of the screening measures, eligible participants were administered a demographic questionnaire, the CESD scale, the CHIP measure, and the LOT-R scale. All administered measures were at an 8th grade reading level or lower and provided information regarding the predictor variables that were of interest in the study. Also, physiological data including METs, blood pressure, height, and body weight were collected from participants' medical records at two time points (at the initiation and completion of Cardiac Rehab) and were used to assess participant outcomes in relation to the predictor variables.

Statistical Procedures

Power Analysis

A power analysis was conducted to determine the likelihood of producing statistically significant results if relationships do in fact exist among the variables (Tabachnick & Fidell, 2007). Previously published studies were referenced for values of effect size, alpha level, and

power level. Based on similar research, assessing coping styles in participants at Cardiac Rehab programs, an effect size of .17 has been sufficient at demonstrating significant relationships between coping styles and quality of life, as well as attendance in the program among participants of Cardiac Rehab. These previous studies conducted regression and mediation model analyses to test their hypotheses (Corace & Endler, 2003; Whimarsh et al., 2003). The present study sought to examine the relationship between coping and physiological outcomes through similar analyses, utilizing regression and moderation models. Therefore, the reported effect size of .17 was deemed as an appropriate comparable measure. With the given effect size of .17, desired alpha of .05, and desired power of .80, a sample of 106 was needed for this study. However, 120 participants were enrolled in the study and all participants were included in the analyses.

Data Screening

Completed questionnaires were scored and then double-scored by three trained graduate students. Collected data was entered into a study database and checked by three independent observers. Data was screened prior to conducting analyses to ensure accuracy of results and meeting of assumptions for statistical tests. Data screening and treatment of missing data was conducted according to Tabachnik and Fidell (2007). Data was screened for missing values, outliers, and normality using frequency histograms, descriptive statistics, and scatter plots. There were no cases of missing values in this data set. Outliers were defined as having a score of three standard deviations or more from the mean and were transformed using the Winsorizing method, which involves setting the outlier to the next highest/lowest non-outlier value to reduce the impact of extreme scores (Tabachnik & Fidell, 2007). A total of 11 predictor and outcome values were transformed using this method.

In order to identify issues of multicollinearity among the predictor variables, zero-order correlations were conducted. Zero-order correlations are presented in Table 3. Correlations among LOT-R scores, CESD scores, and scores on the four CHIP subscales were examined to assess for multicollinearity ($r \geq .85$) and singularity ($r \geq .95$). Review of the zero-order correlations revealed no evidence of multicollinearity (Table 3).

Multiple Regression Analyses

Stepwise linear multiple regression analyses were conducted to examine the relationships between the four coping subscales and changes in physiological outcomes. In the first step, CESD scores were entered as a covariate to control for the effect of depression. T-scores for the coping subscales (distraction, palliative, instrumental, and emotional preoccupation) were entered in the next step, and the changes in physiological values (Time 2 minus Time 1) were entered as outcome variables.

PROCESS Tool - Moderation

Moderator model analyses were used to examine how levels of optimism impact the relationship between coping strategies and physiological outcomes. The moderator variable, optimism, was hypothesized to impact the strength of the relationship between coping and physiological outcomes. Moderator model analyses were run using the PROCESS tool, which is a multifaceted modeling tool that integrates the functions of most statistical tools utilized for moderation analysis, as well as mediation (Hayes, 2012). PROCESS is a computational procedure that is available in SPSS as a custom dialog box, which was developed by Andrew Hayes (2012). The benefit of utilizing this computational tool is that it conducts moderation utilizing a regression routine, while also providing simple slopes analyses in a single examination that integrates all of the necessary steps. Using the PROCESS custom dialog box in

SPSS moderation model analyses were carried out by entering the covariate (CESD depression scores), predictor (CHIP subscale T-scores), moderator (LOT-R optimism scores), and outcome variables (the four physiological outcome variables of interest) into the drop-down boxes. Prior to conducting the analyses, PROCESS centered the predictor (CHIP subscale T-scores) and moderator variables (LOT-R optimism scores), by subtracting the mean from each score. Also, interaction terms of the four coping subscales and optimism were created, by multiplying the centered coping subscale variables by the centered moderator (optimism) variable. These moderator model analyses were repeated for the four CHIP coping subscales and the four health outcome variables of interest. The moderator model hypotheses were supported if the interactions between coping and optimism were significant. If the moderator term was significant, simple slopes analyses followed (Baron & Kenny, 1986). As part of the PROCESS tool, simple slopes analyses were carried out by analyzing the impact of 'high' and 'low' levels of optimism on the relationship between coping and physiological outcomes. The 'high' and 'low' levels of optimism were determined by one standard deviation above and below the mean value of LOT-R scores. The slopes were analyzed based on their significance, and the value and direction of the *b*, in order to determine if the relationship between coping and physiological outcomes varies at different levels of optimism. Additionally, these effects were analyzed by generating simple slopes graphs that plotted the slopes of the relationship between coping and physiological outcomes at 'high', 'mean', and 'low' levels of optimism (Hayes, 2012).

Results

Relationships among predictor and outcome variables

First, means, ranges, and standard deviations of predictor variables were analyzed. As shown in Table 4 participants of this study were generally optimistic (M=16.25, SD=3.83) based

on the possible range of LOT-R scores between 0 and 24. Also, they did not present with clinically significant symptoms of depression (M=10.20, SD=8.79) based on CESD interpretation criteria, where a score below 14 is indicative of no clinically significant symptoms of depression. T-scores on the CHIP were elevated in the Distraction (M=57.28, SD=10.68), Instrumental (M=57.36, SD=12.15), and Emotional Preoccupation (M=52.13, SD=14.62) coping subscales (Table 4). Also, it was observed that participants were typically elevated on more than one CHIP subscale, which indicates that an individual may utilize various coping techniques and are not limited to a single coping style.

Outcome variables were also analyzed for means, ranges, standard deviations, and significant change from Time 1 to Time 2 (Table 5). As Table 5 demonstrates, on average participants improved on all physiological markers including METs, BMI, SBP, and DBP from Time 1 to Time 2; METs increased, while BMI, SBP, and DBP decreased. However, t-test analyses revealed that the change from time 1 to time 2 was only statistically significant for the change in METs (t(119)=-12.69, p<.001) and DBP (t(119)=2.57, p=.01) (Table 5).

Next, variables for the physiological outcome difference scores were created by subtracting scores at Time 1 from Time 2. Zero-order correlation analyses were performed to assess the degree of association among predictor and outcome variables. As demonstrated in Table 6, CHIP Palliative and Instrumental coping subscale T-scores were significantly correlated with the change in METs. Higher CHIP Palliative coping subscale T-scores were associated with smaller changes in METs (r=-.24, p=.01). However, higher CHIP Instrumental coping subscale T-scores were associated with greater changes in METs (r=.22, p=.02). Therefore, these results suggest that active and passive coping styles have opposite associations with the change in

METs; whereas active coping is predictive of improvements in METs, passive coping is predictive of decreases in METs.

The impact of the four CHIP coping styles on health outcomes

Hypothesis I. *Distraction coping, indicative of avoidant coping behaviors, will be associated with poorer health outcomes*.

Hypothesis one posited that avoidant coping, captured by the CHIP Distraction coping subscale, will be predictive of poorer health outcomes. Hierarchical multiple regression analyses controlling for depression, which was measured by the CESD, were conducted to evaluate this hypothesis with Distraction coping subscale T-score as the predictor. The outcomes of interest were the change scores in the four physiological variables: METs, BMI, SBP, and DBP. As shown in Table 7, controlling for depression, Distraction coping was not predictive of changes in any of the four physiological outcomes, as no significant relationships were identified. Thus, the proposed hypothesis, that distraction coping behaviors would be associated with poorer health outcomes, was not confirmed

Hypothesis II. *Palliative coping, indicative of passive coping behaviors, will be associated with poorer health outcomes*.

Hypothesis two proposed that passive coping behaviors will be predictive of poorer health outcomes. Hierarchical multiple regression analyses controlling for depression, which was measured by the CESD, were conducted to evaluate this hypothesis. The outcomes of interest were changes in the four physiological variables: METs, BMI, SBP, and DBP. As shown in Table 8, when controlling for depression, a relationship between scores on the CHIP Palliative coping subscale and the change in METs was observed ($\beta = -.21$, $t(117) = -2.07$, $p = .04$), such that higher T-scores on the CHIP Palliative coping subscale were predictive of decreases in

METs from Time 1 to Time 2. Also, the CHIP Palliative coping subscale T-scores accounted for a significant proportion of the variance in the change in METs ($\Delta R^2 = .04$, F (1, 117) = 3.95, p = .03) (Table 8). Therefore, these results support the hypothesis that passive coping behaviors would be associated with poorer health outcomes, as METs are typically expected to increase from the start to completion of Cardiac Rehab. Also, this finding confirms the correlational finding between Palliative coping and changes in METs previously discussed.

Hypothesis III. *Instrumental coping, indicative of problem-focused coping behaviors, will be associated with improvements in health outcomes.*

Hypothesis three posited that problem-focused behaviors would be predictive of improvements in health outcomes. Hierarchical multiple regression analyses controlling for depression, which was measured by the CESD, were conducted to evaluate this hypothesis. The outcomes of interest were changes in the four physiological variables: METs, BMI, SBP, and DBP. As shown in Table 9, when controlling for depression, a relationship between T-scores on the CHIP Instrumental coping subscale and the change in METs was observed ($\beta = .21$, $t(117) = 2.35$, $p = .02$), such that higher T-scores on the CHIP Instrumental coping subscale were predictive of greater changes in METs from Time 1 to Time 2. Also, the CHIP Instrumental coping subscale T-scores accounted for a significant proportion of the variance in the change in METs ($\Delta R^2 = .04$, F (1, 117) = 4.22, p = .02) (Table 9). This finding supports the proposed hypothesis that problem-focused coping behaviors would be associated with improvements in health outcomes and confirms the correlational finding between Instrumental coping and changes in METs previously discussed.

Hypothesis IV. *Emotional preoccupation coping, indicative of emotion-focused coping behaviors, will be associated with poorer health outcomes.*

Hypothesis four proposed that emotion-focused behaviors would be predictive of poorer health outcomes. Hierarchical multiple regression analyses controlling for depression, which was measured by the CESD, were conducted to evaluate this hypothesis. The outcomes of interest were changes in the four physiological variables: METs, BMI, SBP, and DBP. As shown in Table 10, when controlling for depression, a relationship between scores on the CHIP Emotional Preoccupation coping subscale and the change in BMI was observed ($\beta = .27$, $t(117) = 2.63$, $p = .01$). These results suggest that emotion-focused coping is predictive of an increase in BMI from Time 1 to Time 2, which indicates that participants who reported more emotion-focused coping behaviors gained weight during enrollment in Cardiac Rehab. Also, the CHIP Emotional Preoccupation coping subscale T-scores accounted for a significant proportion of the variance in the change in BMI ($\Delta R^2 = .06$, F (1, 117) = 3.87, $p = .01$) (Table 10). Overall, these findings support the proposed hypothesis, that emotion-focused coping would be associated with poorer health outcomes, and appears to be especially predictive of weight-related outcomes. Possible explanations of these findings are explored in the discussion section.

Optimism as a moderator in the relationship between coping and health outcomes

Hypothesis V. *The interaction of optimism and distraction coping will be significant in predicting health outcomes; with lower levels of optimism moderating the relationship between distraction coping and health outcomes*.

Hypothesis five posited that low levels of optimism would moderate the relationship between Distraction coping T-scores and health outcomes. Utilizing the PROCESS computational tool, regression analyses were conducted to test this moderator model. However, significant interaction effects were not found and this hypothesis was not supported (Table 11).

Therefore, optimism did not moderate the relationship between distraction coping and physiological outcomes.

Hypothesis VI. *The interaction of optimism and palliative coping will be significant in predicting health outcomes; with lower levels of optimism moderating the relationship between palliative coping and health outcomes*.

Hypothesis six posited that low levels of optimism would moderate the relationship between Palliative coping T-scores and health outcomes. Utilizing the PROCESS computational tool, regression analyses were conducted to test this moderator model. As shown in Table 12, this hypothesis was supported and there was a significant interaction effect on BMI (b = -.00, t = -2.14, $p < .05$), which indicates that optimism moderates the relationship between passive coping and the change in BMI. Additionally, the interaction of optimism by palliative coping accounted for a significant proportion of the variance in the change in BMI (ΔR^2 = .04, F (1, 115) = 4.60, p = .03) (Table 12).

Simple slopes analyses followed to determine how the relationship between palliative coping and BMI varied at different levels of optimism. At a low level (one standard deviation below the mean) of optimism there was a significant positive relationship between CHIP Palliative coping T-scores and the change in BMI (b = .03, t = 2.34, p = .02). At the mean level of optimism, there was a non-significant positive relationship between CHIP Palliative coping T-scores and the change in BMI (b = .02, t = 1.66, p = .10). At a high level (one standard deviation above the mean) of optimism there was a non-significant negative relationship between CHIP Palliative coping T-scores and the difference in BMI (b = .00, t = -.00, p = .99). These results suggest that the relationship between palliative coping and the change in BMI among Cardiac Rehab participants only emerges in participants with low levels of optimism, such that at low

levels of optimism passive coping behaviors are predictive of increases in BMI, marked by weight gain. Further, as optimism increases, the effect on the relationship between passive coping and the change in BMI is weakened. Therefore, low optimism appears to be a risk factor for individuals engaging in passive coping behaviors. Figure 1 demonstrates these results in the form of a graph.

Hypothesis VII. *The interaction of optimism and instrumental coping will be significant in predicting health outcomes; with higher levels of optimism moderating the relationship between instrumental coping and health outcomes*.

Hypothesis seven posited that higher levels of optimism would moderate the relationship between Instrumental coping T-scores and health outcomes. Utilizing the PROCESS computational tool, regression analyses were conducted to test this moderator model. However, a significant interaction effect was not found and this hypothesis was not supported (Table 13).

Hypothesis VIII. *The interaction of optimism and emotional preoccupation coping will be significant in predicting health outcomes; with lower levels of optimism moderating the relationship between emotional preoccupation coping and health outcomes*.

Hypothesis eight posited that low levels of optimism would moderate the relationship between Emotional Preoccupation coping T-scores and health outcomes. Utilizing the PROCESS computational tool, regression analyses were conducted to test this moderator model analysis. However, a significant interaction effect was not found and this hypothesis was not supported (Table 14).

Discussion

The present study aimed to expand on current literature on psychosocial factors in Cardiac Rehab patients by examining the impact of coping and optimism on physiological

outcomes. The goal of this study was twofold. First, the study sought to assess the impact of four distinct coping strategies on health-related physiological outcomes among Cardiac Rehab patients. Second, the impact of varying levels of optimism was assessed in this relationship through moderation analyses.

Previous studies established that psychosocial factors have a significant impact on cardiovascular disease onset and progression. In this regard, several studies found that coping strategies influence emotional functioning, health-related quality of life, and adherence in patients of Cardiac Rehab programs (Corace & Endler, 2003; Shen et al., 2004; Whitmarsh et al., 2003). However, data on the impact of coping strategies on physiological outcomes in Cardiac Rehab patients has not yet been explored, and the present study sought to fill that gap in literature in order to better serve this high-risk group.

Additionally, past research with Cardiac Rehab patients has also explored the impact of optimism on patient outcomes. Independently, optimism has been shown to be a significant predictor of health related outcomes and emotional well being among Cardiac Rehab patients (Carver et al., 2010; Shepperd et al., 1996). Additionally, because optimism impacts individuals' appraisals and behaviors it has been proposed to effect coping behaviors and adjustment to cardiovascular disease (Carver et al., 2010; Corace & Endler, 2003; Shen et al., 2004; Nes & Segerstrom, 2006). In this regard, the present study was interested in examining how varying levels of optimism impact the relationship between coping and physiological outcomes through moderation analyses.

The present study included 120 participants that were recruited from the Cardiac Rehab program at Advocate Lutheran General Hospital. Based on participant information, reasons for

referral, and health status, participants of the present study were representative of Cardiac Rehab patients broadly (Lewin & Doherty, 2013; Shen, Wachowiak, & Brooks, 2005).

Initially, coping styles of the study participants were explored and it was revealed that on average participants were elevated on almost all of the four CHIP subscales, which indicates that they may have utilized various coping techniques and were not limited to a single coping style. This finding is in line with the theoretical definition of the coping construct and is supported by other studies (Folkman & Lazarus, 1985; Lazarus & Folkman, 1984). Addition psychological variables, including optimism and depression, were analyzed among the participants. Based on interpretive criteria, participants of the present study were generally optimistic as the mean score for the LOT-R optimism scale was elevated (Hirsch et al., 2010).

Further, although there was some variability on participants' reports of symptoms of depression, as a whole participants did not meet criteria for clinically significant symptoms of depression, because the average score on the CESD was below the clinically significant cutoff. This finding was somewhat surprising, as the lifetime prevalence rate of clinical depression tends to be about 20% higher among individuals with cardiovascular disease than in the general population, and increases following a cardiac event (Frasure-Smith, Lesperance, & Talajic, 1995; Schleifer et al., 1989). Additionally, it has been estimated that as many as 30% of all cardiovascular disease patients may experience some symptoms of depression at some point in their life (Frasure-Smith et al., 1995). Therefore, patients of Cardiac Rehab are expected to present with symptoms of depression. Meanwhile, these participants as a whole did not report elevated symptoms of depression. A possible explanation for this finding may lie in the timing of Cardiac Rehab initiation, as patients typically begin the Phase II Cardiac Rehab program four to six weeks after a cardiac event. Thus, it is plausible that further out from the cardiac event

symptoms of depression resolve. Also, it has been reported that as individuals engage in Cardiac Rehab their symptoms of depression decrease, which has been attributed to improvements in various physical and psychological domains, including exercise capacity, body fat percentage, quality of life, and pain perceptions (Milani, Lavie, & Cassidy, 1996).

Further, physiological outcome variables were also analyzed, as they were expected to improve from the start of Cardiac Rehab to completion of the program. Although, all physiological outcomes of interest improved following completion of Cardiac Rehab, only the changes in METs and DBP were statistically significant. Thus, in this sample of Cardiac Rehab participants, significant changes in physiological markers were isolated to METs and DBP. The lack of significant changes in all physiological markers may be attributed to the 3-month duration of Cardiac Rehab, which may not be a sufficient amount of time to observe significant changes in these markers. A statement published by the American Heart Association Science Advisory and Coordinating Committee discussed expected outcomes of Cardiac Rehab programs to assist staff with program implementation and ensure program recognition by consumers and policy makers. According to their recommendations, blood pressure is expected to be below 130 mmHg systolic and 85 mmHg diastolic following an individuals' completion of Cardiac Rehab (Balady et al., 2000). However, in the present study, participants' blood pressure (systolic and diastolic) was below this recommended value at the start of Cardiac Rehab. Thus, perhaps significant changes in blood pressure were not possible for this group.

In regards to weight, it is recommended that patients of Cardiac Rehab reduce their body weight at a rate of one to two pounds per week, which comes to between 12-24 pounds over the 3-month duration of Cardiac Rehab (Balady et al., 2000). Given that this sample of Cardiac Rehab patients was generally overweight based on an average weight, they may not have

achieved significant weight loss by the time of program completion. Nevertheless, weight loss and decreases in BMI were observed in this group of Cardiac Rehab patients. Overall, although significant changes on all of the physiological outcome variables were not observed, there was evidence of improvements in all of the outcome variables. Therefore, if participants continue to engage in physical exercise and maintain their health behavior changes, they will likely continue to experience trends in improving their physiological markers and cardiac status.

As previously stated, the initial aim of the study was to assess the impact of the four coping styles measured by the CHIP scale on physiological outcomes in participants of Cardiac Rehab. It was predicted that Instrumental coping, marked by an active and problem-focused approach to coping, would be associated with improvements in health-related outcomes. Also, it was predicted that Distractive, Palliative, and Emotional Preoccupation coping would be associated with poorer health-related outcomes. These predictions were made based on previous findings that reported generally favorable outcomes associated with Instrumental coping (Corace & Endler, 2003; Endler et al., 1998). Meanwhile, Distractive, Palliative, and Emotional Preoccupation coping have been deemed as maladaptive coping strategies in medical populations, as they are typically associated with poorer health outcomes and worse adherence (Endler et al., 1993; Endler et al., 1998; Corace & Endler, 2003; Shen et al., 2004; Whitmarsh et al., 2003).

An early analysis revealed that of all of the physiological outcome variables only the change in METs was significantly correlated with two of the CHIP coping subscales, Palliative and Instrumental coping. As predicted, Instrumental coping was associated with improvements in METs, which is intended by engaging in Cardiac Rehab, while Palliative coping was associated with decreases in METs. Thus, Palliative coping was not predictive of improvements

in health-related outcomes, and in fact had a more deleterious impact on outcomes in this sample of Cardiac Rehab patients. Additionally, Palliative coping was positively correlated with depression, which indicates that participants that engage in more passive coping behaviors have more symptoms of depression.

The impact of the four coping styles on physiological outcomes was further explored through multiple regression analyses, where depression was controlled for due to the increased rates of depression in cardiovascular disease patients (Frasure-Smith et al., 1995). These analyses confirmed that even when controlling for depression, Palliative coping predicted decreases in METs from the start of Cardiac Rehab to completion of the program, which is an unfavorable outcome for Cardiac Rehab patients. Additionally, when controlling for depression, Instrumental coping was predictive of increases in METs. Thus, Palliative and Instrumental coping have a distinctly different impact on health-related outcomes in Cardiac Rehab patients; passive behaviors are damaging to Cardiac Rehab patients and problem-focused behaviors are associated with better outcomes.

Therefore, these findings confirm what has been reported in previous studies; Instrumental coping is an adaptive way of dealing with a medical problem, whereas Palliative coping is maladaptive to health outcomes (Endler et al., 1993; Endler et al., 1998; Corace & Endler, 2003; Shen et al., 2004; Whitmarsh et al., 2003). Further, previous studies focused on assessing the impact of these coping strategies on psychological outcomes and data focused on physiological outcomes has been limited in the literature. Nevertheless, these findings fill that gap in literature and extend the predictive value of Instrumental and Palliative coping to physiological outcomes among participants of Cardiac Rehab.

Further, the impact of Distraction and Emotional Preoccupation coping on physiological outcomes was also explored in this sample of Cardiac Rehab patients. Distraction coping was not predictive of any changes in physiological outcomes, which suggests that although participants of Cardiac Rehab may engage in avoidant behaviors, such coping behaviors have no impact on their health-related outcomes. On the other hand, Emotional Preoccupation coping was predictive of increases in BMI, which implies that emotion-focused coping behaviors were associated with weight gain among the participants. Interestingly, emotion-focused behaviors were especially predictive of poorer weight-related outcomes, which implies that coping by focusing on the emotional consequences of the illness was particularly detrimental to weight loss efforts in this group. These findings may be explained by another construct that may be at play here; emotional eating. There is a large body of literature that has identified overeating in obese individuals during negative emotional states (Geliebter & Aversa, 2003). In the present study, emotion-focused coping was positively correlated with symptoms of depression, which suggests that individuals engaging in emotion-focused behaviors experience more negative affectivity. Therefore, emotional eating may explain the observed relationship between emotion-focused coping and weight gain. Since, this is a relatively new finding among Cardiac Rehab patients, future studies are needed to explore how emotional eating may contribute to outcomes in the program.

The second aim of this study was to evaluate whether varying levels of optimism impact the relationship between coping and physiological outcomes in Cardiac Rehab patients. This was accomplished through moderation analyses using the PROCESS tool, with optimism as the moderator. Moderation was supported if the interaction between coping and optimism was significant. In fact, moderation was supported in the relationship between Palliative coping and

BMI. Specifically, it was observed that a relationship between Palliative coping and BMI was only detected at low levels of optimism, such that among individuals with low levels of optimism passive coping was associated with increases in BMI. Further, as optimism increased, the effect on the relationship between passive coping and the change in BMI was weakened. Therefore, low optimism appears to be a risk factor for individuals engaging in passive coping behaviors.

Consequently, optimism appeared to have an especially significant impact on the relationship between passive coping and weight-related outcomes. As previously discussed, Palliative coping was positively correlated with symptoms of depression. Therefore, individuals engaging in passive coping may be predisposed to lower levels of optimism and engage in more passive behaviors that result in poorer health outcomes. Previous research reported that optimism impacts individuals' appraisals and behaviors, and hence is probable in effecting coping behaviors. In this tradition, several studies have reported that more optimistic individuals tend to engage in more problem-focused coping strategies, whereas less optimistic individuals utilize more maladaptive coping strategies (Nes & Segelstrom, 2006). Additionally, a previous study with Cardiac Rehab patients evaluated a mediation model of coping and optimism, among other psychosocial variables, in Cardiac Rehab patients. The authors reported that optimistic individuals engaged in less maladaptive coping strategies, which resulted in better physical functioning (Shen et al., 2004). Therefore, the findings of the present study are supported by previous research, where lower levels of optimism are associated with less adaptive coping behaviors and poorer outcomes.

However, it is important to note that not all of the hypotheses were supported, and optimism did not moderate the relationships among any of the other coping subscales. Explanations for these unsubstantiated findings may be found in the data, as not all associations

between the coping subscales and physiological outcome variables were identified. Therefore, optimism may not be relevant in these relationships that are otherwise not significant. Nevertheless, the moderation model examined in this study was novel in exploring how varying levels of optimism impact the relationship between coping and physiological outcomes. Unlike previous studies that assessed coping as a mediator between optimism and psychological outcomes in Cardiac Rehab, the present study evaluated optimism as a moderator in the relationship between coping and physiological outcomes. Therefore, the findings discussed here contribute to the literature on coping and optimism, and provide support for the interrelatedness of these two constructs. Additionally, this study improves knowledge about the relationship between coping and physiological outcomes in Cardiac Rehab patients, which has not received much attention thus far. However, future replication studies evaluating this model are needed in order to ensure reliability of the results.

Limitations and Future Research

In evaluating the results and significance of the present study, one should be aware of its' several limitations. This sample of Cardiac Rehab participants was comprised of mostly Caucasian, older males. Therefore, the lack of ethnic, gender, and age-related diversity did not allow for between group comparisons. Also, due to the relatively homogenous study sample, the results of the present study lack external validity and are less generalizable to other groups. Future studies with more heterogeneous samples would be valuable in evaluating between group comparisons and increasing generalizability of the findings to other groups. Generalizability is especially important in this population, as cardiovascular disease is currently the leading cause of death impacting individuals of diverse backgrounds nationwide (Murphy et al., 2013).

In regards to measures, the present study included four physiological outcomes of interest. Although changes in these outcome variables were observed, not all were statistically significant. This may be explained by the timing of data collection, as pre- and post-data was collected three months apart. Therefore, future studies evaluating changes in physiological outcomes at several time points and over longer periods of time may be helpful in determining the extent to which these variables can change over time among Cardiac Rehab patients. Also, future studies examining the relationship between coping and other physiological variables, such as cholesterol levels and left ventricular ejection fraction would be helpful in extending the findings discussed here to other physiological markers.

Additionally, the psychological predictor variables (coping, depression, and optimism) were assessed at one time point, at the start of Cardiac Rehab, which limits the ability to determine how these variables may change as the program progresses. Although, past research has established that coping behaviors and optimism are relatively stable psychological domains throughout the duration of Cardiac Rehab, future studies would benefit from measuring psychological variables at several time points, along with physiological outcome variables, to establish temporal precedence and causal relationships. Consequently, a predominant limitation of the present study is that it is correlational in nature and causality may not be assumed. However, these results may be used in developing experimental designs.

Conclusion and Implications

The results of this study provide support for previously published research that explored the associations between coping strategies and outcomes of Cardiac Rehab patients. In line with previous research, passive coping was associated with worse outcomes and problem-focused coping was predictive of better outcomes among Cardiac Rehab patients. Also, optimism was

especially important in the relationship between passive coping behaviors and weight-related outcomes, where as optimism increased the relationship between passive coping and weight gain was weakened. Consequently, these findings provide support for the interrelatedness of coping and optimism in Cardiac Rehab patients and possible pathways through which they are involved.

As a result, Palliative coping appears to have a deleterious effect on outcomes in Cardiac Rehab, while Instrumental coping is associated with better outcomes. In this manner, interventions aimed at increasing psychoeducation about the harmful effect of passive coping behaviors will likely be beneficial in Cardiac Rehab programs. Also, given the positive outcomes associated with Instrumental coping, coping skills training aimed at increasing active coping behaviors will likely be valuable for Cardiac Rehab participants. Additionally, given the impact of optimism on the relationship between Palliative coping and weight-related outcomes, Positive Psychology interventions may be especially helpful in increasing optimism levels in these maladaptive coping behaviors.

Overall, this study has several theoretical and clinical implications. The findings reported here corroborate past research on coping in Cardiac Rehab patients and further enhance our understanding of how the optimism and coping constructs are interrelated. Additionally, these findings suggest that screening for coping factors may contribute to more favorable patient outcomes in the program. Thus, Cardiac Rehab staff may be better equipped at addressing coping factors that are adversely contributing to patient outcomes. For instance, providers and staff may be able to intervene with coping skills training and motivational interviewing towards producing favorable health outcomes. Also, this study sets the stage for future research interested in assessing relationships between coping and optimism and how these psychological constructs influence physiological outcomes among Cardiac Rehab patients. Consequently, this study has

potentially considerable implications for cardiac patient care that may assist in improving assessment and treatment of cardiovascular disease patients.

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Tables and Figures

Table 1

Demographic Variables

Demographic Variable	Frequency	Minimum	Maximum	Mean	Standard deviation (SD)
Age	120	30	86	64.38	11.06
Gender		-	-	-	-
Male	87				
Female	33				
Ethnicity		-		-	-
Caucasian	95				
Asian/Pacific Islander	15				
Hispanic	5				
Other	3				
African American	2				
Education		-	-	-	-
Partial HS	2				
HS	54				
Associates	13				
Bachelors	30				
Masters	17				
Doctorate	4				
Education in Years	120	11	21	14.33	2.48
Occupational Status		-	-	-	-
Retired	60				
Full-time	58				
Part-time	2				
Relationship Status		-	-	-	-
Single	14				
Married	82				
Divorced	15				
Widowed	9				

Living Arrangement		-	-	-	-
Alone	23				
W/ partner or family	97				
Religion				-	-
Catholic	49				
Christian	41				
Other	11				
Jewish	7				
Muslim	5				
None	5				
Hindu	2				

Table 2

Health Demographics

Demographic Variable	Frequency	Minimum	Maximum	Mean	Standard deviation (SD)
Reason for Referral		-	-	-	-
CABG	38				
Stent/Angioplasty	33				
Myocardial Infarction (MI)	19				
Valve Replacement	13				
Angina	9				
Cardiomyopathy	3				
Aneurysm/Stenosis	3				
Heart transplant	1				
Congestive heart failure (CHF)	1				
Total Sessions Attended	120	4	36	33.02	6.41
Status at Completion		-	-	-	-
Graduated	107				
Dropped out (<24 sessions)	12				
Passed away	1				
Current Alcohol Use		-	-	-	-
Yes	55				
No	65				
Current Cigarette Smoking		-	-	-	-
Yes	2				
No	118				
Past Alcohol Use		-	-	-	-
Yes	82				
No	38				
Past Cigarette Smoking		-	-	-	-
Yes	53				

No	67				
Initial BMI	120	18.9	53.77	29.71	6.67

Table 3

Bivariate Correlations Among Predictor Variables

	1	2	3	4	5
1. Optimism (LOT-R)	-				
2. Depression (CESD)	-.50**	-			
3. CHIP-Distraction	.27**	-.17	-		
4. CHIP-Palliative	-.22*	.45**	.30**	-	
5. CHIP-Instrumental	.12	-.08	.52**	.16	-
6. CHIP-Emotional	-.42**	.47**	.17	.36**	.26**

Note: **p < .005, *p < .05.

Table 4

Means and Standard Deviations of Predictor Variables

	Mean	Minimum	Maximum	SD
Optimism (LOT-R)	16.25	6	24	3.83
Depression (CESD)	10.20	0	31	8.79
CHIP-Distraction	57.28	35	82	10.68
CHIP-Palliative	48.20	20	86	14.11
CHIP-Instrumental	57.36	25	78	12.15
CHIP-Emotional	52.13	12	90	14.62

Table 5

Means and Standard Deviations of Physiological Outcome Variables

	Time 1				**Time 2**				**t**
	Mean	Min.	Max.	SD	Mean	Min.	Max.	SD	
METs	3.12	1.80	4.90	0.65	5.89	2.00	15.10	2.74	-12.69**
BMI	29.71	18.90	53.77	6.67	29.645	20.53	55.89	6.69	0.57
SBP	115.35	90	150	14.25	112.817	78	88	15.01	1.62
DBP	70.43	32	58	8.37	68.067	58	86	7.85	2.57*

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

Table 6

Bivariate Correlations Between Predictor and Outcome (Difference Score) Variables

	Optimism (LOT-R)	Depression (CESD)	CHIP-Distraction	CHIP-Palliative	CHIP-Instrumental	CHIP-Emotional
METs	.06	-.15	.13	-.24*	.22*	.03
BMI	.10	-.08	.15	.09	-.01	.17
SBP	-.04	.04	.06	-.03	.16	.11
DBP	.06	.08	.05	-.05	.07	.13

Note: *p < .05.

Table 7

Hierarchical Multiple Regression Analyses of the Effect of CHIP Distraction Coping Subscale T-scores on Physiological Outcomes (METs, BMI, SBP, and DBP) controlling for Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2
Step 1:												
Constant	3.15			.06			-3.52			-3.25		
Depression	-.04	-.15	.023	-.01	-.08	.01	.08	.04	.00	.09	.08	.01
Step 2:												
Constant	1.76			-.87			-10.12			-6.69		
Depression	-.04	-.13		-.01	-.06		.11	.06		.10	.09	
Distraction	.02	.11	.011	.02	.14	.02	.11	.07	.01	.06	.06	.00

Table 8

Hierarchical Multiple Regression Analyses of the Effect of CHIP Palliative Coping Subscale T-scores on Physiological Outcomes (METs, BMI, SBP, and DBP) controlling for Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2
Step 1:												
Constant	3.15			.06			-3.52			-3.25		
Depression	-.04	-.15	.02	-.01	-.08	.01	.08	.04	.00	.09	.08	.01
Step 2:												
Constant	4.54			-.51			-1.56			-.27		
Depression	-.02	-.06		-.02	-.15		.12	.06		.14	.12	
Palliative	-.03	-.21*	.04*	.01	.16	.02	-.05	-.04	.00	-.07	-.10	.01

Note: *p < .05.

Table 9

Hierarchical Multiple Regression Analyses of the Effect of CHIP Instrumental Coping Subscale T-scores on Physiological Outcomes (METs, BMI, SBP, and DBP) controlling for Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2
Step 1:												
Constant	3.15			.06			-3.52			-3.25		
Depression	-.04	-.15	.02	-.01	-.08	.01	.083	.04	.00	.09	.08	.01
Step 2:												
Constant	.81			.17			-16.41			-7.17		
Depression	-.04	-.14		-.01	-.08		.11	.06		.09	.08	
Instrumental	.04	.21*	.04*	-.00	-.02	.00	.22	.16	.03	.07	.08	.01

Note: *p < .05

Table 10

Hierarchical Multiple Regression Analyses of the Effect of CHIP Emotional Preoccupation Coping Subscale T-scores on Physiological Outcomes (METs, BMI, SBP, and DBP) controlling for Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2	B	β	ΔR^2
Step 1:												
Constant	3.15			.06			-3.52			-3.25		
Depression	-.04	-.15	.02	-.01	-.08	.01	.08	.04	.00	.09	.08	.01
Step 2:												
Constant	2.24			-.93			-9.42			-6.92		
Depression	-.06	-.21*		-.03	-.21*		-.02	-.01		.02	.02	
Emotional	.02	.13	.01	.02	.27*	.06*	.13	.12	.01	.08	.07	.01

Note: *p < .05.

Table 11

Hierarchical Multiple Regression Analyses of Optimism as a Moderator of the Relationship Between CHIP Distraction Coping and Physiological Outcomes (METs, BMI, SBP, and DBP) Controlling for the Effect of Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	β	SE B	t	β	SE B	t	β	SE B	t	β	SE B	t
Constant	3.16	.36	8.72**	-.01	.19	-.04	-3.49	2.37	-1.47	-4.07	1.57	-2.60*
Depression	-.04	.03	-1.39	-.01	.02	-.34	.07	.20	.33	.16	.12	1.39
Distraction (centered)	.03	.02	1.15	.01	.01	1.40	.12	.20	.60	.03	.11	.32
Optimism (centered)	-.03	.07	-.41	.01	.04	.37	-.19	.51	-.38	.31	.28	1.09
DistractionxOptimism	.00	.01	.01	.00	.00	.17	.01	.05	.28	.01	.02	.28
	ΔR^2=.00			ΔR^2=.00			ΔR^2=.00			ΔR^2=.01		

Note: *p < .05, **p < .01

Table 12

Hierarchical Multiple Regression Analyses of Optimism as a Moderator of the Relationship Between CHIP Palliative Coping and Physiological Outcomes (METs, BMI, SBP, and DBP) Controlling for the Effect of Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	β	SE B	t	β	SE B	t	β	SE B	t	β	SE B	t
Constant	2.95	.39	7.59**	.09	.19	.48	-3.64	2.54	-1.43	-4.48	1.71	-2.63*
Depression	-.02	.03	-.48	-.02	.02	-1.09	.10	.22	.45	.22	.13	1.66
Palliative (centered)	-.04	.02	-1.72	.02	.01	1.66	-.05	.16	-.42	-.08	.08	-1.03
Optimism (centered)	-.01	.07	-.19	.03	.03	.75	-.10	.47	-.21	.33	.27	1.25
Palliativex Optimism	.00	.01	.86	-.00	.00	-2.14*	.00	.02	.12	.01	.01	.89
	ΔR^2=.01			ΔR^2=.04*			ΔR^2=.00			ΔR^2=.01		

Note: *p < .05, **p < .01

Table 13

Hierarchical Multiple Regression Analyses of Optimism as a Moderator of the Relationship Between CHIP Instrumental Coping and Physiological Outcomes (METs, BMI, SBP, and DBP) Controlling for the Effect of Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	β	SE B	t	β	SE B	t	β	SE B	t	β	SE B	t
Constant	3.13	.37	8.48**	-.00	.19	-.02	-3.45	2.39	-1.44	-3.98	1.58	-2.51*
Depression	-.04	.03	-1.35	-.01	.02	-.38	.07	.19	.38	.16	.11	1.43
Instrumental (centered)	.04	.02	2.26*	-.00	.01	-.28	.23	.15	1.46	.06	.09	.65
Optimism (centered)	-.04	.07	-.55	.02	.03	.56	-.20	.52	-.37	.33	.29	1.16
InstrumentalxOptimism	.01	.01	.90	.00	.00	.90	.01	.04	.21	-.01	.02	-.33
	ΔR^2=.01			ΔR^2=.01			ΔR^2=.00			ΔR^2=.00		

Note: *p < .05, **p < .01

Table 14

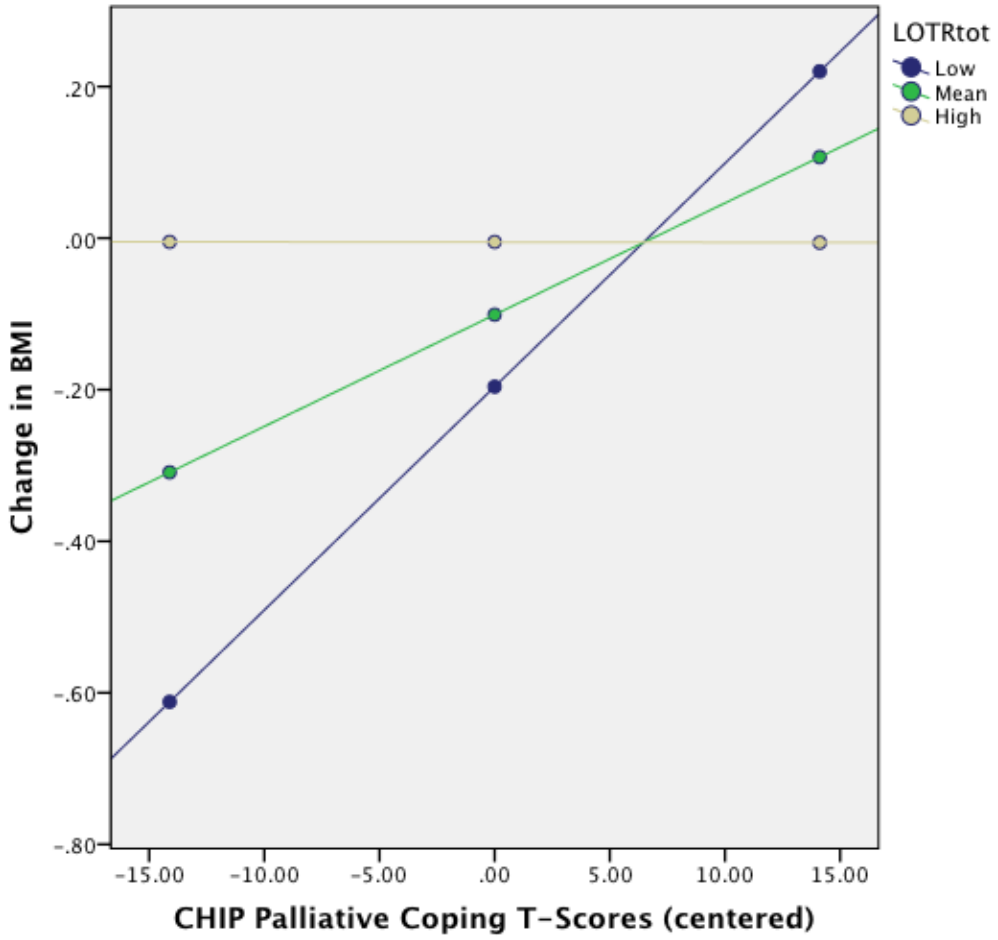
Hierarchical Multiple Regression Analyses of Optimism as a Moderator of the Relationship Between CHIP Emotional Preoccupation Coping and Physiological Outcomes (METs, BMI, SBP, and DBP) Controlling for the Effect of Depression (CESD Scores)

	METs			BMI			SBP			DBP		
	β	SE B	t	β	SE B	t	β	SE B	t	β	SE B	t
Constant	3.31	.40	8.36**	.15	.19	.75	-2.59	2.52	-1.03	-3.35	1.55	-2.17*
Depression	-.05	.03	-1.82	-.02	.02	-1.29	-.03	.22	-.13	.09	.12	.77
Emotional (centered)	.02	.02	1.05	.03	.01	2.76**	.13	.11	1.23	.11	.07	1.62
Optimism (centered)	.01	.08	.07	.05	.04	1.43	.05	.45	.12	.44	.27	1.65
Emotionalx Optimism	.00	.01	.18	-.00	.00	-.68	-.01	.02	-.51	-.00	.01	-.09
	ΔR^2=.00			ΔR^2=.00			ΔR^2=.00			ΔR^2=.00		

Note: *p < .05, **p < .01

Figure 1

Simple Slopes Equations of the Regression of the CHIP Palliative Coping T-Scores on the Change in BMI at Three Levels of Optimism



Appendix A

Permission to Take Part in a Human Research Study

Title of research study: Psychosocial Variables in Cardiac Rehabilitation Patients

Investigator: Joseph Zander, PhD

Why am I being invited to take part in a research study?

We invite you to take part in a research study because you are an adult currently enrolled in Phase 2 Cardiac Rehabilitation.

What should I know about a research study?

Graduate student researchers will explain this study to you. Participation in this research study is voluntary. You can choose not to participate. If you decide to not participate, there is no penalty and you will not lose any benefits that you already have. You can agree to take part and later change your mind. If you now decide you want to participate but later change your mind, you may discontinue your participation at any time without any penalty or loss of benefits to which you are otherwise entitled. You can ask all the questions you want before you decide.

Who can I talk to?

If you have questions, concerns, or complaints, or think the research has hurt you, you can reach the principal investigator Joseph Zander, PhD, at 847-723-5865.

This research has been reviewed and approved by an Institutional Review Board ("IRB") and will be monitored by the IRB of Advocate Health Care. An IRB is a committee, independent of the investigators, that reviews and oversees research studies to protect the rights and safety of participants. You may talk to them at 630-929-6148 or email IRBMail@advocatehealth.com if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research subject.
- You want to get information or provide input about this research.

Why is this research being done?

The purpose of this study is to evaluate which psychological and social factors may contribute to better outcomes during cardiac rehabilitation. Research has shown that higher levels of depression and anxiety can lead to decreased overall health, and certain behaviors and traits may lead to better health outcomes. There is also research showing that an individual's learning history may impact his/her overall health. The goal is to see whether these relationships are also present within the cardiac rehabilitation process. This study may help us get a better understanding of the factors that

contribute to better or worse outcomes during the rehabilitation process. This information could aid in the development of new treatments for rehabilitation.

How long will the research last?

We expect that you will be in this research study until your graduation from Phase 2 Cardiac Rehabilitation.

How many people will be studied?

We expect up to 140 people at this site will be in this research study.

What happens if I say yes, I want to be in this research?

If you agree to be in this study, a graduate student researcher will schedule an individual study visit with you. The study visit will take place in a private room in the Cardiac Rehabilitation Clinic. First, you will be given a test to screen for cognitive impairment (Mini Mental Status Exam [MMSE]). If you qualify for the study, you will be asked to complete a series of questionnaires relating to your psychological well-being:

- Illness Behavior Inventory,
- Illness Behavior Inventory (mother version),
- Illness Behavior Inventory (father version),
- Coping with Health Injuries and Problems (CHIP) scale,
- Life Orientation Scale (LOT-R), and the
- Center for Epidemiologic Studies Depression (CESD) scale.

Completing these questionnaires will take approximately 40 minutes. You will complete each of these questionnaires once. The answers to these questionnaires will be analyzed with your final physiological test results at the conclusion of your 36 sessions of cardiac rehabilitation. Information on your physiological test results will be collected from your medical chart. These research study procedures are not being performed as part of standard care in Cardiac Rehabilitation.

You will be reimbursed $10 for participating in the study. If you leave the study early for any reason or you are found to be ineligible for participation, you will be paid $5 for consenting to participate and/or any portion of the study you have already completed. There is no additional cost to you or your insurance carrier if you participate in this research study.

What happens if I do not want to be in this research?

You can leave the research at any time and it will not be held against you.

What happens if I say yes, but I change my mind later?

You can leave the research at any time it will not be held against you. You will be asked your reason for withdrawal from the study. Any data collected to the point of withdrawal containing personal information will be destroyed.

Is there any way being in this study could be bad for me?

There are no physical risks to participating in this study. There is a low risk of psychological discomfort upon completion of study questionnaires. If there are any indications of significant psychological issues, you will be offered a referral to appropriate counseling. In addition to these risks, this research may hurt you in ways that are unknown.

What happens to the information collected for the research?

Efforts will be made to limit the use and disclosure of your personal information, including research study and medical records, to people who have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of this organization. Limitations on confidentiality include if the research team uncovers abuse, neglect, or suicidal or homicidal ideation. Under such circumstances, this information may be disclosed to appropriate authorities such as the police or hospital emergency room.

Federal law provides additional protections of your medical records and related health information. These are described in an attached document.

Can I be removed from the research without my OK?

The person in charge of the research study or the sponsor can remove you from the research study without your approval. Possible reasons for removal include ineligibility to participate due to: not being an English speaker, not being enrolled in Phase 2 Cardiac Rehabilitation, mental retardation, diagnosis of a psychotic disorder, a medical diagnosis that is considered primary to your diagnosis of cardiovascular disease, or a low score on MMSE.

Signature Block for Capable Adult

Your signature documents your permission to take part in this research.

Signature of subject	Date
Printed name of subject	
Signature of person obtaining consent	Date
Printed name of person obtaining consent	

Advocate Health Care
Institutional Review Board
3075 Highland Parkway
Downers Grove, IL 60515

AUTHORIZATION TO USE AND DISCLOSE RESEARCH RELATED HEALTH INFORMATION

ADVOCATE PROTOCOL NUMBER: 5994

PRINCIPAL INVESTIGATOR: Joseph Zander, PhD
AFFILIATION: Advocate Lutheran General Hospital

ADDRESS: 1775 Dempster St.
Park Ridge, IL 60068

PHONE: 847-723-5865

TITLE OF STUDY: Psychosocial Variables in Cardiac Rehabilitation Patients

STUDY SPONSOR(S): N/A

Note: References to "researchers" below includes the principal investigator and his or her staff members. "Sponsor" refers to the sponsor(s), if any is listed above, and any representatives of same.

AUTHORIZATION PURPOSE
If you **Do Not** sign this authorization you will not be allowed to enter the research study named above.

If you sign this Authorization but wish to limit or withdraw the Authorization in the future you will have to withdraw from the study.

If you sign this Authorization and later wish to revoke it, you should contact the principal investigator listed above.

INTRODUCTION
A U.S. federal law called the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule (45 CFR 160 & 164) requires protection of your health and medical information so that it is kept private and confidential to the greatest extent possible. Protected health information includes identifiers such as your name, date of birth, etc., and also your clinical information, such as your medical history, laboratory and medical imaging test results or photographs, blood or tissue sample results, physical examination findings, and information about illnesses or injuries you have experienced.

Regarding the research study named above, you have either already agreed to participate by signing a consent form describing the study or will soon be given a consent form to read and consider before signing.

The document you are reading now, called an "Authorization" explains how your health information will be used and disclosed as a result of your participation in the research study named above. By signing this Authorization you give the researchers permission to collect and use your personal health information so they can conduct the study.

By signing this authorization you agree to permit the Researchers and Sponsor named above to use and disclose health information that identifies you for the purposes described below. You also agree to permit the personnel of the hospital, clinic, or office where the research will take place, your doctors, and your other health care professionals to disclose health information contained in your medical records to the Researchers and the Sponsor for the purposes described below.

1. **The health information that may be used and disclosed includes:**
    - All information collected during the research that is described in the consent form you have either already signed or will soon be given to read and consider; and
    - Health information in your medical records that is relevant to the research described in the consent form.
2. **Your health information may be disclosed for these purposes:**
    - Verify that you are eligible to enroll in the study;
    - Assure that the information collected during the study is accurate and complete;
    - Make certain that the study is being conducted properly; and
    - Guarantee that your safety and rights as a research subject are protected.
3. **The Researchers may:**
    - Use and share your health information to conduct the research;
    - Disclose your health information to the Sponsor(s);
    - Disclose your health information as required by law to representatives of government agencies (such as the Food and Drug Administration), review boards (such as the Advocate Health Care Institutional Review Board), and other agencies, committees, or persons who are required to watch over the safety, effectiveness, and conduct of human subject research; and
    - Remove your name and other information that could be used to identify you personally when they transmit your health information.
4. **The Sponsor may:**
    - Use and share your health information to conduct the research;
    - Disclose your health information as required by law to representatives of government agencies (such as the Food and Drug Administration), review boards (such as the Advocate Health Care Institutional Review Board), and other agencies, committees, or persons who are required to watch over the safety, effectiveness, and conduct of human subject research; and
    - Remove your name and other information that could be used to identify you personally when they transmit your health information.

5. Once your name and other information that could be used to identify you has been removed, the information that remains is no longer subject to this Authorization and may be used and disclosed by the Researchers and the Sponsor as permitted by law, including for educational or other research purposes.
    - No publication or presentation of the research will reveal your identity unless you have given your specific written permission.
6. Notice is hereby given to the patient or legal representative signing this Authorization that Advocate Health Care cannot guarantee that a third party receiving the requested health information will not redisclose any or all of it to others. However, the Researchers and Sponsor agree to protect your health information by using and disclosing it only as described in this Authorization. The limitations on use of your health information continue even if you revoke this Authorization in the future.
7. If you sign this Authorization today and later want to revoke it you should write to the principal investigator listed above. If you revoke this Authorization in the future, information that has already been obtained may remain as part of the research record, but no additional information will be added to the research record after your revocation.
8. While the research is in progress you will not be allowed to see your health information that is created or collected in the course of the research. After the research is finished, however, you may see this information as described in the Notice of Privacy Practices available in the hospital, clinic, or office where the research was conducted.
9. This Authorization has no expiration date.
10. You will be given a copy of this Authorization after you have signed it.

_____ _____

Printed Name of Research Subject Date

_____

Signature of Research Subject

Research Representative's Statement

I have explained this authorization form to the subject and have answered any questions he/she had.

_____ _____

Signature of Research Representative Date

_____

Printed Name and Title of Research Representative

Demographic Information

Participant Name: _____ **Participants' study #:** _____

Date of birth: _____ **Session #:**_____

Age: _____ **Primary**

Dx:_____

Gender: Male Female **Class time:**_____

Ethnicity: Caucasian African American Hispanic Asian/Pacific Islander Other

Highest level of education: High School Associate's Bachelors Master's Doctoral

Occupational status: Working _____ Retired _____

Marital Status: Single Married Divorced Widowed

Living arrangements: Living alone Living w/partner or family Assisted living

Religious affiliation: Christian Catholic Jewish Muslim Hindu Other:_____

Current and past alcohol and drug use:

Currently using: _____

Past use: _____

CES-D Depression Inventory

INSTRUCTIONS: Below are some statements regarding experiences people have or way people behave. 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".				

Total:_____

Life Orientation test (LOT-R)

Please answer the following questions about yourself by indicating the extent of your agreement using the following scale:

0 = Strongly disagree
1 = Disagree
2 = I neither agree nor disagree
3 = Agree
4 = Strongly agree

Please be as honest and accurate as you can. Try not to let your response to one question influence your responses to other questions. There are no right or wrong answers. Answer according to your own feelings, rather than how you think "most people" would answer.

_____ 1. In uncertain times, I usually expect the best.
_____ 2. It's easy for me to relax.
_____ 3. If something can go wrong for me, it will.
_____ 4. I'm always optimistic about my future.
_____ 5. I enjoy my friends a lot.
_____ 6. It's important for me to keep busy.
_____ 7. I hardly ever expect things to go my way.
_____ 8. I don't get upset too easily.
_____ 9. I rarely count on good things happening to me.
_____ 10. Overall, I expect more good things to happen to me than bad.