THE EFFECT OF FAILURE ON PHYSIOLOGICAL STRESS,

EMOTIONAL RESPONSES, AND PERFORMANCE

IN HIGH AND LOW RESILIENT

ATHLETES

by

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STATEMENT OF DISSERTATION APPROVAL

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ABSTRACT

Resilience is distinguised by positive adaptation following adversity. All athletes inevitably experience adversity in sport, often in the guise of failure. Positive adaptation following failure is a highly desirable pattern of behavior in sport, yet little is known about the key markers of positive adaptation. Three theorized charactersitics of positive adaptation from the literature are low cortisol levels, positive emotional responses, and good performances. With these characteristics in mind, the purpose of this psychophysiological study was to investigate cortisol, emotional, and performance differences following failure in more and less resilient athletes. To identify high and low resilient athletes for study, 116 male and female collegiate lacrosse players were initially recruited to self-assess their resilience. The intial survey pool was split into three groups using a mean +/- one standard deviation split from the resilience measure. High resilient athletes scored at or above the 84.1^{th} percentile (n= 18), low resilient qualities athletes scored at or below the 15.9^{th} percentile (n= 18), and the control group (n= 17) scored at or around the mean. The task was a new lacrosse task where all participants except the control group were given failure feedback. All participants gave baseline, prefailure, and postfailure measures of positive and negative affect, pride and shame, and cortisol. Performance data on the task was collected on trial one and two of the task. Data were analyzed using repeated measures ANOVAs to examine participants' responses to failure.

There were no significant group by time interactions from prefailure to postfailure on cortisol, emotion, or performance. There were significant main effects for time, indicating that irregardless of resilience, all participants reacted similarly to failure. In addition, two exploratory analyses examined group differences from baseline to prefailure and a small subset of participants ($n= 15$), who received an additional condition where success feedback was given to examine group differences from presuccess to postsuccess. There was a significant group by time interaction for negative affect from baseline to prefailure. High resilient and control groups decreased in negative affect whereas the low resilient group increased. There were no significant findings regarding responses to success.

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CHAPTER 1

INTRODUCTION

Sport is a social institution that provides many visible opportunites for both

success and failure. Although success and failure have varying degrees of meaning to

different people, American society narrowly defines success as winning and failure as

losing. With millions of individuals participating in sports, failure is an inevitable

outcome for many athletes. How athletes cope with failure and positively adapt is a

question of interest to many sport psychology researchers. Psychological resilience is an

emerging construct in the sport psychology literature that might provide insight into why

some athletes recover from failure while others struggle.

The Resilience Framework

Psychological resilience is characterized by positive adaptation following stress

and adversity (Lepore & Revenson, 2006; Luthar, Cicchetti, & Becker, 2000). In athletic

settings, one of the most visible and important stressors is failure. Research on the

construct of resilience dates to the 1970s, when researchers were primarily interested in

understanding how a cross-section of at-risk children developed into thriving adults

(Garmezy, 1974). More recently researchers have attempted to apply the concept to

athletes and athletic striving. Despite decades of resilience research, confusion exists in

the literature due to inconsistencies in definitions of resilience, a lack of an established theoretical framework, and measurement issues (Luthar & Cicchetti, 2000; Luthar, et al., 2000). However, in synthesizing past research, a four stage resilience framework emerged. Drawing heavily from previous researchers (Connor & Davidson, 2003; Garmezy, 1985; Luthar & Cicchetti, 2000; Luthar, et al., 2000; Werner & Smith, 1992) the four stages of the resilience framework proposed herein are: (a) the existence of protective factors or assets from one's environment, social relationships, and personal factors, (b) emergence of visible resilient qualities, (c) experiencing adversity or stressors, and (d) positive adaptation and coping despite experiencing adversity. Taken together, these four stages characterize the development and demonstration of resilience. The framework is dynamic, temporal, and inclusive of multiple processes that occur within the four stages.

The first stage of the resilience framework is the existence of protective factors from one's environment, social relationships, and personal factors. Protective factors, or assets, counterbalance or buffer risks and adversities that may be deleterious to an individual's well being (Masten, 2001). For example, the risk of a child's parents divorcing could be buffered or resisted through good parenting or a positive sense of self. Individuals that amass more protective factors and assets tend to exhibit a healthier adaptation profile and experience less threats to their well-being (Luthar, et al., 2000; Masten, 2001). Historically, protective factors and assets were thought to be inherent to the person, suggesting there was some constellation of inherent psychological capabilities that protected individuals from risks. For example, the ability to modify stressors through good temperament, reflectiveness in meeting new situations, developed cognitive skills,

and aspirations are examples of inherent personal protective factors and assets suggested in the literature (Kumpfer, 1999; Masten, Best, & Garmezy, 1990). Researchers have since recognized that protective factors and assets can also be external to a person, developing from interactions within an environment and social relationships (Masten & Garmezy, 1985; Werner & Smith, 1992). For instance, several factors in the environment act as protective factors and assets in at-risk children, such as stable care givers (i.e., mentors, coaches, teachers, and family) and organizations (i.e., churches and community centers; Kumpfer, 1999; Masten, et al., 1990). At the social level, protective factors and assets include identification with a competent role model or the presence of a caring adult (Kumpfer, 1999; Masten, et al., 1990). In summary, protective factors and assets form at the person, environment, and social levels and are proposed to protect individuals from risks to well-being.

The second stage of the resilience framework is the expression of resilient qualities. Over time individuals are thought to develop resilient qualities as a result of continued maturation in settings laden with protective factors and assets. Essentially, protective processes manifest themselves as resilient qualities. Researchers examining the qualities of resilient individuals focus on 'tapping into' the distinctive characteristics and features that enable an individual to adapt positively to adversity (Gucciardi, Jackson, Coulter, & Mallett, 2011). Protective processes, such as developed cognitive skills and reflectiveness when encountering new situations (Kumpfer, 1999; Masten, et al., 1990), are represented in personal resilient qualities such as the perception of having control, awareness of choices, and having the ability to adapt to change (Connor & Davidson, 2003). Additional resilient qualities include growth from stress, perceiving stress as a

challenge, tolerance of negative affect, high self-efficacy, and having control and choices (Connor & Davidson, 2003). Connor and Davidson (2003) found that resilient qualities changed over time, supporting the notion that the qualities are malleable and can be learned.

Importantly, and central to the proposed study, the resilient framework proposes that resilient qualities play a central role in individual's adaptation to the adversity. Theoretically, individuals with greater resilient qualities are thought to be more likely to thrive in the face of adversity. For instance, resilient qualities have been associated with positive outcomes such as low state anxiety, more positive affect, less negative affect, better psychological well-being, and better sport performances (Connor & Davidson, 2003; Fletcher & Sarkar, 2012; Galli & Vealey, 2008; Hosseini & Besharat, 2010). These positive outcomes all have implications for thriving in the face of adversity. Similarly, individuals with less resilient qualities are thought to be more susceptible to reacting to adversity with a negative response pattern.

The third stage of the resilience framework is the experience of a stressor or adversity (Luthar & Cicchetti, 2000; Luthar, et al., 2000). Luthar and Cicchetti (2000) refer to adversity as a risk or negative life circumstance that is known to be associated with adjustment difficulties. Examples of adversity from the child development literature include growing up in poverty and being raised by parents with mental illness (Garmezy, 1974;Werner, Bierman, & French, 1971). In addition to circumstantial stressors or adversity, unexpected situations can also bring about a risk or threat to adjustment and well-being (Masten, 2001). For example, the sudden death of a parent or loved one can bring about change that is difficult, especially for children. In sport contexts, risks such as

losing a competition, being embarrassed by poor performances, and failure at a task in comparison to others of similar skill represent significant threats to athletes, especially in high levels of competition where achievement is highly scrutinized. Failure is the most salient stressor experienced by athletes and will be the focus of this study.

Positive adaptation characterizes the last stage of the resilience framework. Positive adaptation is the ability of an individual to meet the demands of a specific task at a given time and subsequently flourish (Luthar & Cicchetti, 2000). Traditionally, positive adaptation is exhibited when an at-risk or impoverished youth emerges from a challenging upbringing indistinguishable from peers who were raised in less challenging situations. For instance, demonstrating adequate social skills despite having a parent with a mental illness would qualify as positive adaptation. In the context of sport, the hallmark of positive coping and adaptation is enhanced performance. Other indicators of positive adaptation would logically include responding with positive affect as well as a decreased likelihood of reacting with a heightened stress response. Positive adaptation despite the experience of adversity is the distinguishing attribute of resilience, is an area of interest to many researchers, and will be assessed in this study.

Resilience in Sport Populations: Current Research and Shortcomings

Given the fact that adversity, in the guise of failure, is a certainty in sport, researchers have applied concepts of the resilience framework to sport. Uncovering why some athletes thrive in the face of failure whereas others fold is of great interest to sport psychologists. Resilience research in sport is in its infancy. To date researchers have focused on two areas of the resilience framework: a) the acquisition of assets and

protective factors (Galli & Vealey, 2008) and b) positive adaptation following adversity and failure in sports (Martin-Krumm, Sarrazin, Peterson, & Famose, 2003; Mummery, Schofield, & Perry, 2004).

Relative to the first area of study, resilience has been attributed to assets and protective factors at the personal, social, and environmental levels in a sample of elite athletes and college athletes (Galli & Vealey, 2008). Galli and Vealey's (2008) findings are consistent with previous research in the resilience framework (Masten, 2001; Masten & Garmezy, 1985; Werner & Smith, 1992). Assets and protective factors in athletes include achievement motivation (personal factors), peer support (social relationships), and challenging life conditions such as a disadvantaged social status (environmental factors).

Research has also addressed the experience of adversity and subsequent positive adaptation in athletes. Given that sport is often achievement based, researchers and practitioners are quite invested in understanding how positive adaptation enhances the performance of athletes and their well-being. Two prior studies in the sport context examined adverse situations and subsequent outcomes or positive adaptation. The first study of interest was conducted in France with school children on a basketball dribbling task (Martin-Krumm, et al., 2003). In this study, adversity was introduced by providing failure feedback on a basketball dribbling task. Positive adaptation was operationalized as meeting or surpassing prior performance and exhibiting less anxiety on a second trial of the task. The authors denoted resilience as explanatory style, or attributing successes and failures positively or negatively. Children with a positive explanatory style were labeled resilient and those with a negative explanatory style were characterized as not resilient.

The authors found that those exhibiting an optimistic explanatory style had better performance, were more confident, and had less anxiety following failure than those exhibiting a pessimistic explanatory style. These findings support the resilience framework. Following failure, resilient children responded with a more positive profile of adaptive responses than children who were less resilient. Using explanatory style as a proxy for resilience is a limitation of this study. Optimism and pessimism may allude to components of resilient qualities but they do not fully capture the concept. Explanatory style fails to capture resilient qualities such as adapting positively to change and staying focused under pressure (Connor & Davidson, 2003). A more inclusive and conceptually coherent assessment of resilience is warranted. This limitation will be addressed in this study by utilizing a measure that comprehensively assesses qualities of resilience.

The second study of interest was conducted in Australia with athletes at a championship swimming competition (Mummery, et al., 2004). Adversity in this study was defined as failing to equal a prior qualifying mark in a swimming championship meet (Mummery, et al., 2004). The authors characterized the swimmers as resilient if they swam slower than their qualifying time at their first race but were able to match their qualifying time or swim faster in a subsequent race. Thus, resilience was inferred by observing swimming performances. Mummery and colleagues found that those swimmers who were labeled as resilient had high perceptions of their endurance but lower coping abilities than swimmers who were initially successful in the competition. These findings do not support the resilience framework because coping is a hallmark component of resilience.

Although poor performance is an indicator of failure in sport and thus logically could be assumed to represent adversity, employing such a strategy is questionable. Physiologically, periodization and training planning would prepare an athlete to peak at the very end of a season in the final heat of a particular race. Mummery and colleagues assessed athletes in the preliminary rounds where time is not an important factor because place in the race determines who advances. Measuring resilience by performances is a less than optimal strategy given the unreliability of time in preliminary heats of a championship swimming meet. Like Martin-Krumm and colleagues' (2003) study, Mummery and colleagues' study lacked a conceptually based assessment of resilience, another limitation in addition to questionable criteria for failure.

A major limitation of prior research has been the less than cogent means of identifying resilient qualities in athletes. Connor and Davidson addressed this shortcoming by creating the 25-item Connor Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003). The CD-RISC measures qualities of resilient individuals. The qualities were identified based on research conceptually associated with the resilience framework (Kobasa, 1979; Lyons, 1991; Rutter, 1985) and include finding humor in things, viewing stress as a challenge, and tolerance of negative affect. Although the original 25-item CD-RISC is a valid and reliable measure in the sport context (Hosseini & Besharat, 2010), research has found the 10-item CD-RISC to have better factor structure and reliability with athletes (see Gucciardi, et al., 2011). An assessment of resilient qualities is important in advancing resilience research because it is conceptually linked to the framework outline herein. No research has focused on the impact of failure on individuals with more and less resilient qualities.

In summary, resilience research in sport populations is in the early stages of development. Although there are several areas where new research can address limitations in the literature, a main interest is how individuals positively cope and adapt following failure. The proposed resilience framework addresses the development and expression of resilience, but is not sufficiently declarative relative to the characteristics of positive coping and adaptation proposed to accompany resilience (Luthar, et al., 2000). This void is particularly true in sport research. Two factors have been discussed in the literature as possible key outcomes associated with positive coping and adaptation. The first factor is the psychophysiological responses to stress, specifically cortisol (Connor & Davidson, 2003; Luthar, et al., 2000) and the second factor is emotional responses to adversity (Connor & Davidson, 2003; Luthar, et al., 2000; Tugade & Frederickson, 2007). The following section will highlight these key outcomes in more detail as both will be examined in this study.

<div align="center">Psychophysiological and Emotional Responses to Adversity:
Implications for Positive Adaptation and Resilience</div>

The first key outcome of interest associated with positive adaptation is the psychophysiological response to stress, specfically cortisol release (Connor & Davidson, 2003; Luthar, et al., 2000). Cortisol is a glucocorticoid steroid hormone released by the adrenal gland when stress is perceived and is a known physiological indicator of stress (Kirschbaum & Hellhammer, 2000; Southwick, Ozbay, Chaney, & McEwen, 2008). Regulation of cortisol is important as previous research has shown excessive cortisol to

cause poor performances and affect well-being (Filaire, Alix, Ferrand, & Verger, 2009; Kivlighan, Granger, & Booth, 2005; Levine, 2000; Stansbury & Gunnar, 1994).

The cortisol response pattern of individuals high and low in resilient qualities in response to failure is unknown. It is possible that resilient qualities, such as not being easily discouraged by failure and perceiving stress as a positive occurrence (Connor & Davison, 2003) are linked to the secretion of cortisol. Such information might contribute to our understanding of why individuals with differing levels of resilient qualities are characterized by disparate adaptational responses.

The second factor noted as a key outcome associated with positive coping and adaptation is emotional responses to adversity (Connor & Davidson, 2003; Luthar, et al., 2000; Tugade & Frederickson, 2007). Although a constitutive definition of emotion is difficult to ascertain (Vallerand & Blanchard, 2000), an emotion is typically defined as a reaction to a real or imagined stimulus that involves physiological and behavioral changes (Deci, 1980). Researchers have found positive emotions and affect may contribute to effective emotion management in resilient individuals, aiding in their ability to 'bounce back' from adversity (Ong, Bergeman, Bisconti, & Wallace, 2006; Tugade & Fredrickson, 2004). Positive emotions are known to enable individuals to remain goal directed (Kleinginna & Kleinginna, 1981), foster psychological growth (Frederickson, 2005), and broaden the ability to make better decisions under stress (Tugade & Frederickson, 2007). Resilient qualities, such as the ability to adapt to change and the capacity to handle unpleasant feelings (Connor & Davidson, 2003) may enable individuals to respond with more positive affect and less negative affect.

Although positive emotions are associated with resilience (Tugade & Frederickson, 2007), the resilience research base has tended to be cross-sectional in nature and negative emotions have been neglected. Experimental studies provide a more rigorous analysis of the emotional responses to failure of individuals varying in resilient qualities. Furthermore, it is possible that individuals relatively low in resilient qualities will respond to failure with exacerbated negative emotions, which may account for their less than ideal response patterns. In summary, cortisol and emotion are critical responses to examine in order to better understand the response patterns of more and less resilient athletes.

<u>Problem Statement</u>

The research reviewed highlights a gap in the literature relative to understanding how individuals who do and do not exhibit resilient qualities respond following adversity. Additionally, past research has been cross-sectional in nature, and thus definitive cause and effect cannot be established. Waugh, Tugade, and Frederickson (2008) summarized the need for laboratory research to answer lingering questions resulting from past research: "…it is necessary to extend our consideration to include basic laboratory research paradigms that allow direct manipulation and measurement of stress anticipation as a means to observe related changes in adaption and recovery" (p. 199). With several calls for experimental research (Connor & Davidson, 2003; Luthar, et al., 2000; Waugh, Tugade, & Frederickson, 2008) and the need to further understand positive adaptation following failure, the purpose of this study was to experimentally investigate cortisol,

emotional, and performance differences following failure on a sport task in high and low resilient athletes.

Purposes

The purposes of this study were:

1. To examine the effect of failure on cortisol levels in a high resilient group, a low resilient group, and a control group of collegiate lacrosse players.

2. To examine the effect of failure on emotional response in a high resilient group, a low resilient group, and a control group of collegiate lacrosse players

3. To examine the effect of failure on performance in a high resilient group, a low resilient group, and a control group of collegiate lacrosse players

Hypotheses

The hypotheses of this study were:

1. Lacrosse players high in psychological resilient qualities will have less cortisol release in response to failure than players low in psychological resilient qualities. The control group will see little change in cortisol release.

   H_0: There will be no differences among the high, low, and control groups in cortisol response to failure.

2. Lacrosse players high in psychological resilient qualities will have less negative affect in response to failure than players low in psychological resilient qualities. The control group will see no change in affect.

H_0: There will be no differences among the high, low, and control groups in negative affect response to failure.

3. Lacrosse players high in psychological resilient qualities will have more positive affect in response to failure than players low in psychological resilient qualities. The control group will see no change in affect.

H_0: There will be no differences among the high, low, and control groups in positive affect response to failure.

4. Lacrosse players high in psychological resilient qualities will have better performances on the two performance trials than those players low in psychological resilient. The control group will not have a change in performance.

H_0: There will be no differences among the high, low, and control groups in performance following failure.

Definition of Terms

<u>Adversity</u> is a risk or negative life circumstance that is known to be associated with adjustment difficulties (Luthar & Cicchetti, 2000).

<u>Cortisol</u> is a glucocorticoid or steroid hormone produced by the adrenal pituitary gland that naturally increases under perception of a threat and returns to normal levels after a threat ends (Southwick, et al., 2008).

<u>Emotions</u> are defined as a reaction to a real or imagined stimulus that involves physiological and behavioral changes, such as heart rate increases and facial expression changes (Deci, 1980).

Positive Adaptation is "usually defined in terms of behaviorally manifested social competence, or success at meeting state-salient developmental tasks "(Luthar & Cicchetti, 2000, p. 858).

Protective Factors, or assets (Masten, 2001), refer to elements or influences that distinguish individuals with healthy adaptation profiles versus those who are less well adjusted (Luthar, et al., 2000).

Resilience is a dynamic process of experiencing significant adversity and subsequently adapting positively (Lepore & Revenson, 2006).

Resilient Qualities are personal resources or characteristics that are representative of protective processes and assets that lead to positive adaptation (Gucciardi, et al., 2011).

Assumptions

In the present study, it was assumed that:

1. All participants in the experimental conditions found the task to be stressful.

2. All participants valued the task and wanted to perform well.

3. All participants answered each question on the measures honestly and understood what each question was asking of them.

4. All participants properly took their own baseline samples of cortisol and remembered to return the sample upon arriving to the experiment.

5. Participants refrained from talking to other participants about the experiment or their performances.

6. Participants adhered to the restrictions of the salivary cortisol assay.

<u>Delimitations</u>

The elements controlled in this study were:

1. The sport of all the participants was lacrosse.

2. The level of competitive experience of all the players was collegiate.

3. All participants were adults (18 years of age or older).

4. All participants were healthy adults without diagnosed endocrine disorders.

5. All participants did not use prescription medications.

6. All participants could not practice the experimental task.

<u>Limitations</u>

Limitations in this study were:

1. This study was an applied laboratory experiment and might not generalize to actual game performance.

2. Resilience was self-reported and therefore subject to rater bias.

3. The time to recover from adversity was limited to the time of the experiment. It is unclear in the literature when and how positive adaptation occurs and this study may not adequately capture recovery from adversity as designed.

4. Cortisol was the only stress marker used in this study.

5. The experimental protocol was only measuring one instance of stress. Longitudinal instances of stress cannot be made from this study.

Significance

This study was significant because it was theoretically grounded, psychophysiological, experimental, and focused on a critical component of optimal functioning in athletes, namely, the ability to respond positively to failure. The results of this study were to provide empirical evidence relative the effect of resilience on adaptation to failure.

Additionally, the findings of this study might have practical significance. If the hypotheses were supported, empirical evidence would exist that greater resilience is linked to positive emotions and better performance following failure. Therefore, sport psychology consultants can use this information to inform their practice in a number of ways: (a) Learning about the nature of resilience; (b) Becoming adept at identifying more and less resilient qualities in athletes; (c) Integrating a number of creative mental skills that build, sustain, and optimize resilience in their athletes.

CHAPTER 2

REVIEW OF LITERATURE

Professional golfer Sam Snead once said, "The mark of a great player is in his

ability to come back. The great champions have all come back from defeat" (Apfelbaum,

2007; p. 37). With numerous barriers and potential pitfalls to achievement in sport, many

athletes and coaches yearn to further understand how one recovers from defeat in the

world of sport. The study of psychological resilience, or the ability of an individual to

experience adversity and subsequently flourish, may provide insight into how some

athletes are able to come back from hardship and defeat. While the idea of psychological

resilience is quite attractive in principle, research on resilience over the last 50 years

provides little conceptual and theoretical clarity to researchers in many fields of study. In

the field of sport psychology, the study of resilience is quite young, with only a few

studies to date. This chapter will highlight and critique the resilience literature over the

years, discuss the psychophysiological implications of resilience, and discuss the

hypothesized role of emotions in the resilience process. More specifically, this chapter

will identify the many definitions of resilience and offer an operational definition for

future research, identify the components of resilience and suggest a resilience framework,

differentiate resilience from related constructs in the literature, highlight how resilience is

measured and the research involving resilience, and discuss the implications of cortisol

and emotions in the process of resilience.

<div align="center">Historical Origins, Definitions, and Components of Resilience</div>

Historically, psychological research prior to the 1970s emphasized the

development of psychopathology, or the development of abnormal and clinical disorders

(Garmezy, 1993; Richardson, 2002). Although the notion of "abnormal" was of interest

and remains of interest today, the mundane and common psychological development of

individuals was taken for granted. The concept of psychological resilience came about

due to a focus on the common development of children with parents suffering from

schizophrenia and mental illness. To date, much of the resilience literature is derived

from studies involving children and how they developed despite threats to their well-

being (Luthar & Zelazo, 2003). Garmezy (1975) was one of the first individuals credited

with the study of psychological resilience when he noticed that many children vulnerable

to psychopathology had developed and functioned similarly to children without the same

vulnerability. The children in Garmezy's study who overcame the odds of a difficult

childhood encouraged the idea of resilience to adversity. As a result of Garmezy's study,

psychologists began to question how children were able to overcome adversity and what,

if anything, made these particular children develop without psychopathology. This

aforementioned ability to overcome adversity was referred to as resilience (Garmezy,

1973) .

Following the work of Garmezy, Rutter (1987) and Werner and Smith (1992)

conducted longitudinal studies with children exposed to multiple risks and barriers to

their development over the course of 10 and 30 years, respectively. Rutter's study included children of mentally ill parents whereas Werner and Smith studied Hawaiian children growing up in poverty. Rutter (1987) concluded that children who overcame their life circumstances were able to because resilience is due to "individual differences in people's response to stress and adversity " (p. 316). Werner and Smith (1992) purported resilience to include certain characteristics children possessed that facilitated their ability to thrive in the face of adverse circumstances. Specifically, children who were resilient had better bonds and relationships, more social support, and more autonomy than those children who were not resilient. These characteristics, according to Werner and Smith (1992), derive from three protective factors: personal factors or characteristics inherent to the individual, interactions an individual has in his or her environment, and through social relationships. Resilience was assumed, from both Rutter and Werner and Smith's work, to result from characteristics developed from protective factors that enable at-risk children to cope with adversity and lead normal lives. Protective factors provide children with social, environmental, and biological influences, which result in defining features and characteristics that compose resiliency. Characteristics, such as the ability to see stress as strengthening rather than debilitating, are thus a manifestation of protective factors that individuals utilize to display resilience.

Although child development research in the 1970s began to support the notion of acquiring resilience from protective factors, Block and Block (1980) conceptualized resilience as a trait in their writings on ego-resilience and ego-brittleness. Interested in personality development from a psychoanalytic theory perspective, Block and Block wanted to account for how ego impulses are controlled for and how ego functioning can

adapt to various situations when an individual is under stress and uncertainty. Block and Block (1980) conceptualized ego-resiliency as "resourceful adaptation to changing circumstances and environmental contingencies, analysis of the 'goodness of fit' between situational demands and behavioral possibility…" (p. 48). Ego-brittleness, in contrast, was conceptualized as "little adaptive flexibility, an inability to respond to the dynamic requirements of the situation…" (p. 48). Citing their personal longitudinal research on California school children using the Q-Sort (Block, 1978), Block and Block illustrated that children as young as 3 and 4 with high scores in ego-resilience were able to recover from stress, were more verbally developed, less anxious, and less likely to withdraw when faced with stress. In summary, Block and Block proposed resilience to be a personality trait that allowed for children to be more adaptive and flexible in times of distress.

Taken together, the resilience research leading into the mid 1990s resulted in disparities and confusion regarding the definition of and conceptualization of resilience. Researchers were torn between resilience as a personality trait, as proposed by Block and Block (1980), and resilience as a constellation of characteristics developed from protective processes, as suggested by Rutter (1987) and Werner and Smith (1992). This conceptual confusion surrounding the definition of resilience and how resilience is developed led to a lull in the rigor and clarity of resilience research (Luthar & Cicchetti, 2000; Luthar, et al., 2000). For example, Kumpfer (1999) deemed resilience to be "a loose, broadly defined construct" (p. 180). Kumpfer also criticized the multitude of outcomes related to displaying resilience and a deficiency in consistent antecedents and consequences as contributing to the confusion in research. In order to refocus the concept

of resilience and provide clarity, several review papers (see Bonanno, 2004; Kumpfer, 1999; Luthar & Cicchetti, 2000; Masten, 2001) emerged in the later years of the 1990s and early 2000s. The overall theme of these reviews on resilience was to encourage researchers to consider resilience as a dynamic process rather than a trait or collection of characteristics. Modern resilience researchers tend to embrace resilience as a dynamic process as seen in current research.

Elaborating on resilience as a process, Luthar and colleagues (2000) posited that in order for resilience to be experienced someone must (a) be exposed to adversity and (b) subsequently flourish or exhibit positive adaptation. The experience of adversity is an important point Luthar and colleagues emphasized as vital to distinguishing resilience from other constructs. Assuming resilience to be trait-like assumes that resilience is universal across all life conditions and that resilience is difficult to learn. Bonanno (2004) and Masten (2001) challenged the mystique of resilience as something certain people have (i.e., trait) in their review articles entitled "Loss, Trauma, and Human Resilience: Have We Underestimated the Human Capacity to Thrive After Extreme Averse Events?" and "Ordinary Magic: Resilience Processes in Development." Bonanno and Masten's titles are worth specific mentioning because they "demystify" resilience as a trait inherent to some and not to others. To support resilience as a process, Bonanno (2004) cited that much of the research on how individuals cope with loss or trauma comes from only those people who seek therapy following such experiences, and thus resilient individuals often are not accounted for in research. Additionally, trauma, death, and adversity are experiences that many individuals experience at least once during the course of a lifespan, yet not everyone seeks therapy following a traumatic experience or bout of adversity. For

instance, the epidemiology of Post Traumatic Stress Disorder (PTSD) in the United

States hovers around 5-10% of the 50-60% of individuals within the population who

experience a traumatically stressful event (Ozer, Best, Lipsey, & Weiss, 2003; as cited in

Bonanno, 2004). With the development of psychopathology low despite the presence of

adversity, it appears that many individuals develop the means to exhibit resilience

without professional assistance. In sport populations, the epidemiology of

psychopathology is largely unknown or unreported, but sport participants often have

fewer instances of depression and other disorders despite constant exposure to criticism,

stress, and failures (Cox, 2002). Masten's (2001) review article also supports arguments

made by Bonanno that resilience is a more ordinary occurrence than originally thought,

and that it is not limited to a special trait. For instance, Masten stated, "The great surprise

of resilience research is the ordinariness of the phenomena. Resilience appears to be a

common phenomenon that results in most cases from the operation of basic human

adaptation systems" (p. 227). Developing and protecting human adaptation systems,

according to Masten, are most important for resilience researchers and those developing

policies and practices in working with children. The evidence for resilience as a dynamic

process rather than a trait, is strong and thus drives the most current resilience definitions

and conceptualizations.

The works of Luthar, Cicchetti, Bonanno, and Masten marked a paradigm shift in

the definition and conceptualization of resilience in the early 2000s. At this juncture of

the resilience literature, two definitions of resilience stand out as comprehensive and

widely accepted. Luthar, et al. (2000) offered one such definition of resilience, which is

"a dynamic process encompassing positive adaptation within the context of significant

adversity. Implicit within this notion are two critical conditions: (1) exposure to significant threat or severe adversity; and (2) the achievement of positive adaptation despite major assaults on the developmental process" (p. 543). Lepore and Revenson (2006) offered the second definition of resilience, which is "a multidimensional construct that encompasses a variety of adaptive processes and outcomes. Resilience is evident when individuals are able to resist and recover from stressful situations, or reconfigure their thoughts, beliefs, and behaviors to adjust ongoing and changing demands" (p. 27). Thus, a modern constitutive definition of resilience recognizes resilience as a dynamic process (i.e., reconfiguring thoughts, beliefs, and behaviors) in which individuals are able to adapt positively following adversity. Adversity, protective factors, and positive adaptation are necessary conditions that must be present for resilience to be observed.

The Development of Resilience

The developmental origins of resilience encouraged researchers to investigate how resilience develops (Kumpfer, 1999; Masten, et. al., 1990; Werner & Smith, 1992). There are two components to understanding how resilience develops: (a) the risks or vulnerabilities individuals experience and (b) the protective factors or personal resources that individuals have or develop that aid in the successful navigation of risks and vulnerabilities (Masten, 2001). Risks and vulnerabilities are generally associated with situations and circumstances in which developmental problems are known to emerge following exposure, such as poverty, illness, and low education. Once risks and vulnerabilities are present, protective factors "moderate the effects of individual vulnerabilities or environmental hazards so that the adaptional trajectory is more positive

than would be the case if the protective factor were not operational" (Masten, et al., 1990, p. 426). In essence, protective factors enable an individual to process and cope with adversity, or risks and vulnerabilities. Protective factors allow an individual to continue a standard life development or emerge empowered and strengthened for the experience. According to Masten and colleagues, risks and protective factors act in balance. Without a balance, such as a case where there are too many risks and not enough protective factors, resilience cannot occur.

What constitutes protective factors and where they derive from has been the focus of several resilience researchers (Kumpfer, 1999; Luthar, et al., 2000; Masten, et. al., 1990; Werner & Smith, 1992). Werner and Smith, following their groundbreaking longitudinal study in Hawaii, found protective factors derive from three primary sources: within the individual, from social interactions and relationships, and from interactions with one's environment. Protective factors from within an individual are thought to be characteristics or trait-like in nature, reflecting early theorizing about resilience as an inherent element possessed by select individuals. In the literature, personal protective factors include developed cognitive skills (i.e., problem solving and organizing thoughts), self-regulation skills (i.e., stress management techniques such as deep breathing and meditation), reflectiveness in meeting new situations (i.e., revisiting experiences to continue learning), positive views of oneself, self-efficacy, prior competence, and good motivation and achievement goals (Galli & Vealey, 2008; Kumpfer, 1992; Masten, 2001; Masten, et al., 1990; Werner & Smith, 1992).

In addition to personal protective factors, researchers (Masten, 2001; Masten, et al., 1990; Werner & Smith; Kumpfer, 1999) also note the importance of environmental

and social factors in developing resilience during adverse or stressful events. Researchers theorize that an individual's personal factors are influenced by interactions within his or her environment and in social relationships. For example, one of the most important factors across many studies of resilience is the presence and effectiveness of having a stable care-giver during or after major stressful events (Masten, et al., 1990). Stable care-givers such as coaches, mentors, teachers, and family are thought to be factors in both one's environment and social relationships. Merely having access to competent role models and care-givers is not enough to cultivate resilience because how care-givers react to stress themselves and how they relate to the at-risk individuals will determine the development of resilience. Additional environmental factors noted in the literature include a stable and supportive home environment and structure, access to community centers or churches that provide safe havens for children, and schooling (Luthar, et al., 2000; Mandleco & Peery, 2000). Social factors include perceived support from friends and family and good parenting and mentorship (Mandleco & Peery, 2000). In summary, research strongly supports the notion that multiple sources of protective factors, formed at the personal, environmental, and social levels, interact and allow one to exhibit resilience despite daunting odds.

With many different definitions of resilience and numerous protective factors associated with resilience emerging in the 1990s the resilience construct lacked clarity despite increased research (Kumpfer, 1999; Luthar & Cicchetti, 2000; Luthar, et al., 2000). Masten (2001), in an attempt to organize the literature, categorized two primary approaches of explaining variations in resilience (i.e., differences in and development of) among individuals. The first approach was a variable-focused approach, which identifies

variables and concepts that predict the outcome of resilience. The second approach was a person-focused approach, which compares resilient individuals to non-resilient individuals over time to better understand what characteristics lead to resilience.

Most classic studies involving protective factors (i.e., Werner & Smith, 1992) fall under the later category of person-focused studies. Although there is limited variable-focused research, some studies have modeled risk factors, such as parental divorce and poverty, and assets, such as good parenting, to understand effects of these constructs on resilience development (Masten, 2001). Variable-focused approaches also allow researchers to study large sample sizes, test the effectiveness of interventions, and build theories through modeling. Given limitations in resilience measurement, the variable-focused approach has been limited. Although the majority of the resilience literature favors the person-focused model, Masten urged researchers to consider both person and variable-focused models in order to best understand the development of resilience. Additionally, arguments for researchers to consider resilience as an *active process* of characteristics and protective factors interacting within one's contextual environment is important to improve clarity and understanding in the development of resilience (Kumpfer, 1999; Rutter, 1987).

Kumpfer (1999), in one of the only theoretical chapters on the factors and processes that contribute to resilience, created a comprehensive resilience framework to explain the development and process of resilience. Kumpfer (1999) separated the development and process of resilience into six predictors: (a) stressors and challenges, (b) the external environmental context, (c) person-environment interactions, (d) personal internal characteristics, (e) resilience processes, and (f) positive outcomes or adaptation.

In congruence with previous resilience definitions, Kumpfer (1999) began with the all
important presence of a stressor or adversity in order for the resilience process to occur.
Rather than emphasize adversity as something that is objectively difficult to recover from
as defined in past research (see Luthar, et al., 2000), stress is an individual perception.
The individual appraisal of stress explains why some situations are threatening to some
and not everyone experiencing a potential threat. Next, Kumpfer (1999) highlighted the
importance of protective factors against risk factors in the external environmental context.
Without a balance of protective factors to risks, the environmental context becomes
overwhelming for an individual, affecting the subsequent part of Kumpfer's (1999)
framework: the person-environmental processes. Person-environmental processes are
one's ability to cope and reframe situations. While an individual is actively trying to cope
and reframe the current experience of stressors, an interaction with inherent
characteristics of resilience, or internal resiliency factors, occurs. Internal resiliency
factors include cognitive, emotional, environmental, physical, and spiritual characteristics
that influence an individual's ability to process stressors and cope. Resiliency processes
are the result of internal and person-environmental interactions and are the result of
gradual exposure to challenges and stressors. If an individual has ample protective factors,
good characteristics (i.e., problem solving skills, internal locus of control, and emotional
regulation) and good temperament, a healthy perception of stressors, and positive past
experiences with certain stressors, the result of Kumpfer's model would allow an
individual to adapt to the stress or even reintegrate back to his or her situation
strengthened from the experience. Without these aspects of the resilience framework,
Kumpfer stated that maladaptive reintegration would occur, making an individual less

likely to succeed and operate under stress. Although Kumpfer's framework is quite representative of the literature highlighted in this chapter, it has yet to be assessed experimentally and thus lacks empirical support and is largely based on youth and child development.

An interesting point of Kumpfer's framework is the potential for stress to strengthen an individual within the resiliency process. There are conflicting viewpoints and research regarding the strengthening effects of exposure to stress and building resilience (Bonanno, 2004; Lepore & Revenson, 2006; Kumpfer, 1999; Richardson, 2002). For instance, experiencing the loss of employment is an adverse scenario that carries many consequences, especially if a family is dependent upon the income. Some individuals see the loss of employment as an opportunity to reinvent themselves and to seek new skills to become competitive in the work force. For other individuals, especially in a tough economy with few jobs available, helplessness and despair can emerge and debilitate an individual to stop seeking employment after time.

In the sport and performance psychology literature stress is sought out by athletes (Fletcher & Sarkar, 2012). The seeking out of competition, which is inherently stressful for many achievement oriented athletes, provides a nice segue into the sport and performance psychology literature on the predictors and development of resilience. Two grounded theory studies have emerged, which try to explain how individuals experience and exhibit resilience in stressful situations (Fletcher & Sarkar, 2012; Galli & Vealey, 2008). Galli and Vealey (2008) are credited with conducting the first, theoretically based, study on resilience in sport. Guided by Richardson and colleagues' (Richardson, 2002; Richardson, Neiger, Jensen, & Kumpfer, 1990) meta-theory of resilience, Galli and

Vealey interviewed 10 elite athletes who experienced adversity in their athletic careers to understand how they acquired the means to display resilience in the face of failure and how the resilience process worked. Adversity in this study varied, ranging from traumatic injury to personal loss. The ability to display resilience derived from sociocultural influences, such as cultural factors and social support, and personal resources, such as a love for the sport and facilitative achievement motives. Participants cited specific resilience behaviors to include both cognitive and behavioral coping strategies to handle unpleasant emotions and lingering uncertainty following bouts of adversity. Taken together, coping strategies, sociocultural influences, and personal resources all influence positive outcomes associated with being resilient. Galli and Vealey's participants described themselves as being strengthened, educated from their experiences, and that they gained perspective over their situations and lives.

Galli and Vealey's work supports past research (Kumpfer, 1999; Luthar, et al., 2000; Masten, et al., 1990; Werner & Smith, 1992) on the development of resilience, with protective factors developing and strengthening through interactions between the perceived adverse event and established personal, environmental, and social resources. It appears that having strong abilities to cope and behave appropriately for a specific situation, social support, and a supportive environment all influenced the development and display of resilience in athletes. It is important to note that being resilient in one situation does not guarantee universal resilience across all situations. Therefore, resilience as an ability is determined more by a specific situation and the outcome rather than generally determined. Galli and Vealey provided a starting point for resilience

research in sport, but since the publication of their model (see Figure 2.1), empirical studies have yet to be conducted.

A second grounded theory study on psychological resilience in sport by Fletcher and Sarkar (2012) aimed to understand the relationship between resilience and high performance in sport. Fletcher and Sarkar interviewed 12 former male and female Olympic gold medalists across a variety of sports on how they withstood the pressure of athletics.

It is unclear what particular stressors the participants experienced in the process of competing, but a model of resilience emerged from the participants' accounts highlighting the importance of psychological factors and facilitative responses in displaying resilience following a stressor. The main finding of the study highlights the importance of "challenge appraisal and meta-cognitions" (p. 672) utilized by the Olympians to appraise the stressor and respond in a facilitative manner. Challenge appraisals are positive evaluations of stressors, or more simply, viewing adversity as an opportunity for mastery and growth. Seeing competition as a challenge rather than debilitating has its roots in the constructs of hardiness (Kobasa, 1979) and mental toughness (Gordon & Gucciardi, 2011), two related constructs to resilience that emphasize the ability of an individual to experience and appraise competition as facilitative rather than debilitative.

The second component of the stress appraisal, meta-cognitions, are an individual's awareness that he or she is thinking or utilizing cognition to process stimuli and that an individual has the ability to control cognition. To better understand meta-cognitions, consider having the last chance to score a point in a game where the outcome
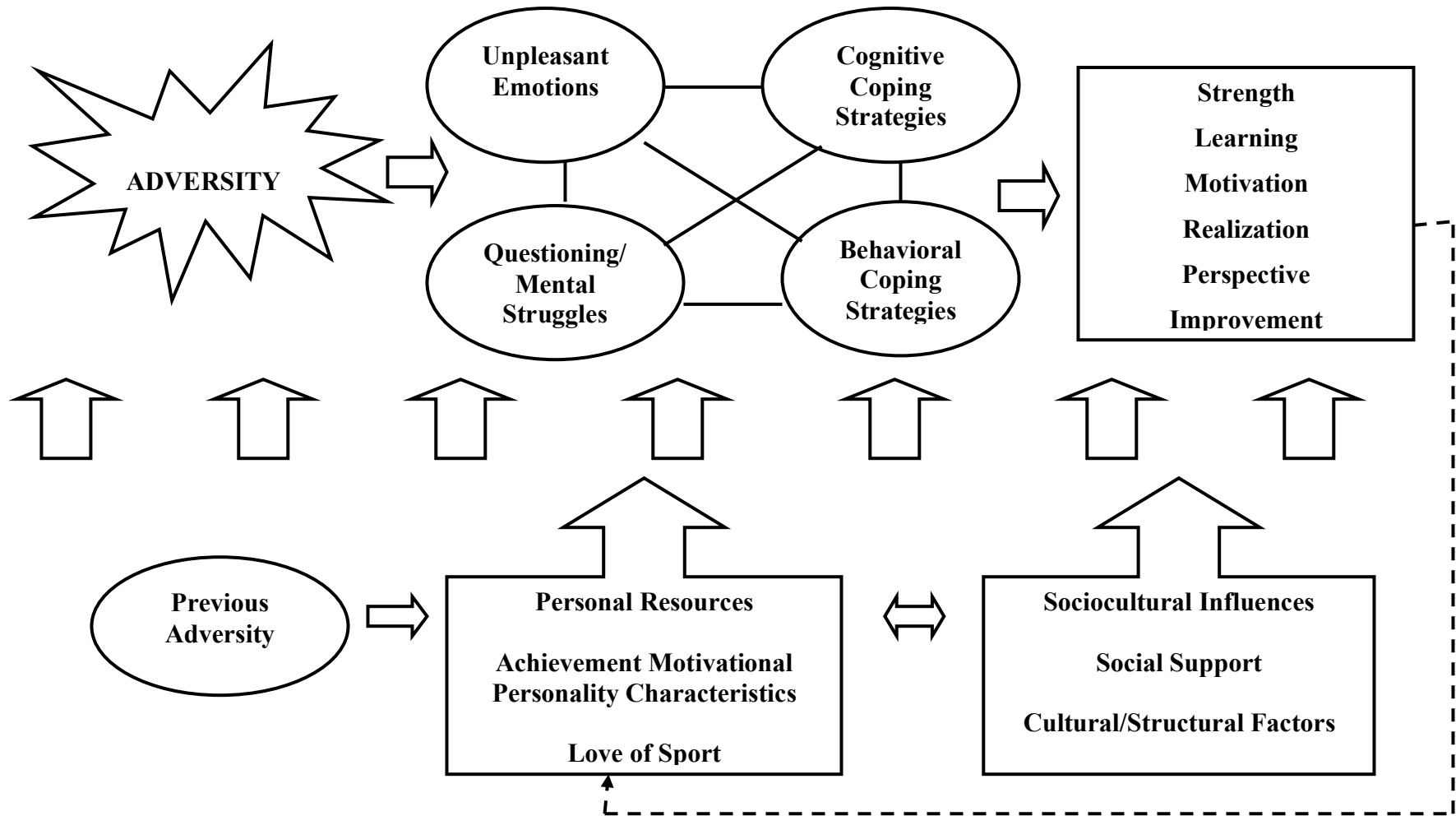
Figure 2.1. *Galli and Vealey's Resilience Model. (Reproduced with permission from Galli and Vealey).*

is determined by whether or not the athlete competing is successful. The stress of a competition could be debilitative and too much pressure for an athlete to handle, but in the case of meta-cognitions, the athlete is able to recognize debilitative thoughts and change them to more facilitative thoughts. Both components of the stress appraisal are important because they highlight the active process of experiencing a stressor and coping with it that characterizes resilience. Fletcher and Sarkar (2012) also recognized the importance of psychological factors on the stress appraisal process, such as motivational orientation, having a positive personality, and perceived social support.

Like Galli and Vealey (2008), Fletcher and Sarkar's notion of psychological factors influencing the processes of resilience, mimics the importance of protective factors in the resilience process. In order to build resilience, at least in sport, it appears vital to satisfy personal, social, and environmental aspects of an individual's life. For instance, a positive personality in Fletcher and Sarkar's study appears to be a trait like orientation, much like the personal protective factors listed previously. Perceiving strong social support, another psychological factor in Fletcher and Sarkar's study, mirrors the social protective factors found in previous literature, such has having strong relationships with a mentor or family member. Although Fletcher and Sarkar's study provides support for different pieces of past resilience literature, it is not without limitations. One limitation in particular is the retrospective response bias of the participants, especially when some of the athletes interviewed were 50 years removed from their Olympic gold medal performances. Despite this limitation, the authors pursued a highly sought out and respected population. Fletcher and Sarkar's model, although noteworthy and highly

descriptive, warrants empirical investigation and further research in order to advance the knowledge behind resilience in sport.

In addition to the theoretical studies on the development of resilience in sport psychology, two application papers have been published describing how to build resilience in athletes. The first study to assess the development of resilience focused on coming back from injuries experienced in sport (Smith, Smoll, & Ptacek, 1990). The study of Smith, et al. (1990) examined social support and coping skills as moderators of life stressors to athletic injuries in high school athletes. The results of the study illustrate that the interaction of social support and coping skills were instrumental in buffering the effect of stressors on athletic injuries in a sample of high school boys and girls. Taken individually, social support and coping skills were not as strong in moderating life stressors and athletic injuries. The findings of Smith, et al. (1990) support the notion that resilience is multidimensional and dynamic in nature, meaning resilience is often the result of several constructs interacting to protect an individual from stressors in times of adversity or threatening stress. Over a decade after this study, both Fletcher and Sarkar and Galli and Vealey echoed this finding, that resilience is multifaceted and dynamic in nature. In this specific study, coping skills and social support were most influential in exhibiting resilience despite injury.

The second study to assess the development of resilience in sport focused on applying resilience training modules developed at the University of Pennsylvania to high performance athletes and coaches (Schinke & Jerome, 2002). Much of the resilience training developed at the University of Pennsylvania is derived from Seligman's (1991) learned helplessness framework. Seligman's framework posits that attributions, or how

an athlete explains good and poor performances, influence how resilient an athlete is in difficult times or while experiencing adversity. In applying the aforementioned resilience modules, Schinke and Jerome (2002) focused on developing three general optimism skills: evaluating personal assumptions, or sequentially analyzing the causes of particular behaviors and recognizing the cause of both good and bad behaviors; disputing negative thoughts, or identifying negative and permanently uncontrollable affirmations and disputing these affirmations and thoughts with positive counter affirmations; and, decatastrophizing, or recognizing thoughts of inability and possible negative outcomes prior to or during performances and considering better alternatives. In administering these cognitive skills to elite athletes and coaches, Schinke and Jerome (2002) found promising results in the athletes they worked with, including increased performance and greater ability to be resilient in their thinking through increased optimism. Although these principles for building resilience appear promising, comprehensive research to support this proposed resilience building program is necessary. Experimentally, it would be beneficial to explore the presence of adversity in a laboratory setting to test the effectiveness of various resilience building programs.

To summarize, the development of resilience has a long history in the developmental psychology literature, with personal, social, and environmental protective factors serving to "build" resilience in at risk youth. Although resilience in the developmental psychology literature is in response to unwanted and sometimes sudden stressors, the nature of resilience in the field of sport psychology differs because individuals in sport willingly participate in a highly stressful and visible endeavor where failure and success are apparent. Despite this difference, there are similarities in the two

approaches. First, the importance of protective factors in developing resilience are important no matter the context, as seen in the works of Galli and Vealey (2008) and Fletcher and Sarkar (2012) in sport and in the works of Masten, et al. (1990), Werner and Smith (1992), and Kumpfer (1999) in developing children. Second, protective factors enable individuals to utilize higher level coping skills in exhibiting resilient behaviors, such as meta-cognition and challenge appraisals (Fletcher & Sarkar, 2012; Kumpfer, 1999). The ability to appraise stimuli in the environment as either stressful and threatening or not stressful and not threatening is an important process in allowing an individual to summon the appropriate psychological and personal resources to exhibit resilience. Despite two grounded theory studies on resilience in the sport context, how individuals exhibit resilience in sport lacks empirical support and thus remains an emerging construct.

<div align="center">Positive Adaptation and Consequences of Resilience</div>

Resilience, by definition, occurs only when an individual experiences a stressor or adversity and yet is strengthened or adapts positively. What constitutes positive adaptation is the focus of this section. Two chapters (Kumpfer, 1999; Lepore & Revenson, 2006) and one paper (Bonanno, 2004) adequately capture the multiple opinions and perspectives defining positive adaptation and consequences of resilience, which will be detailed in the following paragraphs.

Kumpfer (1999) proposed that individuals reintegrate following a stressful or adverse experience in one of four ways: resilient integration, homeostatic reintegration, maladaptive reintegration, and dysfunctional reintegration. In line with the positive

adaptation despite adversity component from the definition of resilience, both resilient reintegration and homeostatic reintegration reflect an individual's positive adaptation. For instance, resilient reintegration is a term Kumpfer used to describe an individual who is strengthened from stress and subsequently better equipped to exhibit resilience in the future. If an individual remains unaffected by a stressful experience, then homeostatic reintegration occurs. Both resilient and homeostatic reintegration are examples of positive outcomes following stress or adversity that can be considered positive adaptation. In contrast to positive adaptation, Kumpfer also discussed maladaptive responses to adversity. Both maladaptive and dysfunctional reintegration are two outcomes from stress that result in an individual declining psychologically and behaviorally. Although resilience is positive adaptation despite stress or adversity, not all individuals experience stressors the same nor are they equally resilient.

Similar to Kumpfer, Lepore and Revenson (2006) argued for multiple terms that encompass the positive adaptation component of resilience. Specifically, Lepore and Revenson argued for three different outcomes of resilience or positive adaptation: recovery, resistance, and reconfiguration. Recovery, much like Kumpfer's homeostatic reintegration, refers to an individual's return to normal functioning following a minor disruption caused by stress or adversity. Lepore and Revenson noted that recovery (and homeostatic reintegration) are points of controversy among resilience researchers, as the time to recovery following a stressor appears to be a sticking point. Bonanno (2004) wrote that immediate recovery was necessary following a stressor for recovery to be a viable form of positive adaptation, but others argue that eventual recovery over time is still better than never recovering at all (Lepore & Revenson, 2006). Time of recovery or

adaptation is a missing piece to resilience literature. In sport, it can be hypothesized that overcoming a loss in a championship game might take time to recover from, whereas a mistake in a game might take a shorter amount of recovery time. Regardless, context and consequences of the adverse experience appear to play a role in what qualifies as positive adaptation and will require further research.

The second form of positive adaptation, resistance, refers to individuals who remain unfazed prior to, during, and after a stressful experience. The notion of resistance has received support from some researchers despite early stress researchers opposing the notion of resistance to stress as a maladaptation with the potential for severe psychopathology later in life. Bonanno (2004), who wrote about the normalcy of resilience, noted (see Historical Origins) that individuals experiencing what some perceive as overtly stressful are not always bound to the assumption that they will experience adversity. It is here where the perception and appraisal of stress appears to be important in the process of resilience. Individuals who are more optimistic and have healthy explanatory styles are more likely to exhibit resilience (Lepore & Revenson, 2006; Martin-Krumm, et al., 2003) but little is known about whether or not it was recovery or resistance. Future research must delineate different forms of positive adaptation in order to clarify the resilience construct. Given the definition of resilience guiding the current study, resistance is counter to positive adaptation and growth from stress and does not appear to be an appropriate outcome in exhibiting resilience.

The third and final outcome of resilience proposed by Lepore and Revenson (2006) is reconfiguration, which resembles Kumpfer's resilient reintegration. Reconfiguration essentially refers to an individual learning from and gaining strength

from a stressor or adversity. Experiencing stressors can enable an individual to learn from his or her thoughts and actions and be more prepared for future stressors as a result. In the context of sport, learning how to play soccer with one less player due to penalty or coping with the loss of a teammate due to injury can prepare athletes to successfully adjust to challenging situations and continue to function at a high level. The idea of growth following stressors and adversity is also reflected in Fletcher and Sarkar's (2012) model of resilience in the form of meta-cognitions and challenge appraisals. Failure and adversity are not permanent outcomes, but merely learning opportunities to sharpen and strengthen cognition through difficulty.

To summarize the literature on outcomes of resilience, there appear to be several forms of positive adaptation possible for an individual under stress. Theoretically, reconfiguration/ resilient reintegration, recovery/ homeostatic reintegration, and resistance are all plausible positive outcomes and consequences of the resilience process, but research has yet to fully grasp which outcomes are most advantageous or common. Additionally, research has failed to adequately examine the outcomes of resilience empirically. The current research project directly examined emotional and stress reactions to adversity to understand how much individuals deviate from baselines and what characteristics individuals possess that influence reactions to adversity.

<u>Developing a Resilience Framework</u>

In synthesizing past research on psychological resilience to this point in this chapter, I designed a four stage resilience framework encompassing protective factors, personal charactersitics, adversity, and positive adaptation. The resilience framework is

depicted in Figure 2.2. The basis of this framework is influenced by the work of several prominent and leading researchers (Connor & Davidson, 2003; Garmezy, 1985; Luthar & Cicchetti, 2000; Luthar, et al., 2000; Werner & Smith, 1992) in resilience research described in detail above. Additionally, the stages of this framework align with how resilience is defined in the current study, which is the ability to experience adversity and subsequently florish or positively adapt. The four stages of the resilience framework are: (a) the existence of protective factors or assets from one's environment, social relationships, and personal factors, (b) emergence of visible resilient qualities, (c) experiencing adversity or stressors, and (d) positive adaptation and coping despite experiencing adversity. This framework is explanative of how resilience forms, what factors are important in developing the ability to exhibit resilience, how adversity fits into the process of exhibiting resilience, and finally includes positive adaptation following adversity. While these stages appear linear, past research indicates that resilience, and hence this framework, is dynamic, temporal, and inclusive of multiple processes within each of the four stages.

This framework is important for the current study because it directs readers to a comprehensive summary of resilience research and it provides a specific framework that guides the current study. This specific study is interested in how individuals high and low in resilient qualities portrayed in part two of the framework experience adversity in realtime and whether or not individuals high in resilient qualities are able to demonstrate positive adaptation to adversity as resilience theory suggests.
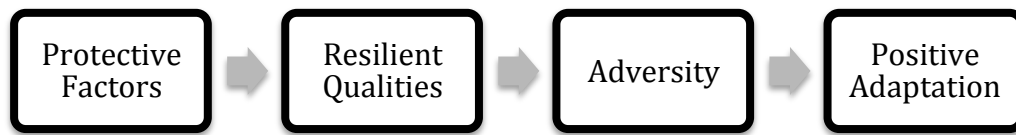
Figure 2.2. *The Resilience Framework.*

Experimental and Measurement Studies of Resilience in Sport

To this point in the chapter, resilience in the sport context has been incorporated into the historical origins of resilience, the development of resilience, and positive adaptation and consequences of resilience. Adding to the resilience research literature in sport are several studies that are either experimental or cross sectional in nature. Specifically, this section will highlight two experimental studies (Martin-Krumm, et al., 2003; Mummery, et al., 2004), and a study of resilient correlates in sport (Hossieni & Besharat, 2010). Much like previous research in developmental psychology, the limited resilience research in sport is riddled with inconsistencies in defining and measuring resilience. The following paragraphs will explain in more detail some of the research findings and limitations of the psychological resilience in sport in a chronological order.

Two experimental studies investigating the role of resilience on performance emerged in the early part of the 2000s (Martin-Krumm, et al., 2003; Mummery, et al., 2004). The first experimental study was conducted by Martin-Krumm and colleagues in France with young school children (Martin-Krumm, et al., 2003). The researchers in this study were primarily interested in the role of optimistic explanatory style in helping children overcome adversity, which was created by providing failure feedback following performance on a basketball dribbling task. Children who had a positive explanatory style

regarding performance were deemed "resilient," and resilience was operationalized as meeting or surpassing prior performance and exhibiting less anxiety on a dribbling task. Children with a negative/ pessimistic explanatory style were hypothesized to be the opposite of the optimistic children and were categorized as "nonresilient." Those children who adopted an optimistic explanatory style had more confidence, equal to or better performance, and had less anxiety despite initial failure than those exhibiting a pessimistic explanatory style. Following failure, resilient children responded with a more positive profile of adaptive responses than children who were less resilient. Although explanatory style appears to be an important component to resilience, it is a limitation of this study to use only explanatory style as an indicator of resilience. Later research would yield several important qualities and protective factors contributing to resilience and explanatory style would capture only part of the reasoning behind why these children were able to overcome failure. Despite this limitation, the basis of the current research design is largely influenced by the design employed by Martin-Krumm and colleagues in this study but with a more comprehensive measure of resilience.

Mummery and colleagues conducted the second experimental study of interest with championship swimmers in Australia (Mummery, et al., 2004). Using survey methods and observation, the researchers quantified resilience by comparing the swimmers to their championship qualifying times. Three groups of participants emerged using this methodology: (a) resilient swimmers, or those swimmers who swam slower than their qualifying time at first but were able to match their qualifying time or swim faster in a subsequent race, (b) initially successful swimmers, or those swimmers who immediately surpassed their qualifying times, and (c) unsuccessful swimmers who did

not equal or surpass their qualifying standards. Resilient swimmers had high perceptions

of their endurance (i.e., high self-image) yet lower perceptions of their coping abilities

than swimmers who were initially successful in the competition. Having a high

perception of ability and a high self-image are similar to having confidence, which is an

important part to the resilience process. Confidence is a personal protective factor and

contributes to protecting an individual from threats to one's ability (Masten, et al., 1993).

The low perceptions of coping, on the contrary, are contrary to the resilience construct

because coping is an instrumental component of exhibiting resilience to adversity.

Although Mummery and colleagues should be commended for their field research

methods, it is unclear if these athletes felt resilient or not. Specifically, the nature of

championship swimming meets are for swimmers to only swim as fast as needed to

advance to the next round so that energy is conserved for the final race. With this in mind,

many athletes may not have been concerned with the qualifying standard, making this

method of categorizing athletes as resilient or not obsolete. A better indicator of

resilience, in addition to observed performance, is needed to advance the research on

what factors into exhibiting resilience despite adversity.

After the experimental work by Mummery, Martin-Krumm, and their respective

colleagues, Hosseini and Besharat (2010) conducted a cross sectional assessment of

athletes with a construct specific measure of resilience. Specifically, Hosseini and

Besharat (2010) examined the correlates of resilience in a sample of male and female

Iranian athletes from a variety of sports. Resilience was measured using the Connor-

Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003), which is a 25-item

scale measuring resilient qualities in individuals. Resilient qualities from the CD-RSIC

include "I am able to adapt when changes occur," "Having to cope with stress can make me stronger," and "Under pressure I can stay focused and think clearly." Using a regression analysis to predict the effects of possessing high resilient qualities, Hosseini and Besharat found better psychological well-being, lower distress, and better sport performances were highly predicted by resilient qualities. The results of Hosseini and Besharat's research illustrate the potential of resilient qualities to predict differences in performances, with better performers possessing higher resilience. The use of the CD-RISC by Hosseini and Besharat is also significant as it improves upon measurement limitations from previous resilience studies with athletes. Further usage of the CD-RISC in sport, a factor analyzed version of the CD-RISC for use with athletes known as the CD-RISC 10 (Gucciardi, Jackson, Coulter, & Mallett, 2011), is discussed in detail in the measurement section of this chapter.

To conclude, studies of resilience in sport are limited as seen in the handful of studies available to date. Whereas previous research is limited, the use of valid and reliable resilience measures should prove instrumental in encouraging future research. Additionally, future research should aim to replicate previous research designs (i.e., Martin-Krumm, et al., 2003) with construct specific measures of resilience like the CD-RISC. The current research study aims to utilize Martin-Krumm and colleagues' (2003) experimental design to examine how well resilient individuals cope with failure feedback in a novel, difficult task.

Related Constructs to Resilience

Resilience continues to have growing pains despite several papers clarifying the construct. One issue in particular is the existence of several psychological constructs related to resilience that are often used synonymously despite differences. Throughout the literature on stress and coping, five concepts emerge that are related to resilience: hardiness, sense of coherence, coping, mental toughness, and grit. Below, each of these related concepts is defined and differentiated from resilience in the hopes of providing clarity to the resilience construct.

Hardiness is a personality construct that enables individuals to buffer stress and is conceptualized by three attitudes (3Cs): commitment, control, and challenge (Kobasa, 1979; Maddi & Kobasa, 2001). Taken together, the three "Cs" provide the mettle and motivation necessary to transform stressors from harming an individual to an opportunity for personal growth and development. For example, the attitude of commitment enables an individual to remain involved in an activity despite difficulty. The attitude of control enables an individual to want to impact the outcome of a situation no matter how difficult. Finally, the attitude of "challenge" enables individuals to perceive potential stressors to not be threatening, but rather, an opportunity to learn and improve. Individuals who possess all three of these attitudes are said to have a hardy personality (Kobasa, 1979).

The primary antecedent of resilience, derived from interviews with stressed managers, come from experiencing adversity earlier in life and receiving strong social support and encouragement from significant figures in an individual's life (Maddi, 2005). The consequences of hardiness are better documented than the antecedents, with the main

consequences of hardiness including lower stress, better psychological well-being, and better performance on a variety of tasks (Maddi, 2005).

In sport psychology research, hardiness appears to separate top athletes from other athletes, even more so than mental toughness (Golby & Sheard, 2004; Sheard, 2009; Sheard & Golby, 2010). Hardiness and resilience are distinct constructs despite similarities in experiencing stress and adversity. Specifically individuals who are mentally tough are said to remain relatively unaffected by stressors whereas resilience posits that individuals who experience adversity are generally enhanced or strengthened by stress. Resilience, according to modern researchers, is a process of experiencing stressors, whereas hardiness is a personality construct that aims to identify inherent individual differences in persons under stress. Despite the promise of hardiness in sport settings, as evidenced in research by Golby and Sheard, current research questions the measurement of hardiness and its relationship to resilience. For example, Gucciardi and colleagues recently examined hardiness as an indicator of convergent validity with a measure of resilience (Gucciardi, et al., 2011). Although moderate positive correlations between the hardiness and resilience were found in Gucciardi and colleagues' study, the reliability of the hardiness measure and its three subscales were quite poor (Cronbach's alphas were below .30 for the subscales and the overall hardiness scale had a Cronbach's alpha of .60). Despite this limitation, the correlations observed between resilience and hardiness show similarity in conceptual make-up, but not enough overlap to consider the two constructs as synonymous.

The second related construct of resilience is Antonovsky's (1987) Sense of Coherence (SOC) construct. SOC is defined, according to Antonvosky as:

a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that a) the stimuli deriving from one's internal and external environments in the course of living are structured and predictable, and explicable; b) resources are available to one to meet the demands posed by these stimuli; and c) these demands are challenges, worthy of investment and engagement. (1987, p. 19)

SOC is a unique construct to the area of resilience and stress management due to its beginnings in medical sociology. SOC came about from the idea that individuals navigate a disease/nondisease continuum where stressors and disruptions are handled with resistance resources. Resistance resources, or antecedents of SOC, include social support, religion, cultural stability, intelligence, and money (Feldt, Kokko, Kinnunen, & Pulkkinen, 2005). Other predictors of SOC include child-centered parenting, where a child is given a safe environment to navigate life stress appropriate with developmental stage, educational success, stable employment, and high parent social economic status. Absent from SOC are traumatic or sudden stressors, which can cause feelings of uncertainty. Without resistance resources an individual is subsequently unable to maintain normal functioning under stress. Persons high in SOC view their lives as "coherent" and are able to navigate potential stressors by not allowing tension to manifest as stress (Feldt, et al., 2005).

Although resistance resources strongly reflect the notion of protective factors in the resilience construct, positive adaptation following a stressor is missing from the SOC construct. Additionally, not all stressors experienced throughout one's life are structured, predictable, and explicable as posited by the SOC construct. The stressors cited most often in the resilience literature involve poverty, mental illness, and death, which are far from predictable and explicable at times. In the sport context, the application of SOC is

nonexistent. Although there are many similarities in SOC to resilience, such as social, personal, and structural influences combating stressors, a lack of emphasis on overcoming stress (i.e., positive adaptation) and the notion that stressors can be predictable are two important points differentiating resilience from SOC.

Coping, a third construct related to resilience, has a long history in the psychological literature. Coping, by definition, is "the person's constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the person's resources" (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986, p. 993). The antecedents of coping are quite difficult to ascertain, especially in sport, as coping is dynamic and individual (Hammermeister & Burton, 2001). Hammermeister and Burton (2001) in a study to identify antecedents of competitive state anxiety found multiple profiles for athletes in endurance sports. Although specific antecedents are difficult to identify, two predictors of coping, according to Lazarus and Folkman's (1984) stress model, precede a coping response. Of importance to coping are (a) cognitive appraisal of a stimulus in the environment, and if a stimulus is appraised as threatening or stressful, then (b) perceived control, or feeling capable of handling a stressor, allows for an individual to employ either cognitive, emotional, or behavioral coping techniques.

Clearly, coping is an important aspect of resilience, as evidenced in Fletcher and Sarkar's (2012) model of resilience in Olympic gold medalists, but how does coping differ from the construct of resilience? Leipold and Greve (2009) suggested that resilience is a "conceptual bridge" between coping and development. Resilience involves processes, or a series of actions, which enable an individual to experience stressors and

adversity and subsequently thrive. These processes of resilience, according to Leipold

and Greve are comprised of coping reactions, constellations of individual characteristics,

and environmental contexts. The "bridge" proposed by Leipold and Greve can be seen in

Figure 2.3. Leipold and Greve argued that the difference between resilience and coping is

that coping is a building block of resilience. In order for an individual to grow or develop,

coping processes must occur for resilience (influenced by personality characteristics and

processes, or a series of actions) to result in development (i.e., positive adaptation).

Coping skills allow for an individual to first experience and process adversity, a

quintessential component to exhibiting resilience. It can be concluded that coping

involves *efforts* to manage stressors whereas resilience implies a positive outcome.

The construct of mental toughness, much like coping, has quite a long history in

the sport psychology literature. Over the course of 2 decades, there was much mystery

and disagreement over what mental toughness was and how it developed. One of the

more popular definitions of mental toughness was offered by Jones, Hanton, and

Connaughton (2007), who defined mental toughness as:

> Having the natural or developed psychological edge that enables you to, generally,
> cope better than your opponents with the many demands (competition, training,
> lifestyle) that sport places on a performer and, specifically, be more consistent and
> better than your opponents in remaining determined, focused, confident, and in
> control under pressure. (p. 247)

Jones and colleagues' definition encompasses both a developed or learned trait that

individuals have to handle pressures *and* the ability or action to continuing to compete

under an optimal psychological state. While mental toughness appears to be similar to

psychological resilience, especially with regard to coping and remaining determined and

in control under pressure, qualitative research has distinguished the two constructs. For

Processes

↓

Coping ⟶ Resilience ⟶ Development
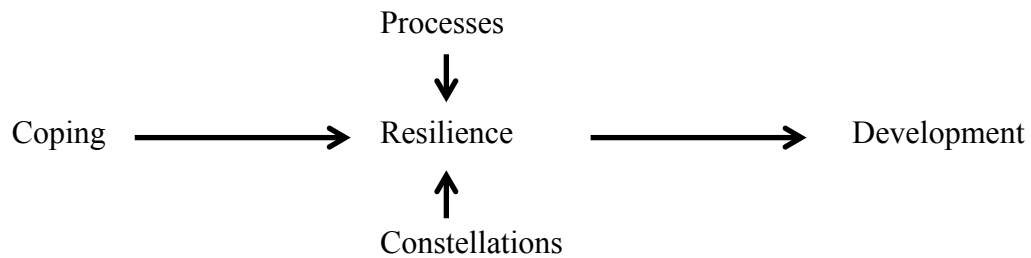
↑

Constellations

Figure 2.3. *Resilience as a Conceptual Bridge Between Coping and Development as proposed by Leipold and Greve (2009).*

example, in a phenomenological study with an elite field hockey coach, mental toughness

and resilience were differentiated as follows:

> I think the word tough sometimes makes you think of absolute strength and it gives a picture of someone who wanders around and looks strong. Whereas I think the term mental resilience is about the ability to cope with lots of things and the ability to keep going and to bounce back. It needs to consider more than just strength such as mental endurance, game intelligence and being able to deal with setbacks and I think that gives me a more preferable picture of what is required at top level, than the term mental toughness. (Fawcett, 2011, p. 23)

Further deciphering the definition of resilience from mental toughness, the field hockey

coach said the following: "I think resilience is also about being proactive and how you

prepare to face particular things that are going to be difficult" (Fawcett, 2011, p. 24).

Resilience appears to be more of a process of preparing for and experiencing adversity in

order to bounce back, which is consistent with the definition of resilience herein. Mental

toughness appears to be more trait like and an absolute strength during times of adversity.

The qualitative narrative provided above leads one to think of mental toughness as the

ability to experience completely unexpected stressors without the means to successfully

cope, yet still find a way to overcome the stress. Resilience, on the other hand, appears to

be a learned process of preparing oneself for potential stressors and having a developed

ability to handle the stress. Although this differentiation of resilience and mental toughness is far from exact or empirical, it begs the question of whether the two constructs are different. As with many studies of resilience and mental toughness, more research is needed in these areas to simplify these constructs and identify unique predictors and processes of each.

Another construct similar to resilience is that of "grit." Grit is a newer psychological concept out of positive psychology that involves similar outcomes to mental toughness, and thus resilience. Originated by Duckworth and colleagues at the University of Pennsylvania in 2007, grit is defined as "trait-level perseverance and passion for long-term goals" and "the capacity to sustain both effort and interest in projects that take months or even longer to complete" (Duckworth & Quinn, 2009, p. 166). Much like mental toughness, grit is a trait level construct that encompasses the strength and perseverance to continually work towards goals and aspirations. Whereas mental toughness refers to demands more explicitly, grit assumes that one is able to remain committed towards a goal over the course of time with or without the explicit presence of adversity Additionally, grit refers to sustained effort regardless of highly evaluative situations where extrinsic rewards are present, or in other words, grit is a stubborn persistence to achieve a goal no matter the rewards or barriers.

There are two factors in the Short Grit Scale (Grit-S; Duckworth & Quinn, 2009): consistency of interest and perseverance of effort. In closely examining the items in the Grit-S, it appears adversity is not of primary importance of the grit construct, whereas being "diligent," "hard working," and "finishing what one begins" are of interest. Although resilience does require some degree of persistence in times of stress or

adversity, resilience places more emphasis on the presence or experience of adversity than grit. Therefore, grit and resilience, although similar constructs, are differentiated by the emphasis on adversity and positive adaptation from resilience. Grit is more concerned with the internal willingness individuals put forth in attempting to accomplish goals regardless of adversity. Additionally, grit is often related to less than enjoyable deliberate practice methods individuals undergo in order to succeed at certain tasks. For instance, grit is a strong predictor in spelling competitions, with grittier competitors spending more time memorizing spelling words, a method of preparation considered to be not enjoyable (Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011). Less gritty competitors prepared less rigorously and consequently performed worse. It is plausible that grit may contribute to or even predict resilient qualities (mental toughness may contribute as well), but the construct on the whole differs from resilience. In conclusion, the constructs of grit and resilience appear to be conceptually different despite some similarities. Grit is a personality trait that is concerned with effort and interest in an activity, whereas resilience is concerned with coping necessary to overcome adversity and subsequently flourish.

To summarize, resilience is defined as a process with two necessary components needed, namely adversity and positive adaptation following adversity. Resilience shares similarities with several constructs, but adversity and positive adaptation ultimately distinguish resilience from hardiness, sense of coherence (SOC), coping, mental toughness, and grit.

Measuring and Quantifying Resilience

Measuring and quantifying resilience in the literature has taken three primary approaches: measuring risks and competencies, variable focused measurement, and individual based measurement (Luthar & Cushing, 1999). Assessing risks and competencies is one of the oldest measures of resilience and focuses on negative life events or risk factors and then subsequent displays of competence such as symptomatology (presence of good behaviors), presence or absence of pathology (depression or no depression), or adjustment to the risk or live event (positive adaptation). Although risks and the display of competence despite risks align well with the constitutive definition of resilience offered within this chapter, the research using this approach to measuring resilience focuses primarily on children and acute versus chronic stressors are often ignored or not addressed. Additionally, individual appraisals of events as stressors are important in understanding stress and coping, thus making resilience difficult to assess using this approach.

The second approach to measuring resilience in the literature has been the interactions of stressors and protective attributes, or a variable focused approach. Using the variable focused approach, researchers use statistical modeling and regression analyses to examine how various protective factor constructs, such as social support, confidence, and stress interact in predicting resilient behavior. In other words, resilience is operationalized as an outcome in this approach. The variable focused approach allows for large scale studies of resilience, but fails to account for the actual presence of adversity and individual processing of a stressor.

The final approach to measuring resilience, individual based measurement, is a well accepted and the most contemporary method of assessing resilience. The individual approach examines characteristics and qualities hypothesized to exist in those who display resilient behavior. More specifically, the individual approach isolates individuals who experienced high risk and demonstrated high competence (Luthar & Cushing, 1999). Several resilience scales have emerged over the last 2 decades that cater to the individual focused approach to resilience (Ahern, Kiehl, Sole, & Byers, 2006).

In a comprehensive review of resilience instruments for adolescents in the nursing profession, Ahern and colleagues (2006) identified six specific scales that assess resilient characteristics and behavior. Although the main purpose of their review article was to find the best assessment of resilience in adolescents, Ahern and colleagues' work provided a critical overview of several resilience scales with good psychometric properties and the recommended target populations for use. The six specific scales identified were Baruth Protective Factors Inventory (BPFI; Baruth & Carroll, 2002), the Connor-Davidson Resilience Scale (CD-RISC, Connor & Davidson, 2003), Resilience Scale of Adults (RSA; Friborg, et al., 2003), Adolescent Resilient Scale (ARS; Oshio, Kaneko, Nagamine, & Nakaya, 2003), Brief-Resilient Coping Scale (BRCS; Sinclair & Wallston, 2004), and the Resilience Scale (RS; Wagnild & Young, 1993). Recall that the individual approach to measuring resilience, as raised by Luthar and Cushing (1999), provides the best assessment of resilience. Out of the six scales mentioned, only the CD-RISC, the BRCS, and the RS were developed with characteristics of resilient individuals as a primary interest, or more specifically, how well individuals rate themselves on stress coping ability and other resilient behaviors. In the sport psychology literature, only the

CD-RISC has been used to assess resilience in athletes (Gucciardi, et al., 2011; Hosseini & Besharat, 2010). In the present study, the CD-RISC 10 (Gucciardi, et al., 2011) was administered instead of the original 25-item CD-RISC due to the better factor structure in sport populations with the CD-RISC 10 as described in greater detail earlier in this chapter. Reliability and validity in the CD-RISC 10 remained on par with the original CD-RISC (see Gucciardi, et al., 2011 for a review).

It would be advantageous to take time here to explain the development behind the CD-RISC and why the CD-RISC is a preferred scale in current resilience research. When Connor and Davidson developed the CD-RISC, their goal was to advance measurement in what had been a difficult and confusing construct. In order to comprehensively examine resilience, Connor and Davidson drew from the works of Kobasa (1979) and hardiness, the works of Rutter (1985) and Lyons (1991) on characteristics of resilient individuals, and added more current work on optimism and faith. One of the main reasons the CD-RISC appears to be the scale of choice for current resilience researchers is because the measure contains items from both current research and from relevant previous work. Additionally, the CD-RISC has sound psychometric properties across several different groups of people and was able to differentiate groups of people who succeeded in their therapy versus those who did not succeed in their therapy. The CD-RISC has been used with athletes and displays adequate reliability (Hosseini & Besharat, 2010). Although the use of the CD-RISC in the sport context addressed a major limitation of prior resilience research in sport, namely it measured resilience with a construct specific measurement, it is unknown from one study how reliable and valid the CD-RISC is with athletes. Indeed, Connor and Davidson (2003) created the CD-RISC to measures

qualities of resilient individuals in the general population rather than a specific context such as sport.

Although Hosseini and Besharat's work was unique and the psychometric properties of the CD-RISC were sound (see Hosseini & Besharat, 2010), further psychometric testing of the CD-RISC with athletes would be necessary in order for researchers to adopt this measure for consistent use. Gucciardi and his colleagues' contributed to this need significantly with their psychometric study of the CD-RISC in a sample of Australian Cricket athletes across different ages (Gucciardi, et al., 2011). After conducting a factor analysis with the original 25-item CD-RISC, Gucciardi and colleagues' research found a10-item CD-RISC to have better factor structure and reliability with athletes (see Gucciardi, et al., 2011). Specifically, the CD-RISC 10 had an overall Cronbach's alpha of .88, convergent validity with hardiness, divergent validity with athlete burnout, and invariance in psychometric properties across ages. Specific psychometric properties of the CD-RISC 10 can be found in the instrument section of Chapter 3.

Gucciardi and colleagues' work is significant in advancing resilience research in sport because establishing an assessment of resilient qualities allows for future researchers to begin establishing antecedents, correlates, and consequences of particular resilient qualities. Although the results of Gucciardi and colleagues' work is promising, their study is an isolated instance of a measure without supporting research. Future research is needed to substantiate the utility of the CD-RISC 10 with athletes. Because the CD-RISC 10 appears to be a valid and reliable measure in athletes, it will be utilized in the current research to assess resilient qualities in the participants.

The CD-RISC is not without disadvantages despite adequate reliability and validity in a wide variety of populations. One of the primary disadvantages is the emphasis on resilient characteristics or qualities rather than the resiliency process. The proposed experimental design utilized the CD-RISC 10 as a screening tool to group individuals into high and low resilient groups in order to test how well individuals possessing resilient characteristics or qualities respond to adversity in an experimental task

To conclude, measuring resilience is a complex process with several different approaches. According to prominent researchers, the individual focused approach to resilience is most advantageous and is a point of emphasis in the current study. This study utilized the CD-RISC 10 to assess resilient characteristics and follow up with an experimental design to examine how well the characteristics account for resilient behavior following adversity.

Factors Associated with Resilient Behavior

In order to better understand the impact of resilient characteristics on human behavior in the face of adversity, two hypothesized variables may contribute to the resilience process: (a) cortisol, a neuroendocrine and physiological marker of stress response, and (b) emotions. The next two sections will highlight the importance of cortisol and emotional responses on the resilience process.

Neuroendocrinology and Resilience

It has been established that stress and adversity are two factors that are necessary for an individual to experience in order for resilience to occur (Luthar, et al., 2000; Masten, 2001). In determining what constitutes a stressor, an individual's appraisal of a stimulus or several stimuli in the environment is important (Bonanno, 2004; Fletcher & Sarkar, 2012). For example, an athlete might consider playing an undefeated team to be stressful because the odds point to a loss and therefore feelings of shame. But another athlete might view playing an undefeated team as not a stressful situation, but a situation full of opportunity to accomplish a large feat. The most current resilience research in sport specifically cites appraisal of a stimuli as central to the resilience process (Fletcher & Sarkar, 2012). In order to better understand the stress appraisal process in more detail, physiological and cognitive processes are worth an intensive look.

The physiological stress response is depicted in Figure 2.4. The frontal cortex of the human brain plays a central role in the perception of a stimulus or event as either stressful or a not stressful. Acting as a master control, the frontal cortex filters information from the senses and decides how threatening a stimulus or event is (Southwick, et al., 2008). If the brain *perceives* stress, such as a threat or feeling of vulnerability, then there is a threat to an individual's allostasis, or their homeostasis of the stress response. Excessive stress can lead to the release of cortisol, a glucocorticoid or steroid hormone produced by the adrenal pituitary gland. Although cortisol serves some facilitative functions in the body, such as heightened awareness to stimuli in the environment, cortisol is gaining attention as one of the main hormones affecting allostasis (Kirschbaum & Hellhammer, 2000). Too much cortisol can lead to health risks and poor
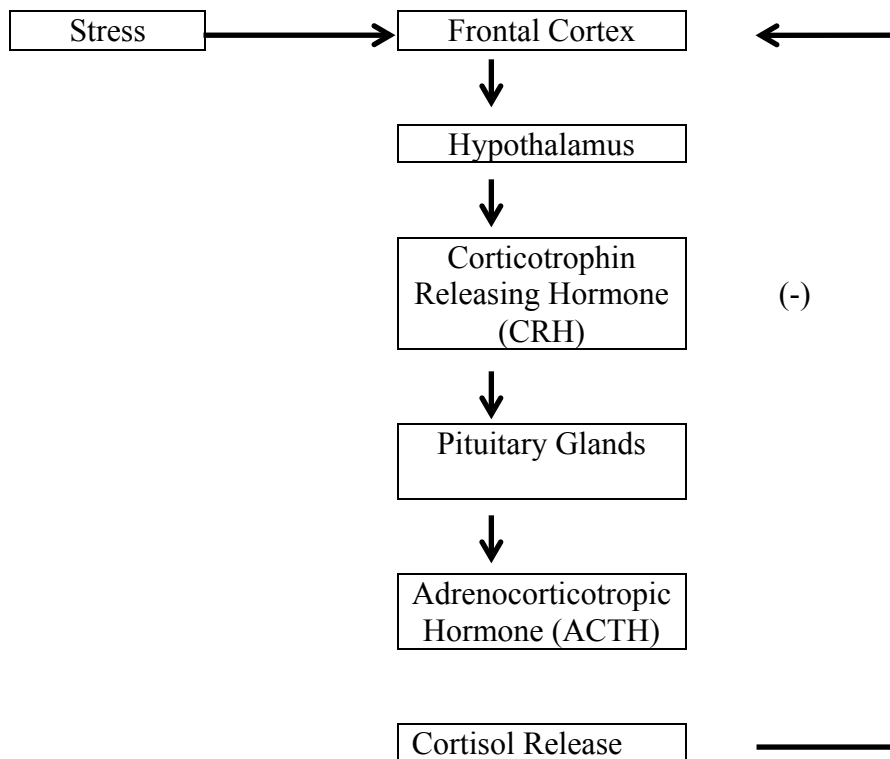
Figure 2.4. *Physiological Stress Response Described by Southwick, Ozbay, Charney, and McEwen (2008).*

performances on various tasks across populations (Filare, et al., 2009; Morgan III, et al., 2004). Generally, a 15% increase in cortisol concentration from baseline signifies a stress response to a stimulus (Kirschbaum & Hellhammer, 1989). Due to the differences across assay kits, which assess cortisol concentrations, there is no standard reference concentration for salivary cortisol, hence the importance of baseline assessment within an experimental protocol in determining the stress response (Kirschbaum & Hellhammer, 1989).

As emphasized in the preceding paragraph, *perception* or *appraisal* of a stimulus as a stressor is key to understanding the stress response (Gill, 1994). If a stimulus is perceived or appraised as stressful, the Hypothalamic Pituitary Adrenocortical (HPA)

axis releases of cortisol in the human body (Southwick, et al., 2008). The HPA axis

begins in the hypothalamus, which upon receiving stress signals from the frontal cortex

will send the corticotrophin releasing hormone (CRH) to the pituitary glands to warn the

human body that there is a stressor in the environment. The adrenal pituitary gland then

triggers the release of the Adrenocorticotropic Hormone (ACTH), which stimulates the

adrenal glands to produce cortisol. The HPA axis plays three important roles in

developing resilience to stress: (a) the HPA axis anticipates energy sources necessary for

a task, (b) cortisol serves a "homeostatic function" in regulating stress sensitive systems

in the body, and (c) cortisol and other hormones can effect memory, learning, and

emotions (Stansbury & Gunnar, 1994). Cortisol naturally increases under perception of a

threat and returns to normal levels after a threat ends, but excessive amounts have a

negative effect on the ability to handle environmental stressors and react appropriately.

Past research has suggested that lower levels of cortisol release are indicative of

resilience to stress (Kivlighan, et al., 2005; Levine, 2000; Stansbury & Gunnar, 1994),

but much of this literature lacks established measurement to assess characteristics or

qualities of a resilient individual. Excessive amounts of cortisol released in the body have

negative consequences in the ability to handle stress, such as increased fear and less

perceived control (Charney, 2004; Haglund, Nestadt, Cooper, Southwick, & Charney,

2007). Given the importance of cortisol in the stress response, resilient individuals

perceive stressful situations as less threatening and more manageable, resulting in lower

levels of cortisol than less resilient individuals (Southwick, et al., 2008). In contrast, less

resilient individuals perceive stressful situations as threatening and unmanageable,

resulting in higher levels of cortisol.

Cortisol is not only important in determining resilience to stress and adversity, it is also an important factor in performance. The effect of excessive cortisol on performance is well documented. For example, cortisol concentrations in a study of tennis players were highest in the losing players (Filaire, et al., 2009). Winning players, on the other hand, had lower cortisol levels, lower cognitive anxiety, and higher self-confidence. Research also shows a significant negative correlation between stress-induced levels of salivary cortisol and military performance (Morgan III, et al., 2004). In addition to high levels of cortisol in poor performing athletes and soldiers, low cortisol levels are indicative of more experienced and successful individuals. For example more experienced surgeons performing surgery have lower levels of cortisol than less experienced surgeons (Detling-Miller, et al., 2006). Clearly, the ability to keep cortisol levels to a manageable amount has positive consequences on performances. Excessive cortisol release might inhibit an athlete's ability to positively adapt to adversity and thus inhibit the resilience process. Cortisol appears to be an important laboratory variable to consider in examining the efficacy of resilient characteristics on managing the stress response *and* on performance on a task, thus it is a variable of interest in the present study.

Emotion and Resilience

Emotional response, like cortisol response, is another factor of interest in the process of resilience given the ability of positive emotions to facilitate resilient behaviors in times of stress (Southwick, et al., 2008; Waugh, et al., 2008). A universally agreed upon definition of emotion is difficult to ascertain. However, theorists cite three components of an emotion: physiological changes, action tendencies, and subjective

experiences (Vallerand & Blanchard, 2000). Taken individually, physiological changes

associated with emotions can be observed by changes in heart rate, skin conductance

(Vallerand & Blanchard, 2000), and cortisol release (Stansbury & Gunnar, 1994). Action

tendencies associated with emotions include the "fight or flight" response, two actions

influenced by stimuli in the environment that are perceived to be threatening. Finally,

subjective experiences associated with emotions may include the creation of conscious

emotional memories, such as remembering threatening situations with fear and anxiety.

In summary, Vallerand and Blanchard (2000) offered these three components in a

definition of emotion authored by Edward Deci (1980):

> An emotion is a reaction to a stimulus event (either actual or imagined). It
> involves change in the viscera and musculature of the person, is experienced
> subjectively in characteristic ways, is expressed through such means as facial
> changes and action tendencies, and may mediate and energize subsequent
> behaviors. (p. 85)

Emotional regulation, specifically sustaining positive emotions, is a key factor in coping

with adversity (Tugade & Fredrickson, 2007). According to the Broaden and Build

Theory (Fredrickson, 2001) of emotions, positive emotions such as joy, happiness, and

assertiveness allow for individuals to broaden their thoughts rather than narrow them.

Broadening thoughts enable individuals to build resources to battle stressors rather than

narrow their thoughts and limit the ability to think through a stressful situation (Tugade &

Fredrickson, 2007). For instance, less resilient individuals, when faced with adversity,

tend to expect the worst outcome to occur and physiologically respond accordingly

(Waugh, Wagner, Fredrickson, Noll, & Taylor, 2009). Research has also found that

positive emotions and affect contributed to effective emotion management in resilient

individuals, aiding in their ability to "bounce back" from adversity (Ong, Bergeman,

Bisconti, & Wallace, 2006; Tugade & Fredrickson, 2004). The preceding research points to the power of emotions in recovery and positive adaptation to adversity.

In summary, emotion appears to play an important role in developing positive adaptation in times of stress and adversity, but the construct of emotion is largely absent from experimental research involving resilient qualities. Additionally, Waugh, Tugade, and Fredrickson (2008) implore researchers to move away from recall studies of stressful events and use laboratory interventions for anticipated stressors. Given the inherent stresses of competitive athletes cited earlier in this chapter, sport is an appropriate vehicle to examine "real-time" stressors and how individuals subsequently react and adapt. The current research aims to assess emotions in real-time pre and post stress in order to more accurately understand the role of emotions in positive adaptation following stress.

<div style="text-align:center">Conclusion</div>

The goal of this chapter was to provide readers with a comprehensive review of the literature regarding the psychological construct of resilience. Additionally, this chapter offered an operational definition of resilience for the current research and future work, suggested a framework of resilience as a process, identified an appropriate measure of resilience, and discussed the importance of two variables in the resilience process-cortisol and emotions. It is my hope that this chapter adequately informed the readers of my decision-making regarding my definition of resilience, my experimental design, the variables I chose to be important to resilience, and the reason behind my measurement choice. With that information in mind, the goal of this research was to understand how

resilience works in a stressful situation and to advance research on resilience in sport populations.

CHAPTER 3

METHODS

<u>Participants</u>

This study initially began with a survey of 116 male and female collegiate

lacrosse players from the Mountain West region of the United States of America using

the CD-RISC 10 to assess participants' perceived resilience. A total of four collegiate

lacrosse teams participated in this study. Both male and female athletes participated due

to minor known differences in salivary cortisol between males and females (Kirschbaum

& Hellhammer, 1989; 2000; Kivlighan, et al., 2005). The mean CD-RISC 10 score for

the preliminary sample was 31.30, with a standard deviation of 4.41. Because the focus of

this study was to examine differences in high and low resilient individuals, one standard

deviation above and below the mean (+/-1 *SD*) was used to categorize participants as

either high resilient (one standard above the mean) and low resilient (one standard

deviation below the mean). The control group was chosen from participants scoring

around the mean CD-RISC 10 score for the sample. A one standard deviation above and

below the mean split was employed because the CD-RISC 10 has no established norms

for categorizing individuals as either high or low in perceived resilient qualities.

After separating participants into groups, a total of 59 participants were identified for the study. However, due to injury, quitting the team, or being cut from the team, only 54 participants completed the study (high resilient, $n= 18$; low resilient, $n= 18$; control, $n= 17$). The demographics for the sample can be found in Table 3.1. The mean CD-RISC 10 scores for the high resilient, low resilient, and control groups were 37.28 ($SD= 1.45$), 24.50 ($SD= 2.31$), and 31.11 ($SD= 1.08$), respectively. The high resilient group had an average of 7.0 ($SD= 2.64$) years of playing experience, whereas the low resilient group had an average of 7.11 ($SD= 2.27$) years, and the control group had an average of 8.33 ($SD= 2.59$) years. All participants had mean ages of approximately 20 years.

Table 3.1: *Demographic Information for All Participants Organized by Group.*

	High Resilient		Low Resilient		Control	
	n	Percent (%)	*n*	Percent (%)	*n*	Percent (%)
Sex						
Male	10	55.6	11	61.1	15	83.3
Female	8	44.4	7	38.9	3	16.7
Starter						
Yes	11	61.1	7	38.9	6	33.3
No	6	33.4	11	61.1	9	50.0
Position						
Attack	5	27.8	8	44.4	5	27.8
Defense	6	33.3	2	11.1	6	33.3
Goalie	1	5.6	3	16.7	1	5.6
Middie	6	33.3	5	27.8	6	33.3
Race						
Caucasian	15	83.3	15	83.3	17	100.0
Asian	2	11.1	3	16.7	0	0
African American	1	5.6	0	0	0	0
Ethnicity						
Hispanic/ Latino	1	5.6	0	0	1	5.6
Non-Hispanic Latino	16	88.9	12	66.7	14	77.8

All participants were free of prescription medications that could affect the neuroendocrine system, endocrine diseases, and all cortisol samples were checked for blood or food particles that could have confounded the results (Kirschbaum & Hellhammer, 1994; 2000). Participants refrained from smoking, tobacco products, citric drinks, caffeine, and eating 2 hours before they gave a cortisol sample (Kirschbaum & Hellhammer, 1994; 2000). Given that the population of interest was collegiate level athletes, many confounding variables regarding cortisol collection were naturally eliminated.

Instrumentation

Demographics

Participants were given a questionnaire asking their name, age, year in school, school affiliation, position on the team, whether or not they were starters or not starters, years playing lacrosse, ethnicity, and race.

Resilient Qualities

Derived via confirmatory factor analysis from the original 25-item Connor Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) the 10-item Connor Davidson Resilience Scale (CD-RISC 10; Gucciardi, et al., 2011) was used to measure resilient qualities. The CD-RISC 10 is more valid and reliable in sport populations than the original 25-item scale (see Gucciardi, et al., 2011). Athletes were directed to indicate how much they agreed with statements as they apply to their lives. Each item was responded to on a five-point Likert-Type Scale (0- *not at all true* to 4- *true nearly all the*

time). Example items included "Under pressure, I stay focused and think quickly," "I am not easily discouraged by failure," and "I am able to adapt when changes occur." Scores were summed and ranged from 0-40 with higher totals indicating more resilient qualities (Gucciardi, et al., 2011). Past research using the CD-RISC 10 has shown Cronbach's alpha to be .88 (Gucciardi, et al., 2011). The CD-RISC 10 also has evidence of convergent and divergent validity. In support of convergent validity, Gucciardi and colleagues (2011) found resilience, assessed with the CD-RISC 10, to be positively and moderately correlated (.62) with hardiness, a personal disposition related to resisting stress (Maddi & Kobasa, 2001). The authors also reported a negative moderate relationship (-.40) with the reduced accomplishment subscale of the Athlete Burnout Questionnaire (Raedeke & Smith, 2001), thus supporting divergent validity. Consequently, the CD-RISC 10 has strong psychometric properties in sport and is recommended over the original 25-item CD-RISC. Cronbach's alpha for the CD-RISC in this study was .89.

Emotion Measures

    Affect. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to assess emotional response in participants at baseline, prefailure, and in response to failure (postfailure). The PANAS is a 20-item questionnaire with two 10-item subscales measuring positive and negative affect. The PANAS uses various adjectives to describe different feelings and emotions, and participants are asked to rate how accurately each adjective describes them on a five-point Likert-Type scale (1 = *very slightly or not at all*, 5 = *extremely*). The PANAS can be used to measure general

affect (how you generally feel on average) and situational/ at the moment affect (how you

feel at this moment now). This study used the situational/ moment affect instructions.

Specific instructions for the PANAS were as follows: "This scale consists of a number of

words that describe different feelings and emotions. Read each item and then mark the

appropriate answer in the space next to that word. Indicate to what extent you feel at this

moment now. Use the following scale to record your answers."

The PANAS has been found to have strong reliability and validity for both

general and at this moment affect (Watson, et al., 1988). Internal consistency reliabilities

for the moment and general PANAS scales range between .85 and .89 for both positive

and negative affect subscales. Intercorrelations between positive and negative affect

subscales for the moment PANAS is -.15 and for the general PANAS is -.17. Test retest

reliabilities for the moment PANAS was .54 for the positive affect subscale and .45 for

the negative affect schedule. For the general PANAS, test retest reliabilities for the

positive affect subscale was .68 and for the negative affect subscale was .71. Finally, the

PANAS has demonstrated convergent and divergent validity with the Beck Depression

Inventory (BDI; Beck, et al., 1961). The positive affect subscale of the PANAS had a

moderate negative correlation ($r = -.35$) with the BDI whereas the negative affect

subscale of the PANAS had a moderate positive correlation ($r = .56$) with BDI. In

summary, the PANAS has strong psychometric properties and has been utilized in many

different contexts with adequate reliability. Cronbach's alphas for positive affect in this

study at baseline, prefailure, and postfailure were .94, .93, and .91. Cronbach's alphas for

negative affect in this study at baseline, prefailure, and postfailure here .78, .82, and .82.

Pride and shame. Pride and shame are two polarized emotions that are powerful

feelings in sport (Hanin, 1999). This study examined the emotions of pride and shame by

adding four additional items (two pride items and two shame items) to the PANAS

measure because the PANAS consists of only single items identifying pride and shame.

The measurement of pride thus included the original PANAS adjective proud, with

gratified and satisfied added. The measurement of shame included the original PANAS

adjective ashamed, with embarrassed and humiliated added. Participants were instructed

to rate their feelings exactly the same as they were instructed with the PANAS measure.

Cronbach's alphas for pride in this study at baseline, prefailure, and postfailure

were .83, .81, and .89. Cronbach's alphas for shame in this study at baseline, prefailure,

and postfailure were .78, .82, and .91.

Physiological Response to Stress and Failure

Cortisol was the psychophysiological marker collected to indicate stress levels in

the participants. Samples of cortisol were collected via saliva samples from each of the

participants. Cortisol is most stable between 3:00 PM and 6:00 PM given that cortisol

follows a diurnal pattern (Kirschbaum & Hellhammer, 2000). Salivettes, which are dental

cotton rolls inside of a plastic tube, from Salimetrics (Salimetrics LLC, State College, PA,

USA) was the method of saliva sampling used. Salivettes are a reliable method of

collecting salivary cortisol samples and are especially helpful when participants have

difficulty providing saliva due to dry mouth (Kirschbaum & Hellhammer, 1994).

Participants inserted the cotton roll into their mouth underneath the tongue for 30-60

seconds and saturated the salivette with roughly 0.05 to 2 microliters (ml) of saliva

(Kirschbaum & Hellhammer, 1994). Once the salivette was saturated, it was inserted

back into the plastic tube and stored until assayed. Cortisol is generally stable for up to 1 month at room temperature, but researchers suggest refrigerating samples for up to 6 months at 2-8 degrees Celsius (Salimetrics LLC, State College, PA, USA).

Cortisol samples were assayed using a salivary cortisol assay kit from Salimetrics LLC (State College, PA, USA). Salivary cortisol assay kits include plate wells, control substances, and wash solutions to add to the collected saliva samples. Instructions on how to assay salivary cortisol (i.e., specific pipette amounts, procedure steps, etc.) are available from Salimetrics LLC. Once properly prepared, cortisol samples were read using a Finstruments ® Multiskan Model 346 plate reader from MTX Lab Systems Inc. (Vienna, Virginia, USA). Salivary cortisol is read at a spectrum of 450 nanometers (nm) and output values were entered into a spreadsheet for data analysis. Cortisol samples were run in duplicate to ensure the reliability of each sample and averaged for the results.

Performance

Performance was assessed by having participants complete a novel lacrosse shooting task at an indoor gymnasium. The task required participants to shoot standard lacrosse balls from a distance of 30 feet to a standard lacrosse goal equipped with a Maverik Paul Wall Lacrosse Goal Shooting Target, which is a practice mat placed in front of a lacrosse goal with seven holes cut into it. There are three holes on the left hand side of the mat, one hole in the bottom middle of the mat, and three holes on the right hand side of the mat. Participants were asked to shoot balls starting with the upper left hand target and to work their way around the shooting target in the shape of a "U." Participants were not permitted to move to the next target without putting a lacrosse ball

successfully into the target. All participants were asked to start with "bounce shots" where the ball has to bounce in front of the goal on the ground on the first sequence of shots. If participants were successful at scoring seven successful bounce shots, then participants were asked to score shots on the fly (where the ball does not touch the ground). If participants were successful at shooting seven successful fly shots, then participants would return to shooting bounce shots and then fly shots alternating until time expires. All participants had 60 seconds to make as many goals as possible in each trial. Each participant's performance was measured by taking the total number of goals scored in each trial.

Manipulation Check

To ensure the fidelity of the research design two manipulation checks were conducted. First, participants' baseline and pretest cortisol levels were compared to ensure that participants found the task instructions to be stressful and ensure that each group was exposed to a similar stressor. Prior research indicates that a 15% increase in cortisol from an individual's baseline to after a stressor is introduced is indicative of a valid stressor (Kirschbaum & Hellhammer, 1989). Second, participants were asked the following question after their first trial following performance feedback to ensure that the participants believed that they failed the task: "How would you categorize your performance?" followed by a forced choice response option "rather good" or "rather poor."

<u>Procedure</u>

After receiving IRB approval, two male and two female collegiate lacrosse teams in the Mountain West region of the United States of America were contacted. Contact with the teams was first conducted via emails and phone calls to the head coaches of the identified collegiate lacrosse programs to gain permission to study their athletes. Upon gaining permission to access the athletes, meetings with the athletes were scheduled to explain the study. Because collegiate athletes have very strict training regimens, gaining access to this population in season is generally impossible. Therefore, data collection took place in the fall, prior to the spring season and early enough in the academic year to avoid the possibility of school stressors impacting the findings. A flow chart of the procedures is provided in Figure 3.1.

Participant Recruitment and Group Assignment

At the preliminary meetings with prospective teams, interested athletes were given consent forms explaining the study. Upon receiving consent, athletes then completed the CD-RISC 10 (Gucciardi, et al., 2011) to assess perceived resilient qualities. After gaining a sample size of 116 athletes, a mean +/- one standard deviation split procedure using CD-RISC 10 scores was performed to create three experimental groups. Participants scoring at or above the 84.1th percentile rank (*n*= 18) on the CD-RISC were placed in the high resilient qualities group, whereas those scoring in the 59th percentile rank or below (*n*= 18) were placed in the low resilient qualities group. The control group consisted of participants scoring at or within +/- .25 standard deviation of the mean (*n*= 17). Once participants were grouped, each participant was coded with a random number
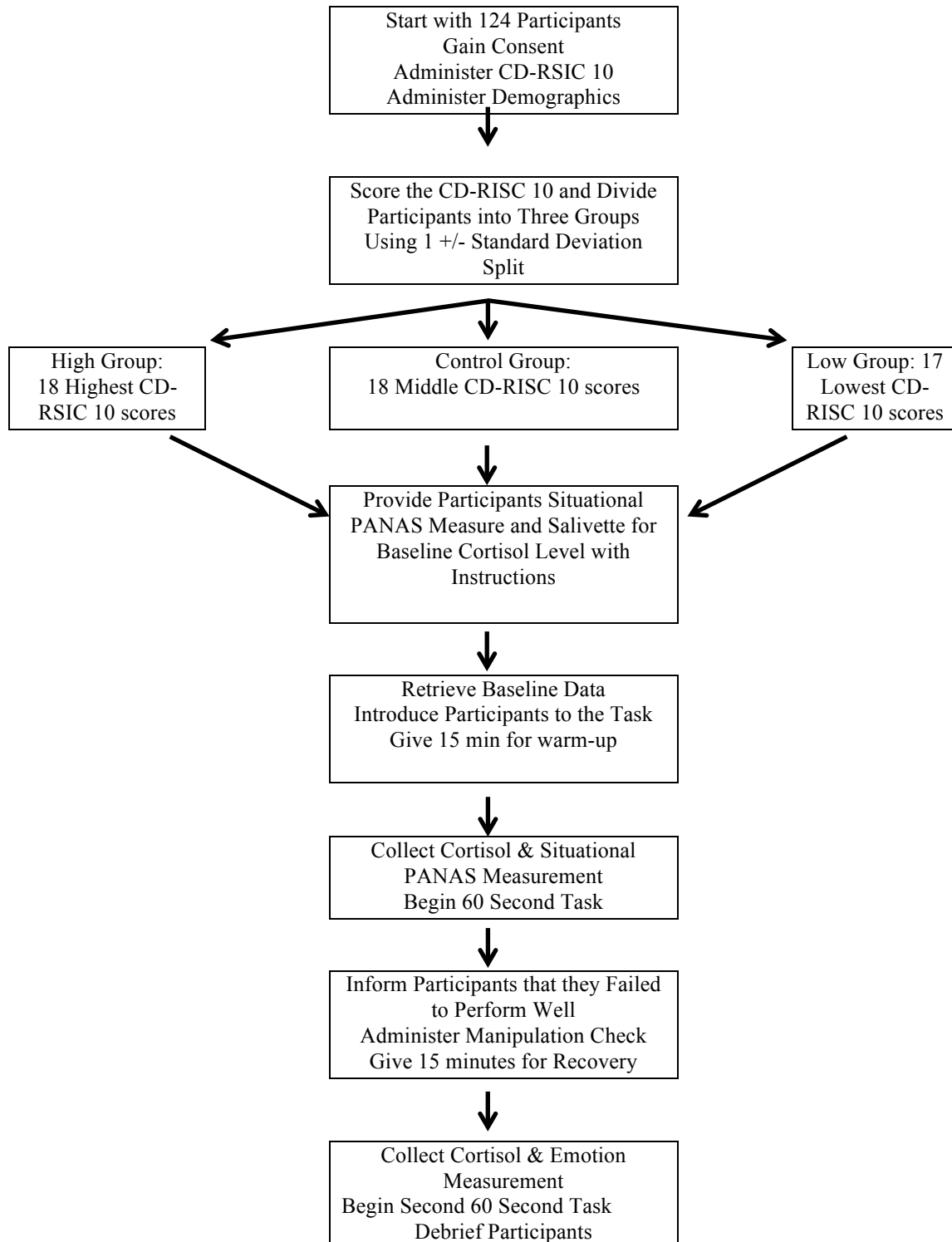
Figure 3.1. *Data Collection Procedures*

to blind the primary investigator so as not to bias treatment of the participants. Three research assistants kept track of the group assignments and revealed the group assignment of each participant following the completion of data collection. The control group participated in the study the same as the other groups, but was not given feedback that they failed in the task.

Baseline Assessments

After assignment to a group, all participants were contacted again and were given two Salivettes and containers (Salimetrics, LLC, State College, PA, USA) to collect a saliva sample between 3pm and 4pm on 2 separate days to get baseline measures of cortisol (which were later averaged). Participants were asked to complete the PANAS with pride and shame items added when taking their cortisol sample to assess emotion. Obtaining a baseline sample without an induced stressor gave a comparison mark to assess the stressfulness of the failure feedback. Cortisol is released in a diurnal or circadian rhythm, and time of collection is important to obtain stable samples of cortisol (Kirschbaum & Hellhammer, 1994; 2000). All data were collected between 3pm and 6pm because cortisol is most stable and acute differences are most observable during this portion of the day (Kirschbaum & Hellhammer, 1994; Kudielka, Schommer, Hellhammer, & Kirschbaum, 2004). All participants returned their self-taken baseline cortisol and PANAS with pride and shame items added assessments to the researcher when they attend the experimental protocol session.

Experimental Protocol (Prefailure)

Participants were asked to visit an indoor racquetball court between 3pm and 6pm where the experimental protocol took place. To foster investment in the task, athletes were deceived and told that their coaching staff was interested in new ways of assessing athlete success and competence to better determine playing time and roster spots on the team. Athletes were informed that their performance on the task would be shared with the coaching staff, so trying their best on the task was important. After receiving the deception information, athletes were informed of the shooting task and were given 15 minutes to warm up. Shooting or ball handling was not allowed. According to researchers, approximately 15 minutes is the minimum amount of time to allow the HPA axis to initiate the stress response and enable an accurate cortisol level to enter the saliva (Filaire, et al., 2009; Kirschbaum & Hellhammer, 2000). After warming up, participants completed a pretest PANAS with pride and shame items added, and cortisol via salivette. Once pretest measures were taken, performance data was collected. Participants were given 60-seconds to score as many points as possible in the lacrosse shooting task. Each participant's performance (number of goals scored and percentage of shots made) was recorded. After the 60-second time period expired, athletes were informed that their performance failed to meet the average performance on their team and the "collegiate standard" on the task.

Posttest (Postfailure)

After the task athletes were informed that they would receive another chance and will have another 15 minutes before their second trial. During this time, athletes

completed the manipulation check (to determine if the failure feedback was effective) and another situational PANAS with pride and shame items added. After 15 minutes, a postfailure cortisol sample was collected. Directly thereafter participants' performance was again measured. Each athlete was given another 60 seconds to score as many goals as possible in the shooting task. The number of goals and shot percentage for each participant makes was recorded.

Debrief

Following the last trial, athletes were thanked and debriefed on the purpose of the study and were assured that their coaching staff was not making playing time or roster decisions based on their performances. Athletes were then informed of how they responded to the stressor via email and personal consultations with a sport psychology consultant were made available to help educate the athletes on ways to increase their resilience in stressful situations. All data were kept confidential and no coaches had access to how their athletes performed. Coaches were also offered consultations with a sport psychology consultant to advise how best to train their athletes to handle failure.

Exploratory Protocol

In addition to failure, a small subset of 15 participants (4 high resilient, $n= 4$; low resilient, $n= 5$; control, $n= 6$) received an additional condition where success feedback was given. The success condition was established and implemented to examine if participants reacted differently to success in comparison to failure. By examining success as well as failure, the results of this exploratory protocol allow for this study to more

strongly attribute reactions to failure feedback as the cause or reason for differences in cortisol, emotion, and performance from the participants. The success condition was counterbalanced with the failure condition to ensure testing effects did not confound the results. The success condition involved participants participating in a short agility task where they would cradle a lacrosse ball while facing forward at all times and would run in an hourglass shape to five cones on a racquetball court. The success condition task is depicted in Figure 3.2. Prior to participating in the success condition, participants were told that they would participate in an agility test that would also be considered by their coaches. Participants were given 15 minutes to warm up prior to participating in the agility test, and right before they participated, cortisol and the PANAS with pride and shame items was collected. Participants completed two loops of the agility course and were given very complimentary feedback. The feedback given was "Wow! That was one of the fastest times we've seen on this task! Great job!" Finally, 15 minutes after success feedback was given, a final cortisol and PANAS with pride and shame items added was collected from participants.

<u>Research Design</u>

The research design of this study was a 3 x 2 mixed repeated measure design. This study was experimental in nature and included two independent variables: resilient qualities with three levels (high resilient qualities, low resilient qualities, and control group), and time (baseline, prefailure and postfailure), as well as three dependent variables: performance, emotion, and cortisol.

Standard Regulation Racquetball Court

Start/ Finish
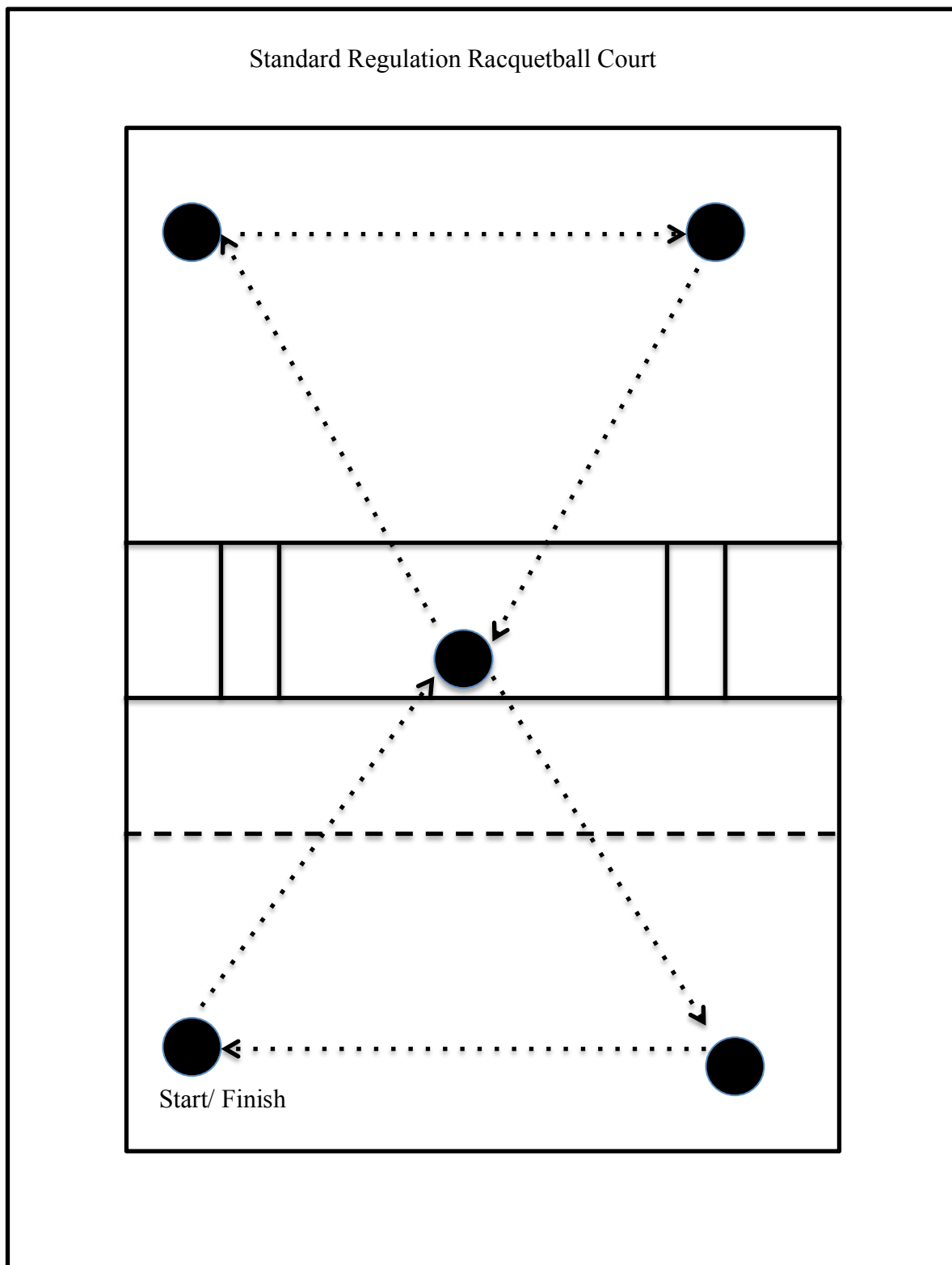
Figure 3.2. *Success Condition Protocol.*

CHAPTER 4

RESULTS AND DISCUSSION

Results

The data analysis for this study took place in four stages: (a) data cleaning and statistical assumption analysis, (b) preliminary analysis, (c) primary data analysis, and (d) exploratory analysis. The following sections will detail the specific procedures utilized in each stage.

Data Cleaning and Statistical Assumptions Analysis

In order to ensure the accuracy of the data entered into SPSS 20.0, two people first entered all the data into two Microsoft Excel spreadsheets. Once the data were entered, the spreadsheets were subtracted from one another to determine if all the data points registered at zero. Minor data entry errors were attended to and then all data were imported into SPSS. All cases were then screened for missing data points and missing data were removed from the analysis to ensure complete data were used in the analysis. All data removed were missing completely at random. Out of the 55 individuals who completed the study, only 1 person was eliminated from the analysis for not returning ample baseline cortisol data for analysis.

The primary analysis for this study required several repeated measures ANOVA with repeated contrasts to adequately answer the research questions and hypotheses. There are four statistical assumptions that must be met in order to successfully compute a repeated measures ANOVA. These assumptions are: (a) normality of the dependent variables, (b) homogeneity of variance, and (c) sphericity, or equal variances of the repeated measures and (d) no multicolinearity of the dependent variables. Because three groups (high resilience, low resilience, and control) were examined in this study, three distinct populations comprised the sample. All dependent variables (cortisol, positive affect, negative affect, pride, and shame) across the time points were thus analyzed for normality by grouping.

Normality of the dependent variables was assessed using visual methods, the Kolmogorov-Smirnov test, and calculations of z-scores for skewness and kurtosis. Histograms with normal curves and Q-Q plots were the visual methods used to examine normality, and visually most data appeared normal. Additionally, the Kolmogorov-Smirnov tests for each variable revealed that the data were normally distributed. To follow up the visual analysis and the Kolmogorov-Smirnov test, z-scores were calculated for skewness and kurtosis. Given the small sample size in this study, all z-scores above 1.96 were examined as possible instances of non-normal data. Although all five variables each had a data point that appeared to be a possible instance of non-normality, it was determined that these data points were representative of the population and were therefore unchanged.

Homogeneity of variance in this study was assessed using the Levene's test. All variables tested had nonsignificant ($p > .05$) probability values on the Levene's test,

suggesting adequate homogeneity of variance for the dependent variables in all groups.

Sphericity was violated for all of the repeated measures ANOVAs indicating a lack of constant correlations across the dependent variables between treatment levels (Field, 2009). In order to produce a valid *F*-ratio for the analyses, several corrections are available to account for unequal variances (Field, 2009). The Greenhouse-Geisser correction (Greenhouse & Geisser, 1959) was applied to all analyses to account for violated sphericity. The Greenhouse-Geisser correction was chosen because the sphericity values were below 0.75 and the Greenhouse-Geisser correction fails to reject false null hypotheses at sphericity values greater than 0.75 (Field, 2009).

Preliminary Data Analysis

Preliminary analyses were conducted to ensure no potential confounding variables would influence the primary analyses and to ensure that the experimental design exhibited adequate fidelity. First, because this study included both male ($n = 40$) and female ($n = 19$) collegiate lacrosse players in the sample, analyses were conducted to ensure that no sex differences contributed any confounding effects to the primary data analyses. To begin, independent samples *t*-tests were computed between males and females on years playing lacrosse, age, and CD-RSIC 10 scores. Experience (in this case, years of experience playing lacrosse) and age could confound the results as prior research suggests experience can enhance resilience (Lepore & Revenson, 2006). The results of the independent samples *t*-tests revealed no statistical differences in males and females on years playing lacrosse, $t(57) = -.933$, $p = .36$, age, $t(57) = -.452$, $p = .63$, and resilience (CD-RISC 10) scores, $t(57) = -.722$, $p = .47$. Secondly, a one way ANOVA was computed

between males and females on cortisol across the three conditions of the study: baseline, prefailure, and postfailure. Males and females did not differ in cortisol levels at baseline, $F(1,57)= .094$, $p=.76$, prefailure, $F(1,57)=.665$, $p= .42$, and postfailure, $F(1,57)= 3.089$, $p=.09$. Given the nonsignificance between males and females on the preceding statistical tests, males and females were kept together for the main analysis.

Next, to examine the fidelity of the experimental design and protocol differences in cortisol from baseline to prefailure were examined. Previous researchers cite at least a 15% increase in cortisol is necessary to qualify an experience as stressful (Kirschbaum & Hellhammer, 1989). The high and low resilient groups and the control group in the experiment, when averaged, had a 10.5% rise in cortisol, which was short of a 15% rise in cortisol from baseline to prefailure. Mean and standard deviation values for cortisol across the protocol are presented in Table 4.1. Given that the 15% rise in cortisol was not established for all groups, the failure feedback was effective in increasing cortisol, just not at a truly significant 15%. Because a rise in cortisol occurred and was over 10%, the experimental design and protocol exhibited some fidelity.

Fidelity of the experimental design and protocol was also explored by examining participants' perceptions of their performance to the failure stimulus. This was important because a central tenant of this study was to induce failure on all participants with an exception for participants in the control group. Therefore, assuring participants in the high and low resilience groups perceived their performance on the experimental task as a failure was important for the fidelity of the experimental design and protocol. For the control group, it was not important for participants' to perceive their performances as a

Table 4.1. *Group Means and Standard Deviations for Dependent Variables from Baseline to Postfailure*

	High Resilience (*N*=18)						Low Resilience (*N*=18)						Control (*N*=17)					
	Baseline		Prefailure		Postfailure		Baseline		Prefailure		Postfailure		Baseline		Prefailure		Postfailure	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Cortisol	.1762	*.0861*	.1921	*.1257*	.1697	*.0823*	.1867	*.0929*	.1922	*.0725*	.1599	*.0533*	.1619	*.1083*	.1939	*.0998*	.1602	*.0825*
PA	36.09	*10.47*	37.24	*7.17*	33.82	*9.50*	31.67	*7.72*	31.00	*7.19*	26.20	*8.74*	38.07	*5.87*	37.67	*5.47*	35.93	*7.43*
NA	15.35	*3.81*	13.82	*4.05*	15.47	*4.85*	15.17	*5.12*	16.13	*6.65*	19.33	*10.46*	16.37	*5.13*	14.40	*3.87*	16.40	*5.63*
Pride	10.00	*3.80*	9.00	*3.28*	6.53	*3.56*	8.86	*2.25*	7.47	*3.37*	4.07	*2.07*	9.83	*2.25*	9.60	*1.92*	8.07	*3.41*
Shame	3.68	*1.38*	3.29	*.99*	5.59	*3.20*	4.10	*1.93*	3.93	*1.62*	6.33	*3.74*	3.40	*.63*	3.07	*.26*	4.47	*2.45*
Perform	--	--	2.22	*1.48*	3.28	*1.67*	--	--	1.67	*1.495*	2.50	*1.543*	--	--	1.94	*1.43*	2.39	*.98*

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"Rather Poor" or "Rather Good," 51 out of the 55 total participants in this study

regardless of grouping perceived their performance to be "Rather Poor" or, in other

words, a failure. Four individuals did not perceive their performance to be a failure. Upon

further review of the individuals perceiving their performance as "rather good," two of

the individuals were in the control group (whom were not given any performance

feedback), one individual was in the high resilient group, and one was in the low resilient

group. Optimistic explanatory style is one characteristic resilient individuals are assumed

to possess (Martin-Krumm, Sarrazin, Peterson, & Famose, 2003). Given previous

research, the resilient individual who perceived his or her performance as successful was

kept in the analysis. The two participants in the control group were retained for the

analysis because their perception of their performance was not as critical as the

experimental groups and was merely used as a comparison. Also, given the novelty of the

task, the control participants have no comparison and thus had no reason to perceive their

performances as a failure, despite a rise in cortisol. The participant in the low resilient

group was eliminated from the analysis as the experimenter determined that he or she was

a contaminant.

Finally, to explore the possibility of multicollinearity in the data, simple Pearson

product moment correlations among the dependent variables at baseline, prefailure, and

postfailure were computed (see Table 4.2). The correlations were calculated to examine

the possible risk for multicollinearity among the dependent variables, which would

violate one of the statistical assumptions of an Analysis of Variance (ANOVA). In the

event of multicolinearity, which would be evidenced by strong correlations amongst the

Table 4.2. *Pearson Correlation Matrix Among Dependent Variables Across Time (Baseline/Prefailure/Postfailure).*

	Cortisol	PA	NA	Pride	Shame
Cortisol	-----				
PA	-.40*/-.05/.03	-----			
NA	-.13/-.06/-.10	.02/-.12/-.17	-----		
Pride	-.46*/-.11/.13	.86*/.71*/.65*	-.13/-.06/-.35*	-----	
Shame	.21/.-.08/-.19	-.13/-.11/-.07	.57*/.62*/-.83*	-.21/-.05/-.42*	-----

Note: *$p < 0.01$.

dependent variables (.70 or higher; Tabachnick & Fidell, 2007), a Multivariate Analysis of Variance (MANOVA) should be conducted in place of ANOVAs. Evaluating the correlations in Table 4.2, the overwhelming majority of the dependent variables across time had small to moderate correlations suggesting minimal multicollinearity. The exceptions were the correlations between positive affect and pride as well as negative affect and shame, which evidenced stronger correlations. In examining the correlations closely, at baseline, cortisol had negatively moderate correlations with positive affect and pride, which is a relationship expected from previous research. If an individual has lower cortisol, he or she is more likely to have more positive affect. The relationship of cortisol to pride at baseline was an interesting finding. Essentially the results allude to lower cortisol translating to higher levels of pride. Whereas the baseline relationships were moderate among cortisol, positive affect, and pride, the relationship between cortisol and the other dependent variables were quite weak with very little uniformity across the remaining time points. Because positive affect and negative affect are from the same construct, there should be a strong, albeit negative, correlation amongst the two variables. Likewise, pride and shame are two measures of emotion and should share strong negative correlations to one another. Because neither subscales of affect or emotion shared strong correlations, ANOVAs were computed in the primary analysis as there appear to not be

overwhelming interrelationships among the dependent variables. If there were stronger, consistent correlations among the dependent variables, a MANOVA analysis would better account for the interrelationships.

<center>Primary Data Analysis</center>

The three purposes of this study were to: (a) examine the effect of failure on cortisol levels, (b) examine the effect of failure on emotional responses, and (c) examine the effect of failure on performance in a high resilient group, a low resilient group, and a control group of collegiate lacrosse players. To answer these research questions, six 3x2 mixed repeated measures ANOVAs were computed to assess group differences in resilience over time for cortisol, emotion (positive affect, negative affect, pride, and shame), and performance. Much consideration was given to the appropriate analysis of the data. The main issue to consider was group differences at specific time points for the study. With multiple dependent variables, two options emerged: multiple mixed repeated measures ANOVAs or a mixed repeated measures MANOVA. With few strong relationships among the dependent variables across time (see Table 4.2) and with a clearer way to interpret the results, multiple mixed repeated measures ANOVAs were chosen. Finally, the research questions for this study were whether or not high and low resilient individuals differed in their reactions to failure on cortisol, emotion, and performance. These three distinct questions would best be answered by separate mixed repeated measures ANOVAs in order to isolate the variables of interest and examine potential group differences more efficiently.

Because multiple ANOVAs were conducted, Type I error, or falsely rejecting the null hypothesis, was a concern. In order to control for Type I error, the Holm-Bonferoni (Holm, 1979) adjustment procedure was applied to the p-values. The Holm-Bonferoni correction was used because it provides statistical tests greater power than the traditional Bonferoni correction (Holland & Copenhaver, 1988). With the Holm-Bonferoni correction, the lowest p-value is compared to the most stringent Bonferoni correction. For example, the current study employed six, 3x2 mixed repeated measures ANOVAs. The traditional Bonferoni adjustment would divide the p-value of .05 by six to get p=.008. The p-values obtained from the ANOVAs would then be compared to the value of .008. If the p-value from the ANOVA is less than .008, than that ANOVA is significant and the next lowest p-value will be compared to a less stringent p-value, or in this case .05 divided by five to get a p-value of .01. Essentially, as long as the preceding ANOVA is significant compared to the adjusted Holm-Bonferoni p-value, the next ANOVA is compared to a new p-value of one less test divided by the original .05 significance level until there is not a significant difference on any remaining ANOVAs. The lowest p-value from an ANOVA is compared to the original significance level of .05 if all other ANOVAs are significant. Referring to the group by time values depicted in Table 4.3, the smallest to largest p-values for the dependent variables are for pride, positive affect, shame, performance, negative affect, and cortisol, respectively. Therefore, with the Holm-Bonferoni correction, the preceding variables will be analyzed at the .008, .010, .015, .017, .025, and .05 levels, respectively, for statistical significance.

The following sections will address each of purpose statement and its corresponding research hypotheses. The means and standard deviations for the dependent

variables across time by group are displayed in Table 4.1. The statistics for all ANOVAs are displayed in Table 4.3.

Purpose One: The Effect of Failure on Cortisol

The first purpose of this study was to examine the effects of failure on cortisol levels in high resilient, low resilient, and a control group of collegiate lacrosse players. It was hypothesized that there would be a significant group by time interaction for cortisol following failure, with the high resilient group having significantly less cortisol change after failure than the low resilient and control groups. The resulting mixed repeated measures ANOVA for cortisol is displayed at the top of Table 4.3. There was a significant main effect for time for all participants from prefailure to postfailure, $F(1,50)=$ 9.344, $p <$.001, regardless of group membership. All groups decreased in cortisol from prefailure (*M*= .1927, *SD*= .0993) to postfailure (*M*= .1633, *SD*= .0727). Although there was a significant main effect for time, there was not a significant group by time interaction from prefailure to post failure, $F(2,50)=$ .138, $p =$.827. More simply, there were no cortisol differences among high resilient, low resilient, and the control participants in response to failure.

Purpose Two: The Effect of Failure on Emotion

The second purpose of this study was to examine the effect of failure on emotional responses in high resilient, low resilient, and a control group of collegiate lacrosse players. Emotional response was conceptualized by four variables: positive

Table 4.3. *Repeated Measures Analysis of Variance (ANOVA) Summaries for Dependent Variables by Group (High and Low Resilient plus Control) and Time (Prefailure to Postfailure)*

Source	Sum of Squares	df	Mean Square	F	P-Value	Partial Eta Squared
Cortisol						
Time	.023	1	.023	9.344	<.001	.16
Group*Time	.001	2	.000	.138	.872	.01
Error	.123	50	.002			
Positive Affect						
Time	320.333	1	320.333	23.867	<.001	.32
Group*Time	32.167	2	16.083	1.198	.310	.05
Error	684.500	51	13.422			
Negative Affect						
Time	112.037	1	112.037	10.142	.002	.17
Group*Time	8.574	2	4.287	.388	.680	.02
Error	563.389	51	11.047			
Pride						
Time	171.259	1	171.259	51.294	<.001	.50
Group*Time	9.463	2	4.731	1.417	.252	.05
Error	170.278	51	3.339			
Shame						
Time	118.231	1	118.231	32.945	<.001	.39
Group*Time	4.241	2	2.120	.591	.558	.02
Error	183.028	51	3.589			
Performance						
Time	.038	1	.038	6.300	.015	.11
Group*Time	.006	2	.003	.476	.624	.02
Error	.308	51	.006			

Note: Sphericity was violated for all ANOVAs. Greenhouse-Geisser correction is reported for all tests to correct for sphericity in the table. Holm-Bonferoni corrections for each of the significance levels for the ANOVAs are (in order): .05, .010, .025, .008, .015, and .017.

affect, negative affect, pride, and shame. There were four hypotheses corresponding with this specific purpose, all of which are addressed in the following paragraphs.

The first hypothesis assumed there would be a significant group by time interaction for positive affect, with the high resilient group having more positive affect following failure than the low resilient and control groups. The resulting mixed repeated

measures ANOVA for PA are displayed in the second section of Table 4.3. There was a significant main effect of time for all participants from prefailure to postfailure, $F(1,51)=$ 23.867, $p <.001$, regardless of group membership. All groups decreased in PA from prefailure ($M= 35.30$, $SD= 6.61$) to postfailure ($M= 31.98$, $SD= 8.56$). Although there was a significant main effect for time, there was not a significant group by time interaction from prefailure to postfailure, $F(2,51)= 1.198$, $p =.310$. The high resilient, low resilient, and the control groups did not differ in positive affect due to resilience in response to failure.

The second hypothesis suggested there would be a significant group by time interaction for negative affect, with the high resilient group having less negative affect following failure than the low resilient and control groups. The resulting mixed repeated measures ANOVA for negative affect is displayed in the third section of Table 4.3. There was a significant main effect of time for all participants from prefailure to postfailure, $F(1,51)= 10.142$, $p =.002$, regardless of group membership. All groups increased in negative affect from prefailure ($M= 14.78$, $SD= 4.86$) to postfailure ($M= 17.07$, $SD= 6.98$). There was not a significant group by time interaction from prefailure to postfailure, $F(2,51)= .388$, $p =.680$. The high resilient, low resilient, and the control groups all responded similarly regarding negative affect in response to failure.

The third hypothesis suggested there would be a significant group by time interaction for pride, with the high resilient group having more pride following failure than the low resilient and control groups. The results of the mixed repeated measures ANOVA are displayed in the fourth section of Table 4.3. There was a significant main effect of time for all participants from prefailure to postfailure, $F(1,51)= 51.294$, p

=<.001, regardless of group membership. All groups decreased in pride from prefailure (*M*= 8.69, *SD*= 2.86) to postfailure (*M*= 6.22, *SD*= 3.01). There was not a significant group by time interaction from prefailure to postfailure, *F*(2,51)= 1.417, *p* =.252. The high resilient, low resilient, and the control groups all responded similarly regarding pride in response to failure. Namely, they decreased in pride. The research hypothesis was rejected. High and low resilient individuals were not differentiated on pride response after failure.

The fourth and final emotional response hypothesis assumed there would be a significant group by time interaction for shame, with the high resilient group having less shame following failure than the low resilient and control groups. The results of the mixed repeated measures ANOVA are displayed in the fifth section of Table 4.3. There was a significant main effect of time for all participants from prefailure to postfailure, *F*(1,51)= 32.945, *p* =<.001, regardless of group membership. All groups increased in shame from prefailure (*M*= 3.43, *SD*= .96) to postfailure (*M*= 5.46, *SD*= 3.13). There was not a significant group by time interaction from prefailure to postfailure, *F*(2,51)= .591, *p* =.558. The high resilient, low resilient, and the control groups all responded similarly regarding shame in response to failure. The research hypothesis was rejected.

Purpose Three: The Effect of Failure on Performance

The third, and final purpose of this study was to examine the effect of failure on performance in high resilient, low resilient, and a control group of collegiate lacrosse players. The research hypothesis stated that there would be a significant difference in group performance on the experimental task, with the high resilient group having better

performance post failure than the low resilient and control group. Before this hypothesis was addressed, the researcher wanted to ensure that group differences in performance did not exist on trial one to avoid a confounding effect of one or more groups having better shooting ability than the others. A one-way ANOVA revealed no significant difference in the groups at trial one in the lacrosse shooting task, demonstrating a level playing field for all participants, F (2,52)= .509, p=.604.

In order to address the performance response to failure for the high resilient, low resilient, and control groups, a final mixed repeated measures ANOVA was computed and is displayed in the final section of Table 4.3. There was a significant main effect of time for all participants from prefailure to postfailure $F(1,51)$= 6.300, p =.015, regardless of group membership. All participants improved their performance from trial one (M= 1.94, SD= 1.47) to trial two (M= 2.72, SD= 1.39). There was not a significant group by time interaction from prefailure to postfailure $F(2,51)$= .476, p =.624. The high resilient, low resilient, and the control groups all responded similarly regarding performance in response to failure. Despite a lack of statistical significance, but interestingly, on a difficult novel task, high resilient individuals scored almost a point better on a second trial (m= 3.3) than their low resilient counterparts (m=2.5). Additionally, when examining the number of shots taken and made on both trials (i.e., shot percentage), high resilient individuals increased their shot percentages from 12.9% on trial one to 18.6% on trial two compared to the low resilient individuals who shot 10.8% on trial one and 14.2% on trial two. In a performance, any advantage is important and this task teased out the ability of the high resilient individuals to play better despite failure on a difficult novel task. Although statistically the research hypothesis was rejected, practically this

result is meaningful as high and low resilient individuals were differentiated on performance response after failure.

Exploratory Data Analysis

In addition to the research hypotheses, two exploratory research questions were investigated. Of specific interest was whether or not there are statistically significant group by time interactions on cortisol and emotions (positive affect, negative affect, pride, and shame) when a stressful unknown evaluative task was presented between baseline to prefailure. Essentially, this analysis ascertained whether or not the high and low resilient groups appraised a stressful situation differently. Although cortisol was used to determine if there was a significant stress response prior to the main analyses, cortisol was included in this analysis to determine if there was a statistical difference from baseline to prefailure.

The second exploratory research question was concerned with whether or not high resilient, low resilient, and control groups reacted differently to success on a task than they did to failure on a task. The following sections detail the analysis conducted on the exploratory questions. Again, because multiple ANOVAs were conducted to analyze the data in the following sections, Holm-Bonferoni adjustments were applied to the p-values that are listed at the bottom of the ANOVA tables.

Exploratory Question One: Group Differences on Cortisol and
Emotion in Response to Stress

To answer the first exploratory research question, five 3x2 mixed repeated

measures ANOVAs were computed to assess group differences in resilience from

baseline to prefailure for cortisol and emotion (positive affect, negative affect, pride, and

shame). Again, given the lack of strong correlations among the variables as seen in Table

4.2 and given the exploratory nature of the questions, a MANOVA was considered to be

an inappropriate test and thus ANOVAs were computed. The results of the ANOVAs for

the groups from baseline to prefailure on the dependent variables can be found in Table

4.4. Mean scores for all variables from baseline to prefailure can be found in Table 4.1.

Negative Affect was the only dependent variable with a statistically significant

group by time interaction from baseline to prefailure $F(2,43)= 5.906, p =.005$ as seen in

section three of Table 4.4. An interaction effect follow up relative to negative affect was

computed to determine the source of the difference among the three groups. The high

resilient group significantly decreased from baseline ($M= 15.35, SD= 3.81$) to prefailure

($M= 13.82, SD= 4.05$) $F(1,44)= 5.967, p =.019$. The control group also significantly

decreased in negative affect from baseline ($M= 16.37, SD= 5.13$) to prefailure ($M= 14.40$,

$SD= 3.87$) $F(1,44)= 8.706, p =.005$. Conversely, individuals in the low resilient group

increased in negative affect from baseline ($M= 15.17, SD= 5.12$) to prefailure ($M= 16.13$,

$SD= 6.65$), but this increase was not statistically significant $F(1,44)= 2.013, p =.154$. The

interaction is displayed in Figure 4.1. Effectively, the high resilient and control groups

responded to the emerging stressful situation with less negative affect than individuals in

Table 4.4. *Repeated Measures Analysis of Variance (ANOVA) Summaries for Dependent Variables by Group from Baseline to Prefailure.*

Source	Sum of Squares	df	Mean Square	F	P-Value	Partial Eta Squared
Cortisol						
Time	.013	1	.013	2.217	.114	.05
Group*Time	.010	2	.005	.872	.425	.04
Error	.248	43	.006			
Positive Affect						
Time	.039	1	.039	.002	.963	<.001
Group *Time	15.190	2	7.595	.428	.655	.02
Error	763.47	43	17.755			
Negative Affect						
Time	18.100	1	18.100	5.385	.025	.11
Group *Time	39.699	2	19.850	5.906	.005	.22
Error	144.529	43	3.361			
Pride						
Time	17.831	1	17.831	5.155	.028	.11
Group *Time	4.917	2	2.459	.711	.497	.03
Error	148.738	43	3.459			
Shame						
Time	2.085	1	2.085	1.891	.176	.04
Group *Time	.213	2	.107	.097	.908	.004
Error	47.406	43	1.102			

Note: Sphericity was violated for all ANOVAs. Greenhouse-Geisser correction is reported for all tests to correct for sphericity in the table. Holm-Bonferoni corrections for each of the significance levels for the ANOVAs are (in order): .025, .013, .01, .017, and .05.

the low resilient group, who increased in negative affect prior to a stressful situation. All other group by time interactions were statistically not significant.

Additionally, there was a significant main effect for time for all participants from baseline to prefailure, $F(1,43)= 5.155, p =.028$, in relation to pride (see the fourth row of Table 4.4). All groups decreased in pride from baseline ($M= 9.56, SD= 2.77$) to prefailure ($M= 8.69, SD= 2.86$). All other main effects for the remaining variables were statistically insignificant.
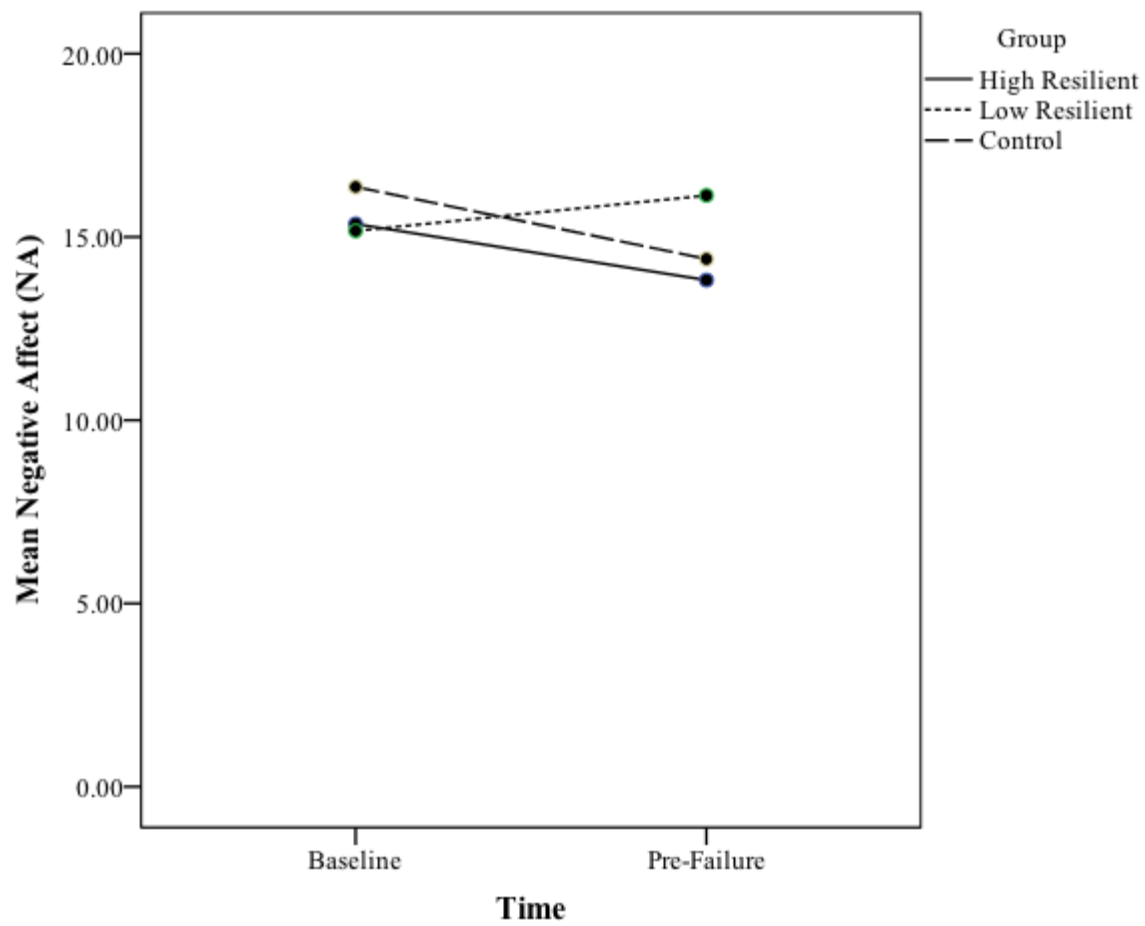
Figure 4.1. *Mean Negative Affect (NA) Change from Baseline to Prefailure Across Groups.*

In summary, it appears that the high in resilient group approached an unknown evaluative situation with less negative affect than the low resilient group and control group. In addition, all groups decreased in pride when given an unknown evaluative task.

Exploratory Question Two: Group Differences on Cortisol and Emotion in Response to Success

The second exploratory research question was concerned with whether or not the high resilient and low resilient groups responded differently to success. A subsample of 15 individuals (4 High Resilient, 5 Low Resilient, 6 Control) from the main sample underwent an additional condition wherein they succeeded (see Chapter 3 for details). Presentation of the success condition was counterbalanced with the failure condition in the subsample. Participants were given a single trial on a timed conditioning and agility test and were told that they were successful on the test. In order to assess how participants differed in their responses to success five 3x2 repeated measures ANOVAs were conducted for pre-success to post-success responses on cortisol and emotion. It should be clarified that the data presented here for the success condition was culled from the larger sample. Again, ANOVAs were chosen over MANOVAs given the lack of relationships among the dependent variables over time as seen in the correlations presented in Table 4.5. Although positive affect and pride shared a strong, positive correlation across the time points, these are the only two variables with statistical correlations and they were derived from different instruments. Given the lack of strong correlations across time for all measures, ANOVAs were conducted to answer this exploratory research question. All means and standard deviations for participants receiving the success condition are presented in Table 4.6. The Holm-Bonferoni

Table 4.5. *Pearson Correlation Matrix Among Dependent Variables Across Time for Success Condition Participants (Presuccess/Postsuccess).*

	Cortisol	PA	NA	Pride	Shame
Cortisol	-----				
PA	-.01/.11	-----			
NA	-.06/.31	.03/-.16	-----		
Pride	.-.08/-.14	.87*/.71*	-.11/-.48	-----	
Shame	-.01/.11	.01/-.22	.19/.71*	-.15/-.40	-----

Note: *$p < 0.01$.

correction was applied to the ANOVAs to control for Type I error so as not to sacrifice power.

In assessing response to success in high resilient, low resilient, and the control group on cortisol and emotion, five 3x2 repeated measures ANOVAs were conducted and the results are displayed in Table 4.7. There were no statistically significant group by time interactions or significant main effects. The only variable that approached significance was shame. Referring to the means and standard deviations of the dependent variables in Table 4.6 of the presuccess and postsuccess time points, the standard deviations are quite large for such a small sample size. The large standard deviations observed in this sample illustrate that response to success was quite specific to the individual. Given that participants were grouped as high resilient, low resilient, or in a control group, the grouping variable of psychological resilience appeared to have little role in influencing or directing responses to success.

Table 4.6. *Group Means and Standard Deviations for Dependent Variables Over Time for Success Participants.*

| | High Resilience | | | | Low Resilience | | | | Control | | | |
| | Presuccess | | Postsuccess | | Presuccess | | Postsuccess | | Presuccess | | Postsuccess | |
Variable	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Cortisol	.1210	.0414	.1160	.0487	.2180	.1181	.1950	.0842	.1580	.0863	.1508	.0875
PA	38.75	8.30	37.75	9.32	35.00	7.07	34.40	8.88	36.00	10.95	35.17	9.33
NA	13.75	3.30	11.00	.82	13.40	3.51	13.20	3.11	17.33	6.09	15.67	6.35
Pride	8.50	4.12	9.75	4.99	8.00	3.54	9.20	2.28	9.33	4.23	8.67	2.66
Shame	4.75	2.06	3.00	.00	3.80	1.79	3.60	1.34	3.17	.41	3.50	.84

Table 4.7. *Repeated Measures Analysis of Variance (ANOVA) Summaries for Dependent Variables by Group from Presucess to Postsuccess (N=15).*

Source	Sum of Squares	df	Mean Square	F	P-Value	Partial Eta Squared
Cortisol						
Time	.001	1	.001	1.013	.334	.08
Group*Time	.000	2	.000	.238	.792	.04
Error	.012	12	.001			
Positive Affect						
Time	4.801	1	4.801	.640	.439	.05
Group*Time	.183	2	.092	.012	.988	.002
Error	90.017	12	7.501			
Negative Affect						
Time	17.281	1	17.281	2.678	.128	.18
Group*Time	7.425	2	3.712	.575	.577	.09
Error	77.442	12	6.453			
Pride						
Time	2.579	1	2.579	.984	.341	.08
Group*Time	6.425	2	3.212	1.226	.328	.17
Error	31.442	12	2.620			
Shame						
Time	2.119	1	2.119	3.012	.108	.20
Group*Time	5.358	2	2.679	3.808	.052	.39
Error	8.442	12	.703			

Note: Sphericity was violated for all ANOVAs. Greenhouse-Geisser correction is reported for all tests to correct for sphericity in the table. Holm-Bonferoni corrections for each of the significance levels for the ANOVAs are (in order):0125, .05, .017, .025, and .01.

Discussion

The overall purpose of this study was to investigate the impact of failure on the physiological stress response, emotional response, and performance of high and low resilient athletes. A laboratory research paradigm was utilized that allowed for manipulation and measurement of physiological stress and emotion changes in high and low resilient individuals over time.

The operational definition of psychological resilience used in this study was the ability of an individual to experience adversity and positively adapt (Luther, Cicchetti, & Becker, 2000). Individual cortisol response, emotional response, and performance on a novel task were examined as indicators of positive adaptation. Adversity was created through deception regarding the importance of performance on an unknown evaluative novel task wherein individuals were provided negative performance feedback. Specifically, athletes were told that their performance was going to be shared with their coaches and could impact their playing time, scholarships, and roster positions. Overall, the results illustrated that irrespective of self-reported levels of resilience, individual's cortisol, emotional, and performance response to failure were statistically the same. Although not statistically significant, performance did increase (one point or over six percentage points for shot percentage) more for the high resilient individuals in the study in comparison to the low resilient individuals.

The results of this study did not support the research hypotheses. Despite deriving the dependent variables (cortisol and emotion) from past literature on factors comprising positive adaptation (Southwick, Ozbay, Charney, & McEwen, 2008; Stansbury & Gunnar, 1994; Waugh, Tugade, & Fredrickson, 2008), all participants reacted to failure similarly.

Although this study appears to be in stark contrast to previous research, this study was an improvement from previous research for three reasons. First, an established measure of psychological resilience was used to place athletes into groups based on resilience. Second, an experimental protocol was employed to induce failure rather than correlational or recall design. Lastly, both psychological and physiological methods were used to comprehensively capture how individuals respond to failure.

Because the results of the study initially indicate that self-reported differences in resilience do not effect stress and emotional response to failure, the measurement of resilience and the time required to positively adapt to failure or adversity come into question. Specifically, did the CD-RISC 10 adequately differentiate individuals on resilience such that differences in stress and emotion could be observed? Also, in the context of a 35-minute laboratory protocol, is it reasonable to observe immediate or full recovery from failure? These questions call into question the effectiveness of the measurement of resilience in sport and support the questioning of the time required to display resilience that has perplexed resilience researchers, regardless of discipline or context.

The specific purposes of this study are discussed in further detail in the following sections of this discussion. Each research finding is explained in relation to previous research and an explanation will be given as to why the results of this study were obtained. Finally, exploratory analyses will be discussed and suggestions for future research directions will be provided.

Purpose One: The Effect of Failure on Cortisol

The first purpose of this study was to examine the effect of failure on cortisol levels in high resilient, low resilient, and a control group of collegiate lacrosse players. It was hypothesized that there would be a significant group by time interaction for cortisol following failure, with the high resilient group having less cortisol after failure than the low resilient and control groups. The research hypothesis was not supported, as there was no statistically significant group by time interaction for cortisol levels from pre- to post-failure. Although high resilient individuals in the present study reduced their cortisol from pre- to postfailure in this study, low resilient individuals and control individuals lowered their cortisol as well. In fact, the mean cortisol value for low resilient individuals following failure was lower than the high resilient individuals. These results are, on the surface, counter to what one would expect individuals differing in psychological resilience to display following failure. According to previous research, high resilient individuals have the ability to perceive potentially stressful situations as manageable and not threatening, resulting in reduced anxiety and stress (indicated by heart rate) (Martin-Krumm, et al., 2003) as well as lower cortisol responses (Southwick, Ozbay, Charney, & McEwen, 2008).

In an attempt to explain the unexpected finding of no group differences in cortisol from prefailure to postfailure, several factors must be considered. The first factor to consider is the magnitude and value of the failure feedback given in this study. The second factor to consider is the measurement used to evaluate both cortisol and resilience. Finally, a third factor to consider is the concept of positive adaptation and the potential

use of psychological skills by the participants in this study to positively adapt to failure. Each of these factors will be examined in more detail in the following paragraphs.

It is possible that the participants did not place particular importance or find much meaning in the failure feedback provided following the first trial of the experimental task. The results of this study suggest that the failure feedback was potentially not meaningful to the participants because cortisol levels decreased in all participants. This finding could be due to the experiences and characteristics of the participants. Collegiate athletes make up less than one percent of all high school athletes (Coakley, 2009), a statistic that suggests collegiate athletes are high functioning, high achieving, and experienced individuals with a track record of athletic success. This fact could translate into collegiate athletes, in general, possessing more resilient tendencies than other athletes and could have confounded the results. Collegiate athletes are constantly training and practicing up to 20 hours per week on new skills and techniques where failure is a common occurrence in the learning process. Because failure on the experimental task was essential to creating adversity in this study, it is possible that failure on the experimental task was not perceived as adversity, but rather a commonplace experience for the participants. Collegiate athletes have a rich history of successes despite failures, which has been found to contribute to resilience in sport (Fletcher & Sarkar, 2012; Galli & Vealey, 2008).

In contrast to the response to failure, when approaching an unknown evaluative task, all participants increased in cortisol. This finding, although not statistically significant, was important because on average participants increased from baseline cortisol by 10.5% prior to participating in the experimental task. This finding, namely

using an unknown evaluative task to elicit a stress response, is supported by previous research (Dickerson & Kemeny, 2004). In a meta-analysis of 208 laboratory studies where acute psychological stressors were used to elicit a cortisol response, Dickerson and Kemeny (2004) found that uncontrollable and social-evaluative tasks were most effective in eliciting a large and sustained cortisol response. In the current study cortisol levels rose in all participants, but 15 minutes later cortisol decreased for all participants. Although the experimental task in this study was both uncontrollable (the participants did not know what the task was and were unable to prepare for it) and social-evaluative (they were being judged by others), cortisol response did not remain elevated following failure. In referring to the response to failure, once participants knew the nature of the task and had a second chance, it eliminated the uncontrollability of the task and may have decreased cortisol levels without the need of resilient qualities. Clearly, this is a potential limitation of this study.

The second factor to consider is the measurement of resilience and stress used in this study. Beginning with the measurement of resilience, although the CD-RISC 10 (Gucciardi, et al., 2011) has strong psychometric properties, experimental research using the CD-RISC 10 is missing from the literature. Because high and low resilient individuals in this study did not differ in key responses associated with resilience (stress and emotion) it is reasonable to suggest that the CD-RISC 10 did not adequately assess psychological resilience. Ideally, a psychological measure should not only have strong psychometric properties, but also predictive qualities. An individual scoring high on the CD-RISC 10 should experience adversity differently than someone with a low CD-RISC 10 score.

The experimental protocol was able to increase participants' baseline cortisol 10.5%, which is shy of the 15% marker that is indicative of a genuine stress response (Kirschbaum & Hellhammer, 1989); however, participants' perceived their performance as poor when given performance feedback. Despite these factors, which created a strong protocol, resilience appeared to not be influential in how participants reacted to failure.

This could be due to the lack of sport specificity of the CD-RISC or due to the average CD-RISC 10 score for the low resilient group. Low resilient individuals, despite scoring on average 10 points lower than high resilient individuals on the CD-RISC 10 scale, still scored around a 25 on the scale. According to the Likert-type Scaling this equates to an average response of "sometimes true." In essence, the characteristics listed in the CD-RISC 10 items were "sometimes true" in describing the low resilient group. If "low resilient" participants, in response to the scale items, were sometimes able to "bounce back from hardship" and sometimes able to experience "strengthening from stress," then it is plausible that the low resilient group was still somewhat resilient. It is possible that the CD-RISC 10 failed to adequately separate individuals for this study or that the items of the CD-RISC 10 might not have enough clarity for use in sport.

Theoretically, resilience is characterized by the ability to cope with adversity (Lepore & Revenson, 2006). Upon closer examination of the CD-RISC 10's items, one might question the construct validity of the CD-RISC 10. Only one item appears to be particularly aimed at stress: "Coping with stress can strengthen me." With only one item assessing stress verbatim in the CD-RISC 10, it is reasonable to question the extent it is able to accurately parse out individual ability to control stress. Other CD-RISC 10 items such as "I think of myself as a strong person when dealing with life's challenges and

difficulties," "I am not easily discouraged by failure," "I believe I can achieve my goals, even if there are obstacles," and, "I tend to bounce back after illness, injury, or other hardships," all make reference to experiencing adversity but are quite broad relative to what adversity is and are written quite generally. For example, "I tend to bounce back after illness, injury, or other hardships," is difficult to decipher from a coping perspective. "Bounce back" and "other hardships" are very broad terms. The CD-RISC 10 addresses adversity, which is central tenant of resilience, but fails in specifically targeting *how* individuals overcome adversity.

Another measurement to consider in this particular study was the use of salivary cortisol, a psychophysiological measure, to assess stress response. The chosen methodology was employed because it is a truer measure of physiological stress (Dickerson & Kemeny, 2004; Kirschbaum & Hellhammer, 1989) and immune to the self-report and social desirability biases associated with self-report assessments. However, a limitation of this study is that stress was only assessed physiologically, and perceptions of stress were unaccounted for in the results. In previous research examining resilience in sport, assessment of stress and coping has primarily been self-reported through psychological measures (Hosseini & Besharat, 2010; Mummery, Schofield, & Perry, 2004). However, one prior study examining resilience in sport employed heart rate (HR) as an indicator of stress following adversity (Martin-Krumm, Sarrazin, Peterson, & Famose, 2003). The present findings, that regardless of resilient qualities athletes have similar stress responses following failure, do not support previous research (Martin-Krumm, Sarrazin, Peterson, & Famose, 2003), which found significant differences in HR in high and low resilient participants following failure.

The third and final factor to consider when interpreting the cortisol results is the concept of positive adaptation and the potential use of psychological skills by the participants in this study to positively adapt to failure. Because all participants reduced their stress levels from prefailure to postfailure, it is plausible that all participants experienced positive adaptation and thus were resilient after failure despite scoring differently in resilient qualities. This conclusion is difficult to make even with the data illustrating that a majority of participants decreased in cortisol, as resilience research regarding time between adversity and positive adaptation varies (Bonanno, 2004; Lepore & Revenson, 2006). In this particular study, due to the constraints of salivary cortisol assays, there was a 15-minute delay from the time individuals were told that they failed on the task to when the participants were able to have a second trial. In the 15 minutes athletes were given, no physical practice occurred and participants were asked to wait in a sitting area.   It is possible that some participants had the ability to calm themselves, irrespective of their level of resilience, because 15 minutes without any influence is a generous amount of time to overcome a stressor.

Bonanno (2004) argued that positive adaptation is characterized by immediate recovery, whereas Lepore and Revenson (2006) argued that eventual recovery and growth from stress are indicative of positive adaptation, regardless of time. Although there is no true consensus in the literature as to when positive adaptation must or does occur, if following Bonanno's parameters, this study most likely failed in adequately assessing stress immediately after adversity was created. However, if following Lepore and Revenson's parameters for positive adaptation, it is plausible that all participants achieved positive adaptation. All participants prior to their second trial on the

performance task were able to not only recover from stress, but to lower their stress from their first trial.

The potential use of psychological skills by the participants might be an explanation of why all participants were able to reduce their stress. Previous research supports the use of psychological skills as important in developing and exhibiting resilience. For example, Fletcher and Sarkar's (2012) model of the resilience process in Olympic gold medalists suggests that Olympians processed adversity through a variety of mental skills. Likewise, Galli and Vealey's (2008) model of psychological resilience in elite athletes suggests that athletes utilize both cognitive and behavioral coping strategies, two foundational components of psychological skills training in the field of sport psychology. Psychological skill usage was not controlled for in this study, as physical practice was, and may have contributed to all groups possibly achieving positive adaptation. The participants of this study were all collegiate lacrosse athletes, making the sample fairly skilled in their sport. Given the sample's extensive experience in lacrosse, it is possible that the participants developed some mental skills competencies over the course of their playing careers.

Purpose Two: The Effect of Failure on Emotion

The second purpose of this study was to examine the effect of failure on emotional responses in high resilient, low resilient, and a control group of collegiate lacrosse players. Emotional response was conceptualized by four variables: positive affect, negative affect, pride, and shame. It was hypothesized that high resilient individuals would have more positive affect and pride, and less negative affect and shame

following failure than those individuals low in resilience. The results indicated no significant group by time interactions for any of the emotion variables from prefailure to postfailure in this study. There were significant main effects for time for all groups on positive affect, negative affect, pride, and shame. All participants decreased in pride and positive affect from prefailure to postfailure and increased in shame and negative affect. Resilience appeared to be nonsignificant in contributing to group differences among the emotional response variables.

The hypotheses for this study were derived from previous literature suggesting that resilient individuals experience more positive emotions and fewer negative emotions when faced with adversity (Bonanno, 2004; Galli & Vealey, 2008; Ong, Bergeman, Bisconti, & Wallace, 2006; Tugade & Fredrickson, 2004, 2007; Waugh, Wagner, Fredrickson, Noll, & Taylor, 2007). The results of this study did not support that notion. Although this study did not achieve statistically significant differences between high and low resilient individuals, the mean scores for positive affect, negative affect, pride, and shame all trended in the hypothesized directions (Bonanno, 2004; Tugade & Fredrickson, 2004, 2007; Waugh, Wagner, Fredrickson, Noll, & Taylor, 2007). Specifically, the high resilient group had higher postfailure means for pride and positive affect and lower postfailure means for shame and negative affect than the control and low resilient groups.

Again, similar to the stress response results, the emotional response results of this study did not support previous literature. When interpreting the results of this study, the nature of previous resilience and emotion research, the measurement of resilience, and the individuality of emotions are all potential contributing factors to consider.

The first factor to consider in interpreting these results is the nature of previous research examining the role of emotions and psychological resilience, which is largely based on recall. Waugh, Tugade, and Fredrickson (2008) caution resilience researchers that experimental evidence is needed to support their research claims about the powers of emotions in building or inhibiting resilience. Waugh and colleagues implored future researchers to move away from recall studies of stressful events and use laboratory interventions for anticipated stressors. This study was an attempt to address these suggestions and fill the noted gap in the literature. The experimental protocol was efficient in providing a stressful experience (as evidenced by several fidelity checks). It is possible that in retrospect, a stressful experience might feel more arduous than it truly was at the time. Recalling that a stressful life experience was more emotionally taxing than it truly was would in effect serve to boost self-perception. Most adverse situations are navigated and if one inflates the negative emotion attached to the experience, then one's ability to successfully cope with the experience becomes even more astonishing. Alternatively, in the moments directly following adversity (as in this study) individuals may be more apt to downplay the emotional toll of the event in order to preserve their sense of self.

As mentioned previously, it is possible that after experiencing the first trial of the difficult task all the participants were able to calm themselves and regain emotional control within the 15-minute time gap preceding measurement. Cortisol and emotion measures were taken simultaneously, and thus the emotion scores were coordinated with the cortisol level. Of note is that despite an increase in negative emotions and a decrease

in positive emotions for both high and low resilient individuals, stress did not increase as cited in previous work by Waugh and colleagues (2007).

Whereas past research has been primarily recall, the results of this study contradict previous literature examining emotions and resilience. Specifically, previous literature purports that positive emotions are important contributors to exhibiting resilience. In contrast, negative emotions are considered barriers to exhibiting resilience. For example, Tugade and Fredrickson (2007) suggest that positive emotions facilitate effective coping when an individual is faced with adversity and is a characteristic of resilient behavior. Also supporting the importance of positive emotions is the work of Ong and colleagues, who found that positive emotions contribute to the effective emotion management necessary for resilient individuals to overcome adversity (Ong, Bergeman, Bisconti, & Wallace, 2006). Previous literature has also cited the importance of negative emotions in preventing an individual from displaying resilient qualities after a set back. Specifically, less resilient individuals under stress tend to adopt a pessimistic outlook and expect the worst outcome to occur (Waugh, Wagner, Fredrickson, Noll, & Taylor, 2007). Physiologically, when less resilient individuals express pessimism, they experience increased stress.

Resilience research in the sport context also supports the importance of emotions in the resilience process. In the model of resilience by Galli and Vealey (2008), the ability to experience negative or unpleasant emotions and subsequently overcome them with various resources is central to exhibiting resilience. In this particular study, the results illuminate the fact that all participants experienced an increase in negative emotions and a decrease in positive emotions following the occurrence of adversity.

According to Galli and Vealey, negative and unpleasant emotions are experienced but eventually overcome. In the current study, the results show an increase in negative emotions in the 15 minutes between trial one of the task and trial two. This result could mean that resilient individuals, while physiologically able to recover, might take more time to emotionally recover. Despite the increase in negative emotions, a positive outcome emerged in the form of consistent performance from trial one to trial two. The conflicting results suggest further research is needed to investigate how and when positive adaptation occurs.

The results of this study beg the question: Is it necessary to completely rid oneself of negative emotions in order to exhibit resilience? The findings in this particular study were only recorded in a 35-minute time frame, which is a quick time period to evaluate recovery from adversity. However, in the course of a lacrosse game, athletes constantly experience adversity in the form of poor passes, poor shots, committing penalties, playing poor defense, and other behaviors that contribute to a team losing a game. It would be expected that athletes, in order to continually contribute to their team winning, would need to overcome these adversities quickly. In this study, it appears participants still experienced negative emotions more than before the experiment began. The results of this study thus question Galli and Vealey's model because negative emotions persisted after failure and yet performance did not decline. It could be that emotions are not a definitive factor in overcoming adversity and exhibiting resilience. It is also possible that emotions are very much an individual experience that are difficult to solidify as typical responses for all individuals given adversity.

The second factor to consider regarding the present study is the measurement of resilience and emotion. As noted previously (see the cortisol discussion in previous section), the CD-RISC 10 was utilized to screen individuals for their self-reported resilience and may not have accurately assessed resilience. Although issues related to how well the CD-RISC 10 assessed stress management abilities were previously discussed, similar issues regarding the assessment of emotional management should also be examined. There are two CD-RISC 10 items that mention the role of emotions in exhibiting resilient characteristics: "I am able to handle unpleasant or painful feelings like sadness, fear and anger" and "I try to see the humorous side of things when I am faced with problems." There are two problems with these items. First, with only two items assessing emotion regulation as part of resilience, it is plausible that the CD-RISC 10 does not accurately capture the role of emotions in facilitating resilience. The second problem to consider regarding these items is the adjectives used to describe emotions and whether or not these emotions are relevant for sport participants. "Sadness, fear, anger, and humor" are the specific words participants completing the CD-RISC 10 are prompted with when considering their experiences in sport and how well they can manage these emotions. There is a possibility that the CD-RISC 10 prompts participants to only think about these emotions rather than other emotions that could be more relevant to the participants, such as frustration, helplessness, and worry, thus potentially confounding the measure of resilience for sport.

How resilience is measured in this study in comparison to previous research assessing resilience in an experimental setting (Martin-Krumm, Sarrazin, Peterson, & Famose, 2003) is also important to examine. Martin-Krumm and colleagues (2003)

operationalized resilience using explanatory style, a trait-like disposition wherein individuals are considered either optimistic or pessimistic depending on their attributional style. If an individual perceives he or she can control the outcome, then he or she is said to be optimistic in explanatory style. Martin-Krumm and colleagues found in their work that children who adopted an optimistic explanatory style were more likely to match or increase their performance on a task after receiving false feedback that their first trial was a failure.

The present study employed a construct specific measure of resilience where characteristics of resilient individuals were assessed. These characteristics are not permanent and can be gained or lost (Connor & Davidson, 2003). It could be that emotional responses are not filtered through resilience or mental skills, two malleable factors, but are due to personal dispositions of optimism or pessimism. This is an important point to consider regarding emotions and performances in sport. Emotions are immediate reactions to stimuli in the environment and impact how an individual perceives a performance, where an individual is evaluated and achieves an outcome of success or failure. Despite having high resilient tendencies or characteristics, an individual who cares about an activity, like a high achieving athlete, should respond with immediate displeasure and sadness regarding a failure. A dispositional trait such as optimistic explanatory style might filter emotional responses a bit better than resilience because explanatory style is a more consistent trait that influences an individual's perception. Indeed, previous research cites that appraisals of events are important (Tugade & Fredrickson, 2004) in facilitating positive emotions to exhibit resilience. Because emotions are immediate responses, the time to exhibit positive adaptation

following failure becomes an interesting point to again reconsider. Although there is no strict guideline as to how long it takes an individual to process emotions, understanding emotional recovery might lead to a better understanding of when positive adaptation occurs following adversity.

The final factor to consider when interpreting the results of this study is the individuality of emotions. Referring to Table 4.1, there is great variability in responses across time for emotion as measured with the PANAS and for the specific emotions of pride and shame. The standard deviations accompanying the means across time in Table 4.1 fluctuate from a quarter point to four points for pride and shame and from just under four points to over 10 for positive and negative affect. These standard deviations point towards great individuality in experiencing emotions from prefailure to postfailure, regardless of self-reported resilience.

Tugade and Fredrickson (2004), although lauding the role of positive emotions in resilience, do cite the notion that emotional intelligence also influences an individual's ability to cope and exhibit resilience. Emotional intelligence is an individual ability to monitor one's feelings and emotions while considering other people's emotions, resulting in appropriate thinking and behaviors to meet specific situations (Salovey & Mayer, 1990). It is important to note that emotional intelligence is an individualized ability, and that individual differences are important to consider when evaluating how an individual processes situations (Tugade & Fredrickson, 2004). This point supports the previous notion that because emotion is an immediate response, filtering emotions through the process of resilience may not be appropriate. Indeed, Tugade and Fredrickson (2004) examined resilience as a trait when evaluating the role of positive emotions in aiding the

ability to be resilient during stress. Because this study employed resilience as a process and examined malleable resilient characteristics, without a tighter emotion range across time, it appears the CD-RISC 10 fails to adequately capture emotion consistently in an experimental setting and thus making the interpretation of the results difficult.

In summary, despite the results of this study deviating somewhat from previous literature, the experimental nature of this study should be strongly considered before ignoring these findings. Without a strong base of experimental research on resilience and emotions, it is hard to immediately refute these findings. However, it is also hard to immediately accept these findings. One aspect of traditional resilience research that is different from this study is the fact that studies of resilient children involved repeated exposure to adversity and stressors over the course of many years. This study only exposed participants to one instance of adversity. Future research should consider longitudinally following athletes through several instances of failure to better understand the processing of emotions in exhibiting resilience. It can be concluded that more research is necessary to further understand how emotions influence the resilience process.

Purpose Three: The Effect of Failure on Performance

The third, and final purpose of this study was to examine the effect of failure on performance in high resilient, low resilient, and a control group of collegiate lacrosse players. The research hypothesis stated that there would be a significant difference in performance on the experimental task, with the high resilient group having better performance post failure than the low resilient and control groups. The results of this study found no statistically significant group differences on performance from trial one to

trial two. There was practical significance as the high resilient participants performed almost a full point better than the low resilient participants on trial two. Additionally, the high resilient participants increased their shot percentage by about six percentage points whereas the low resilient group increased their shot percentage by roughly three and a half percentage points. Although these gains seem trivial, the task the participants performed in this study was much different from any other drill or activity they performed previously. For example, participants bounced lacrosse balls into targets off of a hard racquetball surface rather than a grass or turf field where lacrosse is played. Additionally, all shots had to be bounce shots, where the ball had to hit the ground before it counted, a shot not often taken in lacrosse and a purposefully designed component of this study to eliminate bias towards offensive players. Without prior knowledge of the task and no practice in between trials, the performances measured on the task in this study were an accurate gauge on an individual's ability to adapt to a difficult situation and have to succeed. Finally, college athletes were the participants in this study. Because college athletes are generally quite experienced and practiced in their specific sports, the performance gains are significant as athletic improvements are difficult to obtain at high levels of sport. Any gains are thus practically significant.

The performance results observed in this study are similar to the results of Martin-Krumm and colleagues' (2003) study examining basketball dribbling in school children after failure. In their study, participants were as fast or faster on a second trial of a basketball dribbling task than on their first trial despite failing. In comparison, this study found performance increased for the high resilient group following failure, but surprisingly performance also increased for the low resilient group. Overall the

performance gains were greater for the high resilient group. A possible explanation for both groups increasing in their performance is that cortisol also decreased result from this study. Both the high and low resilient groups decreased in cortisol from prefailure to postfailure, a result contrary to the hypothesized outcome. Cortisol is well documented as a detriment to performance if increased (Filaire, Alix, Ferrand, & Verger, 2009; Morgan III, et al., 2004). Because both groups were able to decrease their cortisol levels prior to the second trial, it is reasonable to assume that the decreased stress response contributed to an increase in performance for both high and low resilient individuals.

What remains uncertain is what contributed to high resilient individuals increasing their performance more than low resilient individuals. Martin-Krumm and colleagues' (2003) operationalized resilience as positive explanatory style, or the ability to not attribute performance issues to an individual's inadequacies but to controllable factors that can be improved. Positive explanatory style was not accounted for in this study and could contribute to an increase in performance. Future research should consider other constructs, such as grit and motivational dispositions, in trying to understand why some individuals improve following failure whereas others do not.

Exploratory Question One: Group Differences on Cortisol and
Emotion in Response to Stress

In addition to the research hypotheses examining the differences between high and low resilient individuals on cortisol and emotion following failure, this study also explored how high and low resilient individuals change in cortisol and emotion when presented with an unknown stressful evaluative task. Much like the reactions to failure, there were no significant group by time interactions for cortisol, positive affect, pride,

and shame for high and low resilient athletes from baseline to prefailure. However, there was a significant group by time interaction from baseline to prefailure on negative affect. High resilient individuals, when given a stressful situation decreased in negative affect from baseline to prefailure whereas low resilient individuals increased in negative affect. It appears that low resilient athletes approach a potentially stressful and threatening situation with negative emotions such as pessimism, anger, and fear while high resilient individuals decrease their negative affect. It is from baseline to prefailure where resilience, as assessed by the CD-RISC 10, had the greatest influence in this study.

Although prior research on emotions and resilience primarily examined reactions to adversity, the literature on emotions cites that a defining factor for individuals who exhibit resilience is not the absence of negative emotions but experiencing less negative emotions (Tugade & Fredrickson, 2007). In this particular study, it appears that resilient individuals do experience fewer negative emotions, but prior to a stressful task rather than after failure. When examined simply, even if an individual is a high resilient individual and given failure feedback, he or she is not going to completely ignore that feedback and immediately think everything is well. Because resilient individuals are vested in their activities and have a desire to continue an activity and adapt, much care is taken when poor performance feedback is received. However in this study, it was observed that negative emotions in high resilient individuals were significantly reduced prior to a stressful event.

This finding is important as high resilient individuals performed slightly better on trial one of the task in comparison to low resilient individuals. In terms of general performance, it appears on the surface that reducing negative emotions prior to an

unknown and stressful task could lead to a better performance. Resilience appears to be a good resource to prepare individuals for a single trial or tryout experience, as resilient characteristics contributed to less negative affect and better performance on the task at trial one. Because many instances of sport performance and evaluation result in a single performance opportunity, understanding and cultivating resilience might help individuals perform and feel better in single evaluative tasks.

Exploratory Question Two: Group Differences on Cortisol and
Emotion in Response to Success

In order to truly understand the impact of resilience it is important to examine responses to success. This tact is novel to the resilience literature. In this study, a small subset of 15 individuals were given not only failure feedback, but also success feedback on an agility test to better understand how high and low resilient individuals respond to success feedback. In assessing participants' stress and emotion response to success, no significant group by time interactions or main effects emerged.

Although there were no statistically significant results in participants' reactions to success, the data show that on the whole, success feedback in an evaluative situation provides neither relief from negative emotions nor an increase in positive emotions. In examining the specific data points for success further, the standard deviations are quite large for such a small sample size. With a lot of variability in the sample, it can be concluded that there is no uniformity among high or low resilient individuals in responding to success. Rather, the response to success was quite individual. With a larger sample size, it is possible that a more uniform response to success may emerge, but this point is speculative. Given that college athletes were participants in this study, there are a

lot of factors in place that could "numb" individuals to success since achievement is an underlying characteristic of college athletes. For example, scholarships, playing time, starting status, and roster positions are all factors student-athletes worry about in regard to their athletic achievements. Scholarships are only an annual commitment and are not guaranteed for the entire time an athlete is in college, another stressor. It appears that college athletes remain alert and concerned with their athletic participation even when given feedback that they performed well. Athletes are socialized to not rest on their laurels (i.e., success) and to not gloat following a good performance. Furthermore, most athletes expect some form of critique, even following a successful performance. A coach may give an athlete a high five for a good play but it will almost certainly be followed by a correction of some sort. Thus, the athletes in this study may have been biding their time, emotionally, rather than reacting with positive emotions following success.

Summary

This study found that individuals, regardless of perceived resilient qualities, reacted similarly to failure. All participants were able to reduce their stress after failing on the task. All participants experienced more negative affect and shame and less positive affect and pride after failing on the task. On the surface, it appears that individuals are able to adapt positively in their stress response, but adapt negatively in their emotional responses to failure. This study also found that individuals high in resilient qualities approached the experimental task with less negative affect, whereas individuals low in resilient qualities approached the experimental task with more negative affect. Resilient characteristics might be more effective in accounting for how individuals appraise a

stressful situation rather than predicting and accounting for different behaviors following

adversity.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, AND

RECOMMENDATIONS FOR FUTURE

RESEARCH

<u>Summary</u>

The overall purpose of this study was to examine differences in cortisol, emotion,

and performance among high resilient, low resilient, and control groups in response to

failure. A mixed repeated measures field laboratory experimental design was employed.

Male and female lacrosse players ($N = 116$) completed assessments of resilience and a

demographics questionnaire during participant recruitment. In order to categorize

participants as high or low in resilience, the CD-RISC 10 was scored and +/- one standard

deviation split from the sample mean score and was employed to create high resilient ($n=$

18), low resilient ($n= 18$), and control ($n= 17$) groups. The experiment had three time

points: baseline, prefailure, and postfailure. Participants provided samples of cortisol (via

saliva) and completed self-report measures of emotion (positive and negative affect, pride,

and shame) for each time point between 3pm and 6pm. Baseline data were collected prior

to reporting to the study. Prefailure data were collected at the study site after participants

were introduced to the unknown evaluative task they would complete. The task consisted

of a timed novel lacrosse shooting exercise where participants have to shoot bounce shots to specific targets for 60 seconds. After the task, all participants were given failure feedback. Postfailure data were collected after failure feedback and participants completed one more trial of the task. An additional, exploratory protocol was also administered. A small subsample of 15 participants (high resilient, $n= 4$; low resilient, $n= 5$; control, $n= 6$) were evaluated on cortisol and emotional response to success feedback on a different task. The success condition was counterbalanced with the experimental protocol to avoid testing effects. Cortisol and emotion were assessed pre-success and post-success.

The data were analyzed using SPSS 20.0 and cortisol was analyzed using a Finstruments ® Multiskan Model 346 plate reader from MTX Lab Systems Inc. Distinct 3X2 (Group X Time) mixed repeated measures Analyses of Variance (ANOVAs) were calculated to answer the primary and exploratory research questions. A Holm-Bonferoni adjustment for each set of repeated measures ANOVAs was employed in order to control for Type I error.

<div align="center">Findings</div>

There were not significant group by time interactions from prefailure to postfailure for cortisol, emotion, or performance. These findings contradicted the major hypotheses of the study. However, there were significant main effects for time for all groups on cortisol, positive affect, negative affect, pride, shame, and performance from prefailure to postfailure. Essentially, all groups irrespective of resilience score behaved similarly when faced with failure.

In relation to the exploratory analyses, no significant group by time interactions were found with the exception of negative affect. Interestingly, high resilient and control groups decreased in negative affect from baseline to prefailure whereas the low resilient group increased. Also, there was a significant main effect for time for all groups on pride from baseline to prefailure. High resilient, low resilient, and control groups all decreased in pride from baseline to prefailure. Finally, there were no significant findings for all groups from presuccess to postsuccess on cortisol and emotion.

Conclusions

High resilient, low resilient, and control groups experienced similar stress and emotional responses to failure. Conceptually and empirically, possessing resilient qualities should differentiate individuals' responses to adversity. Specifically, resilient qualities enable an individual to react to adversity with less stress and negative emotions and more positive emotions. In comparison, individuals with less resilient qualities should experience more stress and negative emotions as well as less positive emotions. In the context of this study, resilient qualities did not influence how individuals responded to failure. Negative performance feedback impacted the performers similarly.

It is possible this study did not adequately capture individuals with low resilient qualities given the mean of the low resilient group. Also, the sample size for this study was small and may not have adequately powered all of the statistical analyses. Finally, it is possible the CD-RISC 10 is not a predictively valid measure of resilience. Given these limitations, these conclusions should be interpreted carefully.

One area where resilient qualities appear to have differentiated individuals is in the appraisal of an unknown stressful evaluative task. This study found that individuals high in resilient qualities approached the experimental task with less negative affect, whereas individuals low in resilient qualities approached the experimental task with more negative affect. These results support the Broaden and Build Theory of Positive Emotions (Fredrickson, 2001), which posits that reducing negative emotions and increasing positive emotions increases an individual's awareness and encourages clearer thinking when faced with difficulty, a critical component of exhibiting psychological resilience. This result suggests that resilient qualities influence an individual's appraisal and approach to a stressful situation rather than a reaction to failure.

All participants exhibited a reduced stress response from prefailure to postfailure. Stress was reduced for the participants, so it can be assumed that positive adaptation occurred in the 15 minutes following adversity. Is it possible, that positive adaptation, a hotly contested topic from several resilience scholars (Bonanno, 2004; Lepore & Revenson, 2006), occurred for these athletes within 15 minutes of failure? If this is truly the case, then when do high resilient and low resilient individuals exhibit poststress recovery? Understanding when and how positive adaptation occurs is a suitable question for future research, the results of which might help coaches understand how much time an athlete needs to overcome adversity.

<u>Practical Applications</u>

Psychological resilience is a highly desirable characteristic that sport psychology consultants and coaches wish to instill and develop in their athletes, but the study of

psychological resilience in sport is quite limited. The results of this study contribute to the limited understanding of psychological resilience in sport. In examining the stress response, all participants were able to reduce their stress after failing on the task. In examining emotional response to stress, all participants experienced more negative affect and shame and less positive affect and pride. On the surface, it appears that individuals are able to adapt positively in their physiological stress response but tended to adapt negatively in their emotional responses to failure. Consultants and coaches can use these results by focusing on helping athletes recover emotionally following failure.

Although psychological resilient characteristics do not appear to contribute to differences in how individuals react to adversity, resilient characteristics do contribute to differences in how individuals appraise and approach potentially stressful situations. Specifically, individuals who rated themselves highly in resilient qualities were more likely to approach and appraise a stressful task with less negative affect than those low in resilient qualities. Fostering resilience in athletes might foster their ability to approach competition and stressful situations better. Specifically, consultants and coaches can help athletes appraise stress with less negative affect when they are about to experience adversity. These characteristics appear to be important in facilitating less negative emotions, which previous research attributes to exhibiting psychological resilience during difficult times (Waugh, et al., 2007).

Positive emotional characteristics are also supported by research conducted by Schinke and Jerome (2002), who focused on developing three general optimism skills in order to develop psychological resilience in athletes: (a) evaluating personal assumptions, or sequentially analyzing the causes of particular behaviors and recognizing the cause of

both good and bad behaviors, (b) disputing negative thoughts, or identifying negative and

permanently uncontrollable affirmations and disputing these affirmations and thoughts

with positive counter affirmations, and (c) decatastrophizing, or recognizing thoughts of

inability and possible negative outcomes prior to or during performances and considering

better alternatives. By fostering these cognitive skills in elite athletes and coaches,

Schinke and Jerome (2002) found promising results in the athletes they worked with,

including increased performance and greater ability to be resilient in their thinking

through increased optimism. Focusing on creating dispositional optimism may be

effective in developing resilience in athletes and should be considered as a practical

application of this research since specific resilient characteristics did not account for the

ability to emotionally recover from failure.

<div align="center">Recommendations for Future Research</div>

The findings from this study illustrate that individuals experiencing failure

respond similarly, regardless of psychological resilience. These findings do not support

previous research, but do bring to light the question of when positive adaptation occurs or

how long positive adaptation takes to occur. There are several areas for future research.

1. The use of the CD-RISC 10 as a screening tool with collegiate athletes did not

    appear to adequately differentiate individuals with respect to psychological

    resilience. It could be that athletes were all generally more resilient than most, the

    CD-RISC 10 may an imperfect measure to use with athletes, despite generally

    sound psychometric properties. Future research should consider improving upon

the CD-RISC 10 with the creation of specific items targeting the sport context and positive adaptation following failure and establish cut-off points for low resilience.

2. The use of collegiate athletes for this study may have confounded the results since collegiate athletes could be more resilient than most athletes. Future research should consider studying different ages of athletes and different sports.

3. This study was conducted in a laboratory with a fake task to create stress in athletes. It could be that athletes did not take the task seriously after initially completing one trial. Because salivary cortisol is a generally mobile collection mechanism, future research may want to track stress and emotional responses to failure during a real tryout for athletes in a youth sport league for instance. Examining an authentic task with real consequences may more accurately address the questions of interest.

4. Previous research involving resilience from developmental psychology followed children who were repeatedly exposed to stress and adversity over time. It could be that this study failed to adequately capture resilience because this was one stressor at one time in the life of the participants. Future research may want to consider examining resilience longitudinally in sport to better capture this phenomenon.

5. Positive adaptation is a concept from resilience literature that many researchers and scholars debate. This study contributes to the elusive nature of truly understanding positive adaptation because participants exhibited positive physiological adaptation but negative emotional adaptation following failure. Data were captured within 15 minutes of adversity. Is it possible that resilience

happens in 15 minutes? How long does it take to emotionally recover from adversity? Is returning to baseline levels of stress and emotion adequate for positive adaptation or does psychological growth need to occur? These are specific questions that future researchers should consider when trying to further understand positive adaptation and resilience.

APPENDIX A

INSTRUMENTS AND MEASURES

Demographics Questionnaire

Name: _____

Email: _____

School: _____

Sex (circle one):   Female   Male

Age: _____ years

Year in college (circle one):   Freshman   Sophomore   Junior   Senior   Graduate

Position: _____

Starter: Yes   No

Years Playing Lacrosse: _____

Do you have a neuroendocrine disorder?   Yes   No

Do you use tobacco products?   Yes   No

Do you take prescription medications?   Yes   No

Race (Indicate which of the following best describes you)

_____*American Indian*

_____*Asian*

_____*Black or African*

_____*Native Hawaiian or Pacific Islander*

_____*White*

_____ *Other*: *please indicate*_____

Select your ethnicity.

_____*Hispanic*

_____ *Latino/ Latin American*

_____*Not Hispanic or Latino*

CD-RISC 10

Please indicate how much you agree with the following statements as they apply to you. If a particular situation has not occurred recently, answer according to how you think you would have responded.

1. I am able to adapt when changes occur.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

2. I can deal with whatever comes my way.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

3. I try to see the humorous side of things when I am faced with problems.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

4. Having to cope with stress can make me stronger.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

5. I tend to bounce back after illness, injury, or other hardships.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

6. I believe I can achieve my goals, even if there are obstacles.

0	1	2	3	4

	Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

7. Under pressure, I stay focused and think clearly.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

8. I am not easily discouraged by failure.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

9. I think of myself as a strong person when dealing with life's challenges and difficulties.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

10. I am able to handle unpleasant or painful feelings like sadness, fear and anger.

0	1	2	3	4
Not true at all	Rarely True	Sometimes True	Often true	True Nearly All the Time

The Positive and Negative Affect Schedule (PANAS)
This scale consists of a number of words that describe different feelings and emotions.
Read each item and then mark the appropriate answer in the space next to that word.
Indicate to what extent you feel at this moment now about your sport participation.

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

___ interested
___ distressed
___ excited
___ upset
___ strong
___ guilty
___ scared
___ hostile
___ enthusiastic
___ proud
___ gratified
___ embarrassed

___ irritable
___ alert
___ ashamed
___ inspired
___ nervous
___ determined
___ attentive
___ jittery
___ active
___ afraid
___ satisfied
___ humiliated

<u>Manipulation Check</u>

How would you categorize your performance? (circle one)

Rather Good   or   Rather Poor

<u>Saliva Collection Instructions</u>

In this plastic bag you will find a cotton swab in a plastic collection tube. You are going to be asked to provide two saliva samples on separate days from 3:00 pm to 6:00 pm where you will insert the cotton swab in your mouth underneath your tongue for 60 seconds. After 60 seconds, you will place the cotton swab the plastic tube provided and seal the plastic bag shut. Once the plastic bag is sealed, take your sample and refrigerate it until you are to report to the lacrosse shooting task.

It is absolutely vital that you:

1. Do not eat anything for 2 hours prior to taking your sample (stop eating around 1-2pm).
2. Do not floss or brush your teeth.
3. Do not smoke, chew, or drink alcohol or citrus products for 24 hours.
4. Stop drinking water at least 10 minutes before you take your samples.

REMEMBER TO BRING YOUR SAMPLE WHEN YOU REPORT TO THE GYM
FOR THE LACROSSE TASK!

Any questions or lost collection devices please call: (814) 244-3094
Stephen P. Gonzalez

APPENDIX B

EXPERIMENTAL SCRIPT

Dissertation Script

Hello. Welcome to the lacrosse skills test study. My name is Stephen and I will be your proctor today. Before I introduce you to the task, can I please take your survey (emotion measure) and your saliva sample please?

Ok, today you will be performing a lacrosse shooting task from that line (points to the line) to that net with the shooting mat on it. Your task will be to shoot as many balls as you can for 90 seconds and make as many shots as possible. You will shoot in the following pattern: Starting with the upper left hand corner hole, working your way down the left to the left middle hole, lower left hole, across the bottom to the middle hole, then lower right corner hole, middle right hole, upper right hole. The goal is to make a "U" shape. You must bounce the ball on the ground first and you must score in order. You cannot move on until you score on the intended hole.

If you complete a full cycle on bounce shots, then you may proceed in the same pattern but with shots on the fly. Should you complete this, you will go back to bounce shots again and in the same pattern. Do you understand?

It is important that you do your very best on this task. The coaching staff is interested in everyone's performances and coaches might make playing time, starting status, and roster decisions based on your performance. You have 10 minutes to warm-up.

(After 10 minutes, collect saliva and affect measure).

When I say go, you will have 90-seconds. Go.

Ok, you made a total of ___ shots. Your performance failed to meet the collegiate standard on this task. I'm afraid you fail the task. Take a minute to compose yourself.

Since you failed, I am going to give you another 90-second trial. Take 15 minutes to get ready to shoot again.

(After 15 minutes, collect saliva and affect measure).

What I say go, you will have 90-seconds once again. Same instructions. Go.

Alright, nice job. Ok, here is a debriefing sheet for you which will summarize what I am about to tell you. This task wasn't a test of a new lacrosse talent identifying skill but was a study of failure on stress, emotion, and performance in individuals who are resilient versus not resilient and a control group. The control group was not told they failed the task. The initial questionnaire you filled out was a test of resilience which separated participants into a high group, low group, or a control group. I was interested in seeing how more resilient players handled failure compared to less resilient athletes. The saliva

samples you gave were used to assess cortisol, which is a physical marker of stress in the body. All of your information will be kept confidential and locked in a laboratory. You coaching staff will not have access to your performance data and your playing time, roster spots, or starting status was not affected by participating in this study. If you wish to be removed from the study, let me know or if you have any questions or comments do not hesitate to ask.

Your performance data will be shared with you when the data is analyzed and I would be happy to sit with you and discuss your results as well as how to enhance your handling of failure to better your performance. I am happy to provide sport psychology consultations to you as a thank you for your participation in this study.

It is absolutely VITAL that you do not speak to your teammates about this project until it is over, as it might compromise the results.

Thank you so much for participating!

REFERENCES

Ahern, N. R., Kiehl, E. M., Sole, M. L., & Byers, J. (2006). A review of instruments measuring resilience. *Issues in Comprehensive Pediatric Nursing, 29*,103–125. doi: 10.1080/01460860600677643

Antonovsky, A. (1987). *Unraveling the mystery of health - How people manage stress and stay well*. San Francisco: Jossey-Bass Publishers.

Apfelbaum, J. (2007). *The gigantic book of golf quotations: Thousands of notable quotables from Tommy Armour to Fuzzy Zoeller* (1st ed.). New York: Skyhorse Publishing.

Baruth, K.E., & Caroll, J.J. (2002). A formal assessment of resilience: The Baruth Protective Factors. *Journal of Individual Psychology, 58,* 235-244. Retrieved from http://www.utexas.edu/utpress/journals/jip.html#684

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4,* 561-571. doi: 10.1001/archpsyc.1961.01710120031004

Block, J. (1978). *The Q-sort method in personality assessment and psychiatric research.* Palo Alto, CA: Consulting Psychologists Press. (Original work published 1961)

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *The Minnesota Symposia on child psychology* (Vol. 13, pp. 39-101). Hillsdale, NJ: Erlbaum.

Bonanno, G. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist, 59,* 20-28. doi: 10.1037/0003-066X.59.1.20

Charney, D. S. (2004). Psychobiological mechanisms of resilience and vulnerability: Implications for successful adaptation to extreme stress. *American Journal of Psychiatry, 191,* 195-216.

Coakley, J. (2009). *Sports in society: Issues and controversies (10th Ed.).* New York: McGraw Hill.

Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety, 18,* 76-82. doi: 10.1002/da.10113

Cox, R. H. (2002). *Sport psychology: Concepts and applications (5th Ed.).* New York: McGraw Hill.

Deci, E. (1980). *The psychology of self-determination.* Lexington, MA: Heath, Lexington.

Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society. Series B (Methodological)*, *39*, 1-38. Retrieved from http://www.jstor.org/sici?sici=0035-9246%281977%2939%3A1%3C1%3AMLFIDV%3E2.0.CO%3B2-Z

Detling, N.J., Smith, A.M., Nishimura, R., Keller, S., Martinez, M., Young W., & Holmes, D. (2006). Psychophysiologic responses of invasive cardiologists in an academic catheterization laboratory. *American Heart Journal, 151*(2)*,* 522-528. Retrieved from http://www.ahjonline.com

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*, 355-391. doi: 10.1037/0033-2909.130.3.355

Duckworth, A. L., Kirby, T., Tsukayama, E., Berstein, H., & Ericsson, K. (2011). Deliberate practice spells success: Why grittier competitors triumph at the National Spelling Bee. *Social Psychological and Personality Science, 2*, 174-181. doi: 10.1177/1948550610385872

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (Grit-S). *Journal of Personality Assessment, 91*, 166-174. doi: 10.1080/00223890802634290

Fawcett, T. (2011). Mental toughness: A phenomenological perspective. . In D. F. Gucciardi & S. Gordon (Eds.) *Mental toughness in sport: Developments in research and theory* (pp. 9-29). Abingdon, United Kingdom: Routledge.

Feldt, T., Kokko, K., Kinnunen, U., & Pulkkinen, L. (2005). The role of family of origin and career background in the development of sense of coherence. *European Psychologist, 10,* 298-308. doi: 10.1027/1016-9040.10.4.298

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed). Thousand Oaks, CA: Sage Publications.

Filaire, E., Alix, D., Ferrand, C., & Verger, M. (2009). Psychophysiological stress in tennis players during the first single match of a tournament. *Psychoneuroendocrinology, 34,* 150-157. doi: 10.1016/j.psyneuen.2008.08.022.

Fletcher, D., & Sarkar, M. (2012). A grounded theory of psychological resilience in Olympic champions, *Psychology of Sport and Exercise*, *13*, 669-678. doi: 10.1016/j.psychsport.2012.04.007.

Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dyamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, *50,* 992-1003. doi: 0022-3514/86/$00.75

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*, 218-226. doi: 10.1037//0003-066X.56.3.218

Fredrickson, B. L. (2005). The broaden-and-build theory of positive emotions. In F. A. Huppert, N. Baylis, & B. Keverne (Eds.) *The science of well-being* (pp. 217-240). Oxford: Oxford University Press.

Friborg, O., Hjemdal, O., Rosenvinge, J. H., & Martinussen, M. (2003). A new rating scale for adult resilience: What are the central protective resources behind healthy adjustment? *International Journal of Methods in Psychiatric Research*, *12*, 65–76.

Galli, N., & Vealey, R. S. (2008). "Bouncing back" from adversity: Athletes' experiences of resilience. *The Sport Psychologist, 22*, 316-335. Retrieved from http://journals.humankinetics.com/tsp

Garmezy, N. (1973). Competence and adaptation in adult schizophrenic patients and children at risk. In S. R. Dean (Ed.), *Schizophrenia: The first ten Dean Award Lectures* (pp. 163–204). New York: MSS Information.

Garmezy, N. (1974). The study of competence in children at risk for severe psychopathology. In E. J. Anthony & C. Koupernick (Eds.), *The child in his family: Children at psychiatric risk* (pp. 77–97). New York: Wiley.

Garmezy, N. (1975). The experimental study of children vulnerable to psychopathology. In A. Davids (Ed.) *Child personality and psychopathology: Current topics* (Vol 2. pp. 171–217). New York: Wiley.

Garmezy N. (1985). The NIMH-Israeli high-risk study: Commendation, comments, and cautions. *Schizophrenia Bulletin,11*, 349–353. Retrieved from http://schizophreniabulletin.oxfordjournals.org/

Garmezy, N. (1993). Vulnerability and resilience. In D.C. Funder, R.D. Parker, C. Tomlinson- Keesey, & K. Widaman (Eds.), *Studying lives through time: Approaches to personality and development* (pp. 377-398). Washington, DC: American Psychological Association.

Gill, D.L. (1994). A sport and exercise psychology perspective on stress. *Quest, 46,* 20-27. Retrieved from http://www.nakhe.org/ChronicleQuest

Golby, J., & Sheard, M. (2004) Mental toughness and hardiness at different level of rugby league. *Personality and Individual Differences*, *37*, 933-942.

Gordon, S., & Gucciardi, D. F., (2011). An introduction to mental toughness in sport: Developments in research and theory. In D. F. Gucciardi & S. Gordon (Eds.) *Mental toughness in sport: Developments in research and theory* (pp. 3-6). Abingdon, United Kingdom: Routledge.

Greenhouse, S.W., & Geisser, S. (1959). On methods in the analysis of profile data. *Psychometrika*, *24*, 95-112.

Gucciardi, D. F., Jackson, B., Coulter, T. J., & Mallett, C. J. (2011). The Connor-Davidson Resilience Scale (CD-RISC): Dimensionality and age-related measurement invariance with Australian cricketers. *Psychology of Sport and Exercise, 12,* 423-433. doi: 10.1016/j.psychsport.2011.02.005

Haglund, M. E., Nestadt, P. S., Cooper, N. S., Southwick, S. M., & Charney, D. S. (2007). Psychobiological mechanisms of resilience: Relevance to prevention and treatment of stress-related psychopathology. *Development and Psychopathology, 19,* 889-920. doi: http://dx.doi.org/10.1017/S0954579407000430

Hammermeister, J., & Burton, D. (2001). Stress, appraisal, and coping revisited: Examining the antecedents of competitive state anxiety with endurance athletes. *The Sport Psychologist, 15,* 67-94. Retrieved from http://www.humankinetics.com/tsp

Hanin, Y. (1999). *Emotions in sport.* Champaign, IL: Human Kinetics.

Holland, B. S., & Copenhagen, M. D. (1988). Improved Bonferroni-Type multiple testing procedures. *Psychological Bulletin, 104,* 145-149. doi: 0033-2909/88/$00.75

Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics, 6*, 65–70. Retrieved from http://www.jstor.org/stable/4615733

Hosseini, S. A., & Besharat, M. A. (2010). Relation of resilience with sport achievement and mental health in a sample of athletes. *Procedia Social and Behavioral Sciences, 5,* 633–638. doi :10.1016/j.sbspro.2010.07.156

Jones, G., Hanton, S., & Connaughton, D. (2007). A framework of mental toughness in the world's best performers. *Sport Psychologist, 21*(2), 243-264. Retrieved from http://journals.humankinetics.com/tsp

Kirschbaum, C., & Hellhammer, D. H. (1989). Salivary cortisol in psychobiological research: An overview. *Neuropsychobiology, 22,* 150-169. doi:10.1159/000118611

Kirschbaum, C., & Hellhammer, D. H. (1994). Salivary cortisol in psychoneuroendocrine research: Recent developments and applications. *Psychoneuroendocrinology,19*, 313-333. doi: 10.1016/0306-4530(94)90013-2

Kirschbaum, C., & Hellhammer, D. H. (2000). Salivary cortisol. In G. Fink (Ed.), *Encyclopedia of stress* (Vol. 3, pp. 379-384). San Diego: Academic Press.

Kivlighan, K. T., Granger, D. A., & Booth, A. (2005). Gender differences in testosterone and cortisol response to competition. *Psychoneuroendocrinology*, *30*, 58-71. doi: 10.1016/j.psyneuen.2004.05.009

Kleinginna, P. R., & Kleinginna, A. M. (1981). A categorized list of emotion definitions, with suggestions for a consensual definition. *Motivation and Emotion, 5*, 345–379. doi: 10.1007/BF00992553

Kobasa, S. C. (1979). Stressful life events, personality, and health: An inquiry into hardiness. *Journal of Personality and Social Psychology, 37*, 1–11.

Kudielka, B.M., Schommer, N.C., Hellhammer, D.H., & Kirschbaum, C. (2004). Acute HPA axis responses, heart rate, and mood changes to psychosocial stress (TSST) in humans at different times of day. *Psychoneuroendocrinology, 29*, 983-992. doi: 10.1016/j.psyneuen.2003.08.009

Kumpfer, K. L. (1999). Factors and processes contributing to resilience: The resilience framework. In M. D. Glantz & J. L. Johnson (Eds.), *Resilience and development: Positive life adaptions* (pp. 179–224). New York: Kluwer Academic/Plenum.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.

Leipold, B., & Greve, W. (2009). Resilience: A conceptual bridge between coping and development. *European Psychologist, 14,* 40-50. doi: 10.1027/1016-9040.14.1.40

Lepore, S. J., & Revenson, T. A. (2006). Resilience and posttraumatic growth: Recovery, resistance, & reconfiguration. In L. Calhoun & R. G. Tedeschi (Eds.), *The Handbook of posttraumatic growth*: *Research and practice* (pp. 24-46). Mahwah, NJ: Erlbaum.

Levine, S. (2000). Influence of psychological variables on the activity of the hypothalamic-pituitary-adrenal axis. *European Journal of Pharmacology, 405,* 149–160. doi: 10.1016/S0014-2999(00)00548-3

Luthar, S., & Cushing, G. (1999). Measurement issues in the empirical study of resilience: An overview. In M. Glantz, & J. Johnson (Eds.), *Resilience and development: Positive life adaptation* (pp. 129-160). New York: Kluwer Academic/Plenum Publishers.

Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology, 12,* 857-885. Retrieved from http://journals.cambridge.org/action/displayAbstract;jsessionid=2273EB2B8638A4 D2E50FA35FC1AE2A3F.journals?fromPage=online&aid=62557

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development, 71*, 543–562. doi:10.1111/1467-8624.00164

Luthar, S. S., & Zelazo, L. B. (2003). Research on resilience: An integrative review. In S. S. Luthar (Ed.), *Resilience and vulnerability: Adaptation in the context of childhood adversities* (pp. 510–549). New York: Cambridge University Press.

Lyons, J. (1991). Strategies for assessing the potential for positive adjustment following trauma. *Journal of Traumatic Stress, 4*, 93–111.

Maddi, S. R. (2005). Hardiness: The courage to be resilient. In J.C. Thomas, D. L. Degal, & M. Hersen (Eds.), *Comprehensive handbook of personality and psychopathology* (Vol. 1; pp. 306-321). Hoboken, NJ: Wiley.

Maddi, S. R., & Khoshaba, D. M. (2001). *Personal views survey* (3rd ed.). Newport Beach, CA: The Hardiness Institute.

Mandleco, B. L., & Perry, J. C. (2000). An organizational framework for conceptualizing resilience in children. *Journal of Child and Adolescent Psychiatric Nursing, 13*(3)*, 99–111. doi: 10.1111/j.1744-6171.2000.tb00086.x

Masten, A. (2001). Ordinary magic. *American Psychologist, 56,* 227- 238. doi: 10.1037//0003-066X.56.3.227

Martin-Krumm, C. P., Sarrazin, P. G., Peterson, C., & Famose, J. (2003). Explanatory style and resilience after sports failure. *Personality and Individual Differences, 35*, 1685–1695. doi: 10.1016/j.paid.2004.09.023

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56,* 227- 238. doi: 10.1037//0003-066X.56.3.227

Masten, A., Best, K., & Garmezy, N. (1990). Resilience and development: Contributions from the study of children who overcome adversity. *Development and Psychopathology, 2*, 425–444.

Masten, A., & Garmezy, N. (1985). Risk, vulnerability, and protective factors in developmental psychopathology. In B. Lahey & A. Kazdin (Eds.), *Advances in clinical child psychology* (Vol. 8, pp. 1–52). New York: Plenum Press.

Morgan III, C. A., Southwick, S., Hazlett, G., Rasmusson, A., Hoyt, G., Zimolo, Z., & Charney, D. (2004). Relationships among plasma dehydroepiandrosterone sulfate and cortisol levels, symptoms of dissociation, and objective performance in humans exposed to acute stress. *Archives of General Psychiatry, 61,* 819-825. Retrieved from http://archpsyc.jamanetwork.com/journal.aspx

Mummery, K. W., Schofield, G., & Perry, C. (2004). The role of coping style, social support and self-concept in resilience of sport performance. *Athletic Insight: The Online Journal of Sport Psychology, 6*. Retrieved from http://www.athleticinsight.com/Vol6Iss3/BouncingPDF.pdf

Ong, A. D., Bergeman, C. S., Bisconti, T. L., & Wallace, K. A. (2006). The contours of resilience and the complexity of emotions in later life. *Journal of Personality and Social Psychology, 91*, 730-749. doi: 10.1037/0022-3514.91.4.730

Oshio, A., Kaneko, H., Nagamine, S., & Nakaya, M. (2003). Construct validity of the Adolescent Resilience Scale. *Psychological Reports*, *93*, 1217–1222.

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin, 129,* 52-73. doi: 10.1037/0033-2909.129.1.52

Raedeke, T., & Smith, A. L. (2001). Development and preliminary validation of an athlete burnout measure. *Journal of Sport and Exercise Psychology, 23,* 281-306. Retrieved from http://journals.humankinetics.com/jsep

Richardson, G. E. (2002). The meta theory of resilience and resiliency. *Journal of Clinical Psychology, 58,* 307-321. doi: 10.1002/jclp.10020

Richardson, G. E., Neiger, B., Jensen, S., & Kumpfer, K. (1990). The resiliency model. *Health Education, 21,* 33–39.

Rutter, M. (1985). Resilience in the face of adversity: Protective factors and resistance to psychiatric disorders. *British Journal of Psychology, 147*, 598–611.

Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry, 57,* 316-331. doi: 10.1111/j.1939-0025.1987.tb03541.x

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition, and Personality, 9,* 185-211.

Schinke, R. J., & Jerome, W. C. (2002). Understanding and refining the resilience of elite athletes: An intervention strategy. *Athletic Insight, 4*. Available online: http://www.athleticinsight.com/Vol4Iss3/ResilienceIntervention.htm

Seligman, M. E. P. (1991). *Learned optimism.* New York: Knopf.

Sheard, M. (2009). Hardiness commitment, gender, and age differentiate university academic performance. *British Journal of Educational Psychology, 79,* 189-204. doi: 10.1348/000709908X304406

Sheard, M., & Golby, J. (2010, Oct). Personality hardiness differentiates elite-level sport performers. *International Journal of Sport and Exercise Psychology*. Retrieved from http://findarticles.com/p/articles/mi_7582/is_201006/ai_n54368819/

Sinclair, V. G., & Wallston, K.A. (2004) The development and psychometric evaluation of the Brief Resilient Coping Scale. *Assessment, 11,* 94-101. doi: 10.1177/1073191103258144

Smith, R. E., Schutz, R. W., Smoll, F. L., & Ptacek, J. T. (1995). Development and validation of a multidimensional measure of sport-specific psychological skills: The Athletic Coping Skills Inventory-28. *Journal of Sport and Exercise Psychology, 17,* 379-398.

Smith, R. E., Smoll, F. L., & Ptacek, J. T. (1990). Conjunctive moderator variables in vulnerability and resiliency research: Life stress, social support and coping skills, and adolescent sport injuries. *Journal of Personality and Social Psychology*, *58*(2), 360-370. doi: 10.1037/0022-3514.58.2.360

Southwick, S. M., Ozbay, F., Chaney, D., & McEwen, B. S. (2008). Adaption to stress and psychobiological mechanisms of resilience. In B. J. Lukey & V. Tepe (Eds.), *Biobehavioral Resilience to Stress* (pp. 91-115). Boca Raton, FL: CRC Press.

Stansbury, K., & Gunnar, M. R. (1994). Adrenocorticol activity and emotion regulation. *Monographs of the Society for Research in Child Development*, *59,* 108-134. doi: 10.1111/j.1540-5834.1994.tb01280.x

Tabachnick, B. G., & Fidell, L.S. (2007). *Using multivariate statistics* (5th ed.). Boston: Allyn & Bacon.

Tugade, M. M., & Frederickson, B. L. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology, 86,* 320-333. doi: 10.1037/0022-3514.86.2.320

Tugade, M. M., & Frederickson, B. L. (2007). Regulation of positive emotions: Emotion regulation strategies that promote resilience. *Journal of Happiness Studies, 8,* 311-333. doi: 10.1037/002-3514.862520

Vallerand, R. J., & Blanchard, C. M. (2000). The study of emotion in sport and exercise. In Y. Hanin (Ed.). *Emotions in sport* (pp. 3-37). Champaign, IL: Human Kinetics.

Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Measurement, 1*, 165–178.

Waugh, C. E., Fredrickson, B. L., & Taylor, S. F. (2008). Adapting to life's slings and arrows: Individual differences in resilience when recovering from an anticipated threat. *Journal of Research in Personality, 42*, 1031-1046. doi: 10.1016/j.jrp.2008.02.005

Waugh, C. E., Tugade, M. M., & Fredrickson, B. L. (2008). Psychophysiology of stress and resilience. In B. Lukey & V. Tepe (Eds.), *Biobehavioral resilience to stress* (pp. 117-138). Boca Raton, FL: CRC Press

Waugh, C. E., Wagner, T. D., Fredrickson, B. L., Noll, D. N., & Taylor, S. F. (2008). The neural correlates of trait resilience when anticipating and recovering from threat. *Social Cognitive and Affective Neuroscience, 3,* 322-332.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070. doi: 10.1037/0022-3514.54.6.1063

Werner, E. E., & Smith, R. (1992). *Overcoming the odds: High-risk children from birth to adulthood.* New York: Cornell University Press, 1992.

Werner, E.E., Bierman, J.M., & French, F. E. (1971). *The children of Kauai Honolulu.* Hawaii, USA: University of Hawaii Press.