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Factors Affecting Athlete Adherence After Disqualificaiton from Competitive Sports

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FACTORS AFFECTING ATHLETE ADHERENCE AFTER DISQUALIFICAITON FROM COMPETITIVE SPORTS

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Dissertation Approval

This is to certify that the thesis presented to us by Aaron Myers

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Committee Members' Signatures:

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Abstract

The purpose of the current study is to examine the relationship between athletic identity, social problem-solving ability, cognitive distortions, depression, and locus of control in predicting adherence to medical advice after athletes have been instructed to stop participating in sports for a cardiac condition. The measures included the Athletic Identity Measurement Scale (AIMS), the Social Problem-Solving Inventory, Revised, Short Form (SPSI-R:S), the Inventory of Cognitive Distortions (ICD), the Patient Health Questionnaire (PHQ-9), the Multidimensional Health Locus of Control scale, Form C (MHLC-C), an adherence measure, and demographic questionnaire. Results revealed significant findings. The internal locus of control, social problem-solving ability, and cognitive distortions predicted a significant amount of the variance, with a large effect ($F(3,16) = 9.20$, $p = .001$). The adjusted R squared is .56 meaning that 56% of the variance in adherence can be predicted from the Internal LOC, ICD total score, and SPSI-R:S total scores. Future research should include a larger sample size to ensure the findings are representative of the larger population.

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Statement of the Problem

Participating in physical activity, more specifically organized sports, undoubtedly produces many health benefits. However, paradoxically, increased exertion on the body may increase the risk of acute cardiac events for those who are unknowingly predisposed to such problems. Athletes are two to three times more likely to experience sudden cardiac death (Schmied & Borjesson, 2014). Among 100,000 athletes, 1-3 die of a cardiac related issue (Schmied & Borjesson, 2014). Recent estimates suggest that rates of sudden death for college athletes (i.e., NCAA participants) are 1 out of 43,000 per year (Harmon, Asif, Klossner, & Drezner, 2011). In many instances these catastrophic circumstances are created by heart arrhythmias, which can take many forms. Regardless of the forms, many athletes have never developed any symptoms; therefore, they do not realize they have dangerous heart problems. Some may have an unexpected fatal or near-fatal event that will lead to a cardiac diagnosis. Triggers of some arrhythmias are unpredictable or inconsistent, and may appear to come out of nowhere.

Despite the risks that athletes face when they are disqualified for medical cause, some are resistant to the resultant medical recommendations. In a study examining athlete compliance with medical recommendations after suffering a concussion, for example, Yard and Comstock (2009) found that 4 of ten high school athletes returned to their sports prematurely. Nonadherence refers to a situation in which a patient does not reasonably do what a physician recommends, thus jeopardizing the therapeutic outcome (DiMatteo, Lepper, & Croghan, 2000). There is a substantial amount of literature documenting the consequences associated with nonadherence (DiMatteo, Lepper, & Croghan, 2000). Patient characteristics can be one major contributing factor in failure to

comply. Colan (2010) acknowledged that convincing athletes to comply with a cessation of exercise participation can be challenging. Within sports communities, adherence to medical advice can be especially difficult because there is often a "culture of risk" that exists (Nixon, 1992). Pain and injury frequently become normalized in sports which can place athletes at risk for the damaging, potentially devastating, consequences to one's health and well-being (Safai, 2003).

Because the course and complexity of heart conditions can vary greatly, there are often differences in recommendations offered to patients by physicians. On one end of the spectrum, a person with mitral valve regurgitation or atrioventricular septal defect may be able to participate in all sports (Pelliccia et al., 2005). On the other end, a person with aortic valve regurgitation or moderate to severe aortic valve stenosis may not be able to engage in any competitive sports (Pelliccia et al., 2005). These more severe conditions can further complicate situations if individuals strongly identify as athletes. Asif et al. (2014) found that athletes recalled anxiety, confusion, denial and shock shortly after being diagnosed with a potentially lethal heart disease.

In sum, heart related problems may place a portion of athletes at risk for sudden death. When athletes are nonsymptomatic, they may be unaware of the impending risk associated with vigorous physical activity, often characteristic of sports related activity levels. In those instances in which an athlete is disqualified for a cardiac reason, the individual may understandably experience a variety of reactions often associated with grief and loss. Among such athletes, the stronger the degree to which individuals identify with their athletic identities, the harder it is for them to transition to adhering to required physical activity restrictions (Lally, 2007). Such restrictions may represent the end of a

career, the impact of which can be quite devastating. There may be a variety of psychological factors (e.g., problem-solving ability, cognitive distortions, and locus of control) that could play a significant role in whether or not an individual adheres to the advice and recommendations of a physician. Identification of such variables may be beneficial in understanding nonadherence and also in informing interventions aimed at fostering adherence.

Purpose of the Study

The purpose of the current study is to examine the relationship between athletic identity, social problem-solving ability, cognitive distortions, depression, and locus of control in predicting adherence after athletes have been instructed to stop participating in sports for a cardiac condition. A cardiac population was chosen, given their often associated, unsuspecting and sudden disqualification from athletics. It is likely that these individuals who identify strongly with athletics have deficiencies in problem solving abilities, exhibit tendencies frequently to distort the processing of information in their lives, and have an external locus of control; they may, understandably, experience more problems related to adherence. The results of this study, then, may contribute to a better understanding of how an athlete's psychological characteristics are associated with nonadherence to advice specifically designed to reduce a potentially life threatening risk.

Literature Review

Non-adherence to medical recommendations has been shown to have significant consequences for individuals with congenital heart disease (Yan & Kowey, 2011). Medical recommendations take on greater importance for individuals with heart conditions who are participating in sports, because individuals who are more active are

more likely to face more severe consequences (i.e., death) due to the increased exertion of the heart (Corrado et al., 2005). Sudden cardiac death can be a devastating event that impacts the communities where it occurs. It has been estimated that, at the collegiate level alone, 1:43,000 of participating athletes die each year from a cardiac related issue (Harmon, Asif, Klossner, & Drezner, 2011). Unfortunately, there are some well known cases to illustrate this point. On March 4, 1990, a basketball star playing at Loyola Marymount, Eric "Hank" Gathers, died of a heart muscle disorder, idiopathic cardiomyopathy (Altman, 1990). He collapsed on the court during a game and passed away shortly after (Altman, 1990). He was aware of his heart condition but continued to play. This is one of many examples that exist. Therefore, examining the factors that increase the likelihood of adherence is extremely important. Little is known about the reasons why some athletes comply and others do not.

General considerations and guidelines have been established for athletes with heart disorders participating in sports. However, it is difficult to establish the severity of a cardiac rhythm disturbance in assessing an athlete's eligibility for competition (Zipes et al., 2005). Although the research data is limited in deciding those arrhythmias that may put an athlete at greater risk, some have been determined to put athletes at greater risk due to the demand that individuals place on their bodies (Zipes et al., 2005). Several of the more common arrhythmias will be discussed.

Hypertrophic Cardiomyopathy

Hypertrophic Cardiomyopathy (HCM) is defined as abnormal left ventricular thickening without chamber dilation that is usually asymmetrical, develops in the absence of an identifiable cause, and is associated with myocardial fiber disarray (Wigle,

Rakowski, Kimball, & Williams, 1995; Wigle, 2001). Put simply, HCM has two types, obstructive and non-obstructive (AHA, 2015). With obstructive hypertrophic cardiomyopathy, the heart muscle cells enlarge and cause the walls of the ventricles to thicken (AHA, 2015). For non-obstructive hypertrophic cardiomyopathy, the heart's mitral valve is affected; this can cause blood to leak backward through the valve (AHA, 2015). HCM is an inherited disorder with a prevalence of 1:500 (Towbin, 2009), which is comparable to approximately 600,000 people in the United States (Gersh et al., 2011). A genotype analysis can help to identify family members with HCM, even if they have not developed symptoms of the disorder (Hensley et al., 2015).

Symptoms. Individuals with HCM can live for decades with no symptoms (Hensley et al., 2015) and the disease will not affect their lives (AHA, 2015). Others have symptoms early in life that may include: exercise intolerance, angina (i.e., chest pain cause when the heart receives insufficient oxygen-rich blood; AHA, 2015), dyspnea (i.e., difficult or labored breathing; AHA, 2015), dizziness, syncope (i.e., temporary loss of consciousness; AHA, 2015), and/or sudden death (Grigg, Wigle, Williams, Daniel, & Rakowski, 1992).

Diagnosis. HCM can be diagnosed in several ways including cardiac catheterization, coronary angiography, or myocardial biopsy (AMA, 2015). Cardiac catheterization is a procedure used to check the pressure and blood flow of the heart (AMA, 2015). This will also allow a physician to collect blood samples and examine heart arteries using X-ray imaging (AMA, 2015). Coronary angiography is a procedure using cardiac catheterization, during which dye is injected into the coronary arteries

(AMA, 2015). The dye illuminates the blood flow through the heart and blood vessels which allows a physician to examine the pumping function of the heart (AMA, 2015).

Treatment. Several treatment options are available, depending on the severity of the disorder. Some of the main goals of treatment are managing conditions that contribute to the disease, controlling signs and symptoms as they arise to help individuals live normally, and risk management and prevention (AMA, 2015). Lifestyle changes are often encouraged such as maintaining a healthy diet, healthy weight, and physical exercise (AMA, 2015). Pharmacological treatment may be encouraged to maintain healthy bodily function (e.g., balancing electrolytes and fluids, lowering blood pressure, prevention of blood clots, etc.; AMA, 2015). Surgery may be necessary for some individuals. Those procedures include techniques to remove thickened areas of the heart (e.g., septum bulging into the left ventricle), implanted devices to help the heart work better (i.e., pacemaker), or heart transplant (AMA, 2015).

Physical activity restrictions. Participation in sports increases the risk of sudden cardiac death in individuals with HCM (Maron, 2002; Maron et al., 1996). HCM is the most common cause of athletic field death in young athletes in the United States (Maron et al., 1996); therefore, most athletes with HCM are recommended to refrain from playing competitive sports (Pelliccia et al., 2005). Some athletes may be identified as having low risk profiles which may allow them to play low dynamic and low static sports such as bowling or golf (Pelliccia et al., 2005). Other athletes may have only gene abnormalities without phenotypic changes. These individuals can participate in recreational, non-competitive sport activities (Pelliccia et al., 2005). Regardless of the type of HCM, all athletes are encouraged to have yearly follow-ups with physicians (Pelliccia et al., 2005).

Long QT Syndrome

Long QT Syndrome (LQTS) is a life-threatening cardiac disease that is the result of irregular prolonged repolarization and a subsequent elongated QT interval (Kramer & Zimebaum, 2011). LQTS occurs in all races and ethnicities (Vincent, Timothy & Zhang, 1997) and the prevalence of the syndrome is approximately 1:2,500 (Schwartz et al., 2009). If left untreated, individuals with LQTS have an increased likelihood of experiencing sudden cardiac arrest (Tester & Ackerman, 2007). Therefore, this illustrates the importance of adherence for this population (Tester & Ackerman, 2007). Ongoing research has explained the variability of the disease, and LQTS may present differently among individuals in terms of symptom presentation, method of diagnosis, type of LQTS, and treatment recommendations (Yan & Kowey, 2011). Symptom presentation often facilitates physicians' treatment recommendations for individuals with LQTS (Yan & Kowey, 2011) and an understanding of the various symptoms that can be experienced is important.

Symptoms. An individual may be diagnosed with LQTS after he or she experiences a cardiac event (Yan & Kowey, 2011). Other symptoms of LQTS may include seizures, palpitations, and sudden cardiac arrest (Yan & Kowey, 2011). Often, cardiac dysrhythmia known as *torsades de pointes* (TdP) is the precursor to a cardiac event when the heart is unable to revert to a normal rhythm (Vincent, Timothy, Fox & Zhang, 1999). TdP is often triggered by physical activity or emotional arousal and 95% of TdP episodes do not result in cardiac events (Yan & Kowey, 2011). However, although information acquired through registries may be biased, ongoing observations

made by the International LQTS Registry reported that the length of the QT interval is a strong predictor of TdP (Kramer & Zimebaum, 2011;Yan & Kowey, 2011).

Some researchers suggest that the chances of sudden cardiac arrest double when the QT interval increases by 40 milliseconds (Kramer & Zimebaum, 2011). Additional risk factors for TdP include a history of cardiac events, having the LQT2 or LQT3 gene mutations, experiencing symptoms before five years of age, and being a postpubertal female (Priori et al., 2003). Additionally, boys have a higher risk of sudden cardiac arrest during childhood but females are at the highest risk during adulthood (Goldenberg et al., 2008). Some focus of the research has been conducted by comparing clinical differences in African American and Caucasian individuals with LQTS. Fugate et al. (2010) found that African American participants had a significantly larger QT interval than Caucasians, even though the risk of experiencing a cardiac event was similar in both groups. If a patient knows that he or she has experienced TdP or is at risk for TdP, adhering to medical recommendations is important for avoiding a potentially life-threatening cardiac event. Moreover, environmental triggers for TdP are variable and specific triggers for an individual with LQTS can be identified with a comprehensive diagnostic evaluation (Kramer & Zimebaum, 2011).

Diagnosis. Diagnosing LQTS can be challenging because the clinical and genetic presentations are highly variable (Modell & Lehmann, 2005). Many individuals who are suspected to have LQTS are diagnosed as a result of genetic testing and/or clinical examination (Kramer & Zimebaum, 2011). There are numerous clinical observations that facilitate the diagnosis of LQTS; these include obtaining family history (Barsheshet

et al., 2011), results of an electrocardiogram test (Kramer & Zimebaum, 2011), and findings obtained from an exercise stress test (Aziz et al., 2011).

Treatment. Cardiologists' treatment decisions are likely to depend on the type of LQTS a patient has, the patient's age, and his or her history of symptoms (Yan & Kowey, 2011; Dorostkar, Eldar, Belhassen & Scheinman, 1999). Medical recommendations often include pharmacological treatment (Yan & Kowey, 2011), surgical procedures (Dorostkar et al., 1999), and lifestyle modifications (Fitzgerald & Ackerman, 2005). Pharmacological treatment often involves being prescribed new medications as well as avoiding specific medications that may elongate the QT interval (Yan & Kowey, 2011). Surgical procedures frequently involve invasive therapies used with patients who have great risk of sudden cardiac arrest (e.g., implantable cardioverter defibrillators; Albertella, Crawford, & Skinner, 2011). Lifestyle changes may include various dietary restrictions as well as making changes to physical activity participation (Yan & Kowey, 2011).

Physical activity restrictions. Researchers produced physical activity restrictions at the 36th Bethesda Conference (Zipes et al., 2005) for individuals with arrhythmias, such as LQTS. These guidelines are largely based on data obtained from non-athletes, the general perceptions of the medical community (Zipes et al., 2005), and expert consensus (Roston, Souza, Sandor, Sanatani, & Potts, 2013). It is recommended that all individuals with electrocardiographically manifested LQTS, (i.e., symptomatic and asymptomatic) avoid participation in most competitive sports (Pelliccia et al., 2005; Zipes et al., 2005). Individuals may be able to participate in sports such as bowling, golf, or riflery (Pelliccia et al., 2005). This set of guidelines also discourages participation in

sports with a danger of bodily collision for individuals with an implantable cardioverter-defibrillator/pacemaker (Zipes et al., 2005). In addition to competitive sports, there are also limitations for various physical activities of high, moderate, and low intensities.

Supraventricular Tachycardia

The American Heart Association (2015) defines Supraventricular Tachycardia (SVT) as "a condition in which the heart tissue in either the upper chambers or the region above the ventricles develops pacemaker activity, resulting in an abnormally fast heartbeat." In other words, the heart beats fast for a reason other than exercise, high fever, or stress (WebMD, 2015). SVT is the most frequently occurring arrhythmia in children (AMA, 2015); it is also more common in women (AMA, 2015). Others likely to have SVT are anxious individuals, people who are physically fatigued, those who drink large amounts of coffee and/or excessive alcohol, and people who smoke heavily (AMA, 2015). There are many types of SVT: sinus tachycardia (ST), atrial fibrillation with rapid ventricular response (AF-RVR), atrial flutter (Afl), atrioventricular nodal reentrant tachycardia (AVNRT), atrioventricular reciprocating tachycardia (AVRT; i.e., Wolff-Parkinson-White syndrome), atrial tachycardia (AT), multifocal atrial tachycardia (MAT), junctional tachycardia, paraoxysmal junctional retrograde tachycardia, and wide-complex reentrant tachycardia (Link, 2012).

Symptoms. There are some common symptoms for SVT such as: dizziness, lightheadedness, rapid heartbeat (i.e., palpitations), angina (i.e., chest pain), and shortness of breath (AMA, 2015). Similar to other heart disorders, some people may be asymptomatic (AMA, 2015). However, in extreme cases, SVT can cause unconsciousness and cardiac arrest (AMA, 2015).

Diagnosis. Physicians typically use two diagnostic tools to diagnose SVT. First, physicians will attempt to identify any triggers for the unusual, fast heart rate (WebMD, 2015). Second, they may perform an electrocardiogram (i.e., EKG or ECG) to measure the heart's electrical activity (WebMD, 2015). Certain tests, such as blood tests or chest X-rays (WebMD, 2015) may also be performed to identify a cause of SVT.

Treatment. Unlike other heart disorders, many people do not need medical treatment for SVT (AMA, 2015). Treatment may be considered if episodes occur often or are prolonged (AMA, 2015). Medical treatment is likely to include various manipulations of the body (e.g., carotid sinus massage, valsalva maneuver or holding nostrils closed while blowing through the nose, etc.). Medications are sometimes considered to help manage symptoms (AMA, 2015). Several lifestyle changes may be recommended such as cutting down on coffee, alcohol, and tobacco use (AMA, 2015). It is also suggested that individuals increase their time spent resting (AMA, 2015).

Physical activity restrictions. Most athletes are able to participate in all competitive sports (Zipes et al., 2005). However, those individuals with syncope, near-syncope, or significant symptoms secondary to the arrhythmia or those with structural heart disease in addition to the arrhythmia are given the suggestion to forgo competitive sports until adequately treated (Zipes et al., 2005). The possibility exists that an athlete with SVT participating in potentially dangerous sports (i.e., diving, downhill skiing, auto racing, etc.) may be at greater risk of dizziness, near syncope or syncope than if playing less hazardous sports (i.e., basketball or baseball; Zipes et al., 2005). Athletes can resume competitive activities if there has been no spontaneous recurrence of tachycardia for two to four weeks (Zipes et al., 2005).

Nonadherence

Adherence to treatment can be defined as "the context in which the individual's behavior agrees with the health-related recommendations" (Silva, Galeano, & Correa, 2005, p. 269) "in terms of taking medication, following a diet, modifying habits or attending clinics" (Bosworth, Oddone, & Weinberger, 2006, p.3). Noncompliance to treatment is a source of ongoing frustration for doctors (Vermeire, Hearnshaw, van Royen, & Denekens, 2001) and a problem that appears at all ages and in all chronic medical illnesses.

Risks of Nonadherence. For the population of participants involved in this study, adherence to medical recommendations can be extremely important. As previously mentioned, there are heart conditions that place individual at greater risk for sudden cardiac death (i.e., hypertrophic cardiomyopathy, long QT syndrome, supraventricular tachycardia, etc.). Additionally, the demands placed on athletes are unique and often different from the general population (Asif et al., 2015). Athletes are faced with the demands of athletics along with the stress of maintaining academic standards, and developmental challenges associated with adolescents and their independence (Asif et al., 2015). Furthermore, athletes are typically healthy individuals that are rarely diagnosed with chronic cardiac conditions and they rely heavily on their abilities and success as anchors for their self-esteem and self-worth (Asif et al., 2015). So, the diagnosis of a chronic cardiac condition poses the threat of having a serious impact on athletes' mental health.

Athletic Identity

Athletic identity has been a focal point of the sport career transition research. Identity is "a multidimensional view of oneself that is both enduring and dynamic" (Lally, 2007, p.86). Additionally, athletic identity is identification with physical activity being central to one's self-definition (Brewer, Van Raalte, & Linder, 1993). One's self-image consists of many dimensions and it is possible for one particular dimension to become dominant or preferred (Lally, 2007). When an identity becomes narrowed, the loss of that identity may be more likely to affect that individual's overall self-concept (Stryker & Serpe, 1994). Although athletic identity has been shown to decline after athletes retire from sport and this decline facilitates adjustment to life after sport (Lally, 2007; Lavallee, Gordon, & Grove, 1997); athletes' degrees of voluntariness of sports career termination directly relates to how individuals adjust. Voluntary career termination is associated with fewer adaptation difficulties (Cecic Erpic, Whylleman, & Zupancic, 2004; Taylor & Ogilvie, 1994).

Many times, athletes' social networks revolve heavily around team members, schedule of events, training, and games. When an athlete becomes disqualified, the event often has adverse consequences, inhibits coping mechanisms, and contributes to feelings of isolation (Asif et al., 2015). Additionally, psychological morbidity increases when disqualification is unexpected (Asif et al., 2015). This may put athletes at risk for depression (Lally, 2007), eating disorders, (Blinde & Stratta, 1992; Ogilvie & Howe 1982), decreased self- confidence (Sinclair & Orlick, 1993), and substance use (Svoboda & Vanek, 1982). Athletes may experience overwhelming identity loss and despair when they are cut or their programs terminated (Blinde & Stratta, 1992).

Athletic Identity and Adherence. The literature is rather limited when it comes to the relationship between athletic identity and adherence. Brewer, Cornelius, Van Raalte, Tennen, and Armeli (2013) used athletic identity as a predictor variable for athletes completing home rehabilitation exercises following an anterior cruciate ligament reconstruction surgery. The individuals that identified themselves as having high athletic identity were more likely to adhere to the home rehabilitation exercises (Brewer et al., 2013). Additionally, those with high athletic identity tended not to allow stress to deter them from completing their home exercises (Brewer et al., 2013). For the current study, it is expected that individuals high in athletic identity will be less likely to adhere to treatment recommendations because it is egodystonic.

Social Problem-Solving Ability

Having adaptive problem-solving abilities can lead to a better life because problems are inevitable and are sources of stress. Coping and problem-solving strategies can be central to managing that stress and daily events that arise (Heppner, Pretorius, Wei, Lee, & Wang, 2002). Problems can be characterized by a discrepancy between an actual situation and the desired state (D'Zurilla, 1986). Conversely, solutions are the responses that are given to change the nature of the problem (Nezu, 2004). Problem-solving skills allow individuals to create alternatives and assess the positives and negatives for each alternative (MacNair & Elliott, 1992). Social problem-solving has been used as a concept to define the process one follows to create effective means of handling problematic situations (D'Zurilla & Nezu, 1982; Nezu, 2004). This term emphasizes the personal and social context in which the solving of real-life problems takes place (D'Zurilla, Nezu, & Maydeu-Olivares, 2002).

The social problem-solving model is based on two general but partially independent processes, problem orientation and problem-solving style (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Problem orientation refers to the "motivational process involving the operation of a set of relatively stable cognitive-emotional schemas that reflect the generalized thoughts and feelings of a person concerning his or her problems in living, as well as his or her own problem-solving ability" (D'Zurilla, Nezu, & Maydeu-Olivares, 2002, p. 4). The two variables of problem orientation are positive problem orientation and negative problem orientation (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Problem-solving style presents cognitive and behavioral activities intended to find a solution to a particular problem (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Problem-solving style consists of three different styles (i.e., rational problem solving, impulsivity-carelessness style, and avoidance style; D'Zurilla, Nezu, & Maydeu-Olivares, 2002).

Problem Orientation Dimensions. People with a positive problem orientation have an inclination to view a problem as a challenge that can be solved (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). These people tend to believe in their ability, understand the commitment, and are dedicated to solving the problem (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). On the other hand, individuals with a negative problem orientation see the problem as a threat to their own existence and believe the problem cannot be solved (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). They lack confidence in their ability to solve the problem and become distressed when faced with it (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). A positive orientation motivates individuals to problem solve rationally, whereas individuals who possess a more negative orientation are more likely

to rely on impulsive, careless, or avoidant ways to solve their problems (D'Zurilla, Nezu, Maydeu-Olivares, 2004).

Problem-Solving Styles. Individuals with a rational problem-solving style display a rational, deliberate, systematic and skillful application of problem-solving skills (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). People with an impulsive-careless style are actively attempting the implementation of effective problem-solving skills, but they are not-well planned in their attempts (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Additionally, those with an avoidance style tend to procrastinate, remain passive, and/or are dependent on others (D'Zurilla, Nezu, & Maydeu-Olivares, 2002).

Problem-Solving and Psychological Adjustment. Many studies have shown a significant relationship between individuals' problem-solving deficits and psychological distress (i.e., depression and anxiety; Nezu, 1985; Nezu 1986a; Nezu & Carnevale, 1987). Effective problem-solving has been shown to be an important mediator or moderator for the harmful effects of stressful life events (Kant, D'Zurilla, & Maydeu-Olivares, 1997; Nezu, 1986b). For instance, when faced with high levels of stress, individuals that use effective problem-solving skills consistently report lower levels of stress when compared to individuals with ineffective skills (D'Zurilla & Nezu, 1999). Additionally, individuals with effective problem-solving skills tend to be positively correlated with having positive psychological well-being (Chang & D'Zurilla, 1996; Elliott, Herrick, MacNair, & Harkins, 1994) and greater life satisfaction among people with chronic disease (Elliott, Shewchuk, Miller, & Richards, 2001).

Social Problem-Solving and Adherence. Social problem-solving ability is directly related to individuals adjusting to chronic health conditions because they are

required to keep up with their daily activities in addition to coping with the responsibilities and symptoms that come with the conditions they experience (Elliott, Grant, & Miller, 2004; Johnson, Elliott, Neilands, Morin, & Chesney, 2006). An individual's problem-solving style can be directly implicated in the development of health complications that can be prevented by adherence to medical recommendations (Johnson et al., 2006). Adherence to medical recommendations becomes less likely when it involves complex self-care behavior on a daily, long-term basis, with little relation to an eventual outcome (Turk & Meichenbaum, 1989). Additionally, individuals are less likely to adhere if they have dysfunctional problem-solving styles (Herrick & Elliot, 2001). On the other hand, constructive, adaptive, social problem-solving style may promote adherence to medical recommendations by providing individuals with the attitudes, emotional regulation, and instrumental skills necessary for coping effectively with ongoing stress and demands (Elliot, Sherwin, Harkins, & Marmarosh, 1995).

Cognitive Distortions

The history of cognitive-behavioral therapy and development of the concept of cognitive distortions began with A. T. Beck's (1967) groundbreaking clinical work. Beck (1967) observed how depressed patients' self-reported thought patterns (i.e., cognitive distortions, cognitive errors, negative automatic thoughts, etc.) related to their depressive behaviors. He then formulated his clinical findings into a format of psychotherapy that recognized the environmental events that triggered cognitive distortions and analyzed the distinctive content of these cognitive distortions (Beck, 1970).

Beck (1967) initially identified five original cognitive distortions: arbitrary inference, inexact labeling, magnification and minimization, overgeneralization, and

selective abstraction. Arbitrary inference is drawing conclusions before gathering evidence to support the conclusion. Inexact labeling involves characterizing an experience in a manner that inaccurately portrays it as more significant or extreme than it really is when all of the evidence is considered. Magnification refers to the overstatement or exaggeration of a potential problem; alternatively, minimization is underestimating the significance of an event. Overgeneralization suggests viewing a single event as a never-ending pattern of defeat. Selective abstraction refers to the focusing in on the negative details of a situation and ignoring the context or other relevant details.

Some theorists have extended the list of cognitive distortions (i.e., Burns 1990; Burns, 1999; Ellis & Dryden, 1997; Freeman & DeWolf, 1992). Much of what was expanded upon could be traced back to Beck's original work. Generally speaking, the changes made were constructed to fit each theorist's line of thinking in a language which patients could understand.

Burns (1990) created a list of cognitive distortions based on his "ten forms of twisted thinking" (p. 8). He listed ten distortions which included all-or-nothing thinking, overgeneralization, mental filter, discounting the positives, jumping to conclusions (which includes mind-reading and fortune-telling), magnification, emotional reasoning, 'should statements,' labeling, and personalization and blame. Later, Freeman and DeWolf (1992) featured the "Ten Dumbest" (p. 12), frequently made thinking mistakes that lead individuals to psychological distress. The mistakes, or cognitive distortions, include the Chicken Little syndrome, mind reading, personalizing, believing your press agent, believing (or inventing) your critics, perfectionism, comparisonitis, what-if thinking, the

imperative should, and yes but-ism. Ellis and Dryden (1997) expanded and developed 12 cognitive distortions from the idea that psychological disturbance originates from self-evaluative distortions that emanate from self-imposed musts. Similarly, their list includes all-or-none thinking, jumping to conclusions and negative non-sequiturs, fortune-telling, focusing on the negative, disqualifying the positive, allness and neverness, minimization, emotional reasoning, labeling and overgeneralization, personalizing, phonyism, and perfectionism.

Researchers continued to focus on the cognitive distortion concept. Yurica (2002) found empirical support (through factor analysis) for 11 cognitive distortions: externalization of self-worth, fortune-telling, magnification, labeling, perfectionism, comparison with others, emotional reasoning, arbitrary inference/jumping to conclusions, minimization, mind-reading, emotional reasoning and decision-making. Yurica and DiTomasso (2002) then created the Inventory of Cognitive Distortions (ICD) based on the previous factor analysis.

Attempts have been made to evaluate variations of cognitive distortions measures. Rosenfield (2004) reviewed several, including the Dysfunctional Attitude Scale (DAS; Weissman & Beck, 1978), the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980), the Cognitive Error Questionnaire (CEQ; Lefebvre, 1981), the Cognitive Distortion Scale (CDS; Briere, 2001), and the Inventory of Cognitive Distortions (Yurica & DiTomasso, 2002) (Rosenfield, 2004). Rosenfield found some degree of utility with the cognitive distortion measures. However, only the ICD clearly states that an operationalized description of cognitive distortion was useful for a broad spectrum of disorders, and provides a factor-analyzed list of 11 distortions.

The ICD is a reliable and internally consistent self-report measure for identifying an individual's frequency of cognitive distortions (Rosenfield, 2004; Yurica, 2002). Rosenfield (2004) indicated the number of Axis I and II psychological disorders co-occurred with a higher frequency of reported cognitive distortions, regardless of the severity of the disorders. Additionally, the frequency of cognitive distortions positively correlates with the severity of psychological impairment (Rosenfield, 2004).

Cognitive Distortions and Adherence. Cognitions can influence adherence and health status. Smith, Peck, Milano, and Ward (1988) found cognitive distortions relate directly to depression and disability among medical patients. Also, health-related cognitive distortions (e.g., catastrophizing about disease-related symptoms) are stronger predictors of health behavior. Distorted thoughts are associated with poorer health practices and negative affect (Christensen, Moran, & Wiebe, 1999). Further, Anderson and Emery (2014) found poor adherence to be associated with a tendency to rely on beliefs that were not grounded in medical science. In regard to the current study, it is anticipated that cognitive distortions will negatively impact individuals' adherence due to the impact irrational thinking has on behavior.

Health Locus of Control

Health locus of control may be a relevant variable when considering adherence to medical recommendations. Locus of control is the belief that results are due to our own actions (i.e., internal locus of control), or to external powers (external locus of control; Wallston & Wallston, 1978). Having control, or the belief of having control has been shown to be important in wellbeing, quality of life, and functioning of patients with chronic psychiatric disorders (Rosenfield, 1992; Wagner et al., 2001; Bengtsson-Tops,

2004). More specifically, internal health locus of control refers to the degree that individuals believe their health status is influenced by their own behaviors (Wallston, 1989). Conversely, external health locus of control is the belief that people, chance, fate or luck determines their health status (Wallston, 1989). Previous studies have also shown that internal health locus of control has associations with healthier choices and healthier behaviors (Helmer, Kramer, & Mikolajczyk, 2012). Also, cohort studies have suggested that high internal locus of control is associated with a reduced risk for common chronic diseases such as cardiovascular disease and cancer (Sturmer, Hasselbach, & Amelang, 2006). High locus of control in chance can be considered a risk factor for unhealthy behavior (Berglund, Lytsy, & Westerling, 2014; Grotz, Hapke, Lampert, & Baumeister, 2011).

Locus of Control and Adherence. Locus of control is another factor that may be a predictor for adherence. It has been demonstrated that when patients feel they are contributing in a significant manner to their own improvement (i.e., internal locus of control) and they are educated about the condition or illness they are experiencing, they are more likely to adhere to medical recommendations (Wallston & Wallston, 1981). When individuals adopt and external locus of control, they tend to have poor adherence to medical recommendations (Cvengros, Christensen, & Lawton, 2004). Additionally, an external locus of control can lead to undesirable health outcomes such as poor self-rated health (Johansson et al., 2001; Leinsalu, 2002) and mortality (Dalgard & Lund Haheim, 1998; Krause & Shaw, 2000).

The fact that individuals have an internal locus of control does not always predict adherence. In a study of adherence to treatment in psychiatric outpatients with

depression, De las Cuevas, Peñate, and Sanz (2014) found that internally oriented patients self-reported higher adherence to prescribed treatment than did externally oriented patients; however, the differences were not statistically significant. In general, the greater the internal control, the more likely it is that individuals engage in health recommendations (Richards & Nelson, 2012; Wallston & Wallston, 1981; Wulandari, Craig, & Whelan, 2013). Furthermore, the chance subscale has been reported to have either no effect or a negative association with health behavior, and the powerful-other subscale has either no effect or a positive association with health compromising behavior (Haslam & Lawrence, 2004; Haslam, Lawrence, & Haefali, 2003; Labs & Wurtele, 1986; Tinsley, 1993).

Depression

Depression is one of the most common and devastating of all psychiatric disorders, with mood, cognitive, and physical symptoms (APA, 2013). Depression is associated with higher rates of chronic disease, increased health care utilization, and impaired functioning (Katon, 2003; Wells et al., 1989). It is the leading cause of disability in the United States and in the world for people between the ages of 15 and 44 (Kessler, Chiu, Demler, & Walters, 2005; World Health Organization, 2004). The twelve-month prevalence of major depressive disorder in the United States is around 7% (APA, 2013). It also is three times higher in those ages 18-29 years old (APA, 2013). Over 70% of people with moderate depression and over 60% of individuals with severe depression will never get help (Pratt & Brody, 2008). Untreated depression can lead to impaired functioning which affects 80% of those who are depressed (Pratt & Brody, 2008). This also can lead to numerous problems at work, including an inability to

concentrate, low efficiency, inability to organize work, use of more disability days, absenteeism, and unemployment (Druss, Schlesinger, & Allen, 2001; Kessler et al, 1999). Thus, the cost of depression in the United States is estimated at $83 billion per year (Greenberg et al., 2003).

Smith and Smith (2010) completed a longitudinal study researching the effects of illness and psychological problems on children's life chances over a 40-year period. Depression directly contributed to children and adults having lower incomes, lower educational attainment, and fewer days working each year (Smith & Smith, 2010). Individuals experienced a 35% decrease in lifetime income due to depression, along with working 7 fewer weeks throughout the year, and an average loss of $10,400 per year in income by age 50 (Smith & Smith, 2010)

Depression and Adherence. Depression is another factor that could be a predictor of adherence. Depression is common in patients with heart conditions and has shown to be associated with recurrent cardiac events, and increased mortality in patients with acute coronary syndrome (ACS), heart failure, and arrhythmias (Barth, Schumacher, & Herrmann-Lingen, 2004; de Jonge, Spikerman, van den Brink, & Ormel, 2006; Rutledge, Reis, Linke, Greenberg, & Mills, 2006). Also, depression negatively influences patients' adherence to medication and recommended health behaviors, which could lead to increased rates of adverse medical events (Gehi, Ali, Na, & Whooley, 2007; Whooley et al., 2008; Ziegelstein et al., 2000). If depression is treated, it appears to lead to improved adherence in patients with a broad range of heart related conditions (Bauer et al., 2012).

Chapter 2

Hypothesis

Athletic identity (as defined by the total score on the AIMS), social problem-solving ability (total score on SPSI-R:S), cognitive distortions (total score on ICD), depression (total score on the PHQ-9), and health locus of control (internal locus of control) will predict self-reported adherence to physical activity recommendations in a sample of adults disqualified from athletics due to cardiac conditions.

Chapter 3

Method

Research Design and Justification

Due to the high variability of the population and the need for further descriptive research concerning adherence to physical activity recommendations, a descriptive, retrospective, self-report survey design was used for the present study. This study was a retrospective design that was implemented via online data collection. Additionally, this study used a stepwise multiple regression to examine the amount of variability in adherence to physical activity recommendations predicted by athletic identity, health locus of control, social problem-solving ability, depression, and cognitive distortions.

The purpose of the current study was to examine the relationship between athletic identity, problem-solving ability, cognitive distortions, depression, and locus of control in predicting adherence to medication regimen. The variables of interest were assessed by incorporating measures in an internet survey format. Web-page-based surveys offer the benefits of appearing identical to all participants, reaching many people, and obtaining data in a consistent fashion (Gray, Mann, & Stewart, 2001). In addition, an Internet survey offers participants anonymity, which is important when reporting sensitive information (Gray, Mann, & Stewart, 2001), such as non-adherent behaviors.

Selection Procedure

Participants and recruitment. This study drew from a sample of cardiac patients with conditions such as: Hypertrophic Cardiomyopathy, Supraventricular Tachycardia, Wolff Parkinson White, Long QT Syndrome, and Atrial Septal Defect. An effort was made to recruit a minimum of 85 participants to reflect a .05 alpha and medium effect size when measuring four independent variables (Cohen, 1992).

Participants were at least 18 years old and had been diagnosed with a potentially life threatening cardiac condition. Because of the method of recruitment, participants were individuals who have access to the internet and visit the websites used for recruitment (i.e., patientslikeme.com, sads.org, researchmatch.org, Facebook, Yahoo user groups, other social media).

Inclusion criteria. Individuals considered for the study were those that have discontinued athletic participation within the previous 3 months to 15 months. Consideration was given to the fact that if individuals were asked to participate earlier than three months, they may still be affected by grief symptoms as a result of being unable to play. The inability to participate could be too acute and recent. However, individuals longer than 15 months away from participating may have been too far removed to be experiencing any symptomatology. The DSM-5 suggests complex bereavement may last 12 months or longer (APA, 2013). This event for athletes would, most likely, not be considered complex bereavement but many athletes could show similar symptoms (e.g., difficulty accepting the loss, experiencing disbelief or emotional numbness, difficulty with positive reminiscing about the loss, maladaptive appraisals about oneself, excessive avoidance of reminders of the loss, etc.). Additionally, many of the disqualified individuals may not be aware of the impact of the loss until the following season and they are unable to participate. Participants were ages 18 and over and were fluent in English at the 6th grade level or higher, as determined by self-identification and ability to comprehend the informed consent. Additionally, participants of all races and ethnicities who met these stated criteria were included.

Exclusion criteria. Individuals that were younger than 18, and had not been formally diagnosed with a potentially life-threatening heart condition were excluded from the study. Participants who report having a medical condition along with a potentially life-threatening heart condition that typically involves physical activity restrictions were also excluded. Individuals were excluded for a lack of willingness or ability to give informed consent, or had incomplete data.

Potential risks and protections of participants. Several precautions were taken to insure protection of the participants. Before the study began, the Institutional Review Board of the Philadelphia College of Osteopathic Medicine reviewed and approved the study. Participants who were recruited from various classified advertisement websites (i.e., Craigslist) were self-selected because they responded to recruitment posts on the website. All individuals who volunteered to participate were recruited without coercion and were prompted to review the informed consent that describes participants' rights prior to filling out the survey. Additionally, participants did not report their names. The experimenter used a secure email address to save data that is used solely for cardiopsychology research. Furthermore, presentation of results in the final manuscript included only information that best reflects the participants as a group with intentions of benefiting the population.

Procedure

Individuals with heart conditions were recruited through Craigslist, Facebook, Twitter, and other social media, a cardiac practice in the Southeast region of the United States, and cardiac websites. Individuals were contacted who had participated in previous LQTS research by the LQTS research team at the Philadelphia College of

Osteopathic Medicine, and those who respond to postings on LQTS and cardiac websites. Recruitment posts containing a link for the survey were made internationally on Craigslist every three days. LQTS and cardiac websites and groups whose administrators gave the experimenter permission to recruit participants received a letter with information pertaining to the study and a link to the survey. Additionally, individuals with heart conditions who participated in previous studies for the research team at the Philadelphia College of Osteopathic Medicine were contacted and provided the link to the survey if they wished and were eligible to participate.

The survey used to obtain data was generated through Survey Monkey, an online resource used to create and administer surveys. After participants clicked on the link to the survey, they were prompted to complete and submit the online survey. Each survey included the adherence measure created for the study, the AIMS (Brewer, Boin, & Petitpas, 1993), SPSI-R:S (D'Zurilla, Nezu, & Maydeu-Olivares, 2002), ICD (Yurica and DiTomasso, 2001), MHLC-C (Wallston, Stein, & Smith, 1994), PHQ-9 (Spitzer, Kroenke, & Williams, 1999), and personal information questionnaire. The measures took approximately 30 minutes to complete, in total. Additionally, resources were included on the survey, including links to information pertaining to heart conditions, as well as depression and anxiety.

After the survey was completed, participants were given the option to enter a lottery for a gift card. If participants chose to enter the lottery, they were asked to provide an e-mail address that will be used to contact the winner. The lottery drawing occurred after recruitment ended.

Measures

Athletic Identity Measurement Scale (AIMS). The AIMS (Brewer, Van Raalte, & Linder, 1993) is a 10-item scale and is used to measure athletic identity. Later, an abbreviated version with a 7-item scale was deemed appropriate for assessing athletic identity in both men and women (Brewer & Cornelius, 2001). The abbreviated version was used in the current study. All items are rated on a 7-point Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Higher total scores indicate a stronger athletic identity than lower scores. The measure is scored by simply adding up the total score. The current study used the scale's total score as a measure of athletic identity. The measure has been found to be internally consistent (Cronbach's alpha = .81 to .93) and there is evidence for test-retest reliability (r = .89 over a two-week period; Brewer, Van Raalte, & Linder, 1993; Good, Brewer, Petitpas, Van Raalte, & Mahar, 1993). Social identity was assessed with three items (i.e., "I consider myself an athlete", "I have many goals related to sports", and "Most of my friends are athletes"). Exclusivity was assessed with two items (i.e., "Sport is the most important part of my life", and "I spend more time thinking about sport than about anything else"). Negative affectivity was measured with two items (i.e., "I feel bad about myself when I do poorly in sport" and "I would be very depressed if I were injured and could not compete in sport").

Social Problem Solving Inventory-Revised: Short Version (SPSI-R:S). The SPSI-R: S (D'Zurilla, Nezu, & Maydeu-Olivares, 2002) is a 25-item questionnaire that can be used for individuals ages 13 and older. The SPSI-R: S measures factors related to a person's ability to problem-solve in social situations, including the ability to make a decision after reviewing consequences of each option. Higher total scores on the SPSI-

R:S indicate better social problem-solving ability, whereas lower scores indicate poorer ability. Participants are asked to respond, using a five-point Likert-type scale ranging from 0 (not at all true of me) to 4 (extremely true of me). Two scales measure the individual's problem orientation, the motivational component of the problem-solving process (Maydeu-Olivares, & D'Zurilla, 1996): Positive problem orientation (PPO) and Negative problem orientation (NPO). It has been established that the problem orientation dimensions overlap with the constructs of optimism and pessimism (Maydeu-Olivares, & D'Zurilla, 1996). A sample item measuring positive problem orientation is: "When my first efforts to solve a problem fail, I know if I persist and do not give up too easily, I will be able to eventually find a good solution." An example of a negative problem orientation item is: "When my first efforts to solve a problem fail, I get very angry and frustrated." The three remaining scales measure an individual's style or approach to problem solving, the "rational search for a solution through the application of specific problem-solving skills [assumed] to increase the probability of finding the 'best' solution or coping response…" (Maydeu-Olivares & D'Zurilla, 1996, p. 116). The three style dimensions are: Rational Problem-solving Style (RPS), Impulsivity/Carelessness Style (ICS), and Avoidance Style (AS). An example of an item that loads on the rational problem-solving style factor is: "When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible." The impulsivity and avoidance styles are characterized as dysfunctional dimensions (Maydeu-Olivares & D'Zurilla, 1996); the impulsive style is hurried and incomplete and the avoidance stance is to procrastinate or wait for the problem to solve itself. Examples of items assessing these styles include: impulsive approach, "When I am attempting to solve a problem, I usually act on the first

idea that comes to mind," and the avoidance approach, "When a problem occurs in my life, I put off trying to solve it for as long as possible."

The SPSI-R:S can be hand-scored. Raw-scores are converted into standard scores. High total SPSI-R scores indicate "good" social problem-solving abilities. On the other hand, low scores indicate "poor" problem-solving abilities; this may contribute to maladjustment or impaired functioning (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Normative scores are available for young adults (17-39), middle age adults (40-55), and older adults (60-80) across the subscales. It has strong psychometric properties, and a manual to guide interpretation.

Inventory of Cognitive Distortions (ICD). The ICD is a 69-item, self-report questionnaire that measures patterns of distorted thinking (Yurica & DiTomasso, 2001). Items are rated on a 5 point Likert scale, ranging from 0 (never think or feel this way) to 4 (always think or feel this way). The ICD consists of one global scale and 11 cognitive distortion subscales (i.e., externalization of blame, fortune telling, magnification, labeling, perfectionism, comparison of others, emotional reasoning, jumping to conclusions, emotional reasoning and decision-making, minimization, and mind reading). The global cognitive distortions scale can be calculated by summing the scores of all 69 items. The greater the score on the global scale, the greater is the presence of distorted thinking in that individual. To compute the cognitive distortions subscales, the scores of the items that fall under that particular subscale are summed. The higher the score on the ICD, the greater the presence of that particular cognitive distortion exhibited by the individual. The ICD is still currently in the developmental phase; however, the current research on the psychometric properties is promising. There are currently a few studies

that provide strong support for the reliability of the ICD. Yurica and DiTomasso (2001) found the test- retest reliability of the ICD over a 6-week period was extremely high (.99) in an outpatient clinical population. Another study found the test-retest reliability of the ICD ranging from .96 to .97 in a nonclinical sample (Whaley, 2001). Uhl (2007) considered the internal consistency of items on the ICD. The results supported the ICD as a reliable measure of cognitive distortions, making it a measure with strong internal consistency (Cronbach's alpha .97). In addition, there are several studies that provide support for the validity of the ICD. Yurica and DiTomasso (2001) conducted a study that provides support for the concurrent validity of the ICD and Ferguson (2006) conducted a study supporting the ICD's predictive validity. Furthermore, Rosenfield (2002) investigated the construct and predictive validity of the ICD in an outpatient clinical population. The global cognitive distortion scale was positively correlated with both Axis I and II pathology, as measured by the MCMI-III. Results also indicated that the ICD predicted 50% of the variance in pathology, as measured by the MCMI-III. Cognitive distortions are constructs that have shown to be highly correlated with both Axis I and II pathology.

Multidimensional Health Locus of Control Scale (Form C; MHLC-C). The MHLC-C is an 18-item questionnaire (Wallston, Stein, & Smith, 1994) that assesses the extent to which participants believe that their heart conditions are due to (1) their own behavior (i.e., internal subscale); (2) the behavior of doctors (i.e., doctors subscale); (3) the behavior of other people, not including doctors (i.e., other people subscale); and (4) chance, luck, or fate (i.e., chance subscale). Items are rated on a six-point Likert scale, ranging from 1 (strongly disagree) to 6 (strongly agree). The MHLC-C does not have a

total score; rather, items within each subscale are summed. All the subscales are independent of one another. The higher the score on a subscale, the more closely one identifies with that factor of locus of control.

The construct of control has been identified as an important psychological construct relevant to physical and mental health (Skinner, 1996). The concept of control has been established as a crucial moderator and mediator within a wide variety of domains of health and healthcare, and several studies have found a perception of being in control is related to positive or improved health outcomes/status (Gebhardt & Bosschot, 2002; Martin, 1999; Martin & Jomeen, 2004). This form of the MHLC has demonstrated impressive reliability and validity (Wallston, Stein, & Smith, 1994). The internal consistency alphas are $\geq .70$. This measure also possesses considerable concurrent and construct validity (Wallston, Stein, & Smith, 1994).

The utility of the MHLC-C is based on the assumption that the measure reliably assesses these four relatively independent domains of locus of control. Wallston, Stein, and Smith (1994) used a broad variety of patient groups to validate the instrument (diabetes, cancer, chronic pain, and rheumatoid arthritis). It is not uncommon to find individuals who together endorse both internal and external health locus of control beliefs.

Patient Health Questionnaire (PHQ-9). The PHQ-9 is a quick depression assessment measure that is composed of nine items based on the criteria for major depressive disorder from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (American Psychiatric Association, 2000; Spitzer, Kroenke, & Williams, 1999). Items are measured on a four point Likert scale, ranging

from 0 (Not at all) to 4 (Nearly every day). The score is summed then interpreted by using the following scale: 1-4 (Minimal depression), 5-9 (Mild depression), 10-14 (Moderate depression), 15-19 (Moderately severe depression), and 20-27 (Severe depression). Kroenke, Spitzer, and Williams (2001) have shown the PHQ-9 to be a valid and reliable measure.

Adherence to physical activity recommendations questionnaire. Adherence was measured in the current study by using the published recommended guidelines for athletic participation for individuals who have heart conditions (Maron et al., 2004; Appendix A). The guidelines include 28 specific activities of high intensity, moderate intensity, and low intensity. Participants were given the opportunity to list their top three physical activities that were not listed. Also, participants were asked to answer three questions regarding each activity to determine adherence. Initially, they used a 7-point Likert scale consisting of daily, weekly, monthly, bi-monthly (once every two months), bi-annually (once every 6 months), annually, and never, in order to report the frequency of participation in each activity since having been formally diagnosed with a heart condition by a physician. This method of scoring allowed for the ability to view adherence on a continuum. Participants were then asked to report their doctors' recommendations for each activity by stating that the activity is either recommended, not recommended, or unsure if it is recommended. Additionally, participants were asked if they participate more, participate less, or there is no change in participation in the listed activities since having been diagnosed with a heart conditions. Participants also had the opportunity to report how the frequency of their participation in physical activities had changed by using a 5-point Likert scale.

In addition to the questions specific to the activity list, participants were asked to report how important they believe physical activity is, in general, on a 7-point Likert Scale indicating not at all important, low importance, slightly important, neutral, moderately important, very important, extremely important (Vagias, 2006).

Additionally, information was obtained for post-hoc analysis regarding participants' frequency of engaging in a variety of sports and safety behaviors.

Personal Information Questionnaire. The current study obtained questions in regard to personal and demographic information. The question also focused on general information about participants' heart conditions.

Chapter 4

Results

Statistical Analysis

A hierarchical linear multiple regression was conducted to test the hypothesis that athletic identity, social problem-solving ability, cognitive distortions, depression, and health locus of control will predict adherence to medication in the sample population. High correlations among predictor variables were evaluated for redundancy, and choices were made to exclude specific variables. Descriptive statistics, including means, medians, and modes were used to describe the sample and the responses to the instruments administered. Pearson product-moment correlations were used to evaluate the relationships among the key variables. It was anticipated that the study needed 85 participants to reach statistical significance. SPSS Excel was used for the statistical analysis.

Demographic Information

There was some diversity among those that participated in the study. Forty-four participants reported their gender, which included 12 males and 32 females (M = 32.8 years, SD = 11.06, age range: 18-64 years). Of the 44 who responded to the question on race, 35 reported being white, 2 black, 2 Asian (including Pacific, South, Southeast, and North), 2 Latino/Hispanic, 1 Native American, 1 Multiracial, and 1 "other." There were 40 respondents to the question on religious beliefs which included: 26 Christian, 9 Atheist, 3 Buddhist, and 2 Agnostic. Forty-three answered regarding employment status which included 25 full-time employees, 7 part-time, 5 unemployed students, 4 unemployed, and 2 on disability. Forty answered regarding their highest academic degrees earned: 18 bachelor's degrees, 12 high school diplomas, 5 associate's degrees, 4

master's degrees, and 1 doctorate. Forty-two responded about their household incomes, including 4 in the $0-5,000 range, 6 in the $5,000-20,000 range, 9 in the $21,000-40,000 range, 7 in the $41,000-60,000 range, 8 in the $61,000-80,000 range, 4 in the $81,000-100,000 range, and 4 in the above $100,000 range. Forty-two responded to the residential area in which they live: 21 in the city, 10 suburban, 8 rural, and 3 on a farm. Twenty-nine answered regarding the region of the country in which they live including, 16 from the Northeast, 7 from the West, 4 from the Midwest, and 2 from the South. Of 38 participants, 19 reported having no children, 13 had 1 or 2, and 6 had 3 or 4. Of 35 participants, 23 reported having no children with heart conditions; 5 participants had 1 child with a heart condition; 6 participants had 2, and 1 participant had 3.

Overall, 71 participants began the study on Survey Monkey. There were 11 participants eliminated after the first question. Sixty participants answered some questions and 32 completed the whole survey. When asked about the nature of their heart conditions, 53 answered; this included 31 with Long QT Syndrome, 16 with Hypertrophic Cardiomyopathy, 3 with Supraventricular Tachycardia, 1 with Inappropriate Sinus Tachycardia, 1 with Congestive Heart Failure, and 1 with Aortic Dissection. Of the 27 that answered whether or not they had genetic testing to confirm their diagnosis, 24 had testing; 3 did not. Of the 27 who answered about having Long QT Syndrome, 9 reported having LQTS1, 9 LQTS2, 3 LQTS3, 3 unidentified gene, 1 unsure and 2 currently waiting to receive their results. Participants were diagnosed with heart conditions at a variety of different ages including birth to age 63. Of 40 respondents, 32 reported having symptoms of their heart conditions. Of 40 respondents, 22 made a visit to the emergency room after having a first episode. Thirty-nine responded to the

question, "How many events (i.e., fainting, seizure, arrest) in total have you had. Only 8 had no events. 9 had 1 or 2 events; 8 had 3 or 4; 5 had 5 or 6, and 9 had 7 or more. Thirty-eight responded about whether or not they had an implantable cardioverter defibrillator (ICD) or pacemaker. Ten reported having an ICD; 2 had a pacemaker; 6 had both, and 20 had neither. Five (of 37) reported having an Automated External Defibrillator (AED). In regard to taking an external defibrillator on outings in the previous 12 months, 7 (of 33) said they had; 19 said they had not and had not been recommended to do so, and 7 said they had not but they had been recommended to do so. Sixteen (of 27) disclosed having worn a medical identification item in the previous 12 months. Of 32 respondents, 12 had a pacemaker.

Some participants were required to take medication. Fourteen (of 27) were required by their cardiologist to take medication once daily, and 13 were required two to three times a day. Twenty-eight participants answered that they were taking medication and those medications included: Aspirin, Atenolol, beta blockers, Carvedilol, Clindamycin, Digoxin, Diltiazem, Gabapentin, Inderal, Isosorbide Dinitrate, Levothyroxine, Midodrine, Nadolol, Nitrostat, Norvasc, Ondansetron, Promethazine, Propranolol, Simvastatin, Topiramate, Valsartan, and Verapamil. Fourteen (of 38) reported experiencing side effects. In particular, they felt dizzy, tiredness/fatigue, "sick in my tummy," tingling skin, confusion, forgetfulness, increased emotionality, insomnia, anxiety, depression, and breathlessness. Respondents listed many reasons about what is important to keep them safe and healthy, such as getting regular exercise and adequate rest, and maintaining a healthy diet, experiencing low stress and good mental health.

Participants were asked if they had been diagnosed with other medical conditions. Of the 40 that responded to the question, 10 said they had additional conditions including: epilepsy, anxiety, endometriosis, color vision deficiency, myopia, spinal cord injury, arthritis, diabetes, chronic staph, high cholesterol, underactive thyroid, postural orthostatic tachycardia syndrome, Legius syndrome, and asthma. When asked about seeing a cardiologist, 8 (of 39) reported going every three months, 8 every four months, 12 twice a year, 8 yearly, and 2 never. Ten participants (of 36) disclosed that they have changed their cardiologist since being diagnosed. Of 33 respondents, 24 reported their cardiologists discuss physical activities with them.

Regarding sports, many participants played at the high school level, some recreationally, and others at the amateur, college, semi-professional, and professional levels. Some (11 of 32) remain involved in sports in some manner (e.g., coaching, athletic training, etc.). Of 33 participants, 16 remain involved as active members at a gym.

Adherence Measurement

Participants were asked to describe their three top activities and to report whether or not those activities were permitted, not permitted, or that they were unsure. Of the 32 that responded to the question, 13 reported that they were permitted for the first activity, 13 for the second, and only 9 for the third. However, for the first activity, 14 said they were not permitted to do their first activity and 5 were unsure. For the second activity, 12 reported they were not permitted and 7 were unsure. For the third activity, 17 reported they were not permitted and 6 were unsure. Some responses were interesting. For example, participants provided answers such as : “35-40 minute walks,” “I run a

daycare…chasing kids all day," "mowing the lawn," "range of motion exercise," "walking (hostess at work)," "I also work a part time job at a pharmacy," "snow blowing the side walk," "squats," "walking the dogs," "water exercise," "yoga," "fitness," "Gaelic," "I raised three kids who are involved in many activities," "jump rope," "kitesurfing," "playing with kids," and "small bike rides with family." Because many of these activities are not sufficient to use for the study, a better predictor of adherence was considered. More specifically, medication adherence was selected as the new measure of adherence because there was sufficient data, and medication is the key intervention for persons with these conditions. Of the 32 people who answered the question, 15 said they take their medications as prescribed; 5 remember most days but forget on average of once a week; 6 do not take medications as consistently as they were prescribed and forget more than once a week; 3 said they do not take my medications, and 3 answered that they are not prescribed or required to take medication.

Alcohol and caffeine are also considered predictors of adherence but were not used because it cannot be confirmed that all patients are knowingly restricted from these substances. Of 32 respondents, 14 reported drinking alcohol in the previous 12 months. All of these participants have drinks multiple times within the month; 9 reported drinking weekly. Similarly, of 33 participants, 25 reported consuming caffeine in the previous 12 months but 8 have not. 1 (of 33) participant disclosed using recreational or prescription drugs not prescribed.

Social Problem-Solving

Social Problem Solving Inventory, Revised, Short Form Descriptive Statistics Table

Subscale	N	Minimum	Maximum	Mean	Standard Deviation
Positive Problem Orientation	27	54	127	97.89	15.58
Negative Problem Orientation	27	74	138	102.78	18.06
Rational Problem Solving	26	56	124	97.58	14.89
Impulsivity/Carelessness Style	26	73	134	105.69	16.66
Avoidance Style	26	78	148	110.19	19.21
SPSIRS Total Score	26	64	122	93.15	13.26

In regard to the SPSI-R:S, participants (n = 26) in this study displayed a wide range of problem-solving ability (M = 93.1538; score range: 64 - 122; 64 = "Very Much Below Norm Group Average," 122 = "Above Norm Group Average"). When interpreted, using the standard scores from the SPSI-R:S manual, a majority of participants of this study, on average, fell within the "Norm Group Average" (i.e., Standard Scores of 86-114). Having average problem-solving skills means having the ability to function in a manner similar to those who can function more competently; it also means to experience less psychological distress when dealing with complicated or stressful problems.

Depression

Patient Health Questionnaire Descriptive Statistics Table

Subscale	N	Minimum	Maximum	Mean	Standard Deviation
PHQ-9 Total Score	31	0	27	12.35	8.01

Most of the participants (n = 31) in the sample showed some level of depression and on average displayed a "Moderate depression" (M = 12.35) when compared with the normed severity of scores (1-4 Minimal depression, 5-9 Mild depression, 10-14 Moderate depression, 15-19 Moderately severe depression, 20-27 Severe depression). There was a wide range of scores from participants, including some who were not depressed (Minimum = 0) and others who were severely depressed (Maximum = 27). When compared with the normative sample of patients in primary care by Kroenke, Spitzer, and Williams (2001), the current sample had a rate of depression (M = 12.35) much higher than patients with no depressive disorder (M = 3.3, SD = 3.8), a slightly higher rate than those who were diagnosed as having other depressive disorder (M = 10.4, SD = 5.4), and a lower rate than those diagnosed with major depression (M = 17.1, SD = 6.1).

Cognitive Distortions

Inventory of Cognitive Distortions Descriptive Statistics Table

Subscale	N	Minimum	Maximum	Mean	Standard Deviation
Externalization of Self-Worth	23	14	70	40.39	18.59
Fortune Telling	24	11	55	29.54	13.54
Magnification	24	7	35	19.83	8.65
Labeling	25	5	25	14.04	6.12
Perfectionism	24	4	20	12.33	4.51
Comparison of Others	23	4	20	11.87	4.88
Emotional Reasoning	24	4	20	12.13	4.58
Jumping to Conclusions	25	3	14	7.96	3.47
Emotional Reasoning and Decision Making	25	2	10	5.88	2.37
Minimization	25	2	10	5.76	2.28
Mind-Reading	24	2	10	5.75	2.64
ICD Total Score	21	58	261	164.10	65.83

All of the participants in this study (n = 21) had some distorted thinking (M = 164, SD = 65.83, Range: 58 – 261). It is expected that participants would have some degree of distorted thought, given their current cardiac conditions. When compared with a nonclinical population by Roberts (2015), the nonclinical population had more distorted thinking (Males M = 166.26, SD = 32.31; Females M = 176.18, SD = 33.12).

Locus of Control

Multidimensional Locus of Control Descriptive Statistics Table

Subscale	N	Possible Range	Minimum	Maximum	Mean	Standard Deviation
Internal LOC	25	6-36	11	36	21.96	7.52
Chance LOC	24	6-36	9	34	21.46	7.52
Doctors LOC	24	3-18	8	18	13.33	3.03
Other People LOC	25	3-18	3	18	9.96	3.75

Participants tended believe that doctors had the greatest control over their heart condition (M = 13, SD = 3.03). Also, participants had some belief in an internal locus of control (M = 21.96, SD = 7.52) and belief in chance (M = 21.46, SD = 7.52). When compared with a group of diabetes patients from the original sample (Wallston, Stein, & Smith, 1994), the diabetes patients had a higher mean for internal locus of control (M = 28.67, SD = 4.95), lower mean for chance locus of control (M = 12, SD = 15.99), slightly higher mean for doctor locus of control (M = 15.99, SD = 8.48), and for similar other people locus of control (M = 8.48, SD = 3.46).

Athletic Identity

Athletic Identity Measurement Scale Descriptive Statistics Table

Subscale	N	Mean	Standard Deviation
AIMS Total Score Female	22	25.59	7.73
AIMS Total Score Male	9	34.67	11.67

There were more females (n = 22) than males (n = 9) who completed the AIMS during this study. The males generally scored higher (M = 34.67, SD = 11.67) than the females (M = 25.59, SD = 7.73), meaning they tended to identify more as athletes than as females. This is consistent with the research. When the athletes of this study were compared with the normative sample created by Brewer and Cornelius (2001), the males identified similarly with their identity as an athlete (M = 35.92, SD = 8.59) and the females identified slightly less with their identity (M = 30.15, SD = 10.68).

Correlations

Pearson correlation coefficients were computed for each relationship between factors. Pearson correlation coefficients for some of the factors were significantly and positively correlated ($p < .01$). There was a large negative correlation found between the SPSI-R Total Score and the PHQ-9 Total Score, $r = -.580$, n = 24, $p = .002$. As participants were more depressed they demonstrated less adaptive problem-solving ability and vice versa. The SPSI-R:S was strongly, negatively correlated with the ICD, $r = -.637$, n = 20, $p = .003$. As participants had more cognitive distortions, they had less ability to problem-solve effectively. In cases in which participants had fewer cognitive distortions, they had a greater ability to use effective problem-solving skills. Participants

with increased scores on the ICD tended to have increased scores on the PHQ-9, $r = .676$, n = 21, $p = .001$. As participants had more distortions, they experienced more depression. If they had less distorted thinking, they had less depression. Those who had an internal locus of control tended to be better at rational problem-solving, based on the rational problem-solving subscale, $r = .537$, n = 24, $p = .007$. Others who felt that other people were in control of their heart conditions tended to have an avoidance style, $r = .559$, n = 24, $p = .005$ or a rational problem-solving style, $r = .546$, n = 24, $p = .006$.

The AIMS had a large correlation effect with the ICD, $r = .618$, n = 21, $p = .003$. As participants identified more as being an athlete, they tended to have more cognitive distortions. When they identified less as an athlete, they had fewer distortions.

Regression

Multiple Regression Model Summary

Model	Variable	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	Internal LOC	.603	.364	.329	1.09284
2	ICD Total Score	.709	.502	.444	.99482
3	SPSI-R:S Total Score	.796	.633	.564	.88053

Multiple Regression Model Summary, Change Statistics

Model	Variable	R Square Change	F Change	Df1	Df2	Sig. F Change
1	Internal LOC	.364	10.301	1	18	.005
2	ICD Total Score	.138	4.722	1	17	.044
3	SPSI-R:S Total Score	.131	5.700	1	16	.030

a. Predictors: (Constant), Internal LOC
b. Predictors: (Constant), Internal LOC, ICD Total Score
c. Predictors: (Constant), Internal LOC, ICD Total Score, SPRI-R:S Total Score

Multiple Regression Model Summary, Coefficients

Constants	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	11.580	2.630		4.403	.000
Internal LOC	-.106	.025	-.634	-4.181	.001
ICD Total Score	-.013	.004	-.672	-3.414	.004
SPSI-R:S Total Score	-.053	.022	-.470	-2.387	.030

Multiple Regression Model Summary, Excluded Variables

Model	Variable	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics: Tolerance
3	AIMS Total Score	.101[d]	.503	.622	.129	.600
	PHQ-9 Total Score	-.229[d]	-1.036	.317	-.258	.467

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	21.395	3	7.132	9.198	.001
	Residual	12.405	16	.775		
	Total	33.800	19			

A stepwise multiple regression was completed to determine the best linear combination in scores on the Internal LOC scale, ICD, SPSI-R:S, AIMS, and PHQ-9 for predicting athlete adherence to recommendations. It was hypothesized that the five measures would predict adherence. Internal LOC, ICD total score, and SPSI-R:S total score were determined to be the most accurate predictors. The scores on the AIMS and PHQ-9 were excluded. This combination of variables (i.e., Internal LOC, ICD total score, SPSI-R:S) significantly predicted adherence, $F(3,16) = 9.20$, $p = .001$, with all three variables significantly contributing to the prediction. The adjusted R squared is .56, meaning that 56% of the variance in adherence can be predicted from the Internal LOC, ICD total score, and SPSI-R:S total scores.

Chapter 5

Discussion

This chapter summarizes the study, discusses the implications of the results, considering the existing literature, study limitations, and directions for future research. This study was developed in response to the need for understanding the factors that affect adherence to treatment recommendations. Although these factors are better understood for other conditions such as diabetes or chronic pain, little research has focused on cardiac conditions. After exploring different factors that could impact adherence in this population, athletic identity, social problem-solving, cognitive distortions, depression, and locus of control were selected. The purpose of this study was to describe and explain how participant athletic identity, social problem-solving ability, cognitive distortions, depression, and health locus of control predict adherence to treatment recommendations. Significant positive findings indicate that this goal was achieved. Although the initial measure of adherence was changed, internal locus of control, problem-solving ability, and cognitive distortions largely predicted athlete adherence. It should be noted that the study achieved significance with a much lower sample number than anticipated in order to have adequate statistical power. So, the results may not be entirely indicative of the larger population. That said, it is thought that these factors remain important aspects of possible treatment.

Statistical Analysis

Locus of control. In regard to locus of control, distinguishing between the means was a difficult concept. Although the doctors locus of control was most strongly endorsed, internal locus of control and chance locus of control were also endorsed. The creators of the test never delineated scores on the measure; they discussed only the fact

that a higher score means that there is a stronger endorsement of a locus of control construct. Thus, the interpretation is left up to clinical judgment. There were four different comparison groups in the original study, including Rheumatoid Arthritis, Chronic Pain, Diabetes, and Cancer (Wallston, Stein, and Smith, 1994). It was thought that the group of diabetes patients may be most similar in prognosis. Therefore, they were selected as the comparison group when observing locus of control.

Social problem-solving. The participants had a wide range of problem-solving abilities. It makes sense that this would be a significant predictor for adherence. If a person is to understand his or her heart condition and has good problem solving ability, it seems likely that he or she would be more likely to adhere to recommendations. On the other hand, if someone has a poor problem-solving ability, he or she may not be able to follow through with what doctors are recommending.

Cognitive distortions. Disordered thinking was rather common among the participants of this study. Having a heart condition is likely to bring upon some stress, given the consequences of the problem if not taken seriously. It is not uncommon to see those under stress have distorted thinking. Therefore, it is those same distorted processes that would likely interfere with participants adhering or not adhering to recommendations. If there is increased distorted thinking, one is less likely to adhere and vice versa.

Depression. This factor was removed during the regression because it did not predict adherence. In this population, it is surprising that depression did not affect adherence. Naturally, depression tends to make people less motivated to complete activities. However, perhaps former competitive athletes are more highly motivated than

the general population despite their depression. This group of participants was moderately depressed.

Athletic identity. It was surprising that athletic identity was not a predictor of adherence. It is thought that because the measure of adherence was changed from adherence to physical activities to adherence to medication, that this affected variable predictability. Although medication adherence was an adequate measure of adherence, athletes are bound to stay engaged in physical activity and athletic identity may have played a greater factor if the study remained focused on physical activity adherence.

Clinical Implications

Researchers are noticing that heart conditions have impacts on individuals' psychological well-being and that emotional support should be tailored appropriately to the individual (Asif et al., 2015). However, the variables of this transition are not well understood, but this study addressed some of the missing pieces. Cognitive distortions were prevalent in this population, providing clinicians with some information about disqualified athletes' thought processes. Cognitive distortions have been shown to affect adherence and are associated with poorer health outcomes (Anderson & Emery, 2014; Christensen, Moran, & Wiebe, 1999; Smith, Peck, Milano, &Ward, 1988). Failure to address these distortions could lead to serious health consequences.

A treating clinician could use the ICD to identify distortions in an athlete. Then, cognitive-behavioral therapy could be a useful treatment modality to help these athletes adjust to their circumstances. Techniques such as cognitive restructuring and psychoeducation could be useful in helping athletes understand how their thoughts and beliefs influence their negative emotional states and problematic behaviors (Leahy,

Holland, & McGinn, 2012). Also, problem-solving therapy, which is a form of cognitive-behavioral therapy, could be helpful in encouraging, providing methods for, reducing, and shifting from negative mindsets (D'Zurilla & Nezu, 1999).

Problem-solving was another important factor in participants' adherence in this study. The better participants were at problem-solving the more likely they were to adhere. This is consistent with the literature. That is, social problem-solving ability is directly related to individuals adjusting to chronic health conditions because they are required to maintain daily activities and cope with the responsibilities and symptoms that come with their conditions (Elliott, Grant, & Miller, 2004; Johnson, Elliott, Neilands, Morin, & Chesney, 2006). Also, an individual's problem-solving style can be directly implicated in the development of health complications that can be prevented by adherence to medical recommendations (Herrick & Elliot, 2001; Johnson et al., 2006).

Social problem-solving style may promote adherence to medical recommendations by providing individuals with the attitudes, emotional regulation, and instrumental skills necessary for coping effectively with ongoing stress and demands (Elliot, Sherwin, Harkins, & Marmarosh, 1995). Research, as it does with the issue of cognitive distortions, supports the use of social problem-solving therapy to help promote better problem-solving skills (D'Zurilla & Nezu, 1999). The goal of treatment is to focus on specific life circumstances that demand responses for adaptive functioning but no effective response is available or identifiable to the person experiencing the situational issue (D'Zurilla, Nezu, & Maydeu-Olivares, 2002).

In this study, internal locus of control was another factor that predicted adherence. Internal locus of control is thought to be essential to empowerment because it is

associated with increased social action and lower psychological stress (Zimmerman, 2000). Other researchers have focused on ways in which having the perception of internal control relate positively to self-determination, self-esteem, self-control, personal responsibility, perceived competence, and self-efficacy (Adams, 2003, Andrews, Guadalupe, & Bolden, 2003). Having an internal locus of control is also associated with resilience (Leontopoulou, 2006). When considering these associated factors with the current population, internal locus of control becomes an extremely important component in an individual's overall wellness when having a heart condition. Not only will he or she be more likely to adhere to recommendations, he or she could have improved mental health symptoms.

Having an internal locus of control has been identified with positive health outcomes; therefore, if athletes are presenting with an external locus of control, a clinician could work with the individual to shift his or her perception. Similar to the treatment of cognitive distortions, a clinician could help the athlete to identify problematic thoughts and beliefs as they relate to his or her health condition and work to shift perceptions to help him or her adjust. Here, psychoeducation could be helpful by informing an athlete how locus of control could impact his or her health-related behaviors.

Limitations

Perhaps the most glaring limitation was that there were not enough participants recruited to have adequate power. The predicted power needed was 85 and, yet, significance was found at 29 participants. It is possible the findings are due to chance or

error and it would be important to replicate this study with a larger sample to be sure the findings hold true.

Although the research team recruiting for the study remained consistent in their efforts, the narrow population was difficult to reach. More time was needed for dedication to the process, but that was not possible, given the limitations of funding. Ideally with more time, some of the current participants could have been removed from analysis because several participants completed only some of the questions, often leaving an unequal number of participants for the different measures used in the survey.

Anxiety was overlooked in the study. Initially, "the PHQ" was decided upon as the measure to capture participants' anxiety and depression symptoms. However, it was overlooked that the PHQ-9 was selected instead of the PHQ-15. The difference in the measures is that the PHQ-9 captures only depression symptoms, whereas the PHQ-15 asks questions related both to depression and to anxiety. The study did not have enough participants to reach statistical significance; however, because anxiety has been shown to contribute to complications when adjusting to heart conditions, its inclusion may have been another factor affecting this population (Huffman, Celano, & Januzzi, 2010).

The current study has several limitations involving the research design and use of self-report measures. The Internet was used as a means of data collection. This did exclude individuals who do not have internet access. These individuals may be part of low socioeconomic status groups that may lack computer skills and/or access. Participants needed to be self-motivated to answer the questions.

In regard to the self-report survey design, there is always a risk of participants being honest when answering the questions. Some researchers suggested the use of self-

report could lead to an over-estimation of adherence (Schneider, Kaplan, Greenfield, Li, & Wilson, 2004). Along the same lines, some of the participants may have been primed by participating in other research through the school.

The adherence characteristics collected were evaluated by a survey created by the lead investigator. However, the survey is a limitation due to the lack of research examining the reliability and validity of the measure. Along the same lines, disqualification guidelines vary among the different cardiac conditions. Those discussed have a greater chance for having a significant event; however, many conditions have their own unique recommendations. Therefore, this makes it difficult to make completely generalizable recommendations for heart conditions.

Medical recommendations were not obtained from participants' doctors and the self-report of the participants was relied upon; this could have misrepresented what was recommended by their doctors.

This study has by no means captured all variables that impact athlete adherence to medical recommendations. Other factors may impact adherence such as having an athletic scholarship, how long the athlete has played the sport, the age of the athlete, etc.

Future Implications

The seriousness of athletes with heart conditions should not be underestimated. Their adherence to medical recommendations (to refrain from participating in sports) could be life threatening. Currently, treatment recommendations are provided for individuals with heart conditions (Pelliccia et al., 2005), but prior to the present study, research has not focused on the psychological factors that may be influencing adherence. Results from the present study described important information to fill in parts of the

gaps; an internal locus of control, few cognitive distortions, and good problem-solving ability can impact individuals' adherence to doctor's recommendations. This information could be used to develop future measures of adherence with this population.

Additionally, this study could guide new research questions regarding potential contributing factors to adherence rates, or how to treat individuals facing a similar circumstance.

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Appendix A

Adherence

Have you been recommended to stop participating in competitive sports?

What sport(s) were you participating in?

At what level were you competing (e.g., high school, college division I, college division II, professional, etc.)?

Are you still involved in sports in some manner (e.g., coaching, athletic training, etc.)?

In regard to your heart condition, what do you think is the most important factor to keep you safe and healthy? _____

How often do you participate in physical activities?
Daily
Weekly
Monthly
Bi-Monthly (about once every 2 months)
Bi-Annually (about once every 6 months)
Annually
Never

What are the top 3 physical activities that you participate in the most?
1._____
2._____
3. _____

Are you an active member of a gym? _____ yes _____no

Using the scale below, in the last 12 months, approximately how often have you participated in the following?:

Daily
Weekly
Monthly
Bi-Monthly (once every 2 months)
Bi-Annually (once every 6 months)
Annually
Never

Basketball
Body Building

Ice Hockey
Racquetball/squash
Rock Climbing
Running
Skiing
Soccer
Tennis
Touch Football
Windsurfing
Baseball/softball
Biking
Motorcycling
Jogging
Sailing
Surfing
Swimming
Treadmill
Weightlifting
Hiking
Bowling
Golf
Horseback Riding
Scuba Diving
Skating
Snorkeling
Brisk Walking

Drank alcohol
If yes, how many days per week do you drink alcohol? _____
How many alcoholic beverages do you consume each day that you drink? _____

Wore a medical identification item
Taken an external defibrillator on outings
Consumed Caffeinated Products (Coffee, Tea, Energy Drinks, Chocolate)
Taken recreational drugs or prescriptions not prescribed by your physician
If yes please name _____

How much water do you drink daily? _____ ounces
How much Gatorade do you drink daily? _____ounces

If applicable, how often do you *remember* to take medication for your heart condition?
_____ Daily, as prescribed
_____ Remember most days, but forget on average of once a week
_____ Not as consistently as I was prescribed; I forget more than once a week
_____ I do not take my medications
_____ I am not prescribed/required to take medications for my heart condition

Do you have a pacemaker or ICD? _____ yes _____no

If yes, how often do you *remember* to check your pacemaker or ICD?

_____ As often as required

_____ Less often than required

Individuals who report that they participate in an activity that is not permitted by their cardiologist will be asked why they participate in the activity.

Of the top 3 physical activities that you listed that you participate in the most, does your *current* cardiologist recommend that they are Permitted, Not Permitted, or are you Unsure if they are permitted.

	Permitted	Not Permitted	Unsure
Activity #1._____			
Activity #2._____			
Activity #3. _____			

Does your *current* cardiologist recommend that the following activities are Permitted, Not Permitted, or are you Unsure if they are permitted?

	Permitted	Not Permitted	Unsure	Not Discussed
Basketball				
Body Building				
Ice Hockey				
Racquetball/squash				
Rock Climbing				
Running				
Skiing				
Soccer				
Tennis				
Touch Football				
Windsurfing				
Baseball/softball				
Biking				
Motorcycling				
Jogging				
Sailing				
Surfing				
Swimming				
Treadmill				
Weightlifting				
Hiking				
Bowling				

Golf
Horseback Riding
Scuba Diving
Skating
Snorkeling
Brisk Walking
Consuming alcohol
Smoking cigarettes
Wearing a medical identification item
Taking an external defibrillator on outings
Consuming Caffeinated Products (Coffee, Tea, Energy Drinks, Chocolate)
Taking recreational drugs or prescriptions that are not prescribed to you by a physician

How much water does your cardiologist recommend that you drink daily? _____ Ounces
_____ Unsure

How much Gatorade does your cardiologist recommend that you drink daily?____Ounces
_____ Unsure

How often does your cardiologist recommend that you take medication for your heart condition?
_____ Once Daily
_____ Two to Three Times Daily
_____ Other; Please specify _____

If you have a pacemaker or ICD, how often does your cardiologist recommend that you check it?
_____
_____ I don't have a pacemaker or ICD

How often have you participated in your top 3 physical activities since you were diagnosed with a heart condition? (So, if you swim monthly, but walk daily, answer with the most frequent activity, i.e., daily).

Daily
Weekly
Monthly
Bi-Monthly (once every 2 months)
Bi-Annually (once every 6 months)
Annually
Never

How often have you participated in the following activities since being diagnosed with a heart condition?

Daily
Weekly
Monthly
Bi-Monthly (once every 2 months)
Bi-Annually (once every 6 months)
Annually
Never

Basketball
Body Building
Ice Hockey
Racquetball/squash
Rock Climbing
Running
Skiing
Soccer
Tennis
Touch Football
Windsurfing
Baseball/softball
Biking
Motorcycling
Jogging
Sailing
Surfing
Swimming
Treadmill
Weightlifting
Hiking
Bowling
Golf

Horseback Riding
Scuba Diving
Skating
Snorkeling
Brisk Walking
Drinking alcohol
Smoking cigarettes
Wearing a LQTS identification item
Taking an external defibrillator on outings
Consuming Caffeinated Products (Coffee, Tea, Energy Drinks, Chocolate)
Taking recreational drugs or prescriptions that are not prescribed to you by a physician
Drinking Water
Drinking Gatorade

In thinking about your frequency of physical activity before your diagnosis of a heart condition compared to after your diagnosis of a heart condition, how much do you think your frequency (how often) of physical activity has changed?

1 2 3 4 5
Not at all Very Much

How important is participation in physical activities to you?

Not at all important
Low importance
Slightly important
Neutral
Moderately important
Very important
Extremely important

Does your cardiologist discuss your physical activities with you? _____ yes _____ no

Appendix B

Recruitment Letters

Letter to Website/Group Administrator

Volunteers Wanted – Adult Athletes Disqualified from Sports due to a Cardiac Condition

A diagnosis of a cardiac condition (e.g., Hypertrophic Cardiomyopathy, Long QT Syndrome, Supraventricular Tachycardia) can impact individuals' lives in many ways. Learning about the specific needs that adults with cardiac conditions have is important when providing the best healthcare possible. To help healthcare professionals who work with this population better understand patients' needs, a study is being conducted on psychological factors affecting adherence to physical activity recommendations. This study is led by Stephanie Felgoise, Ph.D., ABPP and Aaron Myers, M.S. at the Philadelphia College of Osteopathic Medicine (PCOM).

May I have your permission to post a short recruitment letter on your (website/group page)? If you would like additional information about the study, please contact aaronmy@pcom.edu or lqtstudies@pcom.edu.

Letter to Participants

Volunteers Wanted – Adult Athletes Disqualified from Sports due to a Cardiac Condition

A diagnosis of a cardiac condition (e.g., Hypertrophic Cardiomyopathy, Long QT Syndrome, Supraventricular Tachycardia) can impact individuals' lives in many ways. Learning about the specific needs that adults with cardiac conditions have is important when providing the best healthcare possible. To help healthcare professionals who work with this population better understand patients' needs, a study is being conducted on psychological factors affecting adherence to physical activity recommendations. This study is led by Stephanie Felgoise, Ph.D., ABPP and Aaron Myers, M.S. at the Philadelphia College of Osteopathic Medicine (PCOM). *Each participant will have a 1 in 5 chance of receiving a $20 gift card to either Walmart or Target, that can be used in stores or online.*

Participants must:

- Have been diagnosed with Cardiac Condition where it was recommended you no longer participate in competitive sports

- Be at least 18 years old

- Have stopped participating in competitive sports in the last 3-15 months

Participation is ANONYMOUS and the survey takes approximately 20 minutes to complete

To participate in the study, click on the link below. (link)

If you would like more information about the study, email aaronmy@pcom.edu or lqtstudies@pcom.edu.

Appendix C

Resources for Participants

CARE Foundation – http://www.longqt.org/

- Provides online information and resources for families

SADS Foundation – http://sads.org/

- Provides excellent information and resources for families
- Provides networking information to connect with other families
- Offers support services

LQT Yahoo User Group – http://health.groups.yahoo.com/group/ihfgroups/

- Provides individuals with interaction with other people with similar medical disorders

http://www.long-qt6-syndrome.com/lqts_links.html

- Message board and support groups

http://www.qtsyndrome.ch/cgi-bin/discus.pl

- Message board