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Assessing the Psychosocial Risk Factors for Coronary Artery Disease: An Investigation of Predictive Validity for the Psychosocial Inventory for Cardiovascular Illness

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Assessing the Psychosocial Risk Factors for Coronary Artery Disease: An Investigation of Predictive Validity for the Psychosocial Inventory for Cardiovascular Illness

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Dedication

This dissertation is dedicated to my loving family without whom this feat could not have been achieved.

I would like to dedicate this work to my Uncle Al,
who may possibly have the only well sample of cardiac patients in the world due to his life-saving abilities as a physician. I would like to thank him for providing me with the resources that I needed to complete this project, least of which was access to his practice, and greatest of which was his confidence in me.

I also dedicate this dissertation to my husband who is certainly the most important thing that I learned in graduate school, having met him in our introductory statistics class. I would gladly repeat my entire tenure as a graduate student if only to assure that we would meet again! Wes, you are truly my journey mate!

Last, this dedication belongs to my parents and "little" brother.
Mom and Dad, you well know the part that you have played in my life. You have encouraged, supported, believed, suggested, insisted, and allowed, and all at the right times. Yours and Tony's unconditional love is the secure base that has allowed me to pursue a life with purpose, meaning, faith, and love.

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Assessing the Psychosocial Risk Factors for Coronary Artery Disease: An Investigation of Predictive Validity for the Psychosocial Inventory for Cardiovascular Illness

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This dissertation investigated the psychometric properties and clinical applications of the Psychosocial Inventory for Cardiovascular Illness (PICI). The PICI is an inventory developed to measure the psychosocial risk factors for heart disease including anxiety, depression, stress, social isolation, and anger. The inventory was developed to measure the ways that each psychosocial risk factor contributes to the coronary artery disease process through the lifestyle behaviors and pathophysiological mechanisms with which they are associated. The primary purpose of the study was to examine predictive validity for the PICI. With support for predictive validity, the inventory may aid in early identification of individuals at increased risk for coronary artery disease (CAD) so that behavioral, psychosocial, and medical interventions can be implemented. Both healthy and cardiac samples were used in the inventory development and validation process. The PICI was administered in conjunction with similar

inventories and physiological markers of CAD were collected including percent of coronary artery blockage and history of heart attacks.

Item analysis and factor analysis were used to yield a 20-item PICI comprised of three subscales to include Negative Affect, Social Isolation, and Anger. It was hypothesized that the PICI subscales would predict group membership; whether or not a participant carried a diagnosis of CAD, and would be have a strong relationship to the physiological markers of CAD that were measured. Analysis revealed that the PICI was unable to predict diagnostic status and did not have a strong relationship with the physiological markers of CAD. Results suggest that the PICI has acceptable reliability and construct validity as demonstrated in the current sample, yet further investigation must be conducted to gain support for the instrument's predictive abilities.

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Chapter One: Introduction

The current study investigated the five psychosocial risk factors for coronary artery disease that are commonly agreed upon as Anxiety, Depression, Stress, Social Isolation, and Anger (Rozanski, Blumenthal, & Kaplan, 1999). Coronary artery disease (CAD) is a disease of the cardiovascular system that involves the formation of blockages in the arteries, particular in the arteries of the heart. These blockages can prevent the flow of oxygenated blood to the heart, placing the individual at risk for a heart attack .

These five psychosocial risk factors tend to contribute to the coronary artery disease process through the pathophysiological mechanisms and negative lifestyle behaviors with which they are associated and, in some cases, promote (Sapolsky, 2004). For example, individuals who experience chronic stress may develop hypertension (a pathophysiological mechanism of stress) as well as a smoking habit and poor dietary choices (negative lifestyle behaviors associated with stress) (Roohafza, Sadeghi, Sarraf-Zadegan, Baghaei, Belishadi, Mahvash, Sajjadi, Toghianifar, Talael, 2007).

Interestingly, these five psychosocial risk factors for CAD tend to manifest much earlier in life than do the physiological symptoms of coronary disease. Often, difficulties with mood, anxiety, or social relationships emerge in adolescence or young adulthood (DSM-IV, 1994). Alternatively, clinically significant levels of arterial blockage are often not diagnosed until around age 50 or later, and often, not until the individual has had his first heart attack (Painter, Rooij, Bossuyt, Simmers, Osmond, Barker, Bleker & Roseboom, 2006). Therefore, it stands to reason that the psychosocial risk factors for CAD could be used as a means for early identification of individuals who are at risk for

developing CAD. If at-risk individuals were identified, behaviors, medical, and psychological interventions could be implemented to slow the disease process.

PURPOSE

Therefore, the purpose of the present study will be to develop a brief screening instrument that will measure the five psychosocial risk factors for CAD including anxiety, depression, stress, social isolation, and anger. The inventory could then be used in a number of settings, including the offices of primary care physicians, cardiologists, and psychologists for the purposes of identifying individuals who may be at an increased risk for developing CAD. With established norms, health care providers for individuals whose scores indicate significantly more pathology on the psychosocial risk factors could design behavioral, psychological, and medical interventions. Such interventions might include cognitive behavioral therapy, stress and anger management, weight loss, increased cardiovascular exercise, smoking cessation, or medication to lower blood pressure or cholesterol. The inventory could also be used to aid cardiologists in the care of patients recovering from a heart attack. The literature has shown that patients who are recovering from a cardiac event have poorer recovery and increased chances of a second cardiac event if they are depressed or socially isolated (Jaffee, Krumholz, Catellier, Freedland, Bittner, Blumenthal, Calvin, Norman, Sequeira, O'Connor, Rich, Sheps, Wu, 2006), therefore, a screening instrument could be used by cardiologists to determine which patients are at risk an increased risk for a difficult recovery.

INVENTORY

The current study will focus on the development of an inventory called the Psychosocial Inventory for Cardiovascular Illness (PICI) intended to measure the

psychosocial risk factors for CAD. The inventory development will begin with fifty self-report, Likert-style items that are intended to measure the ways in which the five psychosocial risk factors contribute to the coronary disease process through the pathophysiological mechanisms and negative lifestyle behaviors that they are associated with and promote. Of the initial fifty items, ten were written to measure each of the five risk factors. With an undergraduate population, factor analysis and correlations with existing instruments were examined to establish construct validity. Item analysis was then performed and items with high Alpha if Item Deleted values were removed. From the above processes, twenty-five of the most internally consistent items were retained for administration to a sample of individuals with coronary artery disease. In a sample of individuals with CAD, construct validity for the PICI was examined through factor analysis and a three-factor solution emerged with the factors interpreted as Negative Affect, Social Isolation, and Anger. These factors were then correlated with physiological markers of CAD including percent of arterial blockage and heart attack history in attempts to examine the PICI's ability to predict development of the coronary disease process.

Chapter Two: Literature Review

The budding field of behavioral cardiology aims to identify the ways in which behaviors and emotions affect physiological health as it applies to the development, progression, and treatment of heart disease. The literature identifies a number of factors, often within an individual's control, that place one at an increased risk for poor cardiovascular health. These factors include poor dietary choices, lack of exercise, increased physiological stress response, tendencies toward isolation, and persistent negative affect (Rozanski, et al., 1999). Specifically, the literature has identified five psychological and social constructs that are known to have a particularly significant effect on cardiovascular health. These five psychosocial risk factors include depression (Musselman, Tomer, Manatunga, Knight, Porter, Kasey, Marzec, Harker, Nemeroff, 1996), anxiety (Chen, Woods, Wilkie, Puntillo, 2005; Kawachi, Sparrow, Vokonas, Weiss, 1995), perceived stress (Lazarus & Folkman, 1984, Sapolsky, 2004), anger (Donker, Breteler, van der Staak, 2000; Everson, Kauhanen, Kaplan, Goldberg, Julkunen, Tuomilehto, Salonen, 1997), and social isolation (Blazer, 1982; McCarthy, Lambert, Beard, & Dematatis, 2002). Each of these five psychosocial risk factors reduces cardiovascular health by promoting negative lifestyle behaviors and by influencing pathophysiological mechanisms that place one at an increased risk for heart disease (Rozanski, et al., 1999).

In the following literature review, the ways in which the five psychosocial risk factors contribute to cardiovascular health will be discussed. Next, the need for a brief measure that screens for these five factors will be examined in context of the purpose of

the measure, item development, initial psychometric properties, and clinical applications for the Psychosocial Inventory for Cardiovascular Illness (PICI).

The present study focuses on coronary artery disease (CAD), a specific type of heart disease. CAD was chosen first because it is a type of heart disease that is particularly well known as being heavily influenced by emotional and behavioral factors (Rozanski, et al., 1999; Sapolsky, 2004). Second, CAD was chosen as the focus of this study because it is the leading cause of death in industrialized countries (American Heart Association, 2006), and is expected to be the cause of death for upwards of 25% of the current United States population (Stoney, 2003). CAD is a type of heart disease that affects the cardiovascular system through narrowing of the arteries through blockages, which results in decreased blood flow to the heart. This places an individual at an increased risk for a heart attack (Sapolsky, 2004). Specifically, chronically elevated blood pressure and/or chronically elevated cortisol tends to cause wear and tear in vessels, providing places where plaque, stress hormones, and fat can collect and cause a blockage (Sapolsky, 2004). As these blockages worsen, blood flow to the heart becomes pathologically reduced and often leads to necrosis, placing an individual at an increased risk for a heart attack (Sapolsky, 2004). CAD is often referred to as a stress-related disease because the development, progression, symptomology, and treatment of the disease are prominently influenced by negative affect states such as depression, anxiety, and perceived stress, as well as problematic interpersonal variables such as anger, and social isolation.

RISK FACTORS FOR CAD

The literature identifies two ways in which negative affective, interpersonal, and social variables contribute to the development and progression of stress-related diseases:

1) pathophysiology and 2) lifestyle behaviors. Pathophysiology refers to the underlying cause of a disease process and lifestyle behaviors are the unhealthy behaviors with which the risk factors are associated. First, the pathophysiology promoted by the negative affective and social states will be discussed. When experiencing a negative affective, interpersonal, or social state, such as stress, the body releases a mixture of hormones that has the potential to promote chronic increases in blood pressure and arterial build-up known as atherosclerosis (Sapolsky, 2004). Specifically, frequent psychosocial stress that arises when an individual's environmental demands outweigh his or her perceived available resources (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1984) can chronically activate the sympathetic nervous system causing atherosclerosis through chronically increased blood pressure and chronically elevated levels of stress hormones (Lane, Carrol, & Lip, 1999; Sapolsky, 2004). Second, negative affective, interpersonal or social states can also contribute in a more indirect manner through their promotion or association with lifestyle behaviors such as poor diet, inadequate amounts of exercise, poor medical compliance, and smoking (Sapolsky, 2004). These behavioral factors promote the progression of CAD through their effects on hypertension, atherosclerosis, and imbalances in hormones and often cyclically promote the negative affect states themselves (Harvard Heart Letter, 2005; Rozanski, et al., 1999; Sapolsky, 2004).

Another important factor in the mind-body equation is the reciprocal relationship between the psychosocial risk factors and heart health. Just as negative affective states can negatively affect the heart, heart related health problems such as a heart attack or other cardiac event or condition can subsequently affect one's affective state and lead to feelings of depression, stress, anxiety, isolation, or anger (Harvard Heart Letter, 2005). A clearer understanding of this complex relationship may lessen the development and

progression, and promote the treatment of a disease that is currently the leading cause of death in many nations (American Heart Association, 2006).

The following sections will discuss how depression, anxiety, stress, social isolation, and anger are related to CAD through examination of their manifestations in a CAD population and through their contributions to the coronary artery disease process through both the pathophysiological mechanisms and the negative lifestyle behaviors they promote.

Depression

Patients who have been diagnosed with CAD are reported to have three times the incidence of depression than that of a healthy sample (Kop & Adler, 2001). This figure does not include patients with depressive symptomology who do not fully meet criteria for a depressive disorder; if such subclinical symptoms were included, the ratio would likely be even higher. Also, studies support a dose-dependent relationship between the severity of depressive symptoms and the severity of the incurred cardiac event. Individuals whose depressive symptoms are more severe and chronic tend to have more heart attacks (Everson, Goldberg, Kaplan, Cohen, & Pukkala, 1996). Depressive symptoms in a cardiac population also tend to manifest as inactivity and increased fatigue. The term "vital exhaustion" has been applied to this situation, yet researchers note that it is unclear as to whether such exhaustion is a result merely of depression, or of the physiological symptoms of CAD, or most likely, a result of the combination of the two (Kop & Adler, 2001).

Physiologically, depression is important in the progression of heart diseases through both pathophysiological and behavioral pathways. Behaviorally, depression has been linked with smoking and poor compliance to medical direction (Zigelstein, Bush, &

Fauerbach, 1998). Depression's pathophysiological effects include multiple mechanisms that work together to contribute to health problems (Rozanski, et al., 1999). First, depression has been linked with increased levels of hormones such as cortisol, the hormone commonly associated with stress (Sapolsky, 2004). Second, depression has been associated with enhanced platelet functioning (Musselman, et al., 1996). Platelets then have an increased tendency or ability to stick to each other or the arterial walls which leads to clotting. The combination of pathological levels of the stress hormone cortisol and enhanced platelet function establishes the main theoretical basis for depression's effect on heart health (Rozanski, et al., 1999). Also reported common among people with depression are reduced heart rate variability and decreased vagal control (Carney, Sanders, Freedland, Stein, Rich, & Jaffe, 1995, Watkins & Grossman, 1999), both of which are indicative of autonomic imbalance. Further, the autonomic nervous system is the part of the central nervous system that is responsible for cardiac control (Kemeny, 2003). Therefore, autonomic imbalance can be detrimental to heart health as it may be indicative of the potential to develop a ventricular arrhythmia or rapid heartbeat (Rozanski, et al., 1999).

When assessing depression, most measures such as the Beck Depression Inventory-Second Edition (Beck, Steer, & Brown, 1996) focus on the clinical syndrome of depression by assessing for prominent aspects of depression including hopelessness, suicidality, lack of pleasure, self criticism, and worthlessness and then draw cut scores indicative of clinical significance. The PICI could contribute to the assessment of depression because depression has been found to manifest differently in a CAD population (Hans, Carney, Freedland, Skala, 1996; Kop & Ader, 2001) and an inventory tailored to this population would have more applicability when predicting the disease

process. As the BDI is a widely used and validated measure that likely does hold some predictive validity when considering the coronary disease process, the PICI can offer items even more tailored to the ways in which a CAD population experiences depression, and thus, may have even more predictive application. The variety of ways in which depression contributes to the development of CAD through both pathophysiology of the hormones and the associated lifestyle behaviors makes it a unique risk factor for cardiovascular diseases.

Anxiety

The ways that anxiety contributes to CAD have also been studied, yet not quite as thoroughly as depression which remains one of the most thoroughly established risk factors. Anxiety, on the other hand, has been most notably linked to sudden cardiac death, suggesting that ventricular arrhythmias (an irregular heart beat) may be the mechanism by which anxiety influences heart health (Rozanski, et al., 1999). Supportive evidence includes the observation that people with anxiety disorders also have reduced heart rate variability, suggesting autonomic imbalances as another physiological factor that relates anxiety to CAD (Kawachi, et al., 1995). Unfortunately, due to the high levels of comorbidity between anxiety and depression, it can be difficult to disentangle which negative affect state is, in fact, contributing most primarily to reduced heart rate variability (Rozanski, et al., 1999). Another reason for anxiety to be suspected as a contributing factor to poor heart heath is regarding research specific to panic disorder. One study found that, in a sample of CAD patients, those who also had comorbid panic disorder and experienced panic attacks were more likely to have a second heart attack than CAD patients who did not have a comorbid anxiety disorder (Lesperance & Frasure-Smith, 2000). Other studies have further illuminated the relationship between anxiety

and cardiac death as dose dependent (Kawachi, et al., 1995), suggesting that anxiety must reach a clinical threshold before it becomes pathological for heart health. Concerning anxiety's role in promoting negative lifestyle behaviors, studies indicate that individuals with anxiety disorders are more prone to unhealthy lifestyle behaviors such as poor dietary habits, yet the research does not conclusively indicate that those behaviors significantly aid in the progression of CAD (Rozanski, et al., 1999). This evidence is more striking for other risk factors such as stress (Sapolsky, 2004), and anger (Everson, et al., 1997). Anxiety's relationship with negative lifestyle behaviors is further complicated because of a lack of an established causal relationships in the literature. For example, anxiety and smoking are very highly correlated, but it is difficult to ascertain whether or not anxiety causes people to begin smoking, or if smoking (and attempts to quit smoking) increases anxiety (Morrell & Cohen, 2006). Although smoking has a complicated relationship with anxiety, the relationship between anxiety and obesity is more clear. Allison and Heshka (1993) report finding that individuals tend to have more disrupted eating behaviors when feeling anxious or nervous. Likewise, Leaderash-Hofmann, Kupferschid, and Mussgay (2002) found that obese dieters with anxiety tended to lose less weight during a weight-loss program than did dieters who were not anxious. Although the research remains inconclusive in places, it can be reasonably concluded anxiety contributes to the coronary artery disease process both through pathophysiological such as autonomic imbalance and lifestyle behavior mechanisms such as poor diet and possibly smoking.

Stress

Chronic stress has historically been the affective state most associated with the development and progression of the aptly-named category of stress-related diseases

(Sapolsky, 2004). It is widely know that chronic stress contributes to poor cardiovascular health through its associated stress hormones such as cortisol and its promotion of hypertension (Kemeny, 2003). Primarily, the aspects of chronic stress that have been considered are work-related stress and "subacute" life stress – the accumulation of multiple stressful events over the course of a couple of months or more (Rozanski, et al., 1999). Stress has also been conceptualized as perceived stress (Lazaruz & Folkman, 1984) which will be the conceptualization of stress primarily discussed for the proposed study due to its direct impact on the physiological stress response system discussed below.

When confronted with a stressor, an individual will appraise the stressor to determine whether or not the demands of the event are greater than his or her available resources (Lazarus & Folkman, 1984). If the event is appraised as requiring more than the available resources, a physiological stress response will likely occur, commonly known as the fight or flight response (Sapolsky, 2004). This response includes an elevation in heart rate, blood pressure, and respiration in efforts to deliver blood and oxygen to the lower half of the body in preparation for fight or flight (Sapolsky, 2004). When an individual is chronically stressed, which is most likely to be the case when stressors are psychosocial in nature, the stress response is chronically activated. This leads to the potential for chronically high blood pressure and chronic increases in stress hormones. These two occurrences, when combined, lead to the development of CAD because chronically high blood pressure will eventually wear holes in the arteries and the stress hormones will collect in the holes to form arterial blockages, lessening essential blood flow to the heart (Sapolsky, 2004). Blockages can also occur merely due to an overproduction of the stress hormone cortisol (Kemeny, 2003) in the absence of

hypertension. When an individual constantly perceives his or her environmental demands to exceed available resources, the body is frequently in a state of sympathetic nervous system arousal and hypothalamus-pituitary-adrenal activation which results in an overproduction of cortisol (Kemeny, 2003). Cortisol agitates the arteries and causes small tears. Meanwhile, it causes blood platelets to stick together and stick to fat and lodge in the agitated area of the artery causing atherosclerosis (Kemeny, 2003).

Chronic stress not only contributes through the pathophysiological mechanisms detailed above, but it has also been associated with poor lifestyle behaviors that contribute to the coronary disease process. Namely, individuals who are experiencing chronic stress have been found to use more tobacco and eat fewer fruits and vegetables than individuals who are not experiencing chronic stress (Roohafza, et al., 2007). Chronic tobacco use tends to constrict the arteries, and a diet heavy in fat and carbohydrate tends to introduce excess fat and cholesterol into the bloodstream. Narrowed arteries full of excess fat are at an increased risk for blockage (Sapolsky, 2004), providing the theoretical basis for stress's associated lifestyle behaviors' contribution to the coronary disease process.

In measuring stress, much interest has been focused on measuring the construct of perceived stress because of its direct connection with atherosclerotic mechanisms - the fight or flight response, sympathetic nervous system arousal, hypertension, and increased cortisol production (Kemeny, 2003; Sapolsky, 2004). Cohen, Kamarck, and Mermelstein (1983) began studying the measurement of perceived stress for this very reason. They intended to provide a measure of perceived stress for the purposes of examining the role of psychosocial stress in the disease process for diseases that have historically been coined "stress-related". The Perceived Stress Scale (Cohen, et al., 1983) has since been

used in a variety of health psychology research in attempts to identify the psychosocial etiology of diseases such as Coronary Artery Disease (Odden, Whooley, & Shlipak, 2006), and will also be used in the current study.

Anger

The next risk factor commonly seen as a contributing factor to CAD is anger (Rozanski, et al., 1999, Sapolsky, 2004). Anger has emerged as the active ingredient in the "Type A" personality's association with poor heart health (Myrtek, 2006). This research found that the other components of the Type A Personality such as a competition, drive, and focus, do not place individuals at risk for CAD. Instead, it is only the hostile component of Type A that is truly harmful to the heart (Myrtek, 2006). The construct of anger is frequently understood as a combination between the emotion, the experience, and the expression of hostility, more specifically including a negative orientation toward interpersonal relationships, anger, cynicism, and mistrust (Donker, 2000). With anger emerging as a primary predictor of cardiovascular disease, more research is focusing on what, exactly, anger entails. Krantz, Olson, Francis, Phankao, Merz, Sopko, Vido, Shaw, Sheps, Pepine, and Matthews (2006) recently found that distrust, antagonism, and manipulation are some of the aspects of hostility that contribute to increased hypertension, heart-rate, and smoking behaviors. Thus, it is these aspects of hostility that the PICI will attempt to capture for predictive value.

Behaviorally, anger is associated with a higher number of problematic lifestyle behaviors including smoking, poor diet, obesity, and alcoholism, all of which are problematic for heart health (Everson, Kauhanen, Kaplan, Goldberg, Julhunen, Tuomilehto, & Salonen, 1997; Kawachi, Sparrow, Spiro, Vokanas, & Weiss, 1996). Individuals who experience frequent anger are also at risk for increased social isolation

(another risk factor that will be examined in a following section). Physiologically, those with higher levels of anger tend to have a larger, more exaggerated stress response to mental stimuli. These individuals would consequently flood the blood stream even more intensely with the varied hormones that are responsible for the pathophysiological changes that put individuals at an increased risk for CAD (Sul & Wan, 1993). They also may have higher ambulatory blood pressure in the absence of any stressful stimuli (Suazer & Blumenthal, 1991), suggesting that the changes are chronic and more likely to contribute damage. Anger has more recently been found to contribute to increased lipid accumulation and enhanced platelet functioning – two mechanisms that work together to clog fat and blood platelets in the vessels to lead to atherosclerosis (Krantz, et al, 2006).

Social Isolation

The last commonly associated psychosocial risk factor for CAD is social isolation (Harvard Heart Letter, 2005; Rozanski, et al., 1999). Understanding and measuring the construct of social support has long been an interest to social and biological scientists alike because of its suspected abilities to buffer the body from the harmful effects that psychosocial stress has on one's physical and mental health (House, Umberson, & Landis, 1988).

Early research on social support focused first on determining whether it is quality or quantity of social support that influenced health. Next, research began investigating whether social support had a primary effect on health or whether its health effects were due to its ability to buffer the negative health effects of psychosocial stress (House, et al., 1988). Amount of perceived social support, family affiliation, number of friends, and partner status have all been studied in relations to heart health and this more recent research has revealed that low perceived social support, small social networks, and social

isolation (living alone) each put one at an increased risk for developing CAD and increase morbidity and mortality after a heart attack (Blazer, 1982; Rozanski, et al., 1999). Animal studies have shed some light on possible avenues by which social isolation may affect the cardiovascular system. Specifically, social isolation may contribute to an increase of the stress hormone cortisol through the stress that is associated with establishing one's social status in a group of primates (Rozanski, et al., 1999).

Social isolation, similar to the other psychological risk factors, is problematic largely because of physiological changes associated with the body's stress response (Sapolsky, 2004). Current research trends are now focusing on how to prevent the potential for a stress response by reducing the amount of problematic person-environment relationships that an individual is likely to incur. The theories of Lazarus and Folkman (1984), assert that a physiological stress response occurs when an individual decides that correcting the negative person-environment fit would require resources beyond those currently available. Recent theories of preventive coping aim to strengthen the individual's available resources so that a negative person-environment fit occurs less frequently, and when it does, the individual feels more able to negotiate the situation effectively (McCarthy, et al., 2002). Perceived social support may help to reduce the number of harmful physiological changes that the body undergoes in response to a stressor by increasing the individual's perceived resources and decreasing the number of problematic person-environment fits that are encountered (McCarthy, et al., 2002, McCarthy & Tortorice, 2005). When resources are perceived to be greater than environmental demands, a physiological stress response is considered to be less likely to occur (Lazarus & Folkman, 1984).

As perceived social support has emerged as variable often associated with health status, efforts have been made to measure the construct. Specifically, McCarthy and Colleagues (2002) provide validity evidence for the Preventive Resources Inventory's Social Resources subscale. This subscale aims to measure one's perceived ability to function in social situations. Aside from measurement of social resources, research has also focused on measuring social isolation.

Social Isolation, as measured by the absence of social ties or relationships (Arthur, 2006), has been found to place patients recovering from a heart attack at a three times greater risk for mortality during the three years following the cardiac event (Harvard Heart Letter, 2007). Another striking finding revealed that men who responded "yes" to the statement "I am lonely" were twice as likely to die within five years after bypass surgery as men who did not endorse loneliness (Harvard Heart Letter, 2007). Perceived quality of social network, loneliness, and living in isolated conditions all seem to have a negative effect on cardiovascular health by contributing to the development of coronary disease and by raising one's chances of having a second heart attack, or a poor recovery from the first.

Demographic Risk Factors for CAD

In considering the psychosocial risk factors for CAD, it is also important to assess for demographic factors that can have an impact on the coronary disease process. These variables include sex, age, race/ethic identification, socioeconomic status, smoking and alcohol use, and diabetic status. Each will be discussed briefly below.

Sex and age differences are important to consider in conjunction with the CAD because of the pronounced sex differences across age of onset, morbidity, and mortality rates for the disease (American Heart Association, 2006). CAD is the single leading

cause of death in the United States for both men *and* women. Comparable rates occur for both men and women with women exhibiting, on average, a ten year lag in prevalence rates (American Heart Association, 2006). This ten year difference lessens as age increases. Before age fifty, 23% of males and 18% of females are diagnosed with a cardiovascular disease. At around age fifty, the prevalence rates for the sexes are roughly equal. After fifty, women begin to surpass men by about 4% in the late fifties, 8% in the late sixties, and 9% in the seventies and eighties (American Heart Association, 2006). A key factor in understanding such incidence is age of onset. Males often experience an earlier age of onset while females usually have a later age of onset, typically after menopause (Mikkola & Clarkson, 2006).

A second demographic variable is socioeconomic status (SES) which has consistently been associated with the development and progression of coronary artery disease (Rozanski, et al., 1999). It is speculated that SES promotes CAD through a variety of mechanisms. First, an individual raised in a lower SES environment may not be exposed to proper preventive health care such as regular trips to the pediatrician (Rozanski, et al., 1999). Second, individuals of lower SES may not be given access to proper nutrition and may not develop proper nutritional habits as an adult. And last, individuals of lower SES likely have less perceived control over their lives and consequently experience higher levels of chronic stress (Sapolsky, 2004) which leads to chronically elevated blood pressure.

Race and ethnic identification also seems to be an important variable effecting heart health particular for those who identify as African American. African American males develop CAD at higher rates of incidence and severity than any other group in industrialized nations (American Heart Association, 2006). There has been much

speculation as to why this is the case. In response, the literature has identified a few specific risk factors that seem to be more pronounced in the African American male population and they include physiological, psychological, social, and educational variables. Physiologically speaking, African American males tend to have ambulatory higher blood pressure than the general population and this places them, as a group, at a higher risk for developing atherosclerosis (Sapolsky, 2004). Psychologically, perceived racism has been identified as the pathway through which African American males incur stress more chronically than the general population (Williams, 1999). The rationale being that the systemic nature of racism creates an institutionalized system of prejudice and discrimination that is inescapable by members of the African American community (Tatum, 1997). Another variable that has been proposed to place African American males at a greater risk for CAD is socio-economic status (Williams, 1999) as a higher proportion of African Americans are of a lower socio-economic-status than the general population.

Smoking, alcohol use, and obesity are some of the most prominent lifestyle behaviors that are known to contribute to poor cardiovascular health. Cigarette or tobacco smoke increase one's chances for developing CAD through their tendencies to raise one's blood pressure, decrease one's ability to engage in cardiovascular exercise, and increase blood platelet functioning causing blood cells to become sticky. These factors work together to increase atherosclerotic vessels in smokers (American Heart Association, 2006). Alcohol, when abused or over-used (i. e. more than 1-2 serving of alcohol per day) also tends to raise blood pressure and increase caloric intake – again promoting atherosclerotic tendencies in the vessels (The American Heart Association, 2006). Similarly, over-eating resulting in obesity is a predictor of coronary artery disease

because of its association with inactivity and increased caloric intake, it raises unhealthy cholesterol, increases lipids, and increased one's chance of developing diabetes (another CAD risk factor to be discussed next) (Sapolsky, 2004).

Last, diabetic status will be assessed as diabetes is a well-known risk factor for CAD. Also, morbidity and mortality is increased when an individual carries a diagnosis of diabetes and CAD comorbidly. Diabetes is harmful to the cardiovascular system because of it causes hyperglycemia, insulin imbalances, increased lipids, and hypertension which together increase atherosclerosis (Masharoni & Karam, 2002).

NEED FOR PSYCHOSOCIAL INVENTORY FOR CARDIOVASCULAR ILLNESS

The PICI is intended to have two primary purposes. First, it could be used in for preventive purposes by psychologists and physicians to aid in earlier identification of individuals at increased risk for CAD. Second, it is intended to be used in the cardiologist's office to identify patients who recently suffered a heart attack who are at a greater risk of poor recovery including due to increased morbidity or mortality. The first purpose will be discussed in the following section.

Need for Early Detection

The psychological and social risk factors for CAD, including depression, anxiety, stress, anger, and social isolation, are detectable far before many of the pathophysiological mechanisms of coronary artery disease. Often, individuals are not aware of their cardiac health status until after a cardiac event such as a heart attack occurs and causes damage to the vasculature of the heart (Sapolsky, 2004). Further, many of the pathophysiological mechanisms of CAD worsen over the course of a lifetime without showing apparent symptomology because atherosclerosis and hypertension are not

usually painful and thus regularly go undetected until they have reached pathological levels (Rozanski, et al., 1999). Alternatively, the psychological and social risk factors for CAD are frequently apparent at a much earlier age and often show symptoms immediately.

Depression, for example, often manifests in loss of interest, hopelessness, and sadness – symptoms that are easily noticed and identified (DSM-IV, 1994). As these psychosocial risk factors for CAD are often present and identifiable far before the pathophysiological mechanisms of coronary disease are symptomatic, the psychosocial risk factors could provide one avenue for earlier detection and identification of individuals who may have a greater propensity toward the development of a stress related disease such as CAD. To the researcher's knowledge, there is no existing measure available to serve as a brief screening measure of the five psychosocial risk factors for CAD. This earlier detection is so important and necessary for a disease such as CAD because although the pathophysiological mechanisms are not always obvious earlier in life, they are nonetheless decreasing the individual's cardiac health. Over time, atherosclerosis may progress leading to a high percentage of blockage in the arteries increasing one's risk for ischemia and infarction from loss of blood flow through narrowing arteries (Sapolsky, 2004). If, although, individuals with increased propensity to develop CAD were identified earlier in life, before the mechanisms became pathological (i.e., before atherosclerosis causes high levels of arterial blockage), preventive interventions such as nutrition counseling or stress management could be recommended and implemented though medical and mental health care collaboration. As the psychosocial risk factors for CAD are often apparent far before coronary artery disease, the constructs of anxiety, depression, perceived stress, hostility, and social

isolation could be used as ways to identify individuals who may benefit from preventive interventions aimed at slowing the pathophysiological mechanisms of CAD.

Need for Identification of Poor Recovery

As previously noted, the second purpose of the PICI is for use with CAD patients who are recovering from a heart attack so as to identify patients who are at increased risk for poor recovery and are more likely to experience a second heart attack. Primarily, of the five psychosocial risk factors for CAD, depression and low perceived social support have been noted as particularly important for cardiac recovery because they have been shown to increase one's chances of having a second cardiac event or fatality of the first (Jaffee, Krumholz, Catellier, Freedland, Bittner, Blumenthal, Calvin, Norman, Sequeira, O'Connor, Rich, Sheps &Wu, 2006). The mechanisms behind these associations remain somewhat poorly understood, but it is suspected that poor medical compliance and an inability to change problematic lifestyle behaviors are the active ingredients in why depression and social isolation are predictors of poor recovery (Jaffe, et al, 2006).

In efforts to identify psychosocial barriers to cardiac recovery, the Enhancing Recovery in Coronary Heart Disease (ENRICHD) study was launched by the National Institute of Health's National Heart, Lung, and Blood Institute. The ENRICHD study aimed to conduct randomized, controlled clinical trials at multiple sites for the purpose of understanding the effects of depression and social support on rates of morbidity and mortality in patients with CAD. Specifically, the study included 3000 patients who has suffered a heart attack and investigated the effects that interventions designed to decrease depression and increase perceived social support had on recovery (ENRICHD). These interventions included group and individual psychotherapy tailored to the patient's needs as well as pharmacological treatment.

Following data collection, a number of studies have published results from the ENRICHD project that provide partial support for the project's hypothesis. The first study indicated that quality of life, as measured by mental health, medical health, and life satisfaction, increases with interventions aimed at increasing perceived social support and decreasing depression (DeLeon, Czajkowski, Freedland, Bang, Powell, Wu, Burg, DiLillo, Ironson, Krumholz, Mitchell, Blumenthal, 2006). The researchers also found that patients with a poorer prognosis of recovery due to low perceived social support or depression who exercised had a better prognosis than patients with psychosocial deficits who did not exercise. Unfortunately, the ENRICHD results do not fully support the hypothesis as, although quality of life increased in patients who received the interventions, patient morbidity and mortality was not significantly different for the groups who did and did not receive interventions aimed at lowering depression and increasing perceived social support (Shimbo, Davidson, Haas, Fuster, Badimon, 2004). This leaves an unfortunate void in the literature as is has been well established that patients who are depressed and have low perceived social support have increased morbidity and mortality after a heart attack, yet the literature does not include interventions that have been successful at impacting cardiac health. Thus, a brief instrument that measures the psychosocial risk factors for CAD may build on the knowledge acquired from the ENRICHD studies by shedding light on exactly which psychosocial constructs are most problematic for individuals recovering from a cardiac event.

BEHAVIORAL INTERVENTIONS FOR INDIVIDUALS AT RISK

The psychosocial risk factors for CAD are problematic because of both the pathophysiological mechanisms and the negative lifestyle behaviors that they promote.

Preventive interventions for individuals who endorse pathology in the areas of anxiety, depression, anger, stress, or social isolation, would aim to lessen the ways in which the above mentioned psychosocial constructs promote the development of CAD through either pathophysiology or lifestyle behaviors in hopes of slowing the overall disease process. Importantly, the PICI measures three broad areas of psychosocial risk factors – negative affect, negative interpersonal variables, and negative social states. As such, depending on which risk factors are identified as problematic for an individual, behavioral, psychosocial, or medical interventions could be appropriately tailored.

Prevention through Reduced Psychopathology

The psychosocial risk factors for CAD are harmful in two ways, the first being through the pathophysiological mechanisms that they promote. Depression is suspected to promote atherosclerosis through enhanced platelet functioning coupled with increased cortisol (Musselman, et al., 1996; Rozanski, et al., 1999). Therefore, depressed individuals may lessen their chances of developing CAD if the underlying depressed mood was treated through cognitive-behavioral therapy coupled with pharmacological treatments. Behavioral interventions for lessening the negative effects of anxiety would target the problematic autonomic imbalances that are problematic for heart health. Interventions such as mindfulness meditation may be helpful at restoring autonomic balance as it aims to calm the sympathetic nervous response through emphasis on the present moment and affective acceptance. The psychosocial risk factor anger is problematic to heart health mainly because of the exaggerated stress response that seems to accompany the construct (Sul & Wan, 1993). Therefore, interventions designed to provide education about and management of clinically significant anger may be beneficial for individuals whose stress responses have become chronically exaggerated

which causes increased atherosclerosis. Similarly, individuals with increased perceived stress have a higher number of stress responses which chronically increases blood pressure and promotes atherosclerosis. These individuals may benefit from interventions aimed at reducing chronic stress such as breathing techniques, mindfulness based stress reduction, and psychoeducation about coping.

Prevention through Reduced Problematic Lifestyle Behaviors

A second avenue by which the psychosocial risk factors affect the development, progression, and treatment of CAD is problematic lifestyle behaviors such as poor dietary habits, inadequate amounts of exercise, smoking, poor medication compliance, and alcohol consumption (Leaderach, et al., 2002; Morrell & Cohen, 2006; Rozanski, et al., 1999; Sapolsky, 2004; Zigelstein, et al., 1998). Specifically, individuals with depressed affect are more likely to engage in poor nutritional habits (Sapolsky, 2004), smoking (Glassman, Helzer, Covey, Cottler, Stetner, Tipp, & Johnson, 1990), and poor medical compliance (Zigelstein, et al., 1998; Carney, et al, 1995). The psychosocial risk factor anxiety has also been linked with increased smoking and poor diet (Allison & Heshka, 1993; Morrell & Cohen, 2006). Anger, the psychosocial risk factor often referred to as a "toxic" personality trait, is associated with a number of unhealthy lifestyle behaviors that include smoking, poor diet, obesity, inactivity, and increased alcohol use (Everson, et al, 1997). Social isolation also promotes negative lifestyle behaviors that can be problematic for heart health. These behaviors have primarily been researched in elderly populations and are focused around poor medication compliance including not taking medication as directed and not adhering to a heart healthy diet (Lauder, Mummery, Jones, & Caperchione, 2006). Last, chronic stress has been found to promote negative behaviors

such as over-eating and poor dietary choices (Sapolsky, 2004) and smoking (Vogli & Sontinello, 2005).

PURPOSE OF THE PSYCHOSOCIAL INVENTORY FOR CARDIOVASCULAR ILLNESS

In order to identify individuals who may benefit from behavioral interventions aimed at either slowing the progression of CAD or identifying psychosocial barriers to the treatment of CAD, there is a current need for a brief, valid, and reliable inventory to measure the five psychosocial risk factors for CAD. This section will address why current inventories do not fulfill the need for a measure that addresses the five psychosocial risk factors for CAD because of issues around inventory length and item specificity.

Although there are a number of measures in existence that measure each risk factor individually, there are two main reasons why simply compiling five various measures would be an inadequate method of assessment. First compiling the various necessary measures would be far too cumbersome and time consuming for use in a primary care setting due to the high number of items. Instead, a much shorter screening measure may be more appropriate and acceptable for use in a fast-paced primary care or cardiology office or hospital. Second, merely combining existing measures does not take in to account the specific ways that the five psychosocial risk factors promote the pathophysiology and lifestyle behaviors that are detrimental to cardiovascular health. If existing measures for anxiety, depression, social isolation, anger, and perceived stress were combined, one could certainly assess for clinically significant levels of each construct, but one could not accurately assess for how each construct contributes to the disease process. It is important that a measure be designed that can assess for the specific ways that the psychosocial constructs contribute to the CAD disease process. For

example, not every depressed person will develop CAD, but depressed individuals whose depression manifests in sedentary behaviors and overeating very well might. The PICI is designed to measure exactly how the five psychosocial risk factors contribute to the CAD disease process as well as the presence or absence of a construct such as depression. For example, the PICI inquires about lifestyle behaviors that often result from depression such as lack of exercise with the item "When I feel depressed, I find it difficult to get enough exercise". The PICI also focuses primarily on somatic anxiety as that is the often how anxiety manifests in a CAD population (Laviore, Fleet, Laurin, Arsenault, Miller, & Bacon, 2004) with items such as "At times, I have stomach problems that are not related to any particular illness." Also, the PICI assesses for both perceived quality and quantity of social network since those variables are indicative of poor recover from a cardiac event (Harvard Heart Letter, 2007) with items like "At times, I wish I had more friends" and "I am unhappy with the quality of my relationships." Since compiling existing measures would only assess for clinical presence of a construct, it is important that an inventory be developed that assesses for both clinical presence of a construct and how that construct influences that coronary disease process. Therefore, there is a need for a brief, valid, and reliable inventory that measures the specific ways in which anxiety, depression, stress, anger, and social isolation promote the coronary artery disease process – which is the primary purposes of the PICI.

In response to the current need for a brief, valid, and reliable inventory capable of measuring the psychosocial risk factors for coronary artery disease, the Psychosocial Inventory for Cardiovascular Illness (PICI) was developed. The purpose of this brief screening tool is for potential use in two settings. First, it is intended for use in a primary care setting to aid in earlier identification of individuals who may be at risk for

developing the pathophysiological mechanisms and lifestyle behaviors that promote the coronary artery disease process. These individuals could then be referred for behavioral interventions based on the specific psychosocial risk factor or factors that are problematic for the patient. For example, if an individual's PICI scores suggest clinically significant levels of anger and depression, he or she may benefit from interventions such as anger management, psychotherapy, smoking cessation, and nutrition and exercise education.

The second potential use of the PICI is in a cardiologist's practice to quickly screen patients who recently suffered a heart attack to identify individuals who are at greater risk for experiencing a consecutive cardiac event, or who are at increased risk of mortality from the first. Research indicates that patients who are suffering from many of the psychosocial risk factors, particularly depression and social isolation, have a poorer prognosis when recovering from a heart attack (Rozanski, et al., 1999). Although the ENRICHD trials did not indicate that depression and social isolation interventions lessen morbidity and mortality, it still may be of benefit for the cardiologist to know that the presence of these psychosocial risk factors may increase the patient's chances of morbidity and mortality and the cardiologist could apply more aggressive pharmacological maintenance or treatment regiments.

RESEARCH QUESTIONS

This study addressed several investigative questions pertaining to the psychometric properties of the PICI and group differences with respect to the psychosocial risk factors for CAD. These questions were addressed through analysis of the reliability, convergent validity, factor structure, and predictive validity of the PICI. This data was then used to examine how groups differed on the basis of the psychosocial

risk factors for heart disease as informed by the current factor structure for the PICI. The following research questions were offered:

1. Does the factor structure of the PICI result in a 5-factor solution with each of the five factors representing one of the five psychosocial risk factors for CAD including anxiety, depression chronic stress, social isolation, and anger?
2. Can the PICI factors accurately predict group membership in either the CAD group or the Healthy Undergraduate group?
3. Within the CAD group, does a correlation exist between a patient's score on each factor of the PICI factors and his or her percent of arterial blockage in the Left Anterior Descending artery as measured by coronary angiogram?
4. Do patients with a history of heart attacks tend to have higher scores on the PICI factors than do patients with no history of cardiac events?

Chapter Three: Methodology

The purpose of this study was to support reliability as well as construct and predictive validity for a brief, screening version of the Psychosocial Inventory for Cardiovascular Illness. This brief inventory was developed for the purposes of use in various health care settings including psychology, primary care, and cardiology. The inventory is intended to be used for early identification of individuals at risk for developing CAD through measurement of the psychosocial risk factors of heart disease.

To achieve this goal, the current study was executed in two phases. The first phase (Phase I) was primarily concerned with reliability and construct validity of the PICI. This phase subjected the 50-item PICI to Principle Axis Factor Analysis with a Healthy Undergraduate sample (Healthy Group) and was administered along with five other existing inventories that measure constructs similar to each of the five PICI subscales of anxiety, depression, social isolation, anger, and stress. Examination of internal consistency, factor structure and the bivariate correlation matrix yielded a shorter 25-item version of the PICI to be administered to a group of individuals who carry a diagnosis of coronary artery disease (CAD Group).

The second phase of the current study (Phase II) was primarily concerned with the predictive validity of the PICI through administration to the CAD Group where PICI scores were examined in context of pathophysiological markers of CAD. The CAD Group was comprised of individuals who carried a diagnosis of CAD who presented to a regularly scheduled appointment with a private practice cardiologist. The CAD Group was administered the 25-item PICI, Beck Depression Inventory – Short Form, Social Resources Subscale of the Preventive Resources Inventory, Lifestyle Behaviors

Inventory, and demographic questions. Physiological markers of CAD were collected and included percent of blockage in the Left Anterior Descending coronary artery, date and number of heart attacks suffered, and history of Coronary Artery Bypass Graft (CABG) surgeries. The PICI factor structure were be re-examined with the addition of the CAD Group, and predictive validity was investigated through the PICI's ability to predict group membership as tested by Logistic Regression, and the PICI subscales' correlations with physiological markers of CAD.

PHASE I METHODOLOGY

Participants

Participants included 285 healthy undergraduates who were recruited from the Educational Psychology subject pool. The mean age was 22.1 and the sample was 61% female. One percent of participants self-identified as African American, 10% identified as Hispanic, 21% identified as Asian, and 61% identified as Caucasian.

Sample size recommendations for Factor Analysis range from two to ten participants per item administered. In this case, 50 items were administered with a sample size of 285. Therefore, the current sample achieved 5.7 participants per item administered, which safely falls within the recommended sample size needed to gain accurate factor structure.

Instrumentation

Psychosocial Inventory for Cardiovascular Illness – 50 Item (PICI; Tortorice, Markle, & McCarthy, 2007)

The PICI was written by the author to briefly measure the specific ways in which the five psychosocial risk factors for CAD contribute to the disease process. Initially,

fifty four-point Likert-style items were written to create five subscales – one for each of the five psychosocial risk factors for CAD. Each subscale intends to assess for clinical levels of the construct, the specific ways in which the construct typically manifests in individuals with CAD, and the specific ways in which the construct contributes to CAD through lifestyle behaviors. For example, when individuals who have a diagnosis of CAD also show symptoms of depression, one typical manifestation is feeling exhausted after completing an activity that used to be pleasurable (Kop & Ader, 2001), so one item written for the depression subscale is "Activities that I once found pleasurable now seem to wear me out." Also, somatic anxiety has been shown to result from an autonomic imbalance – the active ingredient that causes anxiety to be problematic for heart health (Rozanski, et al., 1999), therefore, many of the items on the anxiety subscale aim to measure somatic anxiety such as "Sometimes I have stomach problems (ache, indigestion, constipation, diarrhea) that are not related to any particular illness." Perceived stress contributes to the disease process through a persistent feeling that one's environmental demands exceed available resources (Lazarus & Folkman, 1984). As a result, a physiological stress response is likely to follow such feelings of perceived stress. Therefore, items written for the perceived stress subscale aimed to measure how likely one is to chronically experience a physiological stress response such as "I think I am more upset than most by the daily annoyances in life." The social isolation subscale items were written to assess for an individual's perception of the quality of his or her social network as perceived quality is a primary predictor of heart health (Rozanski, et al., 1999). An example of an item from the social isolation subscale is "I am not happy with the quality of my relationships." Last, the construct anger has been found to manifest in heart patients as suspiciousness and cynicism, and is most harmful to the

heart when it spawns an angry response to stimuli because of hostile individual's tendency to have an exaggerated stress response when angered (Rozanski, et al., 1999). Therefore, items written for the hostility subscale aim to measure suspicion, cynicism, and expression of anger such as the item "I can be verbally aggressive."

Beck Anxiety Inventory (BAI; Beck & Steer, 1991)

The BAI is a brief, 21-item, forced-choice, self-report measure that has been widely used to assess for severity of anxiety symptoms through established cutoff scores. A score from 0 – 9 reflects normal anxiety, 10 – 18 indicates mild to moderate anxiety, 19 – 29 indicates moderate to severe anxiety, while a score above 29 represents severe anxiety (Beck & Steer, 1991). The BAI places emphasis on the measurement of somatic anxiety as it is most easily distinguished from the general distress symptoms that are shared by both anxiety and depression.

When the BAI is administered, participants are presented with a list physiological, somatic symptoms associated with anxiety and are asked to rate each symptom on a four-point scale according to how severe that symptom has been in the past week (Beck, Epstein, Brown, & Steer, 1988). The BAI has demonstrated high internal consistency in a variety of different samples, most relevant to the current study, coefficient alpha has been found to be .91 in a non-clinical sample (Beck, et al., 1988).

Beck Depression Inventory – Second Edition (BDI-II; Beck & Steer, 1984)

The BDI -II is a brief, 21-item, forced-choice, self-report measure that has been widely used to assess for severity of depression symptoms through established cutoff scores. A total score of 0-13 is considered to represent normal ups and downs while a total score of 14-19 is indicative of mild depression. A total score of 20-28 represents

moderate depression, and 29-63 indicates that depression symptoms are severe. (Beck, Steer, & Brown, 2006). The BDI measures depression symptoms that correspond to diagnostic criteria for depression such as feelings of worthlessness, loss of interest, and changes in sleep and appetite (Beck, et al., 1988).

When the BDI – II is administered, participants are asked to endorse symptom severity over the past two weeks with higher scores representing increased depression symptom severity. The BDI – II has demonstrated high internal consistency with a Coefficient Alpha of .93 for a sample of college students. Test-retest reliability has also been supported in a sample of outpatients who receive the BDI – II twice at a one week interval with a correlation of .90 (Beck, et al., 2006).

Clinical Anger Scale (CAS; Snell, Gum, Shuck, Mosley & Hite, 1995)

The CAS is a 21-item, self report, forced choice inventory that is intended to measure the presence and severity of clinical anger. Participants are instructed to choose one statement out of each of the 21 statement groups that best describes how they feel. Participants are not asked to reference a specific time frame in their answers. The items are intended to measure aspects of clinically significant anger including toward self, anger toward others, and anger that significantly interferes with everyday life (Snell, Gum, Shuck, Mosley, & Hite, 1995).

The CAS is scored similarly to the BDI – II where a total score of 0-13 is considered to represent minimal anger while a total score of 14-19 is indicative of mild clinical anger. A total score of 20-28 represents moderate clinical anger, and 29-63 indicates clinically severe anger (Snell, et al., 1995). Internal consistency for the CAS was 0.94 in sample of both males and females (Snell, et al., 1995).

Perceived Stress Scale (PSS; Cohen, Kamarch & Mermelstein, 1983)

The PSS is a 10-item self report, five point Likert style inventory that is intended to measure the extent to which an individual perceives his or her external demands to exceed internal resources (Cohen, Kamarck, & Mermelstein, 1983). Participants of asked to respond on a five point scale to items such as "In the past month, how often have you felt that things were going you way?" Each item asks the respondent to reference the past month when considering answer choice.

Convergent and discriminant validity studies show that the PSS is positively correlated with measures of stressful life events, depression, and fatigue while negative correlations were present with measures of life satisfaction and social support. Internal consistency has also been measured in a non-clinical population and is considered good (Coefficient Alpha = .88).

Preventive Resources Inventory Social Resources Subscale (PRI-SR; Lambert & McCarthy, 2008)

The Preventive Resources Inventory is an 82-item self report, Likert-style inventory that is intended to measure one's available preventive coping resources such as the ability to maintain perspective, perceived control, and the ability to employ social resources in relationships. The present study will only utilize the Social Resources subscale of the PRI. The Social Resources subscale is a 14-item measure that can be answered on a five-point Likert scale. The subscale is intended to measure perceived interpersonal abilities such as comfort and reciprocity in relationships. In an undergraduate population, the Social Resources subscale has achieved high internal consistency (Coefficient Alpha = .87). The inventory has also supported construct validity as demonstrated by confirmatory factor analysis where the Social Resources

subscale factor structure emerged as four factors including Reciprocity, Comfort, Feedback, and Assistance in relationships (Lambert & McCarthy, 2008).

PHASE I RESEARCH QUESTION, HYPOTHESIS, AND DATA ANALYSIS

Research Question

Does the factor structure of the 50 –item PICI support construct validity prior to its reduction to 25 items through the hypothesized five-factor solution where the five factors correspond to the five psychosocial risk factors for heart disease?

Analysis

The Healthy Group's responses to the 50-item PICI were subjected to Principle Axis Factor Analysis with an oblique Rotation to account for the likelihood of correlated factors. The Scree Plot was used to determine the appropriateness of a 5-facctor solution.

Hypothesis

It was hypothesized that the factor structure of the 50-item PICI would include five factors that can be interpreted as Anxiety, Depression, Stress, Social Isolation, and Anger and that the factors will be correlated.

PHASE II METHODOLOGY

Participants

Participants included 97 heart patients who carried a diagnosis of coronary artery disease and were presenting for a scheduled appointment with their private cardiologist. Participants ranged in age from 44 to 88 with a median age of 68, a mean age of 71 and a standard deviation of 9.8. Participants identified as 7% African American, 2% Asian, 3% Hispanic, 85% Caucasian, and 2% other. Participants were 72% male and 28% female.

Instrumentation

25-Item Psychosocial Inventory for Cardiovascular Illness (PICI, Tortorice, Markle, & McCarthy, 2008)

The PICI is a set of 25 Likert-style items to assess how depression, anxiety, anger, social isolation, and stress may contribute to the coronary disease process. The inventory is comprised of three factors including Negative Affect, Social Isolation, and Anger. Each of the three factors has intercorrelations between 0.42 and 0.56. Coefficient Alpha for the 25-item PICI is 0.87 for a sample that includes both health undergraduates and coronary patients. The items are written to measure the ways in which each factor contributes to the coronary disease process through the pathophysiological mechanisms and lifestyle behaviors associated with the constructs of depression, anxiety, perceived stress, social isolation, and anger. For example, an item written to assess for ways that depression promotes behaviors that are unhealthy for the heart is "When I'm feeling depressed, I find it difficult to get enough exercise." The PICI is scored on a 100 point scale with 100 representing a perfect score and 25 representing the lowest score. Lower scores are indicative of increased pathology because respondents with lower scores will have endorsed a larger number of symptoms. Higher scores represent increased wellness as participants with higher scores are not endorsing as many symptoms of psychosocial risk factors. The median score is 62.5 suggesting that scores above the median may be interpreted as less pathological while scores below the median could be interpreted as more pathological.

Beck Depression Inventory – Short Form (BDI – SF; Beck, Rial, & Rickets, 1974)

The Beck Depression Inventory – Short Form is a 13 item inventory that was developed as a shorter form of the original Beck Depression Inventory. Each of the 13

items are intended to measure a specific symptom of depression. Three factors have accounted for 52% of the variance in the BDI- Short Form. These factors include negative affect, difficulties with performance, and general unhappiness (Reynolds & Gould, 1981). Coeficient Alpha for the BDI- SF has been found to be 0.86 for non-psychiatric populations (Beck, Rial, & Rickets, 1974). This shorter form of the BDI was chosen for the present study to maintain a reasonable amount of time for participants to complete the study.

Preventive Resources Inventory Social Resources Subscale (PRI-SR; Lambert & McCarthy, 2008)

The Perceived Resources Inventory is an 82-item Likert style inventory that is intended to measure preventive coping resources including perceived control, ability to maintain perspective, and social resourcefulness. The Social Resources Subscale was used in the current study as it intends to measure aspects of relationships such as reciprocity, comfort, and assistance. The subscale is a 14-item Likert style inventory that has demonstrated construct validity through confirmatory factor analysis (McCarthy & Lambert, 2008).

Lifestyle Behavior Inventory (LBI; Juncker, 2005)

The Lifestyle Behavior Inventory is a 24-item self report forced-choice inventory that is intended to measure the behavioral risk factors and demographics associated with coronary health (Juncker, 2005). These problematic lifestyle behaviors include tobacco use, alcohol use, diet, and exercise behaviors. The inventory measures the presence and severity of these behaviors over the lifespan. The measure has been found internally consistent in a healthy undergraduate sample with a Coefficient Alpha of .84.

For the present study, only select items will be used from this inventory. Items chosen include those that measure lifestyle behaviors such as tobacco use, alcohol use, dietary behaviors, and exercise habits over the lifespan. Reliability for the use of these select items has been found to range between .73 and .84 in a healthy undergraduate population. These particular items were chosen for the present study due to their overwhelming association with coronary health. Tobacco use has been found to contribute to the coronary disease process through its promotion of hypertension, blood clotting, decreased tolerance of cardiovascular exercise, and decreased HDL (good) cholesterol (American Heart Association, 2006). Alcohol use also contributes to the coronary disease process through its promotion of hypertension as well as through promotion of increased triglycerides and increased risk of an enlarged or weakened heart or congestive heart failure (American Heart Association, 2006). Last, exercise and dietary behaviors were measured by the Lifestyle Behavior Inventory because high caloric intake and inactivity contribute to the coronary disease process through their promotion of high LDL (bad) cholesterol, high triglycerides, and hypertension (American Heart Association, 2006). These risk factors often cluster together to place individuals at an increased risk for CAD as chronic hypertension causes breakages near the arterial branches, and increased triglycerides, cholesterol, and tendency to clot lead to collections of plaque around the arterial tears which results in blockage (Sapolsky, 2004).

Demographic Information

The demographic information that was collected from the CAD Group included age, weight, height, race, sex, and income. These demographic variables have all been shown to be associated with the coronary disease process in ways that were detailed in chapter two.

Physiological Measurement

Coronary Artery Disease Diagnosis

CAD is the result of arterial blockage that causes a pathological loss of oxygenated blood flow to the heart. It can be diagnosed using a variety of invasive and non-invasive techniques all aimed at assessing arterial stenosis in order to gage severity of lack of blood flow to the heart. The most common technique for diagnosing CAD is a coronary angiogram which will be discussed in more detail in the following section. As the angiography techniques are invasive and require catheterization, patients unable to undergo the procedure may be diagnosed through less commonly used methods. Other commonly used techniques for assessing arterial blockage are ECGs, Stress Tests, Nuclear Imaging Scans, Echocardiograms, Chest X-Rays, or MRI scans. In the present study, each participant was diagnosed by coronary angiogram.

Coronary Angiogram

Coronary angiograms are motion picture X-rays of the cardiovascular system used to diagnose and assess severity of coronary artery disease. The angiograms are most often analyzed visually by an experienced cardiologist to determine the percentage of stenosis in the artery in question. Stenosis, or abnormal narrowing of the artery caused by atherosclerosis, infarction, or ischemia, can pathologically reduce blood flow to the heart. The present study will utilize percent of coronary stenosis in the left anterior descending (LAD) artery as the measure of coronary artery disease severity where higher percentages of blockages represent increase severity of the disease. The LAD artery was chosen for measurement in the present study as it is one of the main coronary arteries responsible for maintaining blood flow and because it is particularly susceptible to atherosclerosis.

The angiogram procedure involves inserting a catheter usually through the leg or groin area and it is guided up toward the heart's arteries. When the catheter is properly placed in the target artery, contrast material is injected and X-ray images are produced to aid the cardiologist in visualizing how the dye moves through the artery. The contrast material reveals the degree of stenosis in the target artery to diagnose lack of blood flow to the heart. No angiogram data was collected for the purposes of the present study, instead, the data was obtained through review of medical chart information.

Procedures

Prior to beginning the current study, permission from the University of Texas Institutional Review Board. Next, the researcher secured approval from a Southeast Texas area private practice cardiologist for the opportunity to be present in the office and recruit patients who presented for a scheduled appointment. During the agreed upon times, the researcher was present in the cardiology office and at the end of a CAD patient's appointment, the nurse asked each CAD patient if he or she would be willing to fill out a short survey and sign a release of medical information. Should a patient agree to learn more about the study, the researcher met the patient in a private room to explain the informed consent, answer any questions that the patient had, and administer the 25-item PICI, BDI-SF, Social Resources Subscale, and a demographic information. The patient was asked to sign an authorization for the use and disclosure of protected health information so that the researcher may gain access to the following medical records: all medical diagnosis and dates of initial diagnosis, coronary angiogram data, other diagnostic testing (stress test, echocardiogram, etc.), history of heart attacks, and all current medications.

PHASE II PROPOSED RESEARCH QUESTIONS, HYPOTHESES & DATA ANALYSES

Research Question 1

Does the factor structure of the 25-item PICI resemble the proposed 5-factor solution where each factor represents one of the five psychosocial risk factors for CAD when the Healthy Undergraduate and CAD Group are combined?

Analysis 1

Principle Axis Factor Analysis with Oblique rotation was applied to the combined Healthy Groups' and CAD Groups' responses to the 25-item PICI.

Hypothesis 1

It is hypothesized that, when the Healthy Group's and CAD Group's responses to the PICI are combined, a five-factor solution will emerge that corresponds to the five psychosocial risk factors for CAD.

Research Question 2

When comparing scores on the PICI for the CAD Group and the Healthy Group, does score on each of the PICI subscales (as determined by the factor analysis conducted in Research Question One) on the PICI independently predict group membership in the Healthy Group or the CAD Group?

Analysis 2

Logistic regression (LR) was used where the PICI factors will be the interval level independent variables and group membership will be the dichotomous dependent variable. This statistic will be used so that each factor's independent predictive contribution may be assessed.

Hypothesis 2

It is hypothesized that PICI subscales will each independently predict membership in the CAD diagnosis group. In LR, effect size is measured with an odds ratio and is an indication of each predictor variable's effect on the odds of the dependent variable (the odds of being classified as either in the Healthy Group or the CAD Group based on score on each PICI factor). It is hypothesized that each of the PICI factors will have an odds ratio of about 1.9 which would indicate a moderately high effect (Agras, Crow, Halmi, Mitchell, Wilson, Kraemer, 2000) meaning that the odds of having CAD are about 1.9 times greater for participants who score higher on each of the PICI factors.

Research Question 3

Within only the CAD group, what is the relationship between the psychosocial risk factors for CAD (as measured by the PICI) and percent of arterial blockage (as measured by the coronary angiogram)?

Analysis 3

A bivariate correlation matrix was conducted to examine the relationships between each of the three PICI subscales and the percent of arterial blockage in the Left Anterior Descending coronary artery.

Hypothesis 3

It is hypothesized that each of the PICI subscales will have a moderate to strong negative correlation to the percentage of blockage found in the Left Anterior Descending artery where as subscale scores decrease (indicating increased pathology), percentage of blockage is expected to increase.

Research Question 4

Do individuals with a history of heart attacks score higher on the PICI factors than do individuals with no history of cardiac events?

Analysis 4

A Multiple Analysis of Variance was conducted to test for mean difference on PICI factor scores across individuals who have and have not had a heart attack.

Hypothesis 4

It is hypothesized that individuals who have a positive history of heart attacks will score significantly higher on the Depression and Social Isolation factors than will those patients with no history of cardiac events.

Chapter Four: Results

Prior to the presentation of findings, a description of the manner in which results will be presented is offered. Results will be presented from both phases of the present study – Phase I that was conducted with healthy undergraduates (Healthy Group), and the main study, Phase II, that was conducted with patients who carry a diagnosis of coronary artery disease (CAD Group). First, the Phase I descriptive data will be analyzed. Next, the Phase I research question will be examined to determine the factor structure and to detail the process of narrowing the original 50-item PICI down to the eventual 25-items.

Once the process of developing the 25-item PICI has been explained, then the Phase II research questions will be addressed. Phase II results will begin with an examination of the descriptive data for the CAD Group, followed by a presentation of the factor analysis solutions that were obtained for each the health undergraduate sample combined with the CAD sample so that subscale scores may be determined. Next, descriptive information for the predictor and criterion variables will be presented for the CAD Group. Next, the proposed research questions will be addressed and will aim to provide information relevant to the predictive validity for the PICI. Last, exploratory analysis will be presented to investigate group differences on the psychosocial risk factors for heart disease by comparing mean differences on PICI subscale scores between groups on the basis of sex, race, and socioeconomic status.

PHASE 1 SAMPLE CHARACTERISTICS

Participants from the Phase I data collection included 285 healthy undergraduates who were recruited from the Educational Psychology subject pool at a large public southern university. The mean age was 22. 1 and the sample was 61% female. One

percent of participants self-identified as African American, 10% identified as Hispanic, 21% identified as Asian, and 61% identified as Caucasian.

PHASE I DESCRIPTIVE DATA

Descriptive data for the Healthy Group provides an orientation to the scores that were achieved by the sample during the initial validation of the PICI. Mean scores and standard deviations for the Healthy Group are reported in Table1 for the 50-item PICI, BDI – II, BAI, CAS, PRI Social Resources subscale, and PSS. The 282 students who answered the 50-item PICI had a mean score of 69.8. This version of the PICI has possible scores ranging from 50-200 with 200 representing the lowest amount of pathology and 25 representing the highest amount of pathology in the areas of anxiety, depression, stress, social isolation, and anger. The expected mean score, assuming a normal curve, would be 125. This score would represent a mix of "agree" and "disagree" in response to items concerning the five psychosocial risk factors for heart disease. Assuming a normal curve, one may hypothesize that a score below 125 would be indicative of increased pathology on the psychosocial risk factors of heart disease because it would represent a mix of "agree" and "strongly agree" endorsing items assessing risk factor pathology. Interestingly, the current sample of health undergraduate students achieved a mean PICI score of 69.8, which represents a higher score than expected as mean score of 69.8 would be achieved by a mix of "strongly agree" and "agree" in response to items such as "I tend to eat when I'm depressed" or "I am unhappy with the quality of my relationships." This mean PICI score suggests more pathology that what was expected for a healthy undergraduate sample.

Similarly, the Healthy Group achieved a mean score of 10 on the Beck Depression Inventory – Second Edition which falls in the mild to moderate range of

depression. A score of 10 on the BDI – II is higher than what might be expected for a healthy undergraduate population as scores for comparable healthy undergraduate samples have been reported to average 8.5, falling in the non-clinical range (Zimmerman, 2005). Importantly, standard deviations were found to be 7.2 suggesting a fair amount of variability in self-reported symptoms of depression.

Very similar responses were found on the Beck Anxiety Inventory. The Healthy Group achieved a mean score of 13 which also falls in the mild to moderate range of anxiety according to the scoring guidelines (Beck & Steer, 1991), suggesting that this level of anxiety could be considered clinically significant. Again, this level of endorsement for items measuring somatic anxiety symptomology is slightly higher than what might be expected for a health sample. Also important are the standard deviations of 9.5 suggesting a high amount of variability of responses.

Alternately, on the Clinical Anger Scale, a measure of anger felt toward self and others, the Healthy Group achieved a mean score of 5.7 which falls into the normal range according to the scoring guidelines of Snell and colleagues (1995). This average score is expected for a non-clinical sample of healthy undergraduates.

The Perceived Stress Scale measures one's perceived demands verses available resources. The Healthy Group achieved a mean score of 20.7 on the PSS. As PSS scores can range from zero to 40, and as no clinically significant cutoff scores have been published, a mean score around 20 seems to be appropriately average for a sample of health undergraduates. Similar samples of college undergraduates have achieved a mean score of 19.1 (Cohen, Kamarck, & Mermelstein, 1983).

The Social Resources subscale of the Perceived Resources Inventory contains 14 items scored on a five point scale. The Healthy Group achieved a mean score of 12 on

the Social Resources subscale. Scores for this subscale can range from zero to 56 with higher scores representing increased difficulty in social relationships. Similar samples of healthy undergraduates achieved a mean score of 3.9, suggesting that the current sample may have increased difficulty with social resourcefulness (Lambert & McCarthy, 2008).

Overall, with the exception of somewhat increased pathology on the PICI, BDI – II, PRI-SR, and BAI, the scores represented in the inventory development phase of this study by a healthy undergraduate sample seem reasonably expected.

Table 1: Healthy Group Descriptive Data

	N	Min	Max	Mean	SD
PICI	282	39	92	69.8	9.4
BDI – II	252	0	42	9.5	7.8
BAI	279	0	59	12.9	9.5
CAS	226	0	49	5.7	5.7
PSS	249	5	31	20.7	3.2
PRI-SR	250	0	49	12.0	6.9

Notes. PICI = Psychosocial Inventory for Cardiovascular Illness, 50-Item, BDI –II = Beck Depression Inventory = Second Edition, BAI = Beck Anxiety Inventory, CAS = Clinical Anger Scale, PSS = Perceived Stress Scale, PRI-SR = Social Resources Subscale.

PHASE I RESEARCH QUESTION: FACTOR ANALYSIS

Phase 1 Research Question

Does the factor structure of the 50 –item PICI support construct validity through the proposed five-factor solution where the five factors correspond to the five psychosocial risk factors for heart disease?

Phase I Analysis

The data from the Healthy Group's responses on the fifty PICI items were subjected to an oblique rotated principal axis factor analysis in attempts to support construct validity. A five factor solution where each psychosocial risk factor loads on a separate factor was hypothesized, but did not emerge. Instead, the most interpretable solution emerged as a three-factor solution as suggested by the Scree Plot. This three-factor solution accounted for 37% of the variance where two of the hypothesized factors emerged as expected (anger and social isolation), and one factor emerged as the combination of the three negative affect states (perceived stress, anxiety, and depression) Table 2 supplies the PICI items that loaded on each of the three factors as well as each item's factor loading. Factor values less than .200 were suppressed.

Table 2: Factor Structure for the PICI, Healthy Undergraduate Data

Item	Factor	Loading
When something is bothering me I feel physically anxious	1	.638
I feel anxious	1	.600
I have a hard time coping with things that happen	1	.537
Life's demands are more than what I can handle	1	.530
I feel hopeless that the troublesome aspects of my life will get better	1	.530
It takes me a long time to recover from something upsetting	1	.494
I feel tired after an emotional task even if I have not done any activity	1	.465
My stomach bothers me when I'm stressed	1	.445
When I'm depressed, it is hard to get enough exercise	1	.417
I believe I worry more than most	1	.385
Sometimes I eat to make myself feel better	1	.334
I seem to have more physical ailments when I'm stressed	1	.296
I do not feel closely connected to the people around me	2	.703
I feel isolated from others	2	.621
I am not happy with the quality of my relationships	2	.581
I feel lonely	2	.515
I find it difficult to surround myself with others	2	.490
I feel worthless	2	.475
It doesn't take a lot to make me feel angry	3	.760
I can be angered easily	3	.728
I behave aggressively when I'm in a situation that angers me	3	.397
I can be verbally aggressive	3	.318
Daily hassles bother me	3	.309
I hold resentment toward others who've wronged me	3	.248

Note: Factor One = Negative Affect, Factor Two = Social Isolation, Factor Three = Anger. Factor loadings less than .200 were suppressed.

This three-factor solution collapsed three of the hypothesized factors into one. Instead of anxiety, depression, and stress loading on separate factors, they were combined into one factor that could be best interpreted as Negative Affect. Although it is not surprising that these three similar constructs were not distinguished by the PICI factor structure, it is nonetheless the purpose of this study to measure each of the five psychosocial risk factors for heart disease as a distinct construct. This is because each of the psychosocial risk factors contribute to the coronary disease process in different and unique ways. If the inventory was to combine three risk factors into one subscale, important data regarding the unique contributions of anxiety, depression, and stress may be lost in the Phase II data collection process. Therefore, to obtain the final, 25-item version of the PICI, an alternative method of item analysis was used.

The Alpha if Item Deleted function was be used to help maintain the best five items from each of the five subscales that were originally written to measure each of the five psychosocial risk factors. This process maintained both the theoretical relevance of the inventory and retained the most stable items. The process of eliminating items that yielded the highest Alpha if Item Deleted value was used to achieve a theoretically relevant and reliable instrument. Coefficient Alpha for the final 25-item PICI was 0.87, suggesting that the final 25 items maintain good internal consistency with an undergraduate sample. The final 25 items include five subscales – each of which measures one psychosocial risk factor for heart disease. Construct validity for this 25-item PICI was demonstrated through convergent validity as assessed through correlations between each of the PICI subscales and existing inventories that measure similar constructs. The five PICI subscales include depression, anxiety, stress, anger, and social isolation. To support convergent validity, each subscale was correlated with an existing

inventory that measures a similar construct. As seen in the correlation matrix shown in Table 3, each of the PICI subscales correlates moderately with the appropriate existing inventory, and each PICI subscale correlates most highly with the intended measure as opposed to other inventories that measure similar or related constructs. Each correlation is in the expected direction (noting that lower PICI scores are indicative of increased pathology). Good convergent validity is supported for the PICI Depression Subscale as it has a -0.62 correlation with the BDI – II, and also for the PICI Anxiety Subscale as it has a -0.55 correlation with the BAI. Good convergent validity has also been supported for the PICI Social Isolation subscale as it has a moderate (0.54) correlation with a Social Resources subscale. Acceptable convergent validity was established for the PICI Stress and Anger subscales with -0.32 and -.042 correlations with the Perceived Stress Scale and the Clinical Anger Scale.

Table 3: Correlation Matrix for PICI subscales

	Depression	Anxiety	Stress	Anger	Social Isol.
BDI-II	**-.62**	-.47	-.21	-.4	.39
BAI	-.47	**-.55**	-.43	-.23	.29
PSS	-.20	-.28	**-.32**	-.08	.12
CAS	**-.45**	-.41	-.31	-.42	.40
PRI-SR	-.39	-.28	-.34	-.16	**.54**

Notes. BDI–II = Beck Depression Inventory = Second Edition, BAI = Beck Anxiety Inventory, CAS = Clinical Anger Scale, PSS = Perceived Stress Scale, PRI-SR = Social Resources Subscale. Depression, Anxiety, Stress, Anger, and Social Isolation = PICI Subscales. Bolded values represent each subscale's highest correlation with an existing inventory.

Although the 3-factor solution that was yielded by the Principle Axis Factor Analysis did not support the five factor model that is theoretically relevant to the present

study, a relevant set of items was achieved through the item analysis. Eliminating items with high Alpha if Item Deleted values has identified 25 items that break down into five subscales that correspond to the five psychosocial risk factors for heart disease. These 25 items have demonstrated adequate internal consistency with a Coefficient Alpha of 0.87 and have also shown construct (convergent and discriminant) validity with each subscale correlating moderately to a similar existing inventory. This 25 item version of the PICI will be used in Phase II of this study and administered to a group of individuals who carry a diagnosis of coronary artery disease (CAD Group).

PHASE II SAMPLE CHARACTERISTICS

Participants included 97 heart patients who carried a diagnosis of coronary artery disease and were presenting for a scheduled appointment with their private cardiologist. Six patients declined to participate and reasons for declining included inadequate time to complete the surveys and not bringing one's eye glasses or hearing aid. Participants ranged in age from 44 to 88 with a mean age of 71 and standard deviations of 9.8. Participants identified as 7% African American, 2% Asian, 3% Hispanic, 85% Caucasian, and 2% other. Participants were 72% male and 28% female.

EXAMINATION OF PSYCHOSOCIAL & PHYSIOLOGICAL ASSESSMENT DATA

The descriptive data for the CAD group revealed a number of interesting aspects of the data. Table 4 displays the mean scores and standard deviations for each of the psychosocial and physiological assessments that were conducted with the CAD Group. These include the 25-item PICI, BDI – SF, PRI Social Resources subscale, Lifestyle Behavior Inventory, demographic information, and percent of arterial blockage. First, it should be noted that PICI scores have a possible range of 25-100 with a lower score

suggesting increased pathology. The CAD Group mean PICI score was 73 which is above the possible median score. This mean score of 73 suggests less pathology in the areas of negative affect, social isolation, and anger than what might be expected from a sample of individuals with chronic and fatal health concerns. The 10 item Negative Affect Subscale is scored from 10 – 40 with a score of ten representing increased pathology and a score of 40 representing decreased pathology. The mean score on the Negative Affect Subscale of the PICI for the CAD group was 28 with standard deviations of 5.5. This mean score would be achieved by answering a mix of "Strongly Disagree" and "Disagree" to items such as "I believe I worry more than most" and "I am hopeless that the troublesome aspects of my life will get any better." The CAD Group achieved an average score of 13.8 on the Anger Subscale. This subscale is scored from 5 – 20 with five representing increased pathology and twenty representing no pathology on items that measure anger toward self and others. The CAD Group's mean score of 13.8 would represent responses somewhat equally mixed between "agree" and "disagree" on items such as "I can be verbally aggressive" and "I hold resentment toward those who have wronged me." Last, the CAD Group achieved a mean score of 16 on the Social Isolation Subscale of the PICI. This subscale measures perceived quality and quantity of social relationships and is scored from 2 – 20. A score of 16 would be achieved through a mix of "Disagree" and "Agree" to items such as "I feel lonely" or "I am unhappy with the quality of my relationships."

The CAD Group achieved a mean score of 4 on the Beck Depression Inventory – Short Form, a 13-item inventory that is scored from 0 – 39 with higher scores representing an increased number of depression symptoms endorsed. A mean score of 4 falls into the non-clinical range of the BDI-SF, and is a score that could be achieved by

only minimally endorsing items that measure specific symptoms of depression. The CAD Group achieved a mean score of 7 on the 6-item Social Resources subscale of the Perceived Resources Inventory. This subscale measures perceived social resourcefulness such as comfort and reciprocity in a relationship. This subscale is scored from 0 – 20 with a score of 20 indicating high perceived social resources and a score of zero indicating low perceived ability to function in relationships. A mean score of 7 represents low-average perceived social resources.

The CAD Group was also assessed for lifestyle behaviors that contribute to cardiovascular health with the Lifestyle Behavior Inventory (Juncker, 2005). This inventory assesses for the presence and severity of lifestyle risk factors over the lifetime including tobacco use, alcohol use, dietary choices, and exercise habits. This 16-item inventory is scored from zero to 64 with lower scores indicating increased problematic lifestyle behaviors and higher scores representing healthier lifestyles. The CAD Group achieved a mean score of 44 suggesting that the sample, overall, endorsed healthier lifestyle behaviors in the areas of tobacco use, alcohol use, diet, and exercise.

The CAD Group was also assessed for a physiological marker of CAD - percent of arterial blockage in the Left Anterior Descending (LAD) artery of the heart. LAD occlusion in an indicator of CAD severity as this artery is one of the main cardiovascular arteries that supplies blood to the majority of the body. The CAD sample ranged from 0 – 100% occlusion of the LAD with a mean occlusion of 76%. This average percentage of LAD blockage is indicative of clinically significant coronary disease, as would be expected for a sample of individuals with CAD presenting for a regularly scheduled visit to their cardiologist (Chen, et al, 2003). In addition to percent of LAD blockage, data was also collected on coronary artery bypass graft (CABG) procedures and history of

heart attacks. In the CAD Group, 40% of participants had undergone CABG surgery that ranged from a single to quintuple bypass and 23% of the sample had incurred one or more heart attacks with only 3% of the sample having a history of multiple cardiac events. It was expected that a higher percentage of CAD patient would have incurred one or more heart attacks, but the large percentage of bypass patients accounts for the lack of cardiac events as the bypass procedure is intended to prevent occurrence of a heart attack.

Table 4: Descriptive information for psychosocial and physiological data

	N	Low	High	Mean	SD
PICI Total	87	46	97	73.0	11.2
NA	89	12	40	28.1	5.4
ANG	92	6	20	13.8	3.0
SI	94	8	20	16.2	2.6
BDI –SF	80	0	14	4.0	3.3
PRI-SR	87	0	19	7.1	3.2
LBI	68	25	64	44.3	7.0
LAD	86	0	100	76.0	28.7

PICI Total = Psychosocial Inventory for cardiovascular Illness total score, BDI = Beck Depression Inventory Short Form, PRI-SR = Social Resources subscale from Perceived Resources Inventory, LBI = Lifestyle Behavior Inventory, LAD = Left Anterior Descending artery % blockage

PHASE II RESEARCH QUESTIONS

Research Question 1

The first research question addressed the factor structure of the PICI, hypothesizing that a five factor solution would emerge that correspond to the psychosocial risk factors for CAD including anxiety, depression, stress, social isolation, and anger.

It is important to assess whether or not the addition of the CAD Group will result in the same three-factor solution or if the addition of the CAD Group may result in the initially hypothesized five-factor solution so that subscale scores may be computed and used in later analyses.

The 25 PICI items that were administered to both the Healthy Group and the CAD Group were subjected to Principle Axis Factor Analysis with oblique rotation to account for the likelihood of correlated variables. Upon conducting the analysis, a three-factor solution emerged that was similar to the solution that emerged for the Healthy Group. The three factors included Negative Affect (a combination of the anxiety, depression, and stress items), Anger, and Social Isolation. The highest loading ten items were retained for the Negative Affect factor where the highest loading five items were retained to comprise the Anger and Social Isolation Factors. Coefficient Alpha for the 25-item PICI was found to be 0.87 with alpha values for each of the three subscales ranging from .80 to 0.87. Table 5 displays the items that loaded on to each of the three factors and each item's factor loading value.

Table 5: Three-Factor Solution for Combined Healthy and CAD Groups

Item	Factor 1	Factor 2	Factor 3
I feel like Issues that Arise are bigger than what I can deal with	.665		
When something is bothering me, I feel physically anxious	.634		
I feel hopeless that the troublesome aspects of my life will get any better	.631		
I have a hard time coping with things that happen in my life	.604		
It takes a long time for me to recover from something upsetting	.601		
I feel tired after an emotional task without having done physical activity	.509		
I believe I worry more than most	.468		
My stomach bothers me when I'm stressed	.458		
When I feel depressed, I find it difficult to get enough exercise	.432		
Sometimes I eat to make myself feel better	.338		
I can be easily angered		.741	
At times I behave aggressively when I'm in a situation that angers me		.603	
I can be verbally aggressive		.538	
Daily hassles bother me		.436	
I hold resentment toward others who have wronged me		.353	
I feel isolated from others			-.696
I feel lonely			-.669
I do not feel closely connected to the people around me			-.662
I am not happy with the quality of my relationships			-.641
I find it difficult to surround myself with others			-.476

Notes. Factor One = Negative Affect, Factor Two = Anger, Factor Three = Social Isolation. Factor loadings less than .300 were suppressed.

The three factors are modestly correlated with one another with intercorrelations ranging from 0.27 to 0.45 all in the expected directions. The highest correlated factors

were Negative Affect and Social Isolation (r = 0.45) with the least correlated factors being Anger and Social Isolation (r = 0.27).

Convergent validity was also supported through intercorrelations of factors with existing inventories that measure similar constructs. Convergent validity was examined for each PICI factor as each factor correlated moderately with the expected existing inventory and in the expected direction. No factor correlated so highly with a similar inventory that it could be considered redundant, and each factor correlated most highly with the expected inventory as opposed to other, less relevant inventories. The Negative Affect subscale correlated moderately with the BDI-SF (r = 0.60) as was expected. The Social Isolation subscale also demonstrated good convergent validity through a moderate correlation with the Social Resources subscale of the PRI (r = 0.52). Last, the Anger Subscale demonstrates divergent validity through low correlations with the BDI-SF (r = 0.35) and with the Social Resources subscale (r = 0.38). It should be noted that, for the purposes of the study, it was decided that the CAD Group would only be assessed for symptoms of depression via the BDI-SF and social isolation via the Social Resources subscale because depression and social isolation have been found to be most theoretically relevant to an older population with heart disease (Rozanski, et al, 1999). This is because depression and social isolation have been found to be important predictors in one's likelihood of a successful recovery from a cardiac event. Anger has been found to be of less importance for those recovering from a cardiac event, thus preference was given to measuring the constructs of depression and social isolation in the CAD Group.

Research Question 2

The second research question addressed concurrent validity for the PICI by testing its ability to predict coronary artery disease status based on PICI subscale scores.

It was hypothesized that Negative Affect, Social Isolation, and Anger would each independently predict membership in the CAD group. To test this hypothesis, logistic regression was used where the three PICI factors were the three interval level independent variables and group membership (CAD or Healthy) was the dichotomous dependent variable. It was hypothesized that each of the three PICI factors would have an odds ratio of about 1.9 or greater which would indicate a moderately high effect (Agras, et al., 2000) meaning that the odds of having CAD are about 1.9 times greater for participants who score higher on each of the PICI factors.

Upon conducting the logistic regression, it was found that the three PICI subscales did not independently predict group membership in either the Healthy or CAD group so that this hypothesis was not confirmed and the analysis was not significant. It was hypothesized that adequate prediction would be based on an odds ratio of at least 1.9 to be considered significant. Each of the three subscales had an odds ration of less than 1.9. The Negative Affect subscale had an odds ratio of 0 .95 meaning that the participants who scored highly on this subscale have only a 0.95 greater chance of carrying a diagnosis of CAD. Similarly, the Hostility subscale evidenced an odds ratio of 1.08. The highest odds ratio of 1.3 was seen with the Social Isolation subscale. Interestingly, it was not in the hypothesized direction - individuals who scored highly on items that measured social isolation were 1.3 times more likely to belong to the Healthy group that was comprised of undergraduate students.

Research Question 3

The third research question addressed the relationship between Negative Affect, Social Isolation, and Anger as measured by the three PICI subscales and percent of arterial blockage on the LAD as measured by coronary angiogram. It was hypothesized

that each subscale would correlate negatively with the atherosclerotic percentages yielded from the coronary angiogram data.

The Left Anterior Descending artery was chosen as the physiological measurement for this analysis because it is the artery that supplies oxygen rich blood to a vast portion of the heart. Blockage in the artery frequently leads to a cardiac event resulting in necrosis of heart tissue from oxygen deprivation. The LAD is often referred to by its nickname, the widow's artery, because of the large number of men who die from cardiac events with origins in LAD blockage (Holmes & Bell, 2000).

A bivariate correlation matrix yielded no significant correlations between Negative Affect, Anger, Social Isolation, or the PICI total score and percent of blockage in the LAD artery. The Negative Affect subscale achieved a 0.15 correlation with LAD blockage which represents the highest correlation demonstrated. The Anger subscale achieved a 0.05 correlation with LAD blockage while the Social Isolation Subscale's correlation was 0.12. The PICI total scores were also very lowly correlated with LAD blockage ($r = 0.14$). No correlations were statistically significant at the 0.05 level.

Research Question 4

The fourth research question further investigates the Negative Affect, Anger, and Social Isolation subscales' predictive validity through assessing for mean differences on subscale scores between CAD patients who have and have not had one or more heart attacks.

A one way MANOVA using presence or absence of one or more heart attacks as the independent variable and score on the Negative Affect, Anger, and Social Isolation Subscales as the dependent variable was conducted. The overall test was not significant and the analysis found no main effect of heart attack status. The analysis revealed that

CAD patients who have incurred one or more heart attacks did not score significantly different on any of the PICI subscales than did patients who were negative for cardiac event. For the dependent variable Negative Affect, $F(1, 57) = 1.9$, $p = .16$. For the Anger subscale, $F(1, 15) = 1.6$, $p = .21$. For the Social Isolation variable, $F(1, 3) = .36$, $p = .50$.

EXPLORATORY ANALYSES

With PICI subscales analyzed to measure the different psychosocial risk factors for CAD, the exploratory analysis will first assess for mean differences among the three subscales for the CAD group, and then demographic differences among mean scores on each of the three subscales will be investigated.

Mean Differences on Subscale Scores for Cardiac Group

In examining the mean differences between subscales, it should be noted that the subscales are scored differently due to different numbers of items. The Negative Affect subscale holds ten items on a four-point Likert scale with scores ranging from ten to forty. Lower scores indicate increased pathology. Conversely, the Social Isolation and Anger subscales maintain five items with possible scores ranging from five to twenty, again, with lower scores indicating increased pathology. An examination of the mean scores on each subscale shows that the CAD Group endorsed difficulty with anger and negative affect more so than social isolation. A related-sample t-Test demonstrates that the CAD Group scored significantly lower on the Anger subscales than they did on the Social Isolation subscale ($t\ (91, 14) = 44$, $p < .01$) meaning that respondents in the CAD group, on average, endorsed more feelings associated with anger than social isolation. Similarly, if the Negative Affect scoring principles were adjusted to be compatible with the other two subscales, the Negative Affect mean score would be approximately 14, also

significantly lower than the mean score on the Social Isolation subscale (t (93, 16) = 59, p< .01). Table 6 demonstrates the mean differences between PICI subscale when scoring principles are adjusted for ease of comparison.

Table 6: PICI Subscale Mean Differences

Subscale	N	Mean	SD
NA	89	28.1	5.4
ANG	92	13.8	3.0
SI	94	16.2	2.6

Notes. NA = Negative Affect, ANG = Anger, SI = Social Isolation.

Mean Differences on Subscale Scores across Demographic Variables

Mean differences on subscale scores will also be explored across the variables of sex, race, and income. Demonstration of differential performance on the psychosocial risk factors for CAD could have important implications for prevention and treatment, and thus, will be the focus of this exploratory analysis. To achieve this, a MANOVA was conducted with Sex, Race, and Income as categorical independent variables and the three PICI subscales of Negative Affect, Social Isolation, and Anger as continuous dependent variables. The MANOVA was chosen because it is expected that the dependent variables may be correlated and to reduce the Type I error expected if multiple ANOVAs were conducted. The particular demographic variables of sex, race, and income are of interest concerning differential levels of the psychosocial risk factors for CAD because each variable has been associated with increased risk for development of heart disease. A demonstration of mean differences on risk factor prevalence across these demographic

variables could help to explain why individuals who are categorized as male, African American, or low SES tend to experience higher rates of heart disease or develop the disease earlier in life. Therefore, it is hypothesized that there will be a main effect of sex, race, and income.

Upon conducting the MANOVA, it was found that the overall analysis was not significant and there was no main effect for sex, race, or income as all p values were above 0.1. There was also no significant interaction effect between any of sex, race, and income (see Table 7).

Table 7: Tests of Between-Subjects Effects on PICI Subscales across Sex, Race, and Income

Source	DV	DF	F	Sig.
Sex	SI	1	.497	.484
	Anger	1	.067	.796
	NA	1	.182	.671
Race	SI	4	1.460	.226
	ANG	4	.374	.826
	NA	4	.354	.840
Income	SI	4	.488	.744
	ANG	4	.530	.714
	NA	4	.810	.524

Chapter Five: Discussion

The present study aimed to support construct and predictive validity for the Psychosocial Inventory for Cardiovascular Illness (PICI). Specifically, the study aimed to demonstrate the appropriateness of five PICI factors that corresponded with the five psychosocial risk factors for CAD which include anxiety, depression, stress, social isolation, and anger. Second, the study intended to support the PICI's ability to predict the coronary artery disease process.

Data was examined from two stages of this process. First, the PICI along with corresponding existing inventories were administered to a sample of healthy undergraduates. This yielded a 25-item version of the PICI with support for basic psychometric of reliability and construct validity. Next, this 25-item version of the PICI was administered to a sample of heart patients with a CAD diagnosis and a number of physiological markers of CAD including percent of coronary artery blockage and history of heart attacks were collected from existing medical data.

SUMMARY & DISCUSSION OF HYPOTHESES

Hypothesis 1

The first hypothesis proposed that the factor structure for the 25-item PICI as administered to the combined healthy undergraduates and heart patients would result in a five-factor solution that could be best interpreted as the five psychosocial risk factors for CAD: anxiety, depression, social isolation, stress, and anger. The proposed five-factor solution was not supported by the analysis, but instead, a three-factor solution emerged where the three factors could be best interpreted as Negative Affect, Social Isolation, and Anger. Two factors, Social Isolation and Anger, emerged as hypothesized, while stress,

depression, and anxiety appear to have been combined to form the Negative Affect factor. These three subscales – Negative Affect, Social isolation, and Anger – were used as the PICI subscales in subsequent analysis.

Hypothesis 2

The second hypothesis proposed that the PICI subscales would be able to predict group membership in either the health undergraduate group or the CAD group. Thus, it was proposed that the three constructs of negative affect, social isolation, and anger could independently predict whether or not an individual carried a diagnosis of CAD by level of pathology endorsed in each area. This hypothesis was not supported as none of the three subscale scores nor the PICI total score were able to independently predict who carried a CAD diagnosis.

Hypothesis 3

The third hypothesis proposed that each PICI subscale (Negative Affect, Social Isolation, and Anger) would have a moderate to strong negative correlation with percent of arterial blockage in the Left Anterior Descending coronary artery within the group of CAD patients. Percent of arterial blockage was measured by coronary angiogram and retrieved from existing medical charts. This hypothesis was not supported as, although each correlation was in the proposed direction, the relationship between negative affect, social isolation, and anger was not strong. Instead, correlations between the subscales and percent blockage fell in the low range, suggesting little strength of the relationships.

Hypothesis 4

The fourth hypothesis proposed that individuals who had a history of one or more heart attacks would score significantly lower (endorsing more pathology) on each of the

PICI subscales of Negative Affect, Social Isolation, and Anger than would individuals from the CAD group who did not have a history of any cardiac events. The hypothesis was not supported as there were no differences found between the mean PICI scores for individuals who had a history of heart attacks and individuals who did not have a history of heart attacks.

DISCUSSION OF RESULTS OF PRIMARY HYPOTHESIS

Although the study's hypothesis predicted a five-factor solution where the five psychosocial risk factors each emerged as their own separate and unique factor on the PICI, the three-factor solution can also be interpreted in terms of the current literature on the psychosocial risk factors for CAD. The hypothesized factors would have corresponded with each risk factor, but the emerged factors may be better interpreted in terms of internal negative affective states, negative interpersonal states, and negative social states – each of which seem to have a different effect on cardiovascular health. The first factor to emerge seems to capture internal negative affect states with items that tap into hopelessness, fatigue, somatic experiences, stress, and feelings of inadequacy. These constructs point to a very internal experience and also tend to correspond highly to elevations in cortisol and imbalances in autonomic nervous control (Hans, et al., 1995). The second factor emerged as experiences that seem interpersonal in nature with items measuring constructs such as aggression, anger, and resentment. These constructs have been shown to contribute to coronary artery disease by leading to an exaggerated stress response and higher ambulatory blood pressure (Donker 2000; Sul, & Wan, 1993). Last, the third factor to emerge seemed to deal with situations primarily social in nature with high-loading items appearing to concentrate on isolation, loneliness, and quality of relationships.

Regarding the specific entanglement of anxiety and depression, the literature supports a long history of psychometricians' inability to effectively measure the distinct constructs due to the high number of shared symptoms between the two constructs and the vast comorbidity of depression and anxiety disorders. It has been proposed that one of the primary reasons for this overlap and comorbidity is the shared general distress symptoms that accompany both anxiety and depression (Clark & Watson, 1991). Thus, in attempts to parse out the unique aspects of anxiety and depression, the current study attempted to focus on somatic aspects of anxiety and anhedonic depression. Yet the study aimed to develop an inventory that measured the ways in which these constructs contributed to CAD, and it is likely that anxiety and depression share many overlapping contributions such as autonomic imbalance, inactivity, and poor dietary choices leading to the entanglement of the two constructs.

The data's inability to support the second hypothesis can also be seen in light of current literature. In the second hypothesis, it was proposed that participants' scores on measures of negative affect, social isolation, and anger could predict whether each participant belonged to the healthy undergraduate group or to the CAD group. It was expected that this demonstration of predictive validity could be achieved through the CAD group demonstrating increased pathology on each of the constructs while the healthy undergraduates achieved scores indicative of healthier responses, yet this was not the case. One interesting aspect of the data should be noted with interpreting this finding. When reviewing the descriptive data, it was revealed that, on measures of negative affect, social isolation, and anger, the health undergraduates, on average, scored lower (indicative of increased pathology) than did the heart patients. Yet it was anticipated that the healthier group would demonstrated decreased pathology while the sample of

individuals with coronary disease would score highly on a measure of coronary disease risk factors. To shed light on this unexpected anomaly, Erskine (2007) reports findings similar to the results of this research question. Erskine (2007) administered a number of measures of various psychopathology to a sample with a mean age of 73 and another sample with a mean age of 20 – samples quite similar in age to the samples used in the current study. Erskine (2007) found that that older adults were significantly more likely to endorse less pathology than the younger adults on many different constructs. The study further found that the older adult sample was significantly more likely than the younger sample to utilize repressive coping strategies. Repressive coping can be seen as an attempt to direct attention away from negative affect, which is a perfectly understandable mechanism to be used by a sample of individuals with a chronic health condition. Contrary, though to this explanation is the work of Carstensen, Mayr, Pasupathi, and Nesselroade (2000) which suggests that older adults experience emotions and emotional intensity at similar rates as younger individuals. With this in mind, it may be most important to note that self-report measures such as the PICI are subjective and open to individual interpretation. When items request participants to consider how daunting the world feels, or how often they feel hopeless, answers may seem skewed on the basis of differing opinions of what "often" means. For example, an older adult who lives alone and is rarely visited may be considered socially isolated by younger adults who lead active lives, but that older adult may consider himself lucky to receive a visit from his daughter once per week when he knows many others who never receive any visits at all. Individual interpretation of items and responses cannot be underestimated with the current samples.

The third hypothesis proposed that the CAD samples' levels of negative affect, social isolation, and anger would each be correlated with percent of arterial blockage in the Left Anterior Descending coronary artery. This hypothesis was not supported, as, although in the proposed direction, the relationships between the constructs of negative affect, social isolation, anger, and blockage were weak. Although one would expect the established risk factors for a disease to be strongly related to a major physiological marker of the severity of that disease, these results are not surprising in light of the above discussion on the second hypothesis. For a multitude of reasons discussed above, the CAD sample did not endorse the expected level of psychopathology, thus, relationships between that psychopathology and physiological markers were difficult to illuminate.

Another possible contribution to the unsupported nature of the third hypothesis is 'amount of time that had lapsed between many patients' onset of symptoms and the time of the present study's administration. Due to the well-established nature of the private cardiology practice from which participants were recruited, many participants had been patients at that particular office for decades. The average amount of time that participants in the CAD sample had been patients at this particular office was estimated to be about ten years. Thus, the CAD sample, as a whole, had been receiving treatment for CAD for quite some time, and although percent of arterial blockage is slow to decrease without surgical intervention, lifestyle behaviors and affective disposition can be changed more easily with education from one's physician. It may be the case that many of the current study's participants had received a diagnosis so long ago that they have had plenty of time to make changes to their lifestyle, promoting healthier thoughts, feelings, and behavior, whereas their percent of arterial blockage has not changed

tremendously. This discrepancy could account for the weak relationship between negative affect, social isolation, anger, and percent of coronary blockage.

The fourth hypothesis proposed that individuals who had had one or more heart attack would have significantly higher scores on measures of negative affect, social isolation, and anger than would CAD patients who had no history of heart attacks. This hypothesis was not confirmed and these results may be explained by the fact that only 23% of the CAD patients had a history of heart attacks whereas 60% had a history of a single or multiple coronary artery bypass graft. The CABG procedure is typically performed for the purposes of restoring blood flow to the heart when coronary arteries are severely blocked to the extent that oxygenated blood cannot reach the heart. This procedure reduces the patient's chances for ischemia and cardiac events, thus, is intended to prevent heart attacks (American Heart Association, 2007). The function of this sample having a high percentage of preventive procedures such as the bypass graft and a substantially lower percentage of heart attacks implies that, if a sample is never "allowed" to reach the level of disease severity necessary for a heart attack to occur, that level of severity may be extremely difficult to measure.

EXPLORATORY HYPOTHESES

The data was analyzed to better understand how the CAD sample scored on the three PICI subscales of negative affect, social isolation, and anger to determine if any of the psychosocial risk factors for CAD might be differentially prevalent in the present sample. This information could help guide further research on the risk factors in the context of risk factor severity for different populations.

The data was also analyzed to assess for differences among the constructs of negative affect, social isolation, and anger across the demographic variables of race, sex,

and socioeconomic status. Investigation of these differences could provide useful information to guide providers in treatment planning for individuals at risk for developing CAD who belong to various demographic groups.

Discussion of Results of Exploratory Analysis

Exploratory analysis revealed that the CAD patients endorsed significantly more difficulty with issues related to negative affect and anger than they did for issues related to social isolation. This is surprising given that the average age of the participants was 71, and an older adult population is often at an increased risk for social isolation due to a number of factors that tend to reduce social engagement including depression, cognitive impairment, and limited mobility (Kaytona & Shankar, 1999). This finding may be explained by the nature of this particular sample of patients with CAD. Observationally, it was quite common for patients to be accompanied to their appointments by one or more family members or friends. Being that participants were recruited from a private practice as opposed to a community based clinic, assisted living, or nursing facility, it is likely that the participants in the current study had the additional resources necessary to afford private practice health care and had the social support to arrange transportation to and assistance during the visit.

Exploratory analyses also investigated different levels of psychosocial risk factors across the demographic variables of race, sex, and socioeconomic status. No differences were found in risk factor levels among different demographic groups. This finding suggests that individuals of different demographic groups do not suffer from one psychosocial risk factor more than another. Although a better understanding of differential risk factor prevalence among demographic populations would have been helpful in the treatment planning stages, the current findings suggest that those

differences are not present. Instead, the nature of the Psychosocial Inventory for Cardiovascular Illness allows for treatment to be individually tailored to each at-risk individual by examining which subscales (Negative Affect, Social Isolation, or Anger) are elevated.

APPLICATIONS OF THE PICI

The Psychosocial Inventory for Cardiovascular Illness, in its final form, is a 20-item, Likert-style, self report inventory that measures the psychosocial risk factors for coronary artery disease through the use of three subscales. The three subscales include a Negative Affect subscale that measures anxiety, depression, and chronic stress, a Social Isolation subscale that measures perceived quantity and quality of social relationships, and an Anger subscale that measures anger toward self and others.

From the current data, healthy undergraduate participants' scores are used to establish norm scores as that sample most closely resembles the target population. The average healthy undergraduate Negative Affect subscale mean was 26 with a standard deviation of five. Thus, a Negative Affect subscale score less than 21 might be considered clinically significant. Likewise, the undergraduate participants' Social Isolation subscale mean score was 15 with a standard deviation of 3, therefore a Social Isolation score below 12 might be considered pathologically low. Last, the undergraduates achieved a mean score of 13 on the Anger subscale with a standard deviation of 2 suggesting that a score below 11 may support difficulties with anger.

These suggested cut-off scores may be used in preliminary application of the PICI to help identify individuals at risk for the development of CAD and may also be used to tailor treatment plans for these individuals. These treatment plans may include

behavioral, psychosocial, or medical interventions implemented by the individual's health care provider.

Possible providers that may find the PICI useful include psychologists, primary care physicians, and cardiologists. Ideally, these three types of health care providers would work together to implement complementary behavioral, psychosocial, and medical interventions to reduce at-risk individuals' disease progression. For example, a psychologist might work with a patient on reducing chronic stress and reducing the severity of the physiological stress response, the primary care physician may concurrently work with this patient on weight management, while the cardiologist may monitor the patient for hypertension and high cholesterol, possibly prescribing prescription medications if lab levels exceed normal expectation. Such comprehensive and collaborative care should be a constant goal when considering the treatment of pervasive public health concerns such as coronary artery disease. The PICI is one small tool that may aid in the early identification of at-risk individuals and the subsequent collaboration of related health care providers.

STUDY STRENGTHS

A primary strength of the current study is its use of a clinical population and triangulation of multiple types of data. The use of a sample of individuals with CAD is a strength of this study because it allowed for the study to truly assess how those individuals perform on a measure testing the psychosocial risk factors for heart disease. Important information was yielded from participation of the older, cardiac sample, namely that this population may have a unique response style that demands additional consideration for research design in this field of study. Similarly, the collection of multiple types of data also helped to promote the internal validity of the study.

Particularly in light of the unanticipated response style of the cardiac sample, it was important to include non-self-report data such as percent of coronary artery blockage and history of heart attacks.

STUDY LIMITATIONS

The first limitation of the current study is the comparison of the cardiac sample to the healthy undergraduate sample. In light of the CAD Group's response style, it became important that the older cardiac patients be compared to a matched sample of other, healthy older adults in order to be able to see differences between the groups. The use of a healthy undergraduate comparison group introduced too much unmeasured variance into the study design and limited the study's ability to truly compare healthy and cardiac participants without differences being accounted for by age.

The second limitation of the current study is self-report measurement of many of the variables. This allowed each sample's response style to introduce additional, unmeasured variance into the design. This had a particular effect on the cardiac sample. For a number of reasons, the CAD Group's responses seemed to be heavily influenced by a number of factors other than how they honestly felt about each particular item. For example, a number of the CAD participants asked if they had "passed the test" or if "the doctor was going to see my answers." Observationally, the CAD Group seemed particularly worried about the "correctness" of their responses, and may not have understood that there was no right or wrong answers. Positive self presentation and the above discussed "repressive coping" also seemed to have influenced the CAD Groups' responses. These various unmeasured variables likely added enough unmeasured variance into the design to make differences difficult to see.

Another important limitation of the present study is limited generalizability of results. Due to the homogeneous nature of the CAD Group, findings may not be indicative of the greater population of individuals with heart disease. The sample used in the present study was an older sample of heart patients whose disease processes had largely been controlled under the care of a private practice cardiologist for many years. The current sample was primarily white, male, and middle to upper class, leaving out a number of populations that tend to have high rates of heart disease including females, African Americans, and low-income individuals.

AREAS OF FUTURE RESEARCH

The first area of future research is to obtain a healthy, older adult, matched sample to act as a better comparison group for the CAD Group. This design could reduce unmeasured variance related to response style and provide a better chance of finding group differences on the psychosocial risk factors for heart disease. Evidence of these group differences could help provide support for the predictive validity of the PICI.

A second area of future research would be to increase the diversity in the CAD Group by collecting data from additional females, individuals with low incomes, and African American participants. The addition of these demographics would help the CAD Group more closely resemble the demographics of individuals with CAD in the population, and thus, increase the study's external validity.

A third area of future research might include additional item development to better capture the initially hypothesized five-factor structure with each factor corresponding to one of the five psychosocial risk factors for CAD. The items written for the present study were unable to disentangle the constructs of anxiety, depression, and chronic stress, which is not surprising given then comorbidity and symptom overlap of

those constructs. Yet, further item development may more closely achieve adequate distinction of the risk factors that currently load together on the Negative Affect subscale.

A fourth area of future research would be the collection of longitudinal data in support of predictive validity for the PICI and the investigation of implementation of behavioral, psychosocial, and medical preventive interventions. The best way to determine the usability of the PICI would be to administer the inventory to a sample of younger adult individuals who be easily followed through to later adulthood and then assessed for physiological markers of coronary artery disease. An ideal sample for this research may be a group of veterans who regularly receive treatment at a veteran hospital. It would also be advantageous to use such a sample to investigate collaboration of health care providers and tailoring of treatment plans to implement preventive interventions to slow the coronary disease process. Due to increased health care integration in the veteran hospitals, the VA may also provide a forum to investigate psychosocial risk factors for heart disease in a context of primary care, cardiology, and psychology integration.

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Vita

Maria Kathryn (Tortorice) Baker was born in Beaumont, Texas on August 20, 1981, the daughter of Anthony Salvadore Fertitta Tortorice and Kathryn Cecile (Trail) Tortorice, the granddaughter of Jake and Concetta Tortorice, and Robert and Marilyn Trail, Goddaughter of Rosanne Brady and Robert Trail, and the Godmother of Sarah Elizabeth Brady. After receiving her high school diploma from Monsignor Kelly Catholic High School, Beaumont, Texas, she attended Saint Edward University in Austin, Texas. Maria received her Bachelor of Arts in Psychology in 2002 and Master of Arts in Counseling in 2004 from Saint Edward University. In 2004, Maria was admitted to the Counseling Psychology Training Program at The University of Texas at Austin where she studied under Dr. Christopher McCarthy. Maria completed practica in health psychology at the Austin Outpatient VA Clinic and in neuropsychology the Austin State Hospital. She also served as the instructor for Issues and Debates in Life Development, a developmental psychology course for freshmen. Maria completed her pre-doctoral internship at the Michael E. DeBakey VA Medical Center in Houston, Texas and she has been accepted as a postdoctoral fellow with an emphasis in the treatment of posttraumatic stress disorder also at the Houston VA Medical Center. She will reside in Houston with her husband of two years, Wes, and her Lhasa Apso, Pika.

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