

## ABSTRACT

### The Influence of Athletic Participation and Grit on Stress, Coping, and Health Behaviors among College Students

Kristina A. White, Ph.D.

Mentor: Andrew R. Gallucci, Ph.D.

The purpose of this study was two-fold: 1) examine grit in a sample of undergraduate students and compare scores between student-athletes (SAs) and nonathletes, and 2) test a theoretical model to understand relationships between grit, stress, coping, and adverse health behaviors. Lazarus and Folkman's transactional model of stress and coping was utilized to examine the aforementioned relationships. A paper-and-pencil survey was completed by a sample of undergraduate students ( $N = 522$ ) at a private, religious institution in the southwestern United States. The questionnaire inquired about various factors of college student life (e.g. stress, time attributed to working, studying, and sport participation), health behaviors (e.g. depressive symptoms, substance use), and potential coping strategies (e.g. active, instrumental, emotional, self-distraction, coping via substance use). Predictor and outcome variables were mapped onto the theoretical model and a path analysis was conducted to statistically examine the relationships. The analysis of coping behaviors revealed three coping behaviors were significantly predicted by perceived stress: active coping, self-distraction, and emotional

support. An inverse relationship existed between PS and active coping, indicating that as stress levels increased, the use of active coping decreased. Self-distraction and emotional support had positive associations with PS. Self-distraction was also a significant predictor of both DS and 12-month marijuana use. Finally, based on significant bivariate relationships, athletic participation and grit were tested as moderators. Both sets of regression analyses resulted in less explained variance of DS once the interaction terms were added to the statistical model. The results of this study demonstrate that grit is a valuable construct in the analysis of stress and DS in college students. Additionally, certain coping strategies may influence the relationship between stress and adverse health behaviors more than others. As such, this dissertation provides implications for future research in these areas.

The Influence of Athletic Participation and Grit on Stress, Coping, and Health Behaviors  
among College Students

by

Kristina Amrani White, B.S.Ed., M.S.

A Dissertation

Approved by the Department of Health, Human Performance and Recreation

---

Paul Gordon, Ph.D., Chairperson

Submitted to the Graduate Faculty of  
Baylor University in Partial Fulfillment of the  
Requirements for the Degree  
of  
Doctor of Philosophy

Approved by the Dissertation Committee

---

Andrew Gallucci, Ph.D., Chairperson

---

Beth Lanning, Ph.D.

---

Christopher Wynveen, Ph.D.

---

Kelly Ylitalo, Ph.D.

Accepted by the Graduate School  
December 2019

---

J. Larry Lyon, Ph.D., Dean

Copyright © 2019 by Kristina A. White

All rights reserved

## TABLE OF CONTENTS

LIST OF FIGURES .....	viii
LIST OF TABLES .....	ix
LIST OF ABBREVIATIONS .....	x
ACKNOWLEDGMENTS .....	xi
DEDICATION .....	xii
CHAPTER ONE .....	1
Introduction .....	1
<i>Background</i> .....	1
<i>Statement of the Problem</i> .....	12
<i>Statement of Purpose</i> .....	12
<i>Statement of Significance</i> .....	12
<i>Research Questions</i> .....	13
<i>Hypotheses</i> .....	13
<i>Limitations</i> .....	14
<i>Delimitations</i> .....	15
<i>Terminology</i> .....	15
<i>Journal Selection</i> .....	16
CHAPTER TWO .....	17
Review of Literature .....	17
<i>Life Stress</i> .....	17
<i>Measuring Life Stress</i> .....	18
<i>Depressive Symptoms</i> .....	21
<i>Measurement of Depressive Symptoms</i> .....	22
<i>Depressive Symptoms among College Students</i> .....	24
<i>Depressive Symptoms among College Student-Athletes</i> .....	25
<i>Substance Use</i> .....	29

<i>Grit</i> .....	36
<i>Measuring Grit</i> .....	39
<i>Conceptual Framework</i> .....	40
CHAPTER THREE .....	44
Methods .....	44
<i>Study Purpose and Design</i> .....	44
<i>Participants</i> .....	44
<i>Instrumentation</i> .....	45
<i>Procedure</i> .....	49
<i>Data Processing and Analysis</i> .....	50
CHAPTER FOUR.....	52
Is Grit Legit? Comparing Grit, Stress and Depressive Symptoms between Student-Athletes and Nonathletes.....	52
<i>Abstract</i> .....	52
<i>Introduction</i> .....	52
<i>Materials and Methods</i> .....	56
<i>Results</i> .....	61
<i>Discussion</i> .....	67
<i>Limitations</i> .....	69
CHAPTER FIVE .....	71
Coping with College Athletics: Mediators of stress, depressive symptoms, and substance use through a transactional stress framework .....	71
<i>Abstract</i> .....	71
<i>Introduction</i> .....	72
<i>Methods</i> .....	78
<i>Results</i> .....	82
<i>Discussion</i> .....	89
<i>Limitations</i> .....	92
<i>Conclusions</i> .....	93

CHAPTER SIX.....	94
Summary of Conclusions .....	94
<i>H<sub>1</sub>: Grit and Athletic Participation</i> .....	94
<i>H<sub>2</sub>: Grit and Depressive Symptoms</i> .....	95
<i>H<sub>3-7</sub>: Grit and Substance Use Variables</i> .....	96
<i>H<sub>8</sub>: Perceived Stress and Depressive Symptoms</i> .....	97
<i>H<sub>9-13</sub>: Perceived Stress and Substance Use Variables</i> .....	97
<i>H<sub>14</sub>: Coping Strategies as Mediators</i> .....	97
<i>Implications</i> .....	98
<i>Limitations</i> .....	100
<i>Future Directions</i> .....	101
APPENDIX.....	104
APPENDIX A: Questionnaire .....	105
REFERENCES .....	114

## LIST OF FIGURES

Figure 2.1. Lazarus & Folkman's Transactional Model of Stress and Coping.....	42
Figure 2.2. Athletic Response to Sport Injury Model.....	44
Figure 4.1. Effort Counts Twice .....	60
Figure 5.1. Hypothesized variables mapped to Lazarus & Folkman's Model.....	88
Figure 5.2. Path analysis of significant effects predicting depressive symptoms.....	90
Figure 5.3. Path analysis of significant effects predicting marijuana use.....	90



## LIST OF TABLES

Table 4.1. Demographic Characteristics by Athletic Participation Status.....	64
Table 4.2. Comparisons of Grit, Perceived stress, and Depressive symptoms Between Student-athletes and Nonathletes.....	65
Table 4.3. Mean Weekly Hour Attributions and Athletic Participation Cross Tabulations.....	67
Table 4.4. A Regression Analysis to Predict Increased Depressive Symptoms among a Sample of College Students.....	68
Table 5.1. Participant Demographics.....	85
Table 5.2. Descriptive Results of Grit, Perceived Stress, Depressive Symptos and Coping.....	86
Table 5.3. Reported Rates of Substance Use among the Sample .....	87

## LIST OF ABBREVIATIONS

DS	Depressive symptoms
HED	Heavy episodic drinking
MPS	Misuse of prescription stimulants
MPO	Misuse of prescription opioids
PS	Perceived stress
SA	Student-athlete
TM	Transactional Model of Stress and Coping

## ACKNOWLEDGMENTS

I can hardly put into words the amount of gratitude and appreciation I have for every person who contributed to this project and the person I have become through the process.

My dissertation committee provided guidance when I felt lost, insight when I felt unsure, encouragement when I felt defeated, and praise when I did not deserve it. Drs. Beth Lanning, Chris Wynveen, and Kelly Ylitato: Thank you for the time and effort you contributed to ensuring my dissertation was completed successfully.

I want to thank my parents for providing me uniquely different role models, who ultimately showed me that with hard work, I could accomplish anything.

To my dissertation chair, Dr. Gallucci: Thank you for providing me the opportunity to begin this degree. What is more, thank you for your gentle nudge toward a teaching and research assistantship. This experience opened my eyes to the world of academia, introduced me to scholarly research, and improved my teaching in ways I did not know were possible. May perfect never be the enemy of good.

And last, but certainly not least, my daughter Kamila. Your arrival one month after my dissertation proposal made for the most challenging year of my life. You have taught me to embrace and value every moment. I cannot imagine completing this process in any other way.

## DEDICATION

To my husband, Kortlin,

“What you do isn’t going to be nearly as interesting,  
or important, as *who* you do it with”

– John Green

## CHAPTER ONE

### Introduction

#### *Background*

The association between college and psychological stress is well documented in the literature. For young adults, college poses a breadth of unique transitions and stressors. The transition onto a college campus may be the first time students are away from home. Additionally, college students are expected to adjust to unfamiliar academic, social, and financial stressors (Kahn, Kasky-Hernández, Ambrose, & French, 2017). As a SA, an additional set of sport-specific stressors are typically experienced. Alongside the aforementioned stressors of nonathlete college students, SAs experience added stress from athletic performance demands, conflicts with teammates and coaches, and altered social support. (Hammond et al., 2013, Yang et al., 2010).

A heightened perception of stress or inability to cope have been associated with adverse health outcomes including depression and substance abuse (Tavolacci, 2013). Specifically, it has been hypothesized that highly-stressed individuals with personality traits that exacerbate the stress response may be more likely to deem a situation as stressful (Andersen & Williams, 1988). While sources of stress among college students and SAs are of importance, an understanding of what influences stress perception as well as how students cope with stress is vital.

Research has shown college students respond to stress by demonstrating adaptive coping strategies through instrumental coping (i.e. receiving information or advice),

incorporating psychological skills, and accepting lifestyle adjustments (Grindstaff, Wrisberg, & Ross, 2010). Personality traits related to adaptive coping include resilience, conscientiousness, and extraversion (Campbell-Sills et al., 2006; Reed, 2014). A construct that has been assessed to expand the understanding of resilience and perseverance is grit. Grit is defined as perseverance and the passionate pursuit of long-term goals (Duckworth, 2016). Grit has been assessed using the Grit Scale, an instrument composed of statements addressing an individual's consistency of interests (e.g. my interests change from year to year) and perseverance of effort (e.g. setbacks don't discourage me; Duckworth, 2016). Research has found that some of the grittiest individuals are military cadets (3.75-3.78; Kelly, Matthews, & Bartone, 2014), National Spelling Bee finalists (3.50) and Ivy League undergraduate students (3.46; Duckworth et al., 2007). Grit scores have also been shown to predict retention in the military, the workplace, and in school (Eskreis-Winkler, Duckworth, Shulman, & Beal, 2014).

Beyond the findings among Ivy League students, few studies have described grit among college students. In one study, investigators compared college students' grit scores based on exercise behavior (Reed, 2014). Reed (2014) found that exercise scores (composed of exercise effort and persistence) increased significantly as grit scores increased, and that exercisers reported significantly higher grit scores than non-exercisers. In addition, a recent study of SAs found them to be grittier than their nonathlete peers (Jaegar et al., 2010). Therefore, grit may have the potential to explain differences between college student and SA populations with regard to perceived stress and stress responses.

Although grit has typically been studied among populations who achieve success after adhering to long-term goals (Duckworth et al., 2007), it appears to describe the unique ability to persist through particularly adverse situations (Griffin, McDermott, McHugh, Fitzmaurice, & Weiss, 2016). A recent study focused on the relationship between grit and substance use, which found that patients with substance abuse disorders diagnosed according to the DSM-5 had lower average grit scores compared to a general sample of 1,500 adults, and that a co-occurring psychiatric disorder was associated with lower grit scores (Griffin et al., 2016). These results indicate that grit may be a beneficial construct to assess as a predictor or modifier of adverse health behaviors.

### *Depressive Symptoms*

Depression is a term used to describe several mental health conditions or disorders (American Psychiatric Association, 2013). Depression has become a pervasive public health concern and is a leading cause of disability among people aged 15-44 years (Cohen, 2017). In fact, individuals with depression were associated with an economic burden of approximately \$98.9 billion in the United States in 2010. (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015). In the United States, 16-17% of adults and 11-12% of adolescents have reported experiencing a major depressive episode at least once throughout their lifetime (Kessler & Bromet, 2013; Merikangas et al., 2010). While the term “depression” encompasses several depressive disorders, including Major Depressive Disorder, it is also commonly used to describe the presence of symptoms associated with these disorders. Research has not defined a unified list of signs and symptoms required for a diagnosis; rather, depressive symptoms (DS) are categorized as emotional, cognitive, physical, and behavioral symptoms experienced on a continuum of severity

(National Collaborating Centre for Mental Health (UK), 2010). In addition to those diagnosed with depression, many other people suffer from sub-clinical DS in which individuals report experiencing symptoms but do not meet the full criteria for a depression diagnosis. For instance, across several epidemiological surveys up to 20% of adults (Kessler & Bromet, 2013; Shim, Baltrus, Ye, & Rust, 2011) and 50% of adolescents reported DS in the previous six months (Kessler & Bromet, 2013). These results indicate 1 in 5 adults screened positive for at least mild DS.

Depressive disorders and DS appear to affect various populations and subpopulations differently. First, reported DS vary between age groups. Results of several studies suggest that the highest rates of depression exist among young adults between 18-25 years of age (Brody, Pratt, & Hughes, 2018; Hamdi & Iacono, 2014; Substance Abuse and Mental Health Services Administration, 2017). In regard to gender, the majority of the literature indicates that females experience DS at greater rates than males (Brody et al., 2018; Kessler, Chiu, Demler, & Walters, 2005; Kessler & Bromet, 2013; Nolen-Hoeksema, Larson, & Grayson, 1999). In fact, women (10.4%) are almost twice as likely as men (5.5%) to report experiencing DS (Brody et al., 2018). One explanation for this gender disparity is that women tend to ruminate (i.e. focus attention to the symptoms of one's distress and its possible causes rather than solutions) about DS (Matud, 2004; Nolen-Hoeksema et al., 1999). Ruminative responses have been shown to lead to increases in DS over time (Nolen-Hoeksema & Harrell, 2002; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). By contrast, men tend to distract themselves or utilize problem-focused coping strategies (Matud, 2004; Nolen-Hoeksema et al., 1999).



Additional factors that contribute to increased DS risk include maladaptive personality traits (Vredenburg, O'brien, & Krames, 1988), socio-economic status (Everson, Maty, Lynch, & Kaplan, 2002), major life events (Kendler, Karkowski, & Prescott, 1999), and daily stress (Parrish, Cohen, & Laurenceau, 2011). While major life events include acute, traumatic events such as personal illness or injury, death of a loved one, relationship issues, or losing one's job, daily stresses typically refer to lower-stakes hassles such as running late, trouble finding parking, or being placed in an unfamiliar situation (Brougham, Zail, Mendoza, & Miller, 2009). Both acute stressors in the form of major life events and more chronic daily hassles can negatively affect an individual's mental health. Kessler and colleagues (Kessler, Zhao, Blazer, & Swartz, 1997) noted that both cumulative stress over a long period of time as well as the occurrence of specific, more severe events contribute to increases in depressive symptoms, the occurrence of an initial episode of depression, and the recurrence of major depression.

Individuals utilize various strategies to cope with DS or stressful encounters. Coping is considered a person's cognitive and behavioral efforts to manage internal or external demands appraised as taxing or stressful (Lazarus & Folkman, 1984). Lazarus and Folkman's (Lazarus & Folkman, 1984) analysis of the stress and coping process provides a transactional framework for examining responses to stress. Coping efforts are typically categorized as either emotion-focused or problem-focused coping; the former refers to the regulation of one's emotions or expectations, whereas the latter focuses on planning or acting to alter the situation causing stress (Lazarus & Folkman, 1984). Another type of coping that can be either emotion- or problem-focused is avoidance, which is commonly employed to separate oneself from distress (Suls & Fletcher, 1985).

Using avoidance to cope with stress typically manifests as mental disengagement or denial and the use of alcohol and drugs as distractions (Brougham et al., 2009).

Additionally, personality traits influence how individuals appraise and cope with stress (Afshar et al., 2015), and these traits can affect which coping strategies are selected (Vollrath & Torgersen, 2000). Maladaptive traits (e.g. neuroticism) have been associated with increases in stress exposure and avoidance coping (Connor-Smith & Flachsbart, 2007). Conversely, adaptive personality traits (e.g. conscientiousness and extroversion) have been associated with problem-focused coping styles (Connor-Smith & Flachsbart, 2007; Watson & Hubbard, 1996). The link between specific Big-Five traits (i.e. conscientiousness, agreeableness, neuroticism, openness, extroversion) and various coping styles may be extended through explorations of additional personality traits.

A factor that may increase the risk of DS among young adults (ages 18-24) is the choice to attend college. It has been speculated that the stresses of transitioning into the college experience, alongside new academic and social stressors, pose additional risks for DS within in this population (Beiter et al., 2015b). Students must adjust from being away from home, usually for the first time, while maintaining academic success and traversing a new social landscape (Ross, Niebling, & Heckert, 1999). One systematic review of DS prevalence rates among college students found a weighted mean prevalence of 30.6% (Ibrahim, Kelly, Adams, & Glazebrook, 2013). DS among college students have been associated with decreased grade point average (GPA), financial instability, stressful life events, and substance misuse (Blanco et al., 2008; Eisenberg, Gollust, Golberstein, & Hefner, 2007). One study of DS among college students found that a depression diagnosis was associated with a 0.49-point decrease in GPA (Hysenbegasi, Hass, &

Rowland, 2005). Another study examining depression, alcohol consumption, and harm found college students endorsing depressed mood were more likely to drink to get drunk (56.1% vs. 50.6%,  $p < .001$ ), and report more alcohol-related consequences (23% vs 20.5%,  $p < .01$ ) than their non-depressed peers (Weitzman, 2004).

College students employ many different strategies to cope with stress. College students' use of problem-focused strategies have been associated with positive outcomes, including better health and reduced negative affect (i.e. one's propensity to experience negative emotions or view the world negatively; Dunkley, 2010; Sasak and Yamasaki, 2007). Alternatively, the use of emotion-focused strategies by college students, particularly avoidance strategies, has been associated with greater negative affect (Pritchard, Wilson, & Yamnitz, 2007). Although a definitive conclusion as to the benefits or consequences of various coping methods remains unclear, college students' coping mechanisms that include action, acceptance, and positive reframing have been found to be adaptive, whereas mechanisms that use avoidance, emotional expression, or venting have shown to be maladaptive (Brougham et al., 2009).

Collegiate student-athletes (SAs) are presented with a unique combination of stressors resulting from balancing academic and sport demands (Martens, Dams-O'Connor, & Beck, 2006); these combined stressors can lead to high rates of DS (Wilson & Pritchard, 2005). The pressure to succeed both academically and athletically has been shown to negatively affect SAs (Nixon, 1996; O'Connell & Manschreck, 2012; Wolanin, Gross, & Hong, 2015), and many feel there is simply not enough time to perform at their best in both areas (Humphrey, Yow, & Bowden, 2000). Research has found sport-related stressors to include conflicts with coaches or teammates (Prinz, Dvořák, & Junge, 2016),

competitive or performance failure (Hammond, Gialloredo, Kubas, & Hap Davis, 2013; Nixdorf, Frank, & Beckmann, 2016), and experiences with major life events (Gouttebarga, Frings-Dresen, & Sluiter, 2015) such as physical injury (Appaneal, Levine, Perna, & Roh, 2009; Gulliver, Griffiths, Mackinnon, Batterham, & Stanimirovic, 2015; Houston, Hoch, & Hoch, 2016; Nixdorf, Frank, Hautzinger, & Beckmann, 2013; J. Yang et al., 2007). Research suggests that SAs experience DS at rates equal to or greater than their nonathletes peers (Hammond et al., 2013; Storch, Storch, Killiany, & Roberti, 2005; Wolanin, Hong, Marks, Panchoo, & Gross, 2016). Reported rates of DS among SA samples range from 15-25% (Proctor & Boan-Lenzo, 2010; Wolanin et al., 2016; J. Yang et al., 2007). These rates may still be an underrepresentation of the DS prevalence among SAs due to the negative social stigma of depression supported by coaches and other athletes surrounding mental health disorders (Gulliver, Griffiths, & Christensen, 2012a; Kaier, Cromer, Johnson, Strunk, & Davis, 2015). For example, Hammond et al. (Hammond et al., 2013) found that 68% of SAs reported experiencing DS in the previous three months. Finally, rates of DS among SAs may be underestimated due to a decreased likelihood to seek help or a fear of consequences from revealing symptoms (Putukian, 2016).

It has been theorized that SAs also respond to stressors through a process of appraisals and coping mechanisms (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986; Wiese-Bjornstal, Smith, & LaMott, 1995; Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998). It has been shown that in response to the associated stressors of sport participation, athletes regularly demonstrate avoidance-oriented coping strategies (Nicholls, Holt, Polman, & Bloomfield, 2006) which include behavioral or social

disengagement, denial, and the use of alcohol or drugs (Gaudreau & Blondin, 2002). The role of stress and DS as correlates or predictors of alcohol or drug use poses a distinct threat toward college students, warranting further examination.

### *Substance Use*

Students are using alcohol and drugs for many reasons, including as a coping mechanism (Bravo, Pearson, Stevens, & Henson, 2016; Wilson, Pritchard, & Schaffer, 2004). College students and SAs are considered “high risk” populations for several DS comorbidities including eating disorders, overtraining, and substance use (Armstrong, Burcin, Bjerke, & Early, 2015; Etzel, 2006). Substance use behaviors commonly reported by college students include alcohol consumption, heavy episodic drinking (HED) defined as five or more drinks in one session for males, four for females; (SAMHSA, 2017), and the use of tobacco and illicit drugs (Yusko, Buckman, White, & Pandina, 2008a). A study of a stratified sample of college students found relationships between coping responses and alcohol consumption; using alcohol as a way to “feel better” or “to get through it” was significantly correlated with the frequency of alcohol consumption (Wilson, Pritchard, & Schaffer, 2004).

College students have been shown to misuse particular substances, such as alcohol and prescription stimulants, at rates greater than their age-matched peers who do not attend college (Ford & Pomykacz, 2016; Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2016). Nearly 70% of college students have reported past-year alcohol use and 20-33% have reported past-year marijuana use (Core Institute, 2010; Johnston et al., 2016). This may be due to college students’ overestimation of normative rates of alcohol use amongst their peers, leading to increased personal alcohol use (Dams-

O'Connor, Martin, & Martens, 2007; Ford, 2007). Several other factors appear to affect substance use in this population. College students who are affiliated with a fraternity or sorority (Gallucci & Martin, 2015) or those who have reported DS have been shown to have an increased risk of substance use (Miller, Miller, Verhegge, Linville, & Pumariega, 2002; Weitzman, 2004). One study found that students with positive depression ratings had a significantly higher mean alcohol misuse score than non-depressed students (Miller et al., 2002). Finally, certain personality traits such as increased neuroticism and low self-esteem have also been associated with increased substance use in college student samples (Campbell-Sills, Cohan, & Stein, 2006; Dennhardt & Murphy, 2013; Martens et al., 2006).

Generally speaking, SAs are at an equal or greater risk of alcohol misuse than their nonathlete peers (Cadigan, Littlefield, Martens, & Sher, 2013; Ford, 2007; Martens et al., 2006; Yusko, Buckman, White, & Pandina, 2008a). The results of numerous research suggest SAs report HED at greater rates than nonathletes (Ford, 2007; Leichliter, Meilman, Presley, & Cashin, 1998; Lisha & Sussman, 2009; 2010; Martens et al., 2006; Mastroleo, Barnett, & Bowers, 2018; Nelson & Wechsler, 2001; Wilson, Pritchard, & Schaffer, 2004; Yusko, Buckman, White, & Pandina, 2008a), and male athletes consistently report higher rates of alcohol use in the previous year, month, and two weeks relative to nonathletes (Yusko, Buckman, White, & Pandina, 2008a). Moreover, SAs have been found to report consuming a greater average number of drinks per week than nonathletes (Mastroleo et al., 2018; G. S. Wilson, Pritchard, & Schaffer, 2004).

Research indicates that substance use patterns among SAs vary based on several factors including the type of substance, sport type, and the time of year (i.e. in-season, off-season; O'Malley & Johnston, 2002). For example, one study of SAs and nonathletes found that reported rates of past-year marijuana use were higher among both male and female SAs; however, the rate of use for SAs was significantly lower during their competition seasons compared to off-seasons (Yusko, Buckman, White, & Pandina, 2008a). SAs appear to be less likely to misuse several substances compared to their non-athlete peers including cigarettes (Yusko, Buckman, White, & Pandina, 2008a), prescription stimulants, and energy drinks (Gallucci & Martin, 2015). Additionally, one study of the misuse of prescription opioids (MPO) found significantly fewer SAs reported misuse compared to nonathletes (Ford, 2008). Although ample research has shown college students use alcohol to cope with stressors, additional explorations of illicit substances are needed in regards to SAs, particularly those experiencing DS (Bravo et al., 2016).

To date, little to no research exists that examines the influence grit may have on DS or substance abuse in college students. Studies have explored the relationship between DS and substance abuse (Miller et al., 2002; Putukian, 2016), as well as the influence stress and injury have on DS (Hutchison, Mainwaring, Comper, Richards, & Bisschop, 2009; Kontos, Covassin, Elbin, & Parker, 2012; Vargas, Rabinowitz, Meyer, & Arnett, 2015). However, these studies have not applied theoretical stress models to incorporate influencing personal such as grit. Furthermore, the relationships between grit, stress, and the outcomes of DS and substance abuse in a college student population have not been investigated.

### *Statement of the Problem*

The prevalence and nature of DS and substance use among college students, based on athletic participation, is not well established in the literature. It is also unclear how personal and situational factors, such as grit and daily stressors, influence DS and substance use among college students, along with the effect that coping strategies have on these relationships.

### *Statement of Purpose*

The purpose of this study is twofold: (1) to examine the influence grit, and reported stressors have on DS and substance use behaviors in a sample of college student-athletes and nonathletes, (2) apply the transactional model of stress to identify the role of coping as a potential mediator between grit, stress, athletic participation and health outcomes.

### *Statement of Significance*

Results of this study may provide a better understanding of how various personal factors, including grit, perceived stress, and athletic participation may influence a college student's behavioral and emotional responses to stress. Additionally, by examining grit, we may provide evidence of a psychological factor that protects against DS and the use of substances. Finally, the results may inform professionals of the benefits of incorporating psychological screening tools and interventions for college students and SAs.



### *Research Questions*

1. Do collegiate student-athletes report higher grit scores than college nonathletes?
2. Is there an association between college students' grit scores and reported levels of depressive symptoms?
3. Is there an association between college students' grit scores and reported use of various substances?
4. Do college students with greater perceived stress report increased depressive symptoms?
5. Do college students with greater perceived stress report increased substance use?
6. Do college students' coping styles mediate the relationship between stress and the health outcomes of interest (i.e. DS and substance use)?

### *Hypotheses*

- H<sub>1</sub>: There will be no significant difference in reported grit scores between SAs and nonathletes in this sample.
- H<sub>2</sub>: There will be no significant association between reported grit scores and depressive symptoms in the sample of college students.
- H<sub>3</sub>: There will be no significant correlation between grit and alcohol consumption or HED in this sample of college students.
- H<sub>4</sub>: There will be no significant correlation between grit and marijuana use in this sample of college students.
- H<sub>5</sub>: There will be no significant correlation between grit and ED consumption in this sample of college students.
- H<sub>6</sub>: There will be no significant correlation between grit and MPS in this sample of college students.
- H<sub>7</sub>: There will be no significant correlation between grit and MPO in this sample of college students.
- H<sub>8</sub>: College students who report greater perceived stress will report increased depressive symptoms.

- H<sub>9</sub>: College students who report greater perceived stress will report increased alcohol consumption and HED.
- H<sub>10</sub>: College students who report greater perceived stress will report increased marijuana use.
- H<sub>11</sub>: College students who report greater perceived stress will report increased ED consumption.
- H<sub>12</sub>: College students who report greater perceived stress will report an increase in MPS.
- H<sub>13</sub>: There will be no difference in rates of MPO between students who report greater perceived stress than students who reported less perceived stress.
- H<sub>14</sub>: Coping strategies identified by students in this sample will mediate the relationship between perceived stress and the health outcomes of interest.

### *Limitations*

The study was subject to the following limitations:

1. This study employed a cross-sectional survey, which only provided a snapshot of students' experiences with stressors and health behaviors. Therefore, causal relationships between the variables of interest and behavioral outcomes cannot be established.
2. The sensitive nature of some questions in the questionnaire regarding stress, DS, and substance use may have influenced how participants responded. Study participants may have felt pressure to answer questions in a socially acceptable manner, thus providing untruthful responses in their surveys.
3. The use of self-report measures in this study may have also subjected the results to recall bias, as participants who experienced more significant stressors or greater DS may have had an easier time remembering and report a more accurate depiction of their experiences.

4. It should be taken into consideration that this was a convenience sample from one private, religiously-affiliated academic institution. Identifying with one's faith or expressed religiosity/religiosity may be an underlying coping strategy that was not assessed in this study. Therefore, our results may not be generalizable to all student populations.

### *Delimitations*

The study was subject to the following delimitations:

1. Each participant must have been enrolled full-time at Baylor University.
2. Each participant must have been between 18-25 years of age.

### *Terminology*

*Stress*: The non-specific response of the body to any demand for change (Selye, 1973).

*Coping*: Cognitive and behavioral efforts to manage internal or external demands appraised as taxing or stressful (Lazarus & Folkman, 1984).

*Depressive symptoms (DS)*: Subthreshold emotional, cognitive, physical and behavioral symptoms that fall below the criteria for major depressive disorder and do not have a coding in the ICD-10 Classification of Mental and Behavioral Disorders (National Collaborating Centre for Mental Health (UK), 2010).

*Grit*: A psychological construct that encompasses the tendency to work hard toward long-term goals, maintaining effort and interest despite challenges (Duckworth et al., 2007).

*Heavy Episodic Drinking (HED)*: Consuming five or more alcoholic drinks for males or four or more drinks for females on the same occasion (i.e., at the same time or within a couple of hours of each other; SAMHSA, 2017).

*Misuse of Prescription Stimulants or Opioids (MPS, MPO):* The use of a prescription drug without a valid prescription from a physician or using one's own medication in amounts or for reasons other than those prescribed (McCabe & Teter, 2007).

### *Journal Selection*

Two manuscripts were generated from the data collected in this study to satisfy the manuscript dissertation model. The first manuscript includes examinations of grit in a college student sample, particularly based on levels of athletic participation. The second applies the transactional stress and coping model to examine associations between stressors and coping among college students, as well as their effect on depressive symptoms and substance use. The results of the manuscripts may elucidate substance use patterns among college students and SAs, as well as provide additional evidence for targeted interventions based on identified stressors; thus, they were prepared for submission to the Journal of Substance Use & Misuse. The Journal of Substance Use & Misuse publishes 14 issues per year and has a JCR impact factor of 1.234.

## CHAPTER TWO

### Review of Literature

#### *Life Stress*

Depressive symptoms are commonly identified as manifestations of psychological stress. Hans Selye (Selye, 1956) once said, “stress is a scientific concept which has suffered from the mixed blessing of being too well known and too little understood.” He later broadly defined stress as “the non-specific response of the body to any demand for change” (Selye, 1973). Today, the term “stressor” is used to describe any event or situation that an individual perceives as a threat, causing him or her to adapt or initiate the stress response (Olpin & Hesson, 2015). In other words, a stressor can be considered a stimulus, where stress is the response. Exposures to stressors are thought to vary across several dimensions including severity, lifespan, chronicity, expectedness, type of threat, and mental health consequences (Clark et al., 2012). Stressors can also be considered external (e.g. environmental, psychological, or social situations) or internal (e.g. psychological or physical) (Lazarus & Folkman, 1984).

Life stressors can be conceptualized as both acute major life events (e.g., death of a loved one, personal injury or illness, parents divorcing), or chronic, less severe daily hassles (e.g., running late, trouble finding parking). A catastrophic or major life event is considered one of the most commonly experienced stressors (Keyes, Hatzenbuehler, & Hasin, 2011). Major life events are typically acute, unexpected, severe, and generally not limited to any particular point in the lifespan (Keyes et al., 2011). For these reasons, this

type of stressor can have negative impacts on mental health and well-being (Greeley & Oei, 1999). In a multisite study of 1,528 undergraduate students, 85% of students reported having experienced a traumatic event throughout their lifetime, and 21% reported experiencing this type of event during college (Frazier et al., 2009). In addition, it has been hypothesized that highly-stressed individuals with personality traits which exacerbate the stress response and few positive coping mechanisms, may be more likely to appraise a situation as stressful (Andersen & Williams, 1988).

### *Measuring Life Stress*

Researchers have developed and utilized a variety of instruments to assess life stress. The instruments employed most frequently can be described as measuring either the incidence of stressful events or the individual's perception of stress. The understanding of life stress in the college-aged literature has been constructed through the use of inventories (Olpin & Hesson, 2015). Some of the most frequently cited stress inventories include the College Student Life-Event Scale (CSLES; Levine & Perkins, 1980), the Inventory of College Students' Recent Life Experiences (ICSRLE; Kohn, Lafreniere, & Gurevich, 1990), and the Life Event Survey for Collegiate Athletes (LESCA; Petrie, 1992), ranging from 24 to 99 items. Stress inventories provide unique perspectives into the study of stress; however, there are several disadvantages worth noting. First, in an attempt to capture all possible contributions to stress, these inventories are lengthy and require extensive time to be completed. Additionally, even the longest inventory may not provide an exhaustive list of stressful events that applies to all populations (Cohen, 1988). This can lead to challenges when attempting to make comparisons between two populations with potentially different stressors (Cohen &

Janicki-Deverts, 2012). Finally, an inventory examining the incidence or frequency of a stressful event does not take into account the individual's perception or appraisal of the stressor (Cohen, Kamarck, & Mermelstein, 1983).

### *Perceived Stress Scale*

An alternative method of evaluating life stress is measuring an individual's perceived stress. The Perceived Stress Scale (PSS; (Cohen et al., 1983), grounded in the TM (Folkman et al., 1986; Lazarus & Folkman, 1984), was developed to measure the degree to which situations in one's life are perceived as stressful. The instrument was designed with items and responses that are easy to understand, for use with community populations who have obtained at least a junior high education (Cohen et al., 1983). The PSS has been validated in various forms of the questionnaire (e.g. 4-item, 10-item, and original 14-item; Cohen et al., 1983; Cohen & Janicki-Deverts, 2012; Cohen, 1988). Cohen and colleagues (1983) have argued that the PSS10 allows for the assessment of perceived stress without any loss of psychometric quality (i.e. construct validity) over the longer PSS14. While there is no perfect instrument to evaluate life stress, the PSS10's theoretical base alongside the improved validity over the PSS14 makes it the most appropriate measure for the purposes of this study. Additional scoring and psychometric information for the PSS10 is provided in the methodology.

The PSS has been used across different populations and to measure adverse health outcomes. Higher levels of psychological stress, as measured by the PSS, have been associated with elevated markers of biological aging (Epel et al., 2004), higher cortisol levels (Ruiz, Fullerton, Brown, & Schoolfield, 2001), suppressed immune function (Burns, Drayson, Ring, & Carroll, 2002), and slower wound healing (Ebrecht et al.,

2004). Participants who score higher on the PSS have also reported poorer health practices, including sleeping fewer hours, skipping breakfast, and consuming increased quantities of alcohol than participants with lower PSS scores (Cohen, 1988). The evidence for use of the PSS extends is also present in the college student literature.

### *Perceived Stress in the College Student Population*

In a longitudinal national study comprised of surveys administered at three time points (1983, 2006, 2009), college-aged participants (ages 25 and below) reported the highest mean PSS scores each time ( $m = 14.54$ ) compared to all other age groups (Cohen & Janicki-Deverts, 2012). Researchers have also utilized the PSS to measure stress related to academic success among SAs. One study found that 95% of male athletes and 86% of female athletes were stressed by academic factors including examinations, writing papers for class, missing classes due to sport-related travel, and making up missed assignments (Humphrey et al., 2000). SAs have also reported interpersonal stressors including negative or unsatisfactory relationships with professors, coaches, and teammates (Humphrey et al., 2000; Papanikolaou, Nikolaidis, Patsiaouras, & Alexopoulos, 2003). In a study comparing stressors between nonathletes and SAs, SAs reported more stress than nonathletes in a variety of stressors; specifically conflicts with a boyfriend's or girlfriend's family ( $t = 2.53, p < .05$ ), having a lot of responsibilities ( $t = 1.96, p < .05$ ), not getting enough sleep ( $t = 1.98, p < .05$ ), and having heavy extracurricular demands ( $t = 8.81, p < .05$ ; G. Wilson & Pritchard, 2005). Another study examined PSS among SAs based on injury (i.e. major vs minor injuries) (Malinauskas, 2010). There were significant differences between the two groups for perceived stress ( $t = -4.70, p < .001$ ), with the group suffering from major injuries reporting greater



perceived stress ( $m = 26.89$  vs  $m = 21.26$ ). The use of the PSS in the evaluation of life stress allows for equitable comparisons between subpopulations such as SAs and nonathletes.

To build upon the literature focused on stress and known stressors, researchers have worked to better explain how individuals respond to or cope with stress. Coping is defined as an individual's cognitive and behavioral efforts to manage internal or external demands perceived as stressful (Folkman et al., 1986). Additionally, coping efforts are categorized further as either emotion-focused (i.e. regulating stressful emotions) or problem-focused (i.e. altering the cause of distress) (Folkman et al., 1986). Female college students typically utilize emotion-focused strategies whereas males tend to adopt problem-focused coping (Matud, 2004). No peer-reviewed publications have identified distinct differences in coping styles between SAs and nonathletes. In fact, a recent published master's thesis reported no significant differences in selection of positive coping styles between SAs and nonathletes (Martin, 2018). Additional investigations into how these two populations may cope differently is warranted.

### *Depressive Symptoms*

Depressive disorders are typically identified by the presence of DS (National Collaborating Centre for Mental Health (UK), 2010). DS often include sadness, drowsiness, lack of motivation, inability to concentrate, changes in appetite, changes in sleep patterns, and suicidal ideations (American Psychiatric Association, 2013). From 2013-2016, 8.1% of American adults ages 20 years and older reported experiencing depression in a given 2-week period, with women (10.4%) twice as likely as men (5.5%) to report having had depression (Brody et al., 2018). The majority of the literature

concerning depression has confirmed this gender disparity (Cohen, 2017; National Collaborating Centre for Mental Health (UK), 2010; Pilling et al., 2009). Further, college-aged persons between the ages of 18 and 24 years, are currently at the greatest risk for depression when compared to other adolescent and adult age groups (Rohde, Lewinsohn, Klein, Seeley, & Gau, 2013). Studies across the lifespan have found that DS trend upward from childhood into adulthood (Hankin et al., 1998; Rohde et al., 2013). Hankin and colleagues (Hankin et al., 1998) followed a cohort of children longitudinally from preadolescence to age 18 to assess DS throughout the transition to young adulthood. Between the ages of 15 and 18, lifetime reports of depression within this cohort increased from 5.66% to 20.67% ( $p < .001$ ; Hankin et al., 1998). Moreover, another study found that 20% of participants reported a depressive episode in adolescence (up to age 17) compared to 28% in emerging adulthood (ages 18-23) (Rohde et al., 2013). Depressive symptoms can manifest from a multitude of intrinsic and extrinsic factors, which often interact. Intrinsic factors may include genetic vulnerability such as inherited personality traits, hormones, perceptions, and a history of depression (J. Yang, Peek-Asa, Lowe, Heiden, & Foster, 2010). Extrinsic factors are typically situational or environmental in nature (e.g. stressful life events, alcohol abuse, decreased social support, illness or injury, medication use; Olpin & Hesson, 2015).

### *Measurement of Depressive Symptoms*

Major depressive disorder (MDD), also known more simply as depression, is a mental health condition that is diagnosed according the DSM-5 criteria (American Psychiatric Association, 2013). In order to diagnose MDD, a physician or approved provider screens the patient for a specific set of DS. Based on an individual's self-

reported DS, a semi-structured interview may be indicated. Semi-structured interviews according to the DSM-5 criteria are the gold standard for MDD diagnosis (American Psychiatric Association, 2013).

When assessing sub-clinical DS, there is not a referenced gold standard. Instead, researchers have employed various self-report symptom scales and qualitative interviews to assess DS (Clement, Arvinen-Barrow, & Fetty, 2015; Doherty, Hannigan, & Campbell, 2016; Newman, Howells, & Fletcher, 2016; Radloff, 1991; Smarr & Keefer, 2011). Elevations in self-reported DS that do not warrant a MDD diagnosis may still be considered relevant based on the threshold associated with the specific self-report measure (National Collaborating Centre for Mental Health (UK), 2010). The most commonly used quantitative method of depressive symptom assessment among college students is a self-report instrument (Ibrahim et al., 2013). Several symptom scales have been validated among college-aged patients including the Center for Epidemiological Studies Depression Scale (CES-D; Lenore, 1977), the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, Williams, & Patient Health Questionnaire Primary Care Study Group, 1999) and the Profile of Mood States (POMS; McNair, 1971).

The CES-D has been employed most often and has consistent psychometric properties across several validated populations (Radloff, 1991; J. Yang et al., 2007). The CES-D has high internal consistency, with coefficient alphas ranging from .85 to .90, as well as established criterion validity based on moderate correlations with other depression measures (Bradburn Negative Affect, 0.51-0.61; clinical interview ratings, 0.49; Smarr & Keefer, 2011). This instrument has also been found to discriminate

strongly between psychiatric patients and general population samples (70% with scores >16 versus 21%; Smarr & Keefer, 2011). The use of self-report scales allows health professionals to quickly ascertain a student's mental health status (Smarr & Keefer, 2011). Since these instruments are not meant to diagnose a disorder (Sawyer Radloff & Teri, 1986), it is important to interpret the results correctly and refer any patients who report concerning symptoms. When using the CES-D, a score of 16 or greater warrants a referral (Lenore, 1977).

### *Depressive Symptoms among College Students*

Risk for depression onset is greatest among men and women between the ages of 20 and 30 years, with a national prevalence rate of 10.9% among individuals aged 18-25 (SAMHSA, 2017). This young adult timeframe includes the typical age that many students enroll in college (Weigand, Cohen, & Merenstein, 2013). The transition to a college environment often poses new academic, social and financial stressors, which can lead to a difficult period of emotional adjustment (Kahn, Kasky-Hernández, Ambrose, & French, 2017). In fact, the American College Health Association (American College Health Association, 2013) found that 31.6% of college students reported being so depressed that it was difficult to function. In one survey of college students, students indicated academic performance, pressure to succeed, and financial concerns among their top 10 sources of moderate to extreme stress (Beiter et al., 2015). Additionally, negative major life events can influence college student mental health (Vredenburg et al., 1988). The transition to college has also been reported to be associated with appetite disturbance, problems concentrating, and depression (Price, McLeod, Gleich, & Hand, 2006).

A multitude of factors including gender and year in school may increase a college student's risk of depression. Results have shown female college students are at a greater risk of suffering from DS when compared to male students (Appaneal et al., 2009; Storch et al., 2005; Wolanin et al., 2016; Yang et al., 2007). Differences in DS based on a student's year in school have also been identified (Yang et al., 2007). In a sample of college students, Yang et al. (2007) found that freshman were 3.27 times more likely to report experiencing symptoms compared to upperclassmen.

### *Depressive Symptoms among College Student-Athletes*

In comparison with their nonathlete peers, DS experiences among SAs are far less understood. Initially, it was believed that SAs experienced depressive symptoms at lower rates than student nonathletes (Proctor & Boan-Lenzo, 2010). Several factors contributed to this belief including negative stigmatization of depression and fear of reporting mental illness among athletes (Putukian, 2016), as well as the overlap in symptoms between DS and overtraining syndrome (Glick, Stillman, Reardon, & Ritvo, 2012). Several studies have noted athletes exhibit fewer help-seeking behaviors than their nonathlete peers and are less likely to seek help for depression (Armstrong et al., 2015; Gulliver, Griffiths, & Christensen, 2012; Gulliver et al., 2015; Prinz et al., 2016; Putukian, 2016). It has also been suggested that athletes are shielded from emotional disturbances by their talent, conditioning, and mental stamina (Crossman, 1985), and may have a set of inherent attributes that make them less susceptible to depression including self-esteem, confidence, social support, and connectedness (Armstrong et al., 2015).

Contrary to initial assumptions, results of a 2005 study indicate that female SAs were experiencing DS at a greater rate (9.8%) than female nonathletes (6.1%; Storch et

al., 2005). Since then, published prevalence rates of DS among SAs have ranged from 15.6% to 68% (Hammond et al., 2013; Proctor & Boan-Lenzo, 2010; Wolanin et al., 2015; Yang et al., 2007). The variability in these rates may be explained by methodological differences including the type of survey, timing of the survey, and the selected participants. Nevertheless, it appears that SAs may be suffering from DS at equal or greater rates when compared to the general college student population (Hammond et al., 2013; Wolanin et al., 2016). In an attempt to determine what contributes to DS among SAs, it is important to understand the various risk factors associated with athletic participation.

Since SAs are first and foremost college students, many of the same personal and academic factors that affect nonathletes affect this population (Wilson & Pritchard, 2005). As seen in student nonathletes, findings suggest female SAs are suffering from greater DS (Li, Moreland, Peek-Asa, & Yang, 2017; Prinz et al., 2016; Storch et al., 2005) and greater rates of symptoms (Yang et al., 2007) than male SAs. SAs experience pressure to succeed both academically and athletically (Wolanin et al., 2016), and experience negative consequences due to academic stress (Mann, Bryant, Johnstone, Ivey, & Sayers, 2016). For example, among collegiate football players, the odds of incurring a physical injury were more than three times higher during a period of high academic stress than during a period of low academic stress (OR = 3.19,  $p = .002$ ; Mann et al., 2016). There is also evidence that athletes view their lives to include athletic, academic and social responsibilities, forcing them to make a number of compromises in an attempt to fulfill all three (Miller & Kerr, 2002).

While SAs experience many of the same risk factors as student non-athletes, they also experience a unique set of athlete-specific factors. Researchers have found athlete-specific factors with the potential to influence mental health to include [athletic] performance failure (Hammond et al., 2013; Nixdorf et al., 2016), sport type (Nixdorf et al., 2016; Schaal et al., 2011), conflicts with coaches and teammates, and altered social support (Yang et al., 2010). Beyond the pressure to play, an expectation to achieve certain performance outcomes is another form of pressure often experienced by athletes (Wolanin et al., 2015). Results indicate that athletes whose performance outcomes fall short of the expectation may be at risk for experiencing DS (Hammond et al., 2013). Athletes who participate in team sports can assume guilt or failure attributed to not being able to play their role on the team (Weiss & Troxel, 1986). Therefore, those feelings of failure could lead to mood disturbance (Armstrong & Oomen-Early, 2009; Clement & Shannon, 2011). Similarly, individual sport athletes (e.g., runners) may feel a sense of alienation or a loss of their athlete identity if unable to participate in sport (Weiss & Troxel, 1986). Studies have shown individual sport athletes tend to report more severe DS than team sport athletes (Frank et al., 2013; Nixdorf et al., 2016; Schaal et al., 2011; Wolanin et al., 2016). Nixdorf observed a strong correlation ( $r = .70, p < .001$ ) between depressive symptoms and chronic stress among athletes participating in individual sports (Nixdorf et al., 2013). Although the present study will not examine the effects of sport type on perceived stress or DS, this evidence provides a basis for understanding the added stress from participation in college athletics.

A myriad of injury-related factors are also of concern for SA mental health including history of injury, injury type (Hutchison et al., 2009; Mainwaring, Hutchison,

Bisschop, Comper, & Richards, 2010; Roiger, Weidauer, & Kern, 2015), and severity (Leddy, Lambert, & Ogles, 1994; Malinauskas, 2010; SMITH et al., 1993). More than 50% of athletes will sustain some form of injury throughout their sport participation (Appaneal et al., 2009). One survey of Division I SAs found that 70% of participants reported being injured at least once in their career (Nixon, 1996). As a result, research efforts have been directed toward identifying the psychological consequences following injury. Brewer and Petrie (Brewer & Petrie, 1995) compared DS among athletes stratified by injury status. Using a cutoff score of  $>16$  on the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977), it was found that 33% of injured athletes reported DS compared to 27% of uninjured athletes (Brewer & Petrie, 1995). Results have also shown that different types of injuries result in different patterns of DS (Hutchison et al., 2009; Kontos et al., 2012; Mainwaring et al., 2010; Roiger et al., 2015; Vargas et al., 2015). In one sample of collegiate SAs experiencing concussions, elevated DS according to the BDI were reported at 2 ( $m = 4.68, p < .001$ ), 7 ( $m = 4.06, p < .006$ ), and 14 days ( $m = 3.09, p < .05$ ) post-injury when compared to baseline DS ( $m = 1.68$ ; Kontos et al., 2012). A subsequent study comparing DS between concussed athletes and athletes who suffered ACL ruptures found ACL athletes experienced more intense DS for longer durations than the concussed athletes (Mainwaring et al., 2010). Finally, a recent study examined DS between concussed athletes and non-concussed injured athletes at an NCAA Division I university (Roiger et al., 2015). Concussed athletes reported more intense DS than non-concussed injured athletes at 1-week post-injury (11.0 vs. 9.1 CES-D scores); however, at 1-month and 3-months post-injury, non-concussed injured athletes reported more severe DS (8.9 and 6.9 vs 8.3 and 6.3) while concussed athletes' symptoms



normalized by 1-month post-injury (Roiger et al., 2015). These results indicate that while a concussion may cause a greater initial mood disturbance, musculoskeletal injuries may lead to moderate DS for greater durations (Hutchison et al., 2009; Roiger et al., 2015).

As the focus has shifted from solely physical rehabilitation to include psychological considerations, use of substances among athletes has emerged in the research (Reardon & Creado, 2014). Studies have shown athletes may use specific substances for performance enhancement while avoiding specific substances due negative effects on performance (Green, Uryasz, Petr, & Bray, 2001), or to develop substance use disorders just as a nonathlete may. However, substance use as an outcome of coping with stress (i.e. physical injury) is of interest in this study.

### *Substance Use*

College students are known to engage in risky behaviors, including substance use, that increase negative health-related outcomes (Ford, 2007). College students engage in various patterns of alcohol consumption, such as HED and taking illicit and prescription drugs (O'Malley & Johnston, 2002). Prevalence rates and correlates of substance use in college students vary from one substance to another (Yusko, Buckman, White, & Pandina, 2008a).

Research has shown consistently that alcohol is the most widely used drug on college campuses in America (Johnston et al., 2016; Leichliter et al., 1998). College students generally have higher rates of alcohol consumption than individuals of the same age who do not attend college (Johnston et al., 2016). According to results of the Monitoring the Future survey, a greater percentage of college students reported past-month alcohol use (66% vs. 58%) as well as HED in the previous two weeks (39% vs.

34%) than their non-college age peers (Johnston et al., 2016). In several national studies of college samples, rates of reported alcohol consumption in the previous 30 days were approximately 70%, and nearly 40% reported HED in the previous two weeks (Johnston et al., 2016; O'Malley & Johnston, 2002; Wechsler, 2005). HED and a greater frequency of heavy drinking episodes among college students have been associated with being male, Caucasian, a SA, and being affiliated with a fraternity or sorority (Barry, Howell, Riplinger, & Piazza-Gardner, 2015; Johnston et al., 2016; Mastroleo et al., 2018; Yusko, Buckman, White, & Pandina, 2008b). The substantial rates of alcohol use among college students have been established in the literature, but further investigations into motivations for use (e.g., coping with stress) are warranted.

College students are also using illicit “street” drugs (e.g. marijuana, cocaine) at varying rates. For example, 25-50% of college students have reported past-year marijuana use whereas only 4.8-12.2% have reported cocaine use in the previous year (Yusko, Buckman, White, & Pandina, 2008a). According to the National Survey of Substance Use and Health, young adults aged 18 to 25 years are using marijuana at greater rates than all other age groups (Center for Behavioral Health Statistics and Quality, 2016). Other research suggests that within the young adult population, college students use illicit substances at rates equal to or lower than their non-college peers (Johnston et al., 2016; SAMHSA, 2013). As of 2016, rates of daily marijuana use were at an all-time high for young adults not attending college (12.8%), up from 6.7% in 2006 (Schulenberg et al., 2017). In comparison, 4.7-11.3% of college students reported daily or near-daily marijuana use (Core Institute, 2010; Johnston et al., 2016). It should be noted that one study that produced a high prevalence rate (11.3%) of daily marijuana use

among college students was conducted in a state where legalization had occurred (J. M. Cadigan, Dworkin, Ramirez, & Lee, 2019). The legalization of marijuana may substantially alter reported rates of use and should be taken into consideration when evaluating the literature.

Although rates of daily marijuana use among college students are similar or lower than rates among those not attending college, 20.3-33.2% of students have reported using marijuana in the previous year (Core Institute, 2010; Johnston et al., 2016; SAMHSA, 2017). Further, college enrollment has been shown to be a risk factor for marijuana use initiation (Miech, Patrick, O'Malley, & Johnston, 2017). Specifically, college students in 2013 who had never used marijuana by the 12<sup>th</sup> grade were 31% more likely to report past-year marijuana use than their non-college aged peers; this higher relative risk increased to 51% by 2015 (Miech et al., 2017). College students who are male (Johnston et al., 2016; McCabe et al., 2007; McCabe, Cranford, Boyd, & Teter, 2007), or are members of a fraternity or sorority (McCabe et al., 2005; McCabe, Teter, & Boyd, 2005) are more likely to use illicit drugs. Unlike alcohol use behaviors, athletic participation has been identified as a protective factor against illicit drug and tobacco use in the college student population (Ford, 2007; Yusko, Buckman, White, & Pandina, 2008a).

Another behavior of concern among undergraduate students is prescription drug misuse. Misuse of prescription drugs refers to the use of a drug without a valid prescription from a physician or using one's own medication in amounts or for reasons other than those prescribed (Gallucci, Usdan, Martin, & Bolland, 2014; Gallucci & Martin, 2015; McCabe & Teter, 2007). Two types of prescription drugs that are being misused by college students are stimulants (MPS) and opioids (MPO) (Ford, 2008; Ford

& Pomykacz, 2016; Gallucci et al., 2014; McCabe, Teter, Boyd, Knight, & Wechsler, 2005; Zullig & Divin, 2012). Rates of past-year MPS in college student samples range from 5.9% to 13.9% (Gallucci & Martin, 2015; McCabe, 2008; Weyandt et al., 2009; Zullig & Divin, 2012). In fact, young adults enrolled in college full-time were more likely to report MPS than their same-age peers who did not attend college (Ford & Pomykacz, 2016). Studies have found significantly higher rates of MPS in males, students affiliated with fraternities or sororities, HED, and energy drink consumption (Gallucci & Martin, 2015; Woolsey et al., 2015). Studies of MPO among college students have found rates ranging from 3.6-12% (Ford, 2008; McCabe et al., 2005; McCabe, 2008; Zullig & Divin, 2012). One study found that rates of MPO were higher among college students who were White, residents of fraternity or sorority houses, had lower GPAs, and reported higher rates of other substance use (McCabe et al., 2005). Furthermore, MPO users were over four times more likely to report frequent HED, over eight times more likely to report past-year marijuana use, and over 12 times more likely to report past month MPS compared to nonusers (McCabe et al., 2005; McCabe, West, Teter, & Boyd, 2014; SAMHSA, 2017). MPS and MPO have also been associated with DS in college students. In one study, students who reported feeling depressed were 18% more like to report MPO, and 18% more like to report MPS (Zullig & Divin, 2012). This study aims to extend the literature examining MPS and MPO associated with reported DS.

Energy drink (ED) consumption has gained recent popularity among college students. A recent study of college students found 36.4% of students reported past-month ED use (Gallucci, Martin, & Morgan, 2016). Energy drink use has been associated with

several adverse health behaviors including frequent HED ( $\Phi = .203, p < .001$ ) and past-year MPS ( $\Phi = .203, p < .001$ ) (Gallucci et al., 2016). Another concerning behavior is the consumption of EDs combined with alcohol. A study of college students found that for everyone one unit increase in past-month ED use (i.e., one additional day per month) the likelihood of consuming alcohol in the previous month increased by 80% and the likelihood of consuming EDs mixed with alcohol increased by 90% (Velazquez, Poulos, Latimer, & Pasch, 2012). Students who are male, White, affiliated with a fraternity or sorority, and younger have been significantly more likely to consume EDs mixed with alcohol (O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008).

Although students report similar reasons for ED use and MPS (e.g. to study longer, to improve mental focus; Gallucci & Martin, 2015; Oglesby, Amrani, Wynveen, & Gallucci, 2018), much less is known about the relationship between college student ED use and MPS; however, the results of one study may inform the co-occurrence of these behaviors. Among college stimulant misusers, the odds of MPS increased by 14% with each additional day of ED use in the previous month ( $OR = 1.143, p < .001$ ; Woolsey et al., 2015). Additional research is needed to further explain this relationship.

### *Substance Use among Student-Athletes*

Investigations into the use and misuse of various substances among SAs indicate that rates of use differ from college nonathletes by substance (Yusko, Buckman, White, & Pandina, 2008a). General alcohol consumption and HED have been examined extensively in SA samples (Cadigan et al., 2013; Ford, 2008; Gallucci, Wynveen, Hackman, Meyer, & Usdan, 2014; Leichliter et al., 1998; Martens et al., 2006; McCabe et al., 2005; Nelson & Wechsler, 2001; O'Malley & Johnston, 2002; Wechsler,

Davenport, Dowdall, Grossman, & Zanakos, 1997). Research suggests that increasing athletic involvement has resulted in an increased likelihood of alcohol consumption and HED, specifically (Cadigan et al., 2013; Hildebrand, Johnson, & Bogle, 2001). One study examined athletic involvement by classifying college student participants into three groups: college athletes (those who had been an athlete at both the high school and college levels), high school athletes (those who had participated in high school athletics but not at the college level) and nonathletes (no athletic involvement at the high school or college levels; Hildebrand et al., 2001). The results indicated significantly more college athletes (39.6%) reported drinking an average of more than twice per week compared to high school athletes (35.9%) and only of nonathletes (21.2%;  $\chi^2 = 50.45, p < .001$ ); furthermore, significantly more college athletes (65.8%) reported averaging three or more drinks per sitting compared to nonathletes (44.4%,  $\chi^2 = 40.59, p < .001$ ; Hildebrand et al., 2001). In a subsequent longitudinal study, Cadigan and colleagues (2013) found that individuals who were more athletically involved during their college years showed sharper increases in problem drinking (e.g., HED, frequency of intoxication, alcohol-related problems).

Continued research comparing the prevalence of alcohol use behaviors of SAs to nonathletes has yielded mixed results (Martens et al., 2006). One study found that approximately 80% of SAs reported alcohol use in the previous 12 months (Green et al., 2001); however, rates have been shown to be as high as 85-87% (Wechsler et al., 1997). Although prevalence rates among SAs can be directly compared to those of nonathletes, that alone does not communicate the differences in frequency or amount of alcohol being consumed. Reported HED rates are consistently higher among SAs compared to

nonathletes (Ford, 2007; Martens et al., 2006; Mastroleo et al., 2018; Yusko, Buckman, White, & Pandina, 2008a). In several comprehensive national studies (Leichliter et al., 1998; Nelson & Wechsler, 2001; Wechsler et al., 1997), SAs consumed more alcohol, engaged in more frequent HED, and experienced more negative consequences related to alcohol than nonathletes. Additionally, a 2014 NCAA report found that although SAs had as many drinks per week as nonathletes, HED occurred significantly more often among SAs (National Collegiate Athletic Association, 2014). It has been hypothesized that increased frequencies of HED results from athletes commonly misjudging the substance use patterns of their nonathlete peers; this overestimation leads SAs to believe that their nonathlete peers are consuming alcohol in greater quantities or more frequently, and leads to increased quantities and frequencies among SAs (Dams-O'Connor et al., 2007). Research suggests that male SAs generally consume more alcohol and at rates higher than male nonathletes (Martens et al., 2006; Miller et al., 2002; O'Malley & Johnston, 2002), but this same discrepancy has not been shown in female SAs. Although prevalence rates of alcohol use among SAs only slightly exceed those of nonathletes, HED appears to be a much more common behavior among SAs.

SAs may be consuming alcohol for several reasons. Alcohol use and DS were strongly correlated among a sample of SAs (Miller et al., 2002; Putukian, 2016). It is worth noting that gender may play a role in this relationship. A study of SAs found that gender was a moderating factor between DS and alcohol use; as DS increased, alcohol use increased among males only (Pedrelli et al., 2011). It has also been hypothesized that depression may be an antecedent of substance abuse, where depressed individuals are using substances to self-medicate (Miller et al., 2002). Conversely, researchers have

suggested that alcohol dependent individuals are being made depressed by alcohol (Grant, 1997). The complicated comorbidity of alcohol use and psychiatric disorders is prevalent in the general population as well as among college students, warranting additional investigation.

Athlete status appears to be a protective factor in regards to illicit drug use and MPS. A review of studies examining illicit drug use among SAs identified an inverse relationship between athletic participation and drug use (Lisha & Sussman, 2009; 2010). Increased athletic participation was associated with decreased illicit drug use. Furthermore, Ford (2008) also found SAs to be less likely to report MPO relative to nonathletes. Studies of the effects of athletic participation on ED use provide mixed results (Gallucci et al., 2016; O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008). One study found SAs are consuming fewer EDs relative to nonathletes ( $\Phi = .148, p < .05$ ; Gallucci et al., 2016). In a study of multilevel collegiate sport participation (e.g., intramural, club, varsity), students who were intramural athletes were significantly more like to consume EDs mixed with alcohol compared to nonathletes (O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008). The paucity of literature concerning drug and ED use among SAs calls for replication and expansion of the previously mentioned research.

### *Grit*

Researchers continue to identify associations between various personality traits and substance use and abuse. For example, previous findings have linked alcohol misuse with maladaptive traits such as aggression and impulsivity (Garofalo & Wright, 2017). The personality trait Grit is defined as “perseverance and passion for long-term goals” (Duckworth et al., 2007). Although the concept of grit is relatively new, extant literature



describes related concepts such as hardiness (Grove, Stewart, & Gordon, 1990), perseverance, resilience (Galli & Gonzalez, 2015; Sarkar & Fletcher, 2014), and mental toughness (Connaughton, Wadey, Hanton, & Jones, 2008). In a study of injured sport performers, Grove et al. (1990) found that hardiness was inversely correlated with total mood disturbance. Mental toughness is thought to be an umbrella term composed of many attributes that describe a natural or developed psychological edge enabling performers to cope better than their opponents with the demands and pressures that occur in high level sport (Jones, 2002). Persistence or perseverance has been reported as a behavior of mentally tough individuals, akin to the psychological concept of grit (Gucciardi, Peeling, Ducker, & Dawson, 2016). Finally, a hypothesized indicator of the construct of mental toughness is a success mindset (Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015). The greatest difference between grit and the related constructs is the emphasized temporal aspect of grit; gritty people sustain high levels of focused effort *over time* in pursuit of long-term or higher-order goals (Duckworth et al., 2007). The grit construct was developed from extensive interviews with professionals in investment banking, painting, journalism, academia, medicine, and law (Duckworth et al., 2007).

Researchers investigating the efficacy of grit found the construct to predict success mainly in the academic setting. Increases in grit have been associated with higher grade point averages, higher levels of degree attainment, and increased success among national spelling bee finalists (Duckworth et al., 2007). A web-based survey of 1,500 adult participants found that grit increases with age, potentially showing that life experiences influence grit (Duckworth et al., 2007). Findings also indicated that the level of education obtained by a participant was directly associated with higher grit scores.

Specifically, while controlling for age, participants with post-college graduate degrees displayed more grit than those with a bachelor's degree or high school diploma ( $F = 15.48, p < .001$ ; Duckworth et al., 2007).

### *Grit among College Students*

Few studies have focused on levels of grit in undergraduate students (Duckworth et al., 2007; Jaeger, Freeman, Whalen, & Payne, 2010). One study evaluating grit and GPA among Ivy League undergraduates found that gritty students outperformed their less gritty peers while controlling for SAT scores (Duckworth et al., 2007). A subsequent study of cadets at West Point Military Academy found that grit was the strongest predictor of cadet survival in their summer training regimen (Duckworth et al., 2007). Specifically, cadets whose grit scores were one standard deviation higher were over 60% more likely to complete summer training ( $B = .48, OR = 1.62, p < .001$ ; Duckworth et al., 2007).

Studies have identified differences in grit scores based on gender, age, and athlete status (Duckworth et al., 2007; Jaeger et al., 2010). In a study of college students, Jaeger et al. (2010) found female students scored significantly higher in grit than their male peers. This result was consistent across all years in school, freshman through senior. Jaeger's study also examined differences in grit between university SAs and those not affiliated with organized varsity sport, and found SAs had higher grit scores than nonathletes (Jaeger et al., 2010). Moreover, in a study examining exercise behavior, exercisers (including competitive athletes) reported significantly higher grit scores ( $t = 4.08, p < .001$ ) compared to non-exercisers (Reed, 2014).

### *Grit and Depressive Symptoms*

Research into grit, which received initial attention as a strong predictor of success and performance, has recently shifted from solely predicting success toward the potential to predict health outcomes as well (Blalock, Young, & Kleiman, 2015; Campbell-Sills et al., 2006; Griffin et al., 2016). Grit has been associated with fewer DS and lower levels of substance abuse in an inpatient population (Griffin et al., 2016). Grittier people have also been shown to report higher levels of general psychological well-being (Salles, Cohen, & Mueller, 2014), higher life satisfaction ( $r = .40$ ), higher positive affect ( $r = .47$ ), and lower negative affect ( $r = -.34$ ; Young, Lin, & Duckworth, 2015). However, these relationships have yet to be established in a college student population. Because many college students are affected by DS and engage in substance use, expanding the literature to assess grit within this population could improve our understanding of the influence personality has on adverse health outcomes.

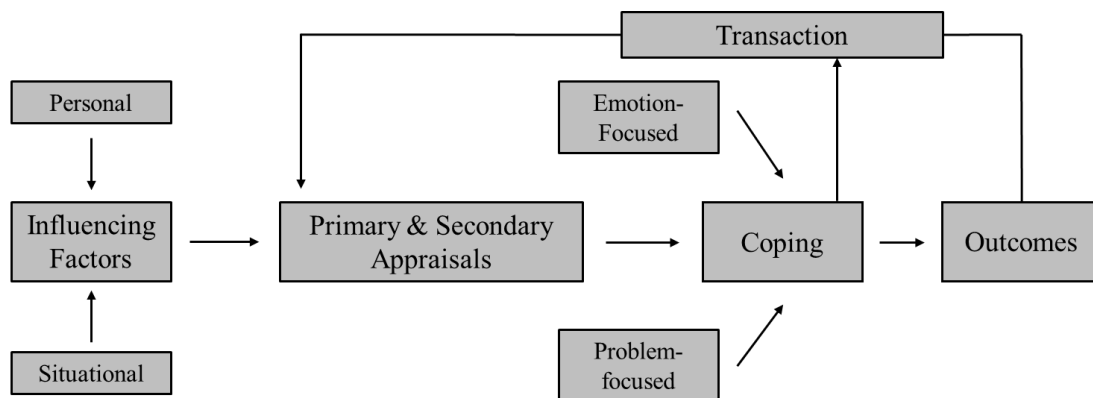
### *Measuring Grit*

The only instrument that can be used to measure grit is Duckworth's Grit Scale (Duckworth et al., 2007). As mentioned previously, grit is typically considered the higher-order construct that encompasses two lower-order factors: "perseverance of effort" (perseverance) and "consistency of interest" (consistency) (Credé, Tynan, & Harms, 2017). The Grit Scale is designed to measure these two distinct subscales, although the majority of researchers has only reported a total grit score (Duckworth, 2016). According to Duckworth et al. (2016), this may be due to, "neither factor consistently being more predictive of outcomes than the other, and in most cases, the two together are more predictive than either alone."

The maximum score on the Grit Scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty). Within this range, benchmark values for low versus high grit have yet to be established. Instead, published mean scores can be used to make comparisons across various populations. Mean scores for adults ages 25 and older range from 3.41 to 3.65 (Duckworth et al., 2007), while studies of Ivy League undergraduates and West Point Cadets revealed mean scores of as high as 3.78 (Duckworth et al., 2007). While this scale may be effective at identifying the amount of grit a person exemplifies, additional research is needed to establish average grit scores or benchmark values.

### *Conceptual Framework*

The theoretical framework selected for this study was Lazarus and Folkman's Transactional Model of Stress and Coping (TM) (Lazarus & Launier, 1978). The TM was developed as an attempt to explain stress as a dynamic process (see Figure 2.1); a product of the interaction between an individual and his or her environment (Lazarus & Launier, 1978). The transaction approach to stress emerged in response to previously accepted theories of stress (Holmes & Rahe, 1967; Selye, 1956).



*Figure 2.1. Lazarus & Folkman's Transactional Model of Stress and Coping*

Initially, stress was described by Hans Selye as a physiological response pattern in the stress-response model (Selye, 1956). Selye (1956) developed this finding into his General Adaptation Model (GAS), comprised of three main concepts: 1) stress is a protective mechanism; 2) stress follows the stages of alarm, resistance, and exhaustion; 3) if stress is too severe or prolonged, it may result in adaptive disease or death. Later, the stress response was expanded to include psychological interpretations of symptoms, potentially leading to positive or negative outcomes (Selye, 1983). Although Selye incorporated cognition into the GAS model, it functioned as a fundamentally physiological model nevertheless.

In contrast to Selye's physiological interpretation, Holmes and Rahe (Holmes & Rahe, 1967) theorized that stress was a psychological predictor variable in the stress-coping interaction. They posited that humans were passive recipients of stress, without any control of the intensity of the stressor itself (Holmes & Rahe, 1967). Several problems with this theory emerged: 1) Rahe began researching the role of human interpretation and its influence on stress; 2) the stress-stimulus theory did not take into account personal or environmental differences, including past life experience, personality, social support or prior knowledge. Thus, researchers were led to develop an explanation of how individual factors may influence stress.

While the TM is valuable for its modern conceptualization of the stress process, it was adopted for this study for additional reasons. First, the TM gained initial attention from its impactful application to the concept of psychological hardiness. Hardiness is defined as a set of personality traits among people who remain healthy while managing life stress (Kobasa, 1979). Since the present study included an examination of grit, a

psychological construct akin to hardiness, application of the TM seemed like a logical extension from the original work. Furthermore, this appears to be the first investigation applying a conceptual framework to the analysis of grit.

A second motivation for selecting the TM came from the target population of the present study. Previous research into stress among SAs suggests a specific transaction occurs between athletes and their environment when an injury is sustained. The Integrated Model of Response to Sport Injury, developed by Wiese-Bjornstal (1998), elaborates on the TM by identifying athlete-specific factors (see Figure 2.2). Although this theory was developed to address unique characteristics of an athletic population, its foundation is a transactional stress model. This commonality provided support for the application of the TM in the present study.

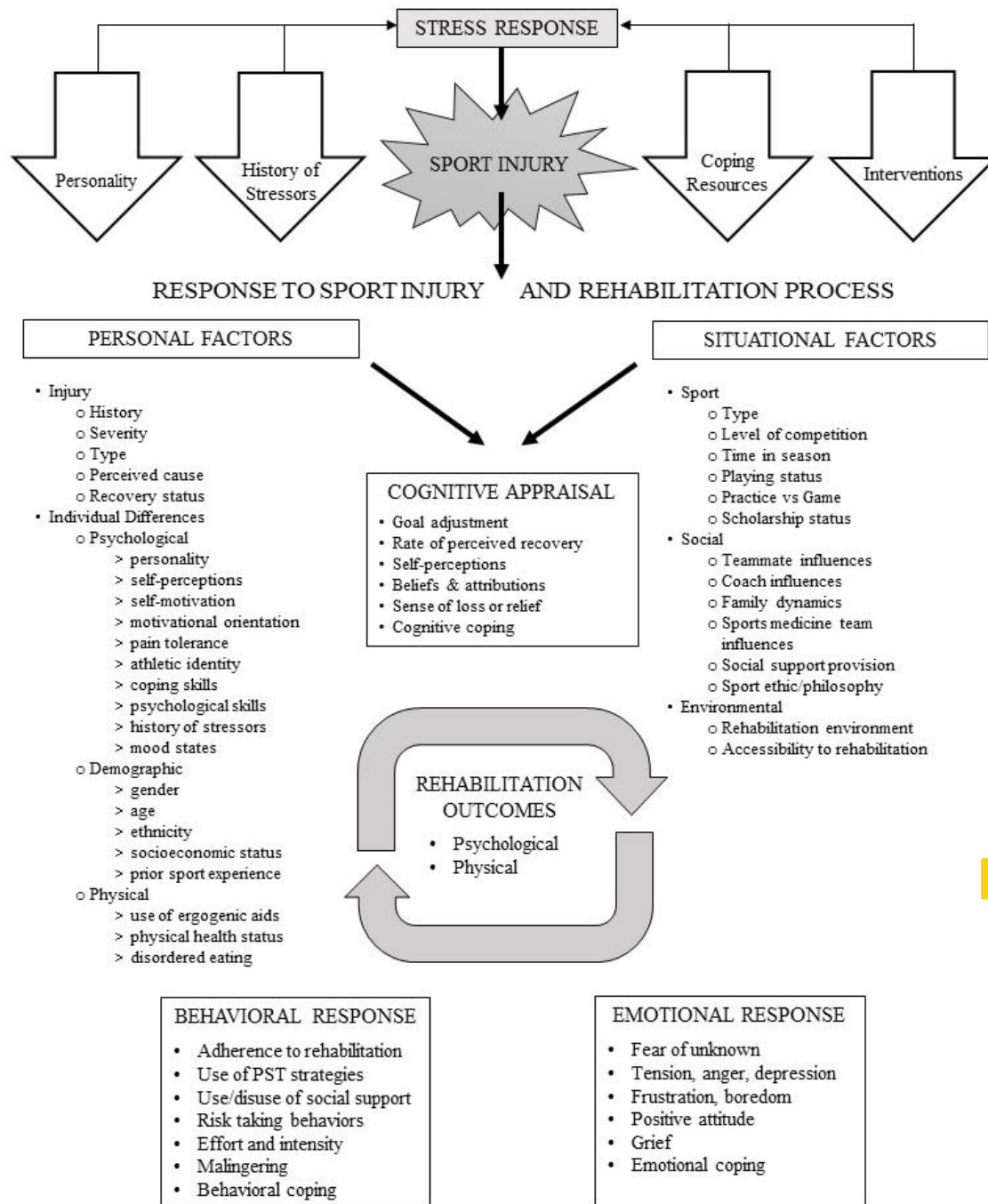


Figure 2.2. Wiese-Bjornstal's Integrated Model of Response to Sport Injury

## CHAPTER THREE

### Methods

#### *Study Purpose and Design*

The purpose of this study was to examine the relationships between grit, athletic participation, stress, coping, and health behaviors (e.g. depressive symptoms, use of various substances) in a sample of college students. The primary investigatory of this study employed a cross-sectional design by generating a paper-and-pencil questionnaire. Several previously validated self-report scales (Perceived stress scale-10; (Cohen et al., 1983), Grit Scale; (Duckworth et al., 2007), Center for Epidemiological Studies Depression Scale - Revised; (Eaton, Smith, Ybarra, Muntaner, & Tien, 2004) and questions were included in the survey to assess athletic participation, stressors, coping, grit, DS, and substance use. Additional questions were included to acquire demographic data in order to compare the present study's data to previous results within the literature. The questionnaire was approved by the Institutional Review Board of Baylor University.

#### *Participants*

Surveys were administered to college students between 18 and 24 years of age in classroom settings at a private Southeastern university in the form of a one-time questionnaire. The participants' anonymity was protected by never asking for any identifiable information. Participants in this study were not asked to sign an informed consent; rather, each participant was asked to read the introductory page of the survey



and choose to continue. Completion of the questionnaire was an affirmation of the participant's consent.

### *Instrumentation*

The following questions and instruments were utilized to assess the constructs of the TM.

### *Influencing Factors*

The first section of the questionnaire included 13 questions to assess the demographics of survey participants. Participants provided data regarding their age, gender, race, year in school, GPA, living arrangements, and Greek status via questions adapted from previous researchers (Gallucci & Martin, 2015; Johnston et al., 2016). Participants identified their level of athletic participation, as well as the estimated amounts of time attributed to sport, work, studying, and sleep per week by responding to questions used previously in the literature (Gallucci & Martin, 2015; Pace & Kuh, 1998). Finally, participants were asked to select any and all of the major life events they have experienced in the previous six months via one question adapted from the Traumatic Life Events Questionnaire (TLEQ; Kubany, 2004). Although the use of a single question from the TLEQ provides a less-comprehensive view of the participant's life event experience, it was only included in this study to compliment the reported PSS scores and potentially control for inflation in perceived stress.

Additionally, a scale created by Angela Duckworth (2007) was used to measure grit. This scale is comprised of two subscales and a total of 12 items. The first subscale, *consistency of interests*, is assessed by six items including statements such as, "My interests change from year to year," and, "New ideas and new projects sometimes distract

me from previous ones.” The remaining six items assessing *perseverance of effort* include statements such as, “I have achieved a goal that took years of work,” and “Setbacks don’t discourage me.” Participants responded to each statement with one of the follow selections: “Very much like me”, “Mostly like me”, “Somewhat like me”, “Not much like me”, or “Not like me at all”. Positively- and negatively-worded statements are included in the Grit scale. Therefore, standard and reverse scoring were taken into account when calculating total grit scores. Total grit scores range from 1 to 5, with scores closer to 5 signifying more grit. The creator of this instrument did not establish benchmark values for low, moderate, or high grit, so comparisons must be made between normative values found in previous populations (Duckworth et al., 2007). The scale’s developer suggests the Grit scale is a valid and moderately reliable ( $\alpha = .68$ ) instrument (Duckworth & Quinn, 2009). Predictive validity has been demonstrated through associations between high grit scores and anticipated accomplishments among elite adolescents and adults in their respective domains (e.g. national spelling bees, Westpoint summer training, athletic competition) (Duckworth & Quinn, 2009).

### *Primary Appraisal*

To address participants’ appraisals of daily life stress, the questionnaire included the Perceived Stress Scale (PSS10; Cohen et al., 1983). This scale includes 10 questions asking about the participant’s feelings and thoughts regarding situations from the previous month (e.g., How often have your felt nervous and “stressed”? or How often have you felt that things were going your way?). Participants were asked to indicate how often they felt or thought a certain way by selecting from five response options ranging from “Never” to “Very Often”. Then, each item was assigned a score of 1 to 5, with

higher scores indicating a higher frequency of feelings or thoughts. The PSS10 is a reliable and valid instrument based on an initial analysis by Cohen and Williamson (Cohen, 1988), and later confirmed by Roberti, Harrington and Storch (Roberti, Harrington, & Storch, 2006). Cronbach's alpha values ranged from .84 to .86 across three initial samples and .89 in a subsequent sample (Cohen, 1988; Roberti et al., 2006). The test-retest reliability was also acceptable ( $r = .85$ ; Cohen, 1988).

### *Coping*

Participants were asked to respond to questions regarding their ways of coping with stress. The questions included several subscales of the Brief COPE Inventory (Carver, 1997). Carver (1997) allows investigators to select only the subscales that are most appropriate. For the purposes of this study, a total of eight items were used to assess the following five subscales: Active Coping, Emotional Support, Instrumental Support, Self-Distraction, and Substance Use. Responses for each item are represented on a 4-point Likert scale ranging from "I haven't been doing this at all" to "I've been doing this a lot." Each item is then assigned a score of 1 to 4, with higher scores indicating increased frequency. The items from the Brief COPE are not intended to be aggregated or totaled into an overall score (Carver, 1997); rather, the investigators utilized participants' responses as possible mediating factors within the applied theoretical model. The Brief COPE Inventory has strong internal reliability (11 of 14 subscales exceeding  $\alpha = .60$ ; Carver, 1997).

### *Health Outcome: Depression*

Participants in this study were asked to complete the Center for Epidemiologic Studies Depression Scale - Revised (CESD-R; Eaton, Smith, Ybarra, Muntaner, & Tien et al., 2004). This scale includes a list of 20 statements assessing an individual's feelings or behaviors including items such as, "I lost interest in my usual activities," and "My sleep was restless." The original CES-D was revised to indicate general dysphoria more reliably and include the nine primary symptoms of a major depressive episode (Eaton, Smith, Ybarra, Muntaner, & Tien et al., 2004; Lenore, 1977). The CESD-R also includes an additional response category (nearly every day for two weeks), which more accurately reflects the timeframe utilized in depression diagnosis (Van Dam & Earleywine, 2011). Therefore, participants responded to each item of the CESD-R by selecting one of the following: "0 = Not at all or less than 1 day", "1 = 1-2 days", "2 = 3-4 days", "3 = 5-7 days", or "4 = Nearly every day for 2 weeks". A score of 16 or greater on the CESD-R is the threshold used to diagnose MDD and warrants a referral to a physician (Lenore, 1977). The CESD scale is considered to be highly reliable ( $\alpha = .85-.90$ ) and has criterion validity established by moderate correlations with other measures of depression (Radloff, 1991; Smarr & Keefer, 2011).

### *Health Outcome: Substance Use*

The final section of the survey included questions assessing the participant's use of various substances. The substances of interest were alcohol, marijuana, prescription stimulants and opioids, and energy drinks. The questions were adapted from the Monitoring the Future Study (Johnston et al., 2016). The temporal components of substance use questions varied by substance (e.g. heavy episodic drinking in the previous

two weeks, marijuana use in the previous month) to remain consistent with prevalence rates typically reported in the literature. Each question in this section had seven possible responses (“Never”, “1-2”, “3-5”, “6-9”, “10-19”, “20-39”, “40+”).

### *Procedure*

After obtaining approval from the Institutional Review Board, the principal investigator (PI) contacted academic course instructors of 32 classes to request class time to administer surveys to their students. The courses belonged to several academic departments. Instructors of 23 courses responded to the initial recruitment email volunteering class time for survey administration. The PI sent the instructors of the remaining nine courses a follow-up email two weeks later, but was unable to yield additional recruitment opportunities. The investigators coordinated opportunities and locations with the athletic trainers to administer the survey. To reduce possible coercion of students, the instructors were asked to leave the room prior to data collection. The PI gave a recruitment speech in each class to provide background for the study and increase participant responses. The speech explained that the study was examining how students experience and cope with stress, as well as several physical and mental health behaviors. The PI emphasized that the survey was anonymous and that none of the participants’ responses could be linked to identifiable information. It was stated that participants may skip any questions they did not feel comfortable answering, and that there was no penalty for not participating. Students were told that they can only participate in this study once. In an attempt to increase confidentiality, surveys were aggregated with previously completed surveys. The PI provided a stack of completed surveys and the participants were asked to place their completed surveys anywhere within the stack.

To address the first research question, the investigators purposefully oversampled SAs by recruiting from multiple athletic facilities. Nine certified athletic trainers working for the university were contacted via email to obtain permission to recruit SAs, resulting in five affirmative responses. Although follow-up emails were sent to the four remaining athletic trainers, no additional recruitment opportunities were provided. The investigators coordinated opportunities and locations with the athletic trainers to administer the survey. In order to reduce possible coercion, the sport's coaches were not present during data collection. SA participants were provided a recruitment speech explaining that the study was examining how students experience and cope with stress, as well as several physical and mental health behaviors. The investigators stressed that the survey was anonymous and that none of the participants' responses could be linked to identifiable information. It was stated that participants may skip any questions they do not feel comfortable answering, and there was no penalty for not participating. In an attempt to increase confidentiality, surveys were aggregated within a stack of previously completed surveys. Completed surveys were stored in a locked file cabinet in the PI's office. Only the PI had access to handle the surveys in this study.

#### *Data Processing and Analysis*

All data from the surveys were manually entered into a Qualtrics form of the survey and exported into an Excel file. This file was saved to a portable storage drive and stored in a locked drawer of the PI's office. Only the PI, dissertation committee chair, and a committee member with statistical expertise had access to the saved data file.

All statistical analyses were performed using SPSS (25.0). Descriptive statistics (e.g. mean, SD, skewness) were used to generally examine the distribution and central

tendency of the data from the sample of participants. Bivariate analyses were conducted to determine relationships between the independent variables of interest (e.g. grit scores, stressors, demographics).

To begin hypothesis testing, the first research question was assessed using an independent T-test between SAs and nonathletes. Similarly, the second research question only contained one hypothesis and was tested using a Pearson Correlation. The third research question was comprised of five hypotheses (one for each substance use outcome) which were tested using correlation analyses based on dependent variable structure (e.g. Spearman rank correlation, point biserial correlation). The hypothesis of Research Question #4 was tested using a Pearson correlation. Finally, regression analyses were utilized to test the fifth and sixth research question hypotheses. Regression models were utilized to determine if independent variables increased or decreased reported substance use or depressive symptoms. With regard to coping, we included a survey item assessing participants' use of substances as a way to cope. Since substance use behaviors were outcome variables, we anticipated and found evidence of multicollinearity. In response, we only included coping with substances in the regressions examining DS and removed it from all substance use outcome analyses. The models were fit based on mapping independent and dependent variables onto the TM. Poisson and logistic regressions were selected for substance use data that were restructured or exhibited a non-normal distribution.

## CHAPTER FOUR

### Is Grit Legit? Comparing Grit, Stress and Depressive Symptoms between Student-Athletes and Nonathletes

#### *Abstract*

Objective: To compare grit between collegiate student-athletes (SAs) and nonathletes, while examining its relationships with time attribution, stress, and depressive symptoms (DS). Participants: 554 college students at a large, southwestern private university. Methods: A 73-question, paper-and-pencil survey composed of several previously-validated instruments was developed and administered to students during academic courses. In an attempt to make accurate comparisons, SAs, were oversampled by administering surveys in various athletic training facilities as well. Results: SAs had higher grit scores ( $t = -4.81, p < .001$ ), less perceived stress ( $t = 1.94, p = .04$ ), and lower DS ( $t = 3.86, p < .001$ ) than nonathletes. Grit was positively correlated with GPA and negatively associated with perceived stress and DS. Among SAs, there was no association between grit and hours attributed to sport. Conclusion: Grit may play a role in students' experiences with stress and DS. Further explorations of grit in college students are warranted.

Keywords: student-athlete, grit, perceived stress

#### *Introduction*

Stress can be broadly defined as the non-specific response of the body to any demand for change (Selye, 1973). College students are known to experience high levels



of stress, and research examining stress among these students has supported this belief (Beiter et al., 2015; Cohen & Janicki-Deverts, 2012; Ross et al., 1999). In a study of national surveys administered between 1983 and 2006, college-aged participants (ages 25 and below) reported higher mean perceived stress scores ( $m = 14.54$ ) than all other age groups (Cohen & Janicki-Deverts, 2012). Although stress is present throughout all phases of life, the combined effects of transitioning out of the home, increased academic rigor, and changes to social circles or support structures likely explain the increased stress experienced in college (Ross et al., 1999). Increased levels of stress in college are problematic because they have been associated with adverse health behaviors such as depression (Parrish et al., 2011; Schönfeld, Brailovskaia, Bieda, Zhang, & Margraf, 2016), alcohol consumption (Keyes et al., 2011), drug use (Lanier, Nicholson, & Duncan, 2001), and decreased physical activity (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006).

Research among college students suggests that stress manifests in different ways and extents based on several factors, including gender, personality traits (Afshar et al., 2015), and student-athlete status (i.e. Varsity sport participation; Humphrey et al., 2000). Similar to nonathletes, student-athletes (SAs) have reported experiencing academic-related stressors (Wilson & Pritchard, 2005). One study found that 95% of male athletes and 86% of female athletes were stressed by academic factors including examinations, writing papers for class, missing classes due to sport-related travel, and making up missed assignments (Humphrey et al., 2000). In addition, SAs have reported stressors unique to their participation in sport which include unsatisfactory relationships with professors, coaches, and teammates (Humphrey et al., 2000; Papanikolaou et al., 2003).

In fact, a study comparing the stressors between SAs and non-athletes found that SAs reported more stress related to conflicts with a boyfriend's or girlfriend's family ( $t = 2.53$ ,  $p < .05$ ), having a lot of responsibilities ( $t = 1.96$ ,  $p < .05$ ), not getting enough sleep ( $t = 1.98$ ,  $p < .05$ ), and having heavy extracurricular demands ( $t = 8.81$ ,  $p < .05$ ; Wilson & Pritchard, 2005). Furthermore, SAs have reported sport-specific stressors to include competitive failure (Nixdorf et al., 2016), performance failure (Hammond et al., 2013), and physical illness or injury (Appaneal et al., 2009; Gulliver et al., 2015; Houston et al., 2016; Nixdorf et al., 2013; Yang et al., 2007). In one of the few published studies utilizing a validated stress scale among SAs, athletes suffering from more severe injuries reported greater perceived stress than those with minor injuries ( $m = 26.89$  vs  $m = 21.26$ ) (Malinauskas, 2010). Although understanding stressors among SAs provides context to the understanding of perceived stress, assessing specific stressors is beyond the scope of this study.

While high levels of stress may be considered normal while attending college, the association between stress and adverse health behaviors is an ongoing concern (Beiter et al., 2015; Lanier et al., 2001). In fact, over 30% of college students have reported feeling so depressed it affected their daily ability to function (American College Health Association, 2013). Among SAs, rates of reported DS have ranged from 15-68% (Hammond et al., 2013; Proctor & Boan-Lenzo, 2010; Wolanin et al., 2015). Despite these findings, an understanding of the factors that positively or negatively influence stress is still needed. Gaining a better understanding of the stress landscape among college students may assist colleges and universities in identifying students who are at greater risk for adverse health outcomes and developing strategies to mitigate them.

## *Grit*

A psychological construct receiving recent widespread attention as a predictor of successful performance is a personality trait known as grit (Duckworth et al., 2007; Duckworth & Quinn, 2009). Grit is the perseverance and passion for long-term goals (Duckworth et al., 2007). Although the concept of grit is relatively new, previous literature describes related concepts such as perseverance, resilience (Galli & Gonzalez, 2015; Sarkar & Fletcher, 2014), and mental toughness (Connaughton et al., 2008). While grit has typically been studied among populations who achieve success based on long-term goals (Duckworth et al., 2007), it may also describe the unique ability to persist through particularly challenging situations (Griffin et al., 2016). Thus, grit may have the potential to explain perceived stress and stress responses within college student populations (Kannangara et al., 2018).

To date, few studies have described levels of grit among undergraduate college students (Duckworth et al., 2007; Jaeger et al., 2010; Reed, 2014). Mean grit scores in samples of college students and SAs have ranged from 3.44 – 3.75 (Duckworth et al., 2007; Gilchrist, Fong, Herbison, & Sabiston, 2018). One study evaluating grit and GPA among Ivy League undergraduates found that gritty students outperformed their less gritty peers ( $r = .30, p < .001$ ; Duckworth et al., 2007). A subsequent study of cadets at West Point Military Academy found that grit was the strongest predictor of cadet survival in their summer training regimen (Duckworth et al., 2007). Specifically, cadets whose grit scores were one standard deviation higher were more than 60% more likely to complete summer training ( $\beta = .48, OR = 1.62, p < .001$ ).

Studies have also identified differences in grit scores based on gender, age, and student-athlete status (i.e. Varsity sport participation; Duckworth et al., 2007; Gilchrist et al., 2018; Jaeger et al., 2010). Conference proceedings from Jaeger et al. (2010) described female students as scoring significantly higher in grit than their male peers across all years in school, freshman through senior. Additionally, Jaeger identified SAs reporting higher grit scores than non-athletes (Jaeger et al., 2010). A subsequent study examining grit and exercise behavior found that exercisers (including competitive athletes) reported significantly higher grit scores ( $t = 4.08, p < .001$ ) when compared to non-exercisers (Reed, 2014).

Previous research has found both grit and perceived stress to differ between individual samples of SAs and nonathletes (Jaeger et al., 2010; Malinauskas, 2010; Nguyen-Michel et al., 2006). However, few published studies have examined grit among collegiate SAs or described the relationships among grit, stress, and DS in this population. This study aimed to elucidate the construct of grit in a single college student sample, comparing the SAs to the nonathlete. Additionally, we aimed to identify the relationships between grit, stress and DS, including how these variables may influence the way students and SAs attribute their time each week.

### *Materials and Methods*

#### *Participants*

The study protocol was approved by the Institutional Review Board of the sponsoring academic institution prior to the start of data collection. The survey was administered in the form of a one-time, paper-and-pencil questionnaire. Participants for

this study were recruited from the undergraduate student population of a large, private, religious university in the southwestern US. Inclusion in the study's sample was predicated on being within 18-24 years of age and the completion of the necessary portions of the survey. The principle investigator contacted academic course instructors of 32 classes to request class time to administer surveys to their students. The courses belonged to various academic departments. Instructors of 23 courses responded to the initial recruitment email. Instructors of the remaining nine courses were sent a follow-up email 14 days after the original recruitment email was sent.

The total enrollment for classes where surveys were administered was 609 students. Following a review of attendance records, 535 students were present in class on the days of data collection. In an effort to make more accurate comparisons based on athletic participation, SAs we oversampled. Investigators contacted nine university athletic trainers to request available times and locations to administer surveys. Five athletic trainers responded and provided available times to survey SAs. A follow-up email was sent to the remaining four athletic trainers; however, the reminder email did not yield any additional participants. A total of 78 surveys were administered to SAs in available athletic training facilities, resulting in 613 surveys when combined with surveys from classrooms. Students in classes as well as additional SAs were instructed to participate in the study only one time.

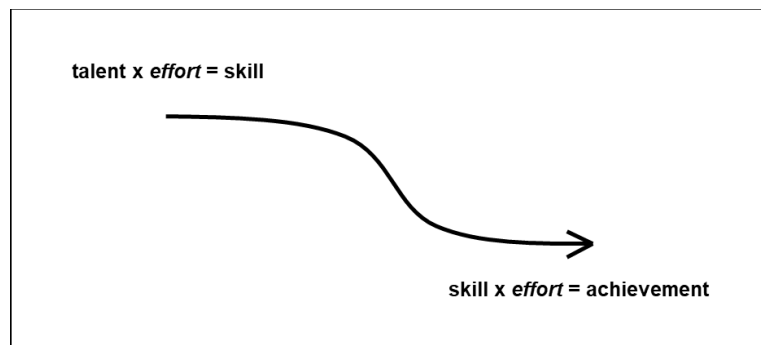
## *Measures*

### *Grit*

The psychological construct of grit was assessed using the 12-item Grit Scale (Duckworth et al., 2007). Six items of the Grit Scale address perseverance of effort, while the remaining six focus on consistency of interest. Each item is scored from 1 “Not like me at all” to 5 “Very much like me”. Total grit scores range from 1.0 (not very gritty) to 5.0 (extremely gritty). Research suggests that the Grit scale is a reliable ( $\alpha > .73$ ) instrument (Duckworth et al., 2007).

### *Effort*

In the conceptualization of grit, an equation was developed to explain the journey from talent (i.e. natural ability) to achievement (See Figure 1; Duckworth, 2016).



*Figure 1.* Duckworth’s effort counts twice theory on moving from talent to achievement.

The theory posits that the variable of effort appears when equating both skill and achievement. Based on this theory, participants in this study were asked to report the average number of hours spent studying, working, and credited toward athletic

participation in an average week of the academic year. The average weekly hours are representative of the amount of effort participants put toward each task.

The survey included both the Perceived Stress Scale-10 (PSS; Cohen et al., 1983) as well as a single question addressing major life events experienced in the previous 12 months to assess stress. The PSS is a 10-item, self-report instrument that assesses the degree to which individuals found their lives to be uncontrollable or stressful in the previous 30 days. Psychometric analyses of the PSS found Cronbach alpha values ranging from .84 to .89 across multiple samples, and an acceptable test-retest reliability ( $r = .85$ ; Cohen, 1988; Roberti et al., 2006). Item responses range from “Never” to “Very often” on a 5-point Likert scale. The PSS is scored 0-40, with higher total scores indicating higher levels of perceived stress. Further, PSS scores may be categorized into low (0-13), moderate (14-26), and high stress (27-40). Participants were also asked to select from a list all major life events they had experienced in the previous 12 months, a question adapted from the Traumatic Life Events Questionnaire (TLEQ; Kubany, 2004). Examples of life events included death or injury of a loved one, personal injury or illness, sexual assault, and motor vehicle accident.

### *Depressive Symptoms*

The Center for Epidemiological Studies Revised Depression Scale (CESD) was utilized in this study. The CESD is considered to have high reliability, with coefficient alphas ranging from .85 to .90, as well as criterion validity established by moderate correlations with other measures of depression (Bradburn Negative Affect, 0.51-0.61; clinical interview ratings, 0.49; Radloff, 1991; Smarr & Keefer, 2011). Participants were asked to consider a list of 20 ways they might have felt or behaved in the previous two

weeks and select an answer from “Not at all or Less than 1 day last week”, “1-2 days last week”, “3-4 days last week”, “5-7 days last week”, or “Nearly every day for 2 weeks”.

Individual item scores were summed and averaged to generate the total CESD score.

### *Demographics*

A set of 13 questions were utilized to assess participants’ demographic data (e.g. gender, race, socioeconomic status, year in school, GPA, Greek affiliation, athletic participation status). Participants who self-reported “Varsity athletics” participation were identified as SAs.

### *Data Analysis*

The data from 613 surveys were entered into SPSS 25.0. Due to the complexity of the model, cases were examined to ensure responses were collected for the variables of interest. Upon review of the data, 554 participants provided complete responses (response rate = 90.4%), with 522 participants satisfying the inclusion criteria (i.e. ages 18-24 years old, enrolled as full-time, undergraduate student) and completing necessary portions of the questionnaire. Descriptive statistics were calculated for grit PSS, and DS measures as well as gender, race, year in school, GPA, Greek affiliation, and athletic participation. Next, correlation analyses were performed to determine if any significant relationships existed between the independent variables of interest, grit and stress, and to control for them in subsequent analyses. Chi squared, Mann Whitney U, and t-test analyses were utilized to compare specific behaviors between student-athletes and non-athletes. Finally, a multiple regression was used to examine the influence of grit and stress on DS.



## *Results*

### *Demographics*

The final sample in this study included 522 undergraduate students between the ages of 18 and 24. The sample was composed of 369 females (70.0%), 109 student-athletes (20.8%) and had a mean age of 20.43 year ( $SD = 1.19$ ). The majority of participants were Caucasian (64.7%) and reported their family's financial situation as "pretty well off" (52.4%). The demographic breakdown of the sample was an adequate representation of the university's undergraduate population with regard to race; however, there was an overrepresentation of upperclassmen (83.1% vs 52.0%) and females (70.0% vs 59.0%) when compared to the overall composition of the sponsoring institution's student population. To make accurate comparisons based on athletic participation, student-athletes were intentionally oversampled for this study. This resulted in a higher percentage of student-athletes when compared to their representation in the university's undergraduate population (20% vs approximately 5%). Additional demographic characteristics can be found in Table 4.1.

Table 4.1

*Demographic characteristics by athletic participation status*

Demographic Variables	Non-athletes		Student-athletes		Total	
	n = 413	%	n = 109	%	n = 522	%
Gender						
Male	128	31	24	22	153	30.0
Female	285	69	85	78	369	70.0
Ethnicity						
White	268	64.7	66	60.6	353	67.5
Black	27	6.5	22	20.2	56	10.7
Hispanic	58	14.0	5	4.6	76	14.5
Native American	2	0.5	-	-	2	0.4
Asian	38	9.2	4	3.7	48	9.2
Multiracial	21	5.1	10	9.2	31	5.9
Year in School						
1 <sup>st</sup> year undergraduate	6	1.4	27	24.8	33	6.3
2 <sup>nd</sup> year undergraduate	62	15.0	18	16.5	80	15.3
3 <sup>rd</sup> year undergraduate	175	42.3	34	31.2	209	40.0
4 <sup>th</sup> year undergraduate	149	36.0	30	27.5	179	34.2
5 <sup>th</sup> year undergraduate	21	5.1	-	-	21	4.0
GPA						
2.0-2.49	14	3.4	1	0.9	15	2.9
2.5-2.99	50	12.1	24	22.0	74	14.1
3.0-3.49	140	33.8	24	22.0	164	31.4
3.5-3.99	193	46.6	50	45.9	243	46.5
4.0 or above	16	3.9	10	9.2	26	5.0
Family Financial Status						
Pretty well-off	217	52.4	57	52.3	274	52.4
About Average	166	40.1	45	41.3	211	40.3
Poor	30	7.2	7	6.4	37	7.1
Greek						
Yes	156	37.7	11	10	167	31.9
No	258	62.3	98	90	355	67.9
Major Life Event						
Unexpected death of loved one	65	15.7	15	13.8	80	15.3
Loved one injury/illness	87	21.0	24	22.0	111	21.2
Sexual assault	18	4.3	2	1.8	20	3.8
Natural disaster	24	5.8	6	5.5	30	5.7
Personal injury/illness	69	16.7	40	36.7	109	20.8
Motor vehicle accident	41	9.9	9	8.3	50	9.6
Other major event	15	3.6	4	3.7	19	3.6

A total grit score was calculated by summing and averaging the participants' individual responses to items from the grit scale. Total grit scores among this sample ranged from 1.83 to 5.00 with a mean of  $3.53 \pm 0.54$ . Grit can also be examined by dividing the 12 items of the instrument into two, six-item subscales, Perseverance of Effort (perseverance) and Consistency of Effort (consistency). The average perseverance score in this sample was  $4.06 \pm 0.58$  while the mean consistency score was  $3.00 \pm 0.75$ . Means, standard deviations, ranges, and relevant frequencies for results of survey scales can be found in Table 2.

Table 4.2

*Comparisons of grit, perceived stress, and depressive symptoms between student-athletes and nonathletes*

Variable	Non-athletes	Student-athletes	Test Statistic	CI	<i>p</i>
Grit, <i>m</i> (SD)***	3.48 (0.55)	3.73 (0.46)	<i>t</i> = -4.81	-.35 – -.15	< .001
Perseverance, <i>m</i> (SD)***	3.99 (.58)	4.33 (.47)	<i>t</i> = -6.50	-.45 – -.24	<.001
Consistency, <i>m</i> (SD)	2.97 (.76)	3.12 (.72)	<i>t</i> = -1.90	-.31 – -.01	.06
PSS, <i>m</i> (SD)	20.20 (6.63)	18.83 (5.92)	<i>t</i> = 1.94	-.02 – 2.74	.053
Low (0-13)	74 (18.0)	23 (5.6)	-	-	-
Moderate (14-23)	259 (63.5)	72 (66.7)	-	-	-
High (23+)	75 (18.4)	108 (26.5)	-	-	-
CESD-R, <i>m</i> (SD)***	19.66 (15.33)	13.80 (13.32)	<i>t</i> = 3.86	2.62 – 9.10	< .001
<16	195 (48.0)	68 (66.0)	-	-	-
>= 16	211 (52.0)	35 (34.0)	-	-	-

All values are present as *N* (%) unless otherwise specified.

PSS indicates Perceived Stress Scale; CESD-R, Center for Epidemiological Studies Depression Scale Revised

\*\*\**p* < .001

Participants in the sample had a mean perceived stress score of 19.9 (SD = 6.51) with females reporting higher perceived stress than males (*m* = 20.78 vs *m* = 17.77; *p* < .001). Established cut scores were utilized to examine levels of PS (i.e. < 14 = low, 14-26 = moderate, > 26 = high) The majority of this sample indicated moderate perceived

stress (63.3%) while 18.5% and 16.8% reported low and high stress, respectively. The second assessment of stress examined the type and quantity of major life events experienced in the previous 12 months. From our sample, 260 (50.9%) participants reported experiencing at least one major life event in the previous 12 months. The most frequently cited life event reported was the serious injury or illness of a loved one (21.2%). In addition, participants were provided the response option “Other” and could write in a major life event. The following examples were reported and would not normally have been measured: attending too many events (1), depression (3), marriage or relationship problems (5), temporary homelessness (1), and pregnancy/abortion (1).

### *Bivariate Analyses*

We completed bivariate analyses to examine relationships between stress, and possible covariates including gender, age, SES, year in school, and GPA. Significantly more females reported moderate and high stress compared to male participants ( $\phi = .183$ ,  $p < .001$ ). There was significant effect of SES on PS at the  $p < .05$  level for the three SES conditions (i.e. pretty well-off financially, above average, poor) [ $F(2, 513) = 5.294$ ,  $p = .005$ ]. Additionally, a weak negative correlation existed between PSS and GPA ( $r = -.168$ ,  $p < .01$ ). This indicates that as perceived stress increased, GPA decreased. Further analyses failed to identify significant differences in PSS based on age ( $r = .001$ ,  $p = .975$ ), or athletic participation ( $F = 1.166$ ,  $p = .053$ ).

Relationships between grit and potential covariates were also tested. Caucasian participants reported significantly higher overall grit scores than participants of other races ( $t = -2.52$ ,  $p = .012$ ). Moreover, a slight positive correlation existed between grit and GPA ( $r_\tau = .156$ ,  $p < .001$ ). Differences in grit scores between SAs and nonathletes

are shown in Table 3. SAs were significantly grittier than nonathletes [ $t(515) = -4.81, p < .001$ ]. Specifically, SAs scored significantly higher on the perseverance subscale than nonathletes [ $t(515) = -5.710, p < .001$ ]. There were no significant differences in grit based on gender, age, year in school, or SES. We found a moderate negative correlation between grit and PSS ( $r = -.35, p < .001$ ) with higher grit scores associated with less perceived stress. The relationships between stress and time attributions throughout the week were also examined. Results indicated that PSS ( $r = .135, p = .006$ ) had a weak positive correlation with hours spent studying. Additionally, there was a small negative correlation between PSS and hours spent sleeping ( $r = -.261, p < .001$ ).

An examination of hourly attributions revealed participants reported an average of 17.85 weekly hours ( $SD = 10.48$ ) spent studying. Concerning hours spent working per week, the majority of the sample reported not having a job (55%). With regard to weekly sports participation, participants reported 1-10 hours most frequently (41.1%). Thirty-five percent of participants reported they did not participate in any level of sport. We examined potential relationships between grit and how participants attributed their time. Grit appeared to be slightly associated with hours attributed to studying ( $r = .134, p = .015$ ), and sport participation ( $r = .10, p = .003$ ). Conversely, we saw no association between grit and hours spent working ( $r = -.064, p = .064$ ).

Mann-Whitney U and independent samples t-tests were utilized to assess the differences between student-athletes and non-athletes in terms of hours spent studying, working, and attributed to sport/athletic participation weekly (See Table 3). Significant differences existed between SA and non-athletes in the reported number of hours spent studying ( $t = 6.597, p < .001$ ), working ( $U = 1032, p < .001$ ), and participating in sport

( $U=13,182$ ,  $p < .001$ ). While these results indicate that SAs attributed significantly more hours towards sport participation, they also reported significantly fewer hours spent studying and working a job.

Table 4.3

*Mean weekly hour attributions and athletic participation crosstabulations*

Variable	Non-athletes	Student-athletes	Test Statistic
Study Hours, $m$ (SD)***	19.11 (10.69)	13.04 (8.01)	$t = 6.597$
Work Hours*			$U=1032$
None; I don't have a job	196 (47.5)	95 (87.2)	
1-10	87 (21.1)	9 (8.3)	
11-20	86 (20.8)	4 (3.7)	
21+	44 (10.6)	1 (.8)	
Athletic/Sport Hours*			$U=13,182$
None	185 (44.9)	-	
1-10	209 (50.7)	6 (5.5)	
11-20	17 (4.1)	29 (26.6)	
21+	1 (< 1.0)	74 (67.9)	

All values are presented as N (%) unless otherwise specified.

\* $p < .05$

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

*Multivariate Analyses*

A multiple regression analysis was used to examine the relationship between PSS and DS, while accounting for significant independent variables (i.e. gender, year in school, athletic participation, grit). Results of this analysis are presented in Table 4. Grit ( $B = -2.17$ ,  $t(491) = -2.13$ ;  $p < .05$ ) and athletic participation ( $B = -2.7$ ,  $t(491) = -1.98$ ;  $p < .05$ ) were negative predictors of DS. Alternatively, PSS ( $B = 1.43$ ,  $t(491) = 16.88$ ,  $p < .001$ ) was a significant positive predictor of DS. Overall, the final model explained approximately 44% of the sample's variance in DS scores ( $R^2 = .44$ ,  $F(5, 491) = 75.75$ ,  $p < .001$ ).

Table 4.4

*A regression analysis to predict increased depressive symptoms among a sample of college students (N=522).*

Predictor	B	S.E.	95% C.I.	
Step 1				
Gender	-.897	1.174	-3.203	1.409
Year in School	.404	.575	-.725	1.533
Athletic Participation	----	----	----	----
Varsity Athlete*	-2.700	0.159	0.550	1.030
Grit*	-2.17	1.02	-4.17	-.16
Perceived Stress***	1.43	.085	1.27	1.60
Note. *p<.05. ***p<.001				

### *Discussion*

To our knowledge, this was the first study examining grit, stress, and DS in a college student population, as well as comparing grit between SAs and nonathletes. In this study, grit was negatively correlated with both PSS and DS, indicating that higher grit scores were associated with decreased stress and depression. Furthermore, higher grit was a significant negative predictor of reported DS, when controlling for PSS. Although few studies have examined grit and DS, our results support previous findings that the presence of a psychiatric disorder was associated with lower grit scores (Griffen et al., 2016).

This study also explored the basic concept of grit in a college student population, and its potential relationships among PSS and attributions of effort. Previously published literature has reported mean grit scores ranging from 3.41 to 3.78 in a variety of samples (e.g. adults 25 and older, West Point Cadets, National Spelling Bee finalists; Duckworth et al., 2007). The mean grit score of 3.53 among participants (3.48 among nonathletes, 3.73 among SAs) in this sample falls within the range of those previously reported scores. However, the present study failed to identify differences in overall grit scores based on

gender. This finding is contrary to results of a previous study (Jaeger et al., 2010). However, the failure to find a significant difference based on gender may be related to sample composition which was predominately female. We also calculated scores for each subscale of grit. In regard to the subscales of grit, participants in this study scored higher on perseverance than consistency. This difference may reflect the explorative environment that college and young adulthood provide. Students are encouraged to experience new things, which may result in a decrease in consistency of interests. To gain a better understanding of college student grit, both grit and its subscales need to be explored further.

Scores on the subscales of grit, perseverance and consistency, also differed based on athletic participation. For the perseverance subscale, SAs scored significantly higher than nonathletes ( $t(515) = -5.710, p < .001$ ). This is in line with previous research examining exercise behavior, which found active students scored higher on grit than inactive students ( $t = 4.08, p < .001$ ; Reed, 2014). In contrast, differences in consistency scores only approached statistical significance ( $t(518) = -1.903, p = .058$ ). Since SAs are first and foremost college students, it is understandable that consistency scores were comparable to nonathletes. However, the challenges and failures associated with athletic participation and competition may influence this group of students and result in increased perseverance (Weight, Navarro, Huffman, & Smith-Ryan, 2014). This is the first study to have examined grit and its subcomponents in SAs. Additional analyses are needed to understand how grit manifests and differs between these populations.

In our sample, the mean PSS score was 19.53 of a possible 40. This result was higher than the mean scores ( $m = 14.54$ ) for college students reported previously in the



literature (Cohen & Janicki-Deverts, 2012). Since female students reported significantly higher PSS scores, both in this study and in previously literature (Humphrey et al., 2000), the elevated mean PSS of the sample could be explained by the overrepresentation of females.

Previous literature has described rates of DS among SAs to be at or above those of nonathletes peers (Hammond et al., 2013; Storch, Storch, Killiany, & Roberti, 2005; Wolanin, Hong, Marks, Panchoo, & Gross, 2016). In our sample, mean DS scores differed significantly between SAs and nonathletes, with nonathletes scoring higher on the CESD-R. Scores from SAs may have been affected by the time of year our data was collected (in-season vs. out-of-season), increased athletic success (wins vs. losses), presence or absence of injury, or increased perceived support (e.g. social, instrumental, emotional). Analysis of the specific factors influencing differences in DS between SAs and nonathletes requires further examination.

### *Limitations*

It should be noted that our study faced several limitations. First, the data were derived from an anonymous survey; thus, no students were interviewed directly, making it impossible to confirm reported DS or PSS. Additionally, this was a cross-sectional, self-report survey. Our results only provide a snapshot and causality cannot be inferred. Since our survey questions were retrospective in nature, it is also possible that participants experienced recall bias, leading to potentially erroneous responses. As previously referenced, the sample in this study included an overrepresentation of upperclassmen and females, potentially skewing age and gender-based analyses. Finally, the study was conducted at only one private, southeastern university; therefore, the results

may not be generalized to all college or university campuses. There are likely additional variables that may be important components of the relationships evaluated in this study and should be considered for future studies.

The results of this study suggest a relationship between grit, stress, and DS. Higher grit scores appear to mitigate perceived stress and DS in this college student sample. Future studies should continue to evaluate grit in college students and its possible relationship with perceived stress or DS. Future research should also expand upon this comparison of stress and DS between SAs and non-athletes.

## CHAPTER FIVE

### Coping with College Athletics: Mediators of Stress, Depressive Symptoms, and Substance Use Through a Transactional Stress Framework

#### *Abstract*

**Background:** Lazarus & Folkman's Transactional Model of Stress and Coping (TM) proposes that appraisals of stress influence health outcomes through the utilization of coping mechanisms. This model has been used previously to examine how college students perceive stress, and how personality traits (e.g. hardiness) protect against stress. **Objectives:** To apply the TM in testing grit and athletic participation as moderators of perceived stress (PS) and adverse health outcomes, including depressive symptoms (DS) and substance use, among college students. **Methods:** This cross-sectional study sampled undergraduate students from a large, private university in the southwestern United States, during the fall of 2018. A one-time, paper-and-pencil questionnaire was administered in academic classrooms and athletic training facilities, yielding a sample size of 516 participants. The questionnaire, composed of previously-validated instruments, assessed PS, DS, as well as the use or misuse of alcohol, marijuana, prescription stimulants, prescription opioids, and energy drinks. Data analyses were performed in SPSS version 25.0. **Results:** Path analyses were utilized to analyze the data in this study. Independent (i.e. demographics, grit, PS, coping strategies) and dependent (i.e. DS, substance use) theoretical variables of interest were mapped onto the TM to determine which variables altered levels of DS and use of various substances. Mediation and moderation testing was conducted when applicable. Grit was inversely correlated with PS. PS had a direct

effect on two forms of coping (i.e. self-distraction, drinking to cope) and DS. Further, self-distraction and drinking to cope were significantly associated with DS and partial mediators of the relationship between PS and DS. Finally, grit and athletic participation were tested as moderators of the mediated relationship between stress, coping and DS. Neither grit nor athletic participation were supported as moderators by the findings of this study. **Conclusions/Importance:** The results of this study suggest the TM may to be a beneficial framework for analysis of relationships between stress, coping, and DS. Many of the coping strategies selected for this study did not appear to have direct effects on the substances of interest. Future research should consider assessing additional forms of coping as predictors of substance use behaviors. Alternatively, the TM may support substance use as a coping behavior rather than an adverse health outcome.

**Keywords:** transactional stress, perceived stress, coping, student-athlete, depression, substance use, grit

### *Introduction*

College students and student-athletes continue to report high levels of perceived stress (PS) and depressive symptoms (DS; Cohen & Janicki-Deverts, 2012; Dyson & Renk, 2006; Papanikolaou et al., 2003; Rohde et al., 2013). Recent studies have found both stress and DS to be associated with alcohol use among college students (Chen & Feeley, 2015; Magrys & Olmstead, 2015). A record college enrollment in 2010, and expected continued growth in college attendance rates, show more young adults are attending college than ever before (Snyder, De Brey, & Dillow, 2018). With known risks of increased stress associated with college attendance, a greater understanding of how students perceived stress, cope with stress, and the effects these may have on DS and

substance use is needed. Previous studies of the determinants and effects of stress in college have utilized transactional frameworks to guide explorations of influencing factors which included various personality traits (e.g. hardiness, mindfulness; Bravo et al., 2016; Kelly et al., 2014; Soderstrom, Dolbier, Leiferman, & Steinhardt, 2000). Grit, a similar psychological construct to hardiness, has yet to be studied for its moderating or buffering effects on stress among college students (Duckworth et al., 2007). To determine if grit was a moderator of stress and coping, we assessed the relationships of these variables using Lazarus & Folkman's Transactional Model of Stress and Coping (TM).

The relationships between stress and the mechanisms employed to mitigate it have been examined extensively in the published literature (Afshar et al., 2015; Brougham et al., 2009; Dyson & Renk, 2006; Matud, 2004). Previous studies have primarily applied cognitive-behavior models to test the predictors (e.g. performance expectations, interpersonal relationships, being away from home) and outcomes (e.g. physical, psychological) of stress in college student samples (Weiss & Troxel, 1986; Wiese-Bjornstal et al., 1998). Studies of collegiate student-athletes (SA) have utilized cognitive-behavior models as well (Giacobbi Jr et al., 2004; Weiss & Troxel, 1986; Wiese-Bjornstal et al., 1998). Pearlin's Stress Process Model (1981) first attempted to explain how stressors affect mental health by outlining a system of mediating and moderating relationships. While this model contains several important constructs related to college life (e.g. stress, coping, mental health), its focus on social status hierarchies makes it less applicable in the examination of college students. In contrast, the TM is more frequently applied to examine the determinants and outcomes of stress in public

health and psychology literature (Carver & Scheier, 1994; Soderstrom et al., 2000; Weigold & Robitschek, 2011).

The TM describes broadly how stressful appraisals influence health outcomes through the use of coping (Lazarus & Folkman, 1984). The model (Figure 2.1, page 40) proposes that personal and situational factors lead to an individual's primary and secondary stress appraisals (Lazarus & Folkman, 1984). Then, the extent to which an individual appraises an event as stressful determines which forms of coping are utilized (e.g. problem-based, emotion-based). Finally, health outcomes are resultants of the selected coping strategies. In the model, an individual ultimately evaluates how coping influenced the outcomes, reappraises his or her stress, and restarts the process (Lazarus & Folkman, 1984).

The TM has been used to describe the interaction between stress, coping, and selected health outcomes in various populations, including college students (Folkman et al., 1986; Kohler Giancola, Grawitch, & Borchert, 2009). Kohler & Giancola (2009) found the model's prediction of adaptive and maladaptive coping from stress appraisals among college students was supported by their results. Specifically, students' positive appraisals (i.e. decreased stress) were predictive of adaptive coping strategies (e.g. instrumental support, active coping; Kohler Giancola et al., 2009). Furthermore, the TM has been applied to relationships between psychological hardiness, stress, and coping (Kobasa, 1979). Research in this area suggests that individuals with increased hardiness typically employ adaptive coping styles (e.g. approach, problem-focused) and avoid maladaptive styles (e.g. emotion-focused; Weigold & Robitschek, 2011). Conversely, individuals with decreased hardiness tend to engage in avoidance coping (e.g. distraction,

denial, drinking to cope) (Weigold & Robitschek, 2011). These results suggest that the TM may be beneficial in describing how grit influences the relationships between stress, DS, and substance use through coping in college student populations.

### *Constructs of the Transactional Stress Model*

*Influencing Factors.* Lazarus & Folkman proposed personal and situational factors influence how an individual appraises stress (Lazarus & Folkman, 1984). Demographic, physical, social, and psychological differences are among many factors of stress reported in the literature (Wiese-Bjornstal et al., 1998). Grit has been shown to predict both physical and mental performance (Duckworth et al., 2007) and may predict how individuals respond in challenging obstacles or setbacks (Griffin et al., 2016).

*Primary Appraisal.* The concept of stress has evolved from its original definition as a reaction or outcome. Stress is now believed to serve as both a stimulus and an outcome in a greater landscape of psychological and behavior processes (Selye, 1973). Stress appraisals in the TM are divided into the primary appraisal (e.g. perceived susceptibility), and the secondary appraisal (e.g. perceived ability to alter the situation) (Lazarus & Folkman, 1984). An individual's perception of *overall* stress has shown to be associated with affect and health practices (Cohen et al., 1983; Cohen, 1988). Perceived stress (PS) has been measured in a previous college student sample, identifying them as the group with the highest stress ( $m = 14.54$ ) of all age groups (Cohen & Janicki-Deverts, 2012).

*Coping.* Coping is defined as behavioral efforts to manage stress demands and can be considered problem-based (e.g. active coping, instrumental coping) or emotion-based (e.g. emotional support, self-distraction, drinking to cope; Lazarus & Folkman, 1984). Problem-based coping is considered adaptive in nature, while emotion-based strategies can be either adaptive (e.g. positive reframing, acceptance) or maladaptive (e.g. self-distraction, drinking to cope). Previous examinations of TM have found that college students and student-athletes have been found to use alcohol or drugs and demonstrate avoidance-oriented coping strategies in response to stress (Nicholls et al., 2006; Pritchard et al., 2007).

In response to stress, college students select and apply various coping strategies (Brougham et al., 2009). Using avoidance to cope typically manifests as mental disengagement or denial with the use of alcohol and drugs as distractions (Brougham et al., 2009). In one study, college females reported maladaptive, emotion-based coping more frequently than their male peers (Brougham et al., 2009). Personality traits can also influence how individuals appraise and cope with stress (Afshar et al., 2015); these traits can affect which coping strategies are selected (Vollrath & Torgersen, 2000). Maladaptive traits (e.g. neuroticism) have been associated with increases in stress exposure and avoidance coping (Connor-Smith & Flachsbart, 2007). Conversely, adaptive personality traits (e.g. hardiness, conscientiousness, extroversion) have been associated with problem-focused coping styles (Connor-Smith & Flachsbart, 2007; Watson & Hubbard, 1996).



*Health Outcomes.* The TM theorizes that health outcomes are behaviors effected by stress and coping (Lazarus & Folkman, 1984). College-aged students are experiencing some of the highest rates of DS of all age groups and have reported adverse health behaviors to include DS and substance use (Brody et al., 2018; Hamdi & Iacono, 2014; SAMHSA, 2017). A study of college students, utilizing the Center for Epidemiological Studies Depression Scale (CESD), reported a mean score of 14.51, where a score greater than 16 warrants a psychological referral (Smarr & Keefer, 2011). It has been suggested that DS among college students are responses to academic, social, financial, family, and personal stress (Parrish et al., 2011). Furthermore, athletic participation (i.e. Varsity student-athlete) has been found to impose additional sport-related stress (Nixon, 1996; O'Connell & Manschreck, 2012; Wolanin et al., 2015).

Research has also shown that college students and SAs are using and misusing many different substances to cope with stress (Armstrong et al., 2015; Etzel, 2006). Nearly 70% of college students reported past-year alcohol use and 20-33% reported past-year marijuana use (Core Institute, 2010; Johnston et al., 2016). Although research has shown consistent alcohol use among college students (Bravo et al., 2016), additional explorations of illicit substances are needed in regards to SAs.

Previous research has found stress and depressive symptoms to be associated with substance use in college students (Eisenberg et al., 2007; Weitzman, 2004) and student athletes (Reardon & Creado, 2014). The purpose of this study was to apply Lazarus & Folkman's TM as a theoretical framework to examine the effects of grit, athletic participation, and coping on relationships between stress, DS, and substance use among college students.

## *Methods*

### *Participants*

Participants in this study ( $n = 516$ ) were recruited from the student population of a private, religious university in the southern United States. To be included in study, participants had to be 18-24 years of age, undergraduate students, and successfully complete several measures of interest. Participants who indicated an age outside of the identified range, reported being a graduate student, or provided incomplete responses were excluded from this study.

### *Procedures*

A cross-sectional, paper-and-pencil survey design was utilized to collect data for the study. The survey was developed from several previously validated scales (Carver, 1997; Cohen et al., 1983; Duckworth et al., 2007; Eaton, Smith, Ybarra, Muntaner, & Tien, 2004), substance use questions from a national survey (Johnston et al., 2016), and relevant demographic questions. The principle investigator contacted academic course instructors of 32 classes from one department to request class time to administer surveys. The survey was administered during either the first or last 15 minutes of a scheduled class. The majority (23) of instructors responded to the recruitment email with availability for data collection, while the remaining nine failed to respond. Follow-up emails were sent two weeks later, but did not yield additional recruitment opportunities. Of the 609 students on the class roles for the classes recruited, 535 students were present in class during data collection.

In order to assess the role of athletic participation in the model, student-athletes were purposefully oversampled for this study. Investigators contacted all of the athletic trainers at the sponsoring institution to request times and locations to recruit participants. Of the nine, five athletic trainers provided times to recruit athletes. The remaining four athletic trainers were sent reminder emails; this failed to yield any additional recruitment opportunities. The recruitment efforts of the investigators yielded a total of 613 surveys. In both data collection settings, students were instructed to participate in the study only one time.

### *Questionnaire*

The questionnaire utilized in this study was comprised of several previously-validated scales and question sets that assessed each component of the TM. Each construct (as described below) was mapped onto the TM for analysis. Descriptions of the relevant portions of the survey include the following:

*Demographics.* Thirteen questions assessed participants' demographics including gender, ethnicity, socioeconomic status (SES), year in school, GPA and athletic participation status (Gallucci & Martin, 2015; Johnston et al., 2016). Participants who selected "Varsity athletics" participation were identified as SAs.

*Grit.* Grit was assessed using the 12-item Grit Scale (Duckworth et al., 2007). Each item was scored from 1 "Not like me at all" to 5 "Very much like me". Total grit scores, computed by summing individual item scores and calculating an average, ranged from 1.0 (not very gritty) to 5.0 (extremely gritty).

*Perceived Stress.* The survey used the Perceived Stress Scale-10 (Cohen et al., 1983) and a single item measuring the major life events experienced in the previous 12 months. The Perceived Stress Scale is a 10-item, self-report instrument that assesses the degree to which individuals found their lives to be uncontrollable or stressful in the previous 30 days. Item responses range from “Never” to “Very often” on a 5-point Likert scale. The scale is scored 0-40, with higher total scores indicating higher levels of PS.

*Coping.* Specific coping strategies were measured using items from the Brief Cope Inventory (BCOPE; Carver, 1997). For the purposes of this study, 8 items were used to assess the following 5 subscales: active coping, emotional support, instrumental support, self-distraction, and coping with substance use. Responses for each item were represented on a 4-point Likert scale ranging from “I haven’t been doing this at all” to “I’ve been doing this a lot.” Each response item was assigned a score of 1 to 4, with higher scores indicating increased frequency. Coping with substance use and active coping were assessed by two questions. In accordance with the creators of the inventory, aggregate variables were generated by summing the values from both questions and calculating an average (Carver, 1997).

*Depressive Symptoms.* The Center for Epidemiological Studies Revised Depression Scale (CESD-R) was utilized to measure DS in this study. Participants were asked to consider a list of 20 ways they might have felt or behaved in the previous two weeks and select an answer from “Not at all or Less than 1 day last week”, “1-2 days last week”, “3-4 days last week”, “5-7 days last week”, or “Nearly every day for 2 weeks”. Individual item scores were summed and averaged to generate the total CESD-R score.

*Substance Use.* To examine substance use, the survey included questions from the national Monitoring the Future Study (Johnston et al., 2016). Participants were asked to respond to items assessing their use of alcohol, marijuana, prescription opioids, prescription stimulants, and energy drinks. The temporal component of each question varied by substance, ranging from use in the previous 2 weeks (e.g. HED) to the previous 12 months (e.g. prescription painkillers), based on how prevalence rates are typically reported in the literature. Each question had seven possible answers (“Never”, “1-2”, “3-5”, “6-9”, “10-19”, “20-39”, “40+”) and was scored from 0 (“Never”) to 6 (“40+”).

#### *Statistical Analysis*

All data were entered into Microsoft Excel and subsequently uploaded for statistical analyses in SPSS (version 25.0; IBM Corp, Armonk, NY). A ten percent check was completed to ensure manual data entry resulted in minimal error. After randomly selecting and reviewing 52 surveys, data entry resulted in an error rate of .01% (7 total errors). Upon review of the data, 516 participants satisfied the inclusion criteria and provided complete responses. The variables included in the analyses were grit, PS, coping strategies, DS, and the use or misuse of various substances.

Descriptive statistics (e.g. mean, SD, range) were used to examine the distributions and central tendencies of each variable. Assumptions of normality and homoscedasticity were checked using normal P-P plots and scatterplots. Then, path analysis via multiple regression was performed. Correlation analyses were used to determine if any significant relationships existed between the independent variables of interest and stress, and to control for them in subsequent analyses. Additional tests of

association were performed to ascertain the significance of relationships between the predictors and outcome variables of the TM.

The variables of interest were then mapped onto the TM (Figures 5.2 and 5.3; Lazarus & Folkman, 1984). All personal and situational factors (i.e. gender, grit, Greek affiliation, SES, athletic participation) were selected as independent variables in several regressions predicting PS and coping strategies (i.e. self-distraction, active coping, emotional support, instrumental support, and coping via substance use). Then PS was used as the independent variable in several simple regressions predicting each coping strategy.

Finally, coping strategies that were significantly predicted by PS were used as independent variables in seven multiple regressions, one to predict DS and the remaining six to predict each substance use outcome (i.e. alcohol use, HED, marijuana, prescription opioids, prescription stimulants, energy drinks). In all the multiple regression analyses, multicollinearity was checked using variance inflation factors. Multicollinearity was identified between drinking to cope and substance use health outcomes. As a result, coping with substance use was only used as a possible mediator between stress and DS.

## *Results*

### *Demographics*

Participants in this study ( $n = 516$ ) had an average age of  $20.46 \pm 1.18$  years, were predominantly female (70.7%), white, non-Hispanic (64.2%), and identified as upperclassmen (74.4%). Due to purposeful oversampling, student-athletes made up nearly 21% of the sample. Additional participant demographic information can be found

in Table 5.1. When compared to the demographics of the sponsoring institution, the sample had an overrepresentation of female, upperclassmen students, and SAs. However, the sample was representative in terms of ethnicity.

Table 5.1

*Participant Demographics (N = 516)*

Demographic Variable	<i>n (%)</i>
Age (m, SD)	20.4 (1.19)
Gender	
Male	151 (29.3)
Female	365 (70.7)
Ethnicity	
White	333 (64.5)
Black	49 (9.5)
Hispanic	61 (11.8)
Native American	2 (0.3)
Asian	42 (8.1)
Multiracial	19 (3.7)
Year in School	
1 <sup>st</sup> year undergraduate	32 (6.2)
2 <sup>nd</sup> year undergraduate	80 (15.5)
3 <sup>rd</sup> year undergraduate	207 (40.1)
4 <sup>th</sup> year undergraduate	178 (34.5)
5 <sup>th</sup> year graduate	19 (3.47)
GPA	
2.0-2.49	15 (2.9)
2.5-2.99	73 (14.2)
3.0-3.49	162 (31.4)
3.5-3.99	241 (46.7)
4.0 or above	25 (4.8)
Family Financial Status (SES)	
Pretty well-off	273 (52.9)
About Average	207 (40.1)
Poor	36 (7.0)
Varsity Athlete	
Yes	108 (20.9)
No	408 (79.1)

Descriptive statistics (i.e. frequencies, means, standard deviations, ranges) of results from the PS, CES-D, and BCOPE are provided in Table 5.2. The mean PS score

in this sample was  $19.87 \pm 6.47$ . Approximately 47% of participants reported DS meeting the criteria for referral to a psychologist ( $>16$  on CES-D), with an average CES-D score of  $18.41 \pm 15.12$ . In regard to coping strategies, active coping was the most frequently reported, whereas coping with substance use was reported the least.

Table 5.2

*Descriptive Results of Grit, Perceived Stress, Depressive Symptoms and Coping*

Scale	Items	Mean	SD	Range
Grit	12	3.53	.54	0-5
PSS	10	19.91	6.51	0-20
CES-D	20	18.47	15.11	0-80
BCOPE Item	Not at all	A little bit	A medium amount	A lot
Active Coping	31 (5.9)	153 (29.3)	243 (46.5)	92 (17.6)
Emotional Support	41 (7.8)	162 (31.0)	183 (35.0)	134 (25.6)
Instrumental Support	54 (10.3)	133 (25.4)	190 (36.3)	143 (27.3)
Self-distraction	60 (11.5)	188 (35.9)	175 (33.5)	97 (18.5)
Substance Use	410 (78.4)	67 (12.8)	28 (5.4)	15 (2.9)

Reported rates of substance use differed among the sample (see Table 5.3). When compared by gender, significantly more males reported heavy episodic drinking (HED) in the previous 2 weeks than females ( $V = .115$ ,  $p = .009$ ). Further analyses based on gender failed to identify significant differences in marijuana, prescription stimulants, prescription painkillers, or energy drink use. Examination of normal P-P plots revealed that several substances (i.e. marijuana, energy drinks) closely followed a Poisson distribution rather than a normal distribution. Thus, Poisson regressions were utilized for these analyses. Additionally, reported usage of prescription opioids and prescription stimulants followed a bimodal curve. Therefore, both the prescription opioid and



prescription stimulant variables were dichotomized (0 = no use, 1 = at least once) and selected as dependent variables in binary logistic regressions.

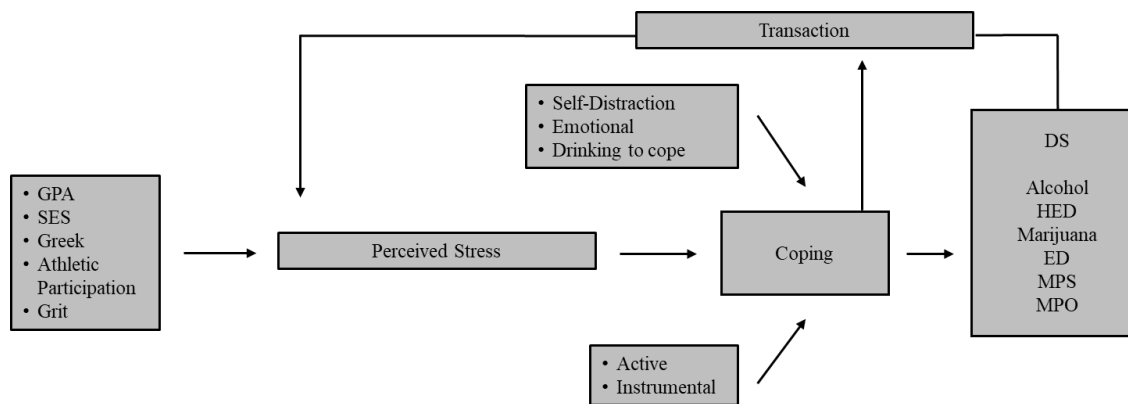
Table 5.3

*Reported rates of substance use among the sample.*

Substance	Never	1-9	10-19	20-39	40+
Alcohol (12 months)	117 (22.4)	209 (39.9)	84 (16.1)	44 (8.4)	67 (12.8)
Heavy Episodic Drinking (2 weeks)	369 (70.6)	148 (28.3)	2 (0.4)	-	-
Energy Drink (30 days)	352 (67.3)	134 (25.6)	26 (5.0)	7 (1.3)	3 (0.6)
Marijuana (12 months)	433 (82.8)	56 (10.7)	8 (1.5)	9 (1.7)	16 (3.1)
Substance	Never	One or more times			
Prescription Stimulant (12 months)	469 (90.2)	51 (9.8)			
Prescription Opioid (12 months)	509 (97.5)	13 (2.5)			

### *Path Analysis*

Path analyses were performed to assess the relationships between all independent (i.e. demographics, grit, PS) and dependent (i.e. DS, substance use) variables (see Figure 5.1). Due to the number of regressions performed, only those that produced significant results will be described in detail. The first analysis examined relationships between influencing factors (e.g. grit, GPA, gender, athletic participation, SES, Greek affiliation) and perceived stress. Gender ( $\beta = .117, p = .008$ ), grit ( $\beta = -.33, p < .001$ ), and GPA ( $\beta = -.168, p < .001$ ) were significant predictors of PS. While being female was associated with increased PS, both increased grit and higher GPAs predicted decreased PS.



*Figure 5.1* Hypothesized variables mapped onto Lazarus & Folkman's Model

Further analyses focused on potential relationships between PS and reported coping strategies. Simple regressions resulted in PS significantly predicting self-distraction ( $\beta = .213, p < .001$ ), instrumental support ( $\beta = .117, p = .008$ ), and drinking to cope ( $\beta = .277, p < .001$ ). Perceived stress also had an inverse relationship with active coping ( $\beta = -.164, p < .001$ ).

Next, regression analyses were performed to evaluate PS as a possible predictor of the adverse health outcomes. A series of regressions (linear, Poisson, binomial logistic) revealed that PS was a significant predictor of alcohol use in the previous 30 days ( $\beta = .112, p = .011$ ; 95% CI = .005, .040;  $R^2 = .013$ ) and HED in the previous 2 weeks ( $\beta = .155, p < .001$ ; 95% CI = .008, .027;  $R^2 = .024$ ). Furthermore, PS was a significant predictor of annual marijuana use ( $\beta = .057, p < .001$ ; 95% CI = .037, .077) and 12-month MPS ( $\beta = .067, p < .005$ ; CI = 1.021, 1.119;  $R^2 = .033$ ).

Finally, multiple regression analyses were utilized to examine the associations between reported coping strategies and the adverse health outcomes of interest (i.e. DS, substance use variables). Various regressions were selected and performed based on the

distribution of the dependent variables. A linear regression showed that self-distraction ( $\beta = .227, p < .001$ ; CI = 2.416, 5.043) and coping via substance use ( $\beta = .334, p < .001$ ; CI = 6.025, 9.638) were significant positive predictors of DS, while active coping negatively predicted DS ( $\beta = -.106, p = .012$ ; CI = -4.134, -.521). Figure 5.2 provides a depiction of the significant effects of variables predicting DS.

A series of linear regressions were performed to evaluate relationships between coping strategies and alcohol use behaviors (e.g. 12-month alcohol use, 2-week HED), and failed to find any variance explained by coping. Poisson regressions were utilized to assess relationships between coping strategies and marijuana and ED use. Self-distraction was the only significant predictor of marijuana use in the previous 12 months ( $\beta = .105, p = .018$ ; CI = .026, .284). Emotional support was the only significant predictor of ED use ( $\beta = -.165, p = .006$ ; CI = -.412, -.069), and exhibited an inverse relationship. Binary logistic regressions failed to result in significant associations between any coping strategies and both prescription stimulant and painkiller use. Based on these analysis, 12-month marijuana use was the only substance outcome assessed for coping mediation (see Figure 5.3).

### *Mediation and Moderation*

The TM proposes coping as a mediator between stress and health outcomes (R. S. Lazarus & Folkman, 1984). For every instance that a coping variable was associated with both PS and a health outcome (i.e. DS or use of a substance) in this study, a test of mediation was performed. Due to the number of mediation tests required, only those that produced significant results (3) will be described or shown in detail (see Figures 5.2 and 5.3).

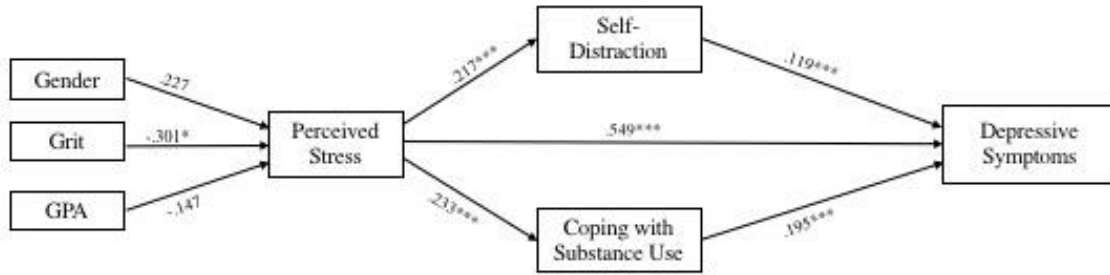


Figure 5.2. Path analysis of significant effects predicting depressive symptoms

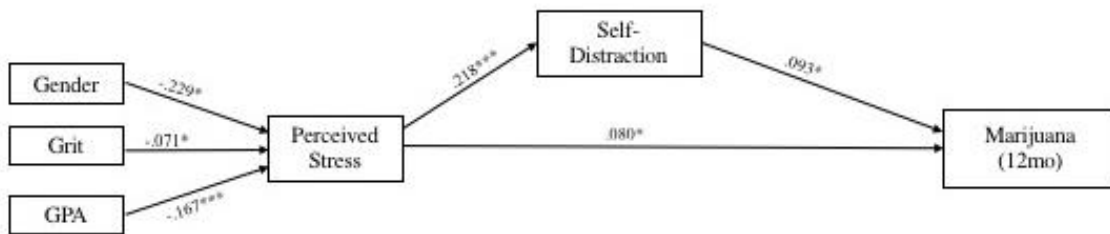


Figure 5.3 Path analysis of significant effects predicting marijuana use

The effect of self-distraction on PS's relationship with DS resulted in a decrease in the standardized coefficient from  $B = .648$  to  $B = .619$ . Additionally, the effect of self-distraction on the relationship between PS and marijuana use in the previous 12 months decreased the standardized coefficient from  $B = .057$  to  $B = .050$ . Finally, the mediation effect of coping via substance use on PS's relationship with DS resulted in a decrease in the standardized coefficient from  $B = .648$  to  $B = .584$ .

To assess the influence grit and athletic participation may have on the mediated relationship between stress and health behaviors, we tested for moderation effects. First, grit and PS were entered into the model predicting DS, resulting in both being significant predictors with 43% of the variance explained ( $F(3) = 123.09$ ,  $p < .001$ ). Next, we created mean-centered grit and PS variables and generated an interaction term by

multiplying the mean-centered variables together. Finally, the interaction term was added to the model to examine its possible effects. Upon examination, the grit interaction term was not a significant predictor of DS ( $B = -.02$ ,  $p = .57$ ). In fact, the explained variance decreased by .5% ( $r^2 = .425$ ).

A similar process was performed to assess the potential moderating effects of athletic participation on the relationship between stress and health behaviors. Upon entering athletic participation and PS into the model predicting DS, both were significant predictors ( $B = -3.55$ ,  $p = .006$  and  $B = 1.47$ ,  $p < .001$ , respectively) and explained 43% of the variance in DS. However, the generation and addition of the interaction term was insignificant and resulted in a decrease in explained variance ( $r^2 = .425$ ).

### *Discussion*

The results reported elucidate the relationships between stress, coping, and health outcomes among college students. To our knowledge, this is the first published study to apply the TM to examine grit and athletic participation as possible moderators of the relationships between stress, coping, and adverse health outcomes in an undergraduate student sample. Within the TM, coping is generally considered a mediator between stress and subsequent outcomes. The results of this study are mixed; while the assessment of students' athletic participation, grit, and selected coping strategies explained significant variance in reported DS, the same was not true for substance use outcomes. In addition, understanding the effects various coping strategies may have on DS could inform how universities evaluate and address students who are struggling with high levels of PS and DS. By utilizing the TM, university officials engaging with students and SAs may gain a better understanding of the influence stress and coping have on adverse health behaviors.

### *Path Analysis*

Perceived stress and DS among students in this sample were higher than previously published PS (19.68 vs 14.54) and CESD scores (18.41 vs 14.51; Cohen & Janicki-Deverts, 2012). It is possible that students in the sample experienced greater stress at the time of data collection, due to typical academic stressors experienced at mid-semester when data collection occurred. However, consistent with the TM and previously published work, perceived stress had a direct effect on DS (Dyson & Renk, 2006).

The analysis of coping behaviors revealed three coping behaviors were significantly predicted by perceived stress: active coping, self-distraction, and emotional support. An inverse relationship existed between PS and active coping, indicating that as stress levels increased, the use of active coping decreased. This finding is consistent with the proposed relationship in the TM and previous empirical findings (Kohler Giancola et al., 2009; Lazarus & Folkman, 1984). Self-distraction and emotional support had positive associations with PS. Although a definitive conclusion as to the benefits or consequences of various coping methods remains unclear, college students' coping mechanisms that include action, acceptance, and positive reframing have been found to be adaptive, whereas mechanisms that use avoidance, emotional expression, or venting have shown to be maladaptive (Brougham et al., 2009). The results of this study suggest that avoidance or maladaptive coping mechanisms were predictive of adverse health behaviors. It is important to continue examining the effects coping has on health behaviors, which may influence interventions focused on introducing adaptive coping mechanisms.

Several coping strategies were also significant predictors of adverse health behaviors. Self-distraction, an avoidant coping strategy, was a significant predictor of both DS and 12-month marijuana use. These findings support the findings of Pritchard et al. (2007), who found college students utilizing avoidance coping reported greater negative affect. Furthermore, use of avoidance coping typically manifests as denial and the use of alcohol and drugs as distraction (Brougham et al., 2009).

### *Mediation and Moderation*

Mediation analyses tested the possibility that coping strategies influenced the relationship between PS and adverse health behaviors. When accounting for self-distraction in the model, the direct effect of PS on DS decreased. Similarly, when controlling for drinking to cope, the direct effect of PS on DS decreased. These results imply that the relationship between PS and DS is partially mediated by both self-distraction and drinking to cope. Our findings support previous studies that reported positive relationships between avoidance coping strategies (e.g. self-distraction, drinking to cope) and adverse health outcomes (Nicholls et al., 2006; Pritchard et al., 2007).

Subsequent analyses examined the potentially mediating effect of various coping strategies on the relationship between PS and substance use. Because significant relationships existed between PS and self-distraction, as well as self-distraction and marijuana use, self-distraction was the only coping variable assessed for mediation. While the direct effect of PS on marijuana use decreased once self-distraction was controlled for, the model only explained 3% of the variance in marijuana use. This result indicates that there are likely other variables (perhaps coping strategies) influencing the relationship between PS and marijuana use that should be examined.

Finally, based on significant bivariate relationships, athletic participation and grit were tested as moderators. Both sets of regression analyses resulted in less explained variance of DS once the interaction terms were added to the statistical model. Based on previous findings supporting hardiness as a moderator of the relationship between stress and DS, we anticipated grit to have similar effects (Kobasa, Maddi, & Courington, 1981); yet our findings were inconclusive.

### *Limitations*

The findings of this study should be viewed within the context of its limitations. First, this was a cross-sectional study. The exposures and outcomes were reported in a one-time survey, therefore, causality cannot be determined. Since our survey questions were retrospective in nature, it is possible that participants experienced recall bias. In addition, the temporal components of the survey varied across scales. Participant responses may have been inaccurate if they were not attentive to different timeframes.

Due to the sensitive material included in the questionnaire, it is possible that participants provided socially desirable responses. Participants were informed that the survey responses were anonymous and no identifiable information would be collected. Participants were also asked to place their completed surveys in a stack of previously-completed surveys, forming an aggregate pile across classes. These efforts were an attempt to provide participants with an environment conducive to honest responses, but we are not able to discern their effectiveness.

The sample in this study included an overrepresentation of upperclassmen and females, leading to potentially skewed age and gender-based analyses. Finally, due to the



large number of regressions performed during the path analysis, is it possible that some statistically significant results were by chance.

### *Conclusions*

Overall, the results of this study suggest that the TM is a beneficial theoretical framework for examining DS. In contrast, our results suggest that the TM supports substance use behaviors as coping strategies rather than health outcomes. Surprisingly, the addition of moderating variables (i.e. grit, athletic participation) was not supported in this study. Additional research of grit may help elucidate its relationships with adverse health outcomes.

Certain coping strategies effect the relationship between PS and adverse health behaviors more than others. While problem-based coping (i.e. active coping) was associated with decreased DS, the use of avoidant coping strategies (i.e. self-distraction, drinking to cope) predicted increased DS. It is also important to note that many coping strategies were not assessed in this study. Thus, future studies may consider examining additional coping strategies provided by the B-COPE inventory to explain more variance within substance use behaviors. Also, research should continue to monitor substance use and DS in college student populations. As expressed in our results, we recommend capturing a broader view of DS by providing both an average score as well as the frequency of scores above the recommended cutoff warranting psychological referral (i.e. CESD > 16). Finally, since our findings regarding relationships between specific alcohol use behaviors were inconclusive, it would be beneficial to inquire about students' motivations for alcohol use (e.g. socializing, peer pressure).

## CHAPTER SIX

### Summary of Conclusions

Results of the present study provide insight into the relationships between grit, PS, and depressive symptoms, as well as differences in these constructs between SAs and nonathletes. Research has suggested that adaptive personality traits are associated with less PS and DS. The results of this study indicate grit may be an additional adaptive trait that can positively shift the perception of stress. Research has also suggested that maladaptive personality traits and emotion-focused coping, particularly avoidance, are associated with adverse health behaviors including substance use and DS. According to the results of this study, neither avoidance coping nor being “less gritty” appear to be significant predictors of substance use among college students. In contrast, a significant relationship between avoidance coping and DS was noted, which is consistent with the literature. This was the first study to a) compare grit between SAs and nonathletes and b) examine the potential influence of grit on stress, coping, and adverse health behaviors through a theoretical lens. Therefore, the purpose of this dissertation was to test the following hypotheses:

#### *H<sub>1</sub>: Grit and Athletic Participation*

In this study, grit scores differed significantly between SAs and nonathletes. Student-athletes scored higher in total grit than nonathletes. This finding may indicate that SAs are grittier than their nonathlete peers. Specifically, SAs scored significantly higher on the perseverance subscale compared to nonathletes. These results add to the

conference proceedings of Jaeger et al. (2010), which stated that SAs scored higher on the perseverance subscale of grit than nonathletes. It is reasonable to conclude that SAs may experience obstacles and setbacks throughout years of sport participation, contributing to an increase in perseverance. While SAs may be familiar with overcoming sport-related obstacles, they may not realize that the construct of grit is not confined to the lines of the field or court. Improving SA's understanding of grit, particularly perseverance, and extrapolating sport-related successes may help SAs achieve success beyond sport participation. Based on the significant differences in grit scores, we rejected the null hypothesis.

Additionally, I examined reported weekly hour attributions to examine effort between SAs and nonathletes. Student-athletes reported significantly more hours attributed toward sport participation and significantly fewer hours attributed to work and studying. While it has been assumed that time requirements attributed to sport participation leaves less time for studying among SAs compared to nonathletes, we were unable to locate empirical data from previous research. The results of this study may support the notion that a SA sport schedule leads to sacrificed study time.

### *H<sub>2</sub>: Grit and Depressive Symptoms*

Based on a lack of previous research examining grit and psychological health outcomes, I hypothesized there would be no difference in depressive symptoms based on grit scores. The results indicated moderate negative correlations between both grit and PSS as well as grit and DS. In this sample, students with higher grit scores reported less perceived stress and less DS. Therefore, the null hypothesis was rejected. Although the majority of the grit literature has focused on identifying grit as a predictor of success,

recent investigators have speculated that grit may also protect against adverse psychological outcomes. According to the results of this study, the inverse relationship identified between grit and DS may provide a mechanism to further explain a “gritty” individual’s ability to succeed.

### *H<sub>3-7</sub>: Grit and Substance Use Variables*

Bivariate examinations of grit and alcohol consumption variables (i.e. 12-month alcohol use, 2-week HED) resulted in significant, weak, negative associations. These findings were inconsistent in a previous study that reported higher grit scores to be associated with decreased alcohol use (Griffin et al., 2016). However, it is worth noting that the target population of the aforementioned study included individuals enrolled in in-patient rehabilitation for substance use disorders. Replication of the present study’s examination of grit and alcohol use are recommended in college student and SA populations.

Our analyses found a weak negative correlation between Grit and MPS in college students. We are unaware of any previously published investigations into this association. However, since students commonly misuse stimulants to increase academic effort, it is logical to infer, that students with increased grit scores, which were associated with increased efforts and hours attributed to studying, would be less likely to report MPS.

Finally, our results suggest that there is little to no relationship between grit and 12-month marijuana use, 12-month MPO, and ED use in the previous 30 days among college students. Based on these findings, we accept the null hypotheses of H<sub>4</sub>, H<sub>5</sub>, and H<sub>7</sub>. To our knowledge this is the first study to examine the potential influence of grit on the use or misuse of these substances.

#### *H<sub>8</sub>: Perceived Stress and Depressive Symptoms*

In this sample, there was a strong positive correlation between PS and DS. Furthermore, in multivariate analyses, perceived stress was positive significant predictor of DS. These results are consistent with previous findings that PS was significantly associated with DS (Beiter et al., 2015). Based on our findings, we accepted this hypothesis.

#### *H<sub>9-13</sub>: Perceived Stress and Substance Use Variables*

Our analyses showed that perceived stress was associated with several of the substance use behaviors assessed in this study. Specifically, perceived stress was a significantly predictor of HED, marijuana use in the previous year, energy drink consumption in the previous 30 days, and MPS. This was not in agreement with a previous study which failed to identify a significant relationship between PS and HED (Tavolacci et al., 2013). This discrepancy may be due to differing motivations for HED between study samples. Future research is needed to determine if HED prevalence may be the result of coping with stress or other motivations such as socializing with peers.

The results of this study suggest that PS is neither a significant predictor of ED use in the previous 30 days nor MPO in previous 12 months. With regard to MPO, this finding may be due to the extremely low prevalence of MPO among the sample.

#### *H<sub>14</sub>: Coping Strategies as Mediators*

The results of mediation analyses suggest specific coping strategies influence the relationship between PS and adverse health behaviors. Both self-distraction and drinking to cope decreased the direct effect of PS on DS when entered into the models. These

results imply that the relationship between PS and DS is partially mediated by both self-distraction and drinking to cope. These findings support previous studies that reported positive relationships between avoidance coping strategies (e.g. self-distraction, drinking to cope) and adverse health outcomes (Nicholls et al., 2006; Pritchard et al., 2007).

Subsequent analyses examined the potentially mediating effect of various coping strategies on the relationship between PS and substance use. Because significant relationships existed between PS and self-distraction, as well as self-distraction and marijuana use, self-distraction was the only coping variable assessed for mediation. While the relationship between PS and DS appeared to be partially mediated by self-distraction, the model explained minimal variance in marijuana use. This indicates that there are likely other variables (perhaps additional coping strategies) influencing the relationship between PS and marijuana use that should be examined.

### *Implications*

As a whole, the results of this study warrant discussion of the differences that may exist between SAs and noathletes. In general, athletic departments have shown a commitment to providing SAs with resources and access to professionals who specialized in the treatment and optimization of their physical health. Data identifying the prevalence of injury or malnutrition among collegiate SAs is used to assess the needs of the population. In response, athletic trainers, strength and conditioning coaches, and nutritionists are employed to address their respective facet of a SA's physical health.

Conversely, it is more difficult to establish data or objectively measure the attributes of psychological distress, DS, and adverse substance use (Green et al., 2001). In more recent years, athletic departments have recognized and responded to the need for

additional resources and trained professionals addressing psychological, emotional, and/or spiritual aspects of SA wellness. Findings from this study, alongside previous examinations of PS and DS among SAs, indicate SAs are experiencing stress at similar rates of their nonathlete peers (Humphrey et al., 2000; Papanikolaou et al., 2003; Malinauskas, 2010). In addition, regardless of their intentions, it appears SAs may be using particular substances at rates similar to or greater than their nonathlete peers (Gallucci et al., 2014; Cadigan et al., 2013; Martens et al., 2006). All professionals associated with a component of SA wellness are responsible for recognizing the signs and symptoms of these behaviors and intervening or referring on behalf of the SA. Additional programming for SAs and associated athletic department professionals focused on the personal, academic, and sport-related consequences of substance use are also warranted.

The responsibility of athletic trainers and athletic department personnel to address SA psychological health is one implication of the findings from this study; however, dissemination of these findings to SAs themselves may also have value. Student-athletes are typically attuned to the obstacles and required perseverance in their respective sport, but may struggle with adversity off of the field (i.e. classroom, work place). Student-athletes could benefit greatly from the insight into grit that was garnered from this study. Educating SAs on the universal quality of grit, and how perseverance and resilience will benefit them into adulthood could be an integral component of preparing them for life after college athletics.

### *Limitations*

Several notable limitations emerged throughout the completion of this study. First, this study was designed to be cross-sectional. The resulting data only provided a snapshot of various constructs reported by the participants. It is quite possible that a participant may have experienced a particularly more or less stressful day, leading to an artificially high or low score on the PSS. Furthermore, participants who had particularly bad days may have reported an increased number or intensity of DS, resulting in inflated scores on the CES-D depression scale.

Another important aspect of this study that may have been affected by a cross-sectional design is the examination of PS, DS and rates of substance use among SAs. While student-athletes have unique daily schedules, they also typically fluctuate throughout the calendar year. The time demands, performance expectations, and additional sport-specific stressors vary within pre-season, in-season, and off-season periods. Also, rates and types of substance use have been shown to fluctuate among SAs based on when their sport is in-season (Yusko, Buckman, White, & Pandina, 2008). The survey did not include a question inquiring about in- or off-season status, making it impossible to factor in the differences into the analyses.

The use of retrospective survey methodology in this study resulted in the collection of self-reported data. Self-report data is subject to several limitations which may include recall bias, social desirability bias, and the Hawthorne effect. Recall bias is a systematic error that occurs when participants do not remember previous experiences accurately or have a heightened awareness of details. In addition, questions regarding unhealthy or undesirable habits are typically subject to a social desirability bias.



Participants may have inauthentically answered questions regarding stress, depressive symptoms, or substance use to appear in a better light. Finally, by knowingly participating as a subject of a research study, participants' answer may have been biased (i.e. the Hawthorne effect).

It is also important to acknowledge that although statistical path analysis, a subset of structural equation modeling, implies causal pathways between independent and dependent variables, the research design did not allow for the determination of causation. It would be incorrect to conclude that lowever PS directly caused lower rates of DS or substance use. Correlations determined by path analysis in this study were used to interpret the present data set, however, not used for generalization beyond this population.

A final limitation of this study was the inability to capture potential confounding variables in the questionnaire. The complexity of the theoretical model selected for this study included broad categories of personal factors, influencing factors, and coping that may contributed to perceived stress and associated health outcomes. The variables and associated survey questions selected for this study were intentional, but by no means exhaustive. It is quite possible that by not measuring all possible extraneous variables, DS, and substance use, confounding occurred in this study.

### *Future Directions*

While the results of this study contribute to the grit literature, as well as advance the knowledge of differences in PS, DS, and substance use between SAs and nonathletes, further research is needed. If this study was to be replicated, it is recommended to re-evaluate measures of socioeconomic status other than mother's education level and a

subjective interpretation of childhood financial status. Socioeconomic status has been cited in the literature as a significant predictor of outcome variables included in this study; however, we were unable to establish significance. Additionally, the inclusion of religious coping or spirituality would be advantageous when sampling students from a religiously-affiliated institution. While religion or spirituality was not a focus of this project, it is recommended to include this in future examinations of this population.

With regard to grit, most of the literature has focused on its ability to predict successful performance or outcomes among elite students, athletes, or professional. Based on the results of this study, it appears grit scores differ significantly between collegiate SAs and nonathletes within this sample. Additional studies of grit among SAs at institutions of various sizes, locations, and competition levels are warranted. It is also unclear as to what predicts, or even grows, grit in an individual. Future research may aim to elucidate the potential precursors to young adult grit, such as childhood adversity, deliberate practice, and experiences with failure.

Finally, this study only captured five coping strategies through the use of the Brief Cope Inventory. The intention behind limiting the number of coping strategies was to examine differences between generalized emotion- and problem-based coping, as well as compare frequencies between SAs and nonathletes. Since the selecting coping strategies did not appear to explain much of the variance in any use of substances in this study, future studies may include additional coping strategies or motivation for substance use. Students may not be attributing their substance use to coping with stress, and rather consider it mainly a social commitment or obligation.

### *Conclusions*

In conclusion, grit may help explain how college students perceive their life experiences as more or less stressful. College students and SAs continue to suffer from high levels of stress and depression, alongside ongoing substance use. Since relationships between perceived stress and several substances (e.g. HED, marijuana, ED, prescription stimulants) were identified, grittier students with subsequently lower stress levels may also use fewer substances, or use substances less frequently. Because our study suggests that grit has an inverse relationship with perceived stress and depressive symptoms, increasing efforts to understand grit and the ability to increase one's grit should be taken. Grit also appears to manifest differently between SAs and nonathletes, and may be potentially helpful in predicting future success from aspiring athletes.

## APPENDIX

## APPENDIX A: QUESTIONNAIRE

1. What is your age? (Fill in)
2. What is your gender?
  - ☐ Male
  - ☐ Female
  - ☐ Other
3. With which race do you identify? (Select all that apply)
  - ☐ White, non-Hispanic (includes Middle Eastern)
  - ☐ Black, non-Hispanic
  - ☐ Hispanic or Latino
  - ☐ Asian or Pacific Islander
  - ☐ Native American or American Indian
  - ☐ Biracial/Multiracial
  - ☐ Other: \_\_\_\_\_
4. What is your year in school?
  - ☐ Freshman (1<sup>st</sup> year undergraduate)
  - ☐ Sophomore (2<sup>nd</sup> year undergraduate)
  - ☐ Junior (3<sup>rd</sup> year undergraduate)
  - ☐ Senior (4<sup>th</sup> year undergraduate)
  - ☐ 5<sup>th</sup> year or more (undergraduate)
  - ☐ Graduate or Professional student
5. What is your approximate cumulative grade point average (GPA)? If you are a first-semester freshman, please select your final high school GPA.
  - ☐ Lower than 2.0
  - ☐ 2.0 – 2.49
  - ☐ 2.5 – 2.99
  - ☐ 3.0 – 3.49
  - ☐ 3.5 – 3.99
  - ☐ 4.0 or higher
6. Within the last 12 months, have you participated in organized college athletics at any of the following levels? Please select ALL that apply.
  - ☐ Did not participate
  - ☐ Recreational Sports
  - ☐ Intramural Sports
  - ☐ Club Sports
  - ☐ Varsity Athletics (Division I)

7. Where do you currently live? (Select one)
- ☐ Campus residence hall
  - ☐ Other university housing
  - ☐ Off-campus apartment or rental house
  - ☐ Parent/Guardian's home
  - ☐ Other: \_\_\_\_\_
8. Are you a member of a social fraternity or sorority (e.g. National Interfraternity Conference, National Panhellenic Conference, National Pan-Hellenic Council, National Association of Latino Fraternal Organization)?
- ☐ No
  - ☐ Yes
9. During the time school is in session, approximately how many hours per week do you usually spend working on a job for pay?
- ☐ None; I don't have a job
  - ☐ 1-10 hours
  - ☐ 11-20 hours
  - ☐ 21-30 hours
  - ☐ 31-40 hours
  - ☐ More than 40 hours
10. During the time school is in session, approximately how many hours per week do you usually devote to sport, either varsity sport or intramural/club sport participation? (This includes practice, film, weight lifting, condition, and/or team meetings).
- ☐ None; I don't participate
  - ☐ 1-10 hours
  - ☐ 11-20 hours
  - ☐ 21-30 hours
  - ☐ 31-40 hours
  - ☐ More than 40 hours
11. Approximately how many hours per week do you spend studying? (To the nearest half hour) (Fill in)
12. Approximately how many hours of sleep do you get during a typical week (To the nearest half hour) (Fill in)

13. Have you experienced any of the events listed below in the previous 12 months?

Select all that apply.

- Sudden and unexpected death of close other
- Loved one serious accident/injury/illness
- Sexual assault
- Natural disaster
- Personal injury or severe illness
- Motor vehicle accident
- Other type of accident

#### 14. Grit Scale

*Here are a number of statements that may or may not apply to you. For the most accurate score, when responding, think of how you compare to most people – not just the people you know well, but most people in the world. There are no right or wrong answers, so just answer honestly.*

For each of the following statements, please select one of the following responses:

Very much like me

Mostly like me

Somewhat like me

Not much like me

Not like me at all

a. I have overcome setbacks to conquer an important challenge.
b. New ideas and projects sometimes distract me from previous ones.
c. My interests change from year to year.
d. Setbacks don't discourage me.
e. I have been obsessed with a certain idea or project for a short time but later lost interest.
f. I am a hard worker.
g. I often set a goal but later choose to pursue a different one.
h. I have difficulty maintaining my focus on projects that take more than a few months to complete.
i. I finish what I begin.
j. I have achieved a goal that took years of work.
k. I become interested in new pursuits every few months.
l. I am diligent.

## 15. Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the LAST MONTH. In each case, you will be asked to indicate your response by marking the circle representing HOW OFTEN you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the response that seems like a reasonable estimate.

*For each question, please select one of the following responses:*

- 0 - Never*
- 1 - Almost never*
- 2 - Sometimes*
- 3 - Fairly Often*
- 4 - Very Often*

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that were outside of your control?
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?



## 16. Brief Cope

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

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

1. I've been turning to work or other activities to take my mind off things.
2. I've been concentrating my efforts on doing something about the situation I'm in.
3. I've been using alcohol or other drugs to make myself feel better.
4. I've been getting emotional support from others.
5. I've been taking action to try to make the situation better.
6. I've been using alcohol or other drugs to help me get through it.
7. I've been getting comfort and understanding from someone.
8. I've been trying to get advice or help from other people about what to do.

## 17. Center for Epidemiologic Studies Depression Scale - Revised (CESD-R)

*Below is a list of the ways you might have felt or behaved following your most recent stressful experience. Consider the first two weeks after that event occurred. Please select the most accurate response to tell us how often you felt or behaved in the following ways.*

	Last Week				Nearly every day for 2 wks
	Not at all or < 1 day	1 -2 days	3 - 4 days	5 - 7 days	
My appetite was poor.	0	1	2	3	4
I could not shake off the blues.	0	1	2	3	4
I had trouble keeping my mind on what I was doing.	0	1	2	3	4
I felt depressed.	0	1	2	3	4
My sleep was restless.	0	1	2	3	4
I felt sad.	0	1	2	3	4
I could not get going.	0	1	2	3	4
Nothing made me happy.	0	1	2	3	4
I felt like a bad person.	0	1	2	3	4
I lost interest in my usual activities.	0	1	2	3	4
I slept much more than normal.	0	1	2	3	4
I felt like I was moving too slowly.	0	1	2	3	4
I felt fidgety.	0	1	2	3	4
I wished I were dead.	0	1	2	3	4
I wanted to hurt myself.	0	1	2	3	4
I was tired all the time.	0	1	2	3	4
I did not like myself.	0	1	2	3	4
I lost a lot of weight without trying to.	0	1	2	3	4
I had a lot of trouble getting to sleep.	0	1	2	3	4
I could not focus on the important things.	0	1	2	3	4

18. On how many occasions (if any) have you had alcoholic beverages – more than just a few sips – during the last 12 months?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

19. On how many occasions (if any) have you had alcoholic beverages – more than just a few sips – during the last 30 days?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

20. On how many occasions (if any) have you been drunk in the last 30 days?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

21. How many times (if any) have you had five or more drinks in a row (4 or more for females) in the last 2 weeks? (one drink is considered 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of liquor.)

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

22. On how many occasions (if any) have you used marijuana (weed, pot) or hashish (hash, oil) during the last 12 months?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

23. On how many occasions (if any) have you used marijuana (weed, pot) or hashish (hash, oil) during the last 30 days?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

24. There are a number of narcotics other than heroin such as methadone, opium, morphine, codeine, Demerol, Vicodin, OxyContin, and Percocet. These are sometimes prescribed by doctors as prescription painkillers. On how many occasions (if any) have you taken narcotics, not including heroin, on your own – that is without a doctor telling you to take them – during the last 12 months?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

25. "Energy drinks" are non-alcoholic beverages that usually contain high amounts of caffeine, including such drinks as Red Bull, Monster, and Rockstar. They are usually sold in 8- or 16-ounce cans or bottles. On how many occasions have you consumed an energy drink or energy shot in the last 30 days?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

26. During the last 12 months, on how many occasions (if any) have you had an alcoholic beverage mixed with an energy drink (like Red Bull)?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

27. Amphetamines are sometimes prescribed by doctors for people who have trouble paying attention, are hyperactive, have ADHD, or have trouble staying awake. They are sometime called uppers or pep pills, and include drugs like Adderall and Ritalin.

Drugstores are not supposed to sell them without a prescription from a doctor.

Amphetamines do NOT include any nonprescription drugs, such as over-the-counter diet pills or stay-awake pills. On how many occasions (if any) have you taken amphetamines on your own – that is, without a doctor telling you to take them – in the previous 12 months?

- ☐ Never
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10-19
- ☐ 20-39
- ☐ 40+

## REFERENCES

- Afshar, H., Roohafza, H. R., Keshteli, A. H., Mazaheri, M., Feizi, A., & Adibi, P. (2015). The association of personality traits and coping styles according to stress level. *Journal of Research in Medical Sciences*, 20(4), 1.
- American College Health Association. (2013). American college health association-national college health assessment II: Thompson rivers university executive summary spring 2013. *American College Health Association: Hanover, MD*.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)* American Psychiatric Pub.
- Andersen, M. B., & Williams, J. M. (1988). A model of stress and athletic injury: Prediction and prevention. *Journal of Sport and Exercise Psychology*, 10(3), 294-306.
- Appaneal, R. N., Levine, B. R., Perna, F. M., & Roh, J. L. (2009). Measuring postinjury depression among male and female competitive athletes. *Journal of Sport & Exercise Psychology*, 31(1), 60-76.
- Armstrong, S. N., Burcin, M. M., Bjerke, W. S., & Early, J. (2015). Depression in student athletes: A particularly at-risk group? A systematic review of the literature. *Athletic Insight*, 7(2), 177.
- Armstrong, S., & Oomen-Early, J. (2009). Social connectedness, self-esteem, and depression symptomatology among collegiate athletes versus nonathletes. *Journal of American College Health*, 57(5), 521-526.
- Barry, A. E., Howell, S. M., Riplinger, A., & Piazza-Gardner, A. K. (2015). Alcohol use among college athletes: Do intercollegiate, club, or intramural student athletes drink differently? *Substance use & Misuse*, 50(3), 302-307.
- Beck, A., Ward, C., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Arch Gen Psychiatry*, 4(6), 561-567.
- Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & Sammut, S. (2015a). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *Journal of Affective Disorders*, 173, 90-96.

- Blalock, D. V., Young, K. C., & Kleiman, E. M. (2015). Stability amidst turmoil: Grit buffers the effects of negative life events on suicidal ideation. *Psychiatry Research*, 228(3), 781-784. doi:10.1016/j.psychres.2015.04.041.
- Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B. F., Liu, S., & Olfson, M. (2008). Mental health of college students and their non-college-attending peers: Results from the national epidemiologic study on alcohol and related conditions. *Archives of General Psychiatry*, 65(12), 1429-1437.
- Bravo, A. J., Pearson, M. R., Stevens, L. E., & Henson, J. M. (2016). Depressive symptoms and alcohol-related problems among college students: A moderated-mediated model of mindfulness and drinking to cope. *Journal of Studies on Alcohol and Drugs*, 77(4), 661-666.
- Brewer, B., & Petrie, T. (1995). A comparison between injured and uninjured football players on selected psychosocial variables. *Academic Athletic Journal*, 10(1), 11-18.
- Brody, D., Pratt, L., & Hughes, J. (2018). Prevalence of depression among adults aged 20 and over: United states, 2013–2016. *NCHS Data Brief*, no. 303.
- Brougham, R. R., Zail, C. M., Mendoza, C. M., & Miller, J. R. (2009). Stress, sex differences, and coping strategies among college students. *Current Psychology*, 28(2), 85-97. doi:10.1007/s12144-009-9047-0.
- Burns, V. E., Drayson, M., Ring, C., & Carroll, D. (2002). Perceived stress and psychological well-being are associated with antibody status after meningitis C conjugate vaccination. *Psychosomatic Medicine*, 64(6), 963-970.
- Cadigan, J. M., Dworkin, E. R., Ramirez, J. J., & Lee, C. M. (2019). Patterns of alcohol use and marijuana use among students at 2-and 4-year institutions. *Journal of American College Health*, 67(4), 383-390.
- Cadigan, J. M., Littlefield, A. K., Martens, M. P., & Sher, K. J. (2013). Transitions into and out of intercollegiate athletic involvement and risky drinking. *Journal of Studies on Alcohol and Drugs*, 74(1), 21-29.
- Campbell-Sills, L., Cohan, S. L., & Stein, M. B. (2006). Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behaviour Research and Therapy*, 44(4), 585-599.
- Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the brief cope. *International Journal of Behavioral Medicine*, 4(1), 92.
- Carver, C. S., & Scheier, M. F. (1994). Situational coping and coping dispositions in a stressful transaction. *Journal of Personality and Social Psychology*, 66(1), 184.

- Center for Behavioral Health Statistics and Quality. (2016). 2015 national survey on drug use and health: Detailed tables. *Substance Abuse and Mental Health Services Administration (SAMHSA)*.
- Chen, Y., & Feeley, T. H. (2015). Predicting binge drinking in college students: Rational beliefs, stress, or loneliness? *Journal of Drug Education*, 45(3-4), 133-155.
- Clark, C., Pike, C., McManus, S., Harris, J., Bebbington, P., Brugha, T., . . . Stansfeld, S. (2012). The contribution of work and non-work stressors to common mental disorders in the 2007 adult psychiatric morbidity survey. *Psychological Medicine*, 42(4), 829-842.
- Clement, D., Arvinen-Barrow, M., & Fetty, T. (2015). Psychosocial responses during different phases of sport-injury rehabilitation: A qualitative study. *Journal of Athletic Training*, 50(1), 95-104.
- Clement, D., & Shannon, V. R. (2011). Injured athletes' perceptions about social support. *Journal of Sport Rehabilitation*, 20(4), 457-470.
- Cohen, N. L. (2017). *Public health perspectives on depressive disorders* JHU Press.
- Cohen, S., & Janicki-Deverts, D. (2012). Who's stressed? distributions of psychological stress in the united states in probability samples from 1983, 2006, and 2009. *Journal of Applied Social Psychology*, 42(6), 1320-1334.
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 385-396.
- Cohen, S. (1988). Perceived stress in a probability sample of the united states. (pp. 31-67). Thousand Oaks, CA, US: Sage Publications, Inc.
- Connaughton, D., Wadey, R., Hanton, S., & Jones, G. (2008). The development and maintenance of mental toughness: Perceptions of elite performers. *Journal of Sports Sciences*, 26(1), 83-95.
- Connor-Smith, J. K., & Flachsbart, C. (2007). Relations between personality and coping: A meta-analysis. *Journal of Personality and Social Psychology*, 93(6), 1080-1107. doi:10.1037/0022-3514.93.6.1080.
- Core Institute, Southern Illinois University. (2010). CORE alcohol and drug survey executive summary. doi:Available at: [https://core.siu.edu/\\_common/documents/report0911.pdf](https://core.siu.edu/_common/documents/report0911.pdf)
- Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*, 113(3), 492.



- Crossman, J. (1985). Psychological factors and athletic injury. *Journal of Sports Medicine and Physical Fitness*, 25, 151-154.
- Dams-O'Connor, K., Martin, J. L., & Martens, M. P. (2007). Social norms and alcohol consumption among intercollegiate athletes: The role of athlete and nonathlete reference groups. *Addictive Behaviors*, 32(11), 2657-2666.
- Dennhardt, A. A., & Murphy, J. G. (2013). Prevention and treatment of college student drug use: A review of the literature. *Addictive Behaviors*, 38(10), 2607-2618.
- Doherty, S., Hannigan, B., & Campbell, M. J. (2016). The experience of depression during the careers of elite male athletes. *Frontiers in Psychology*, 7, 1069.
- Duckworth, A. (2016). *Grit: The power of passion and perseverance*. Simon and Schuster.
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92(6), 1087.
- Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (GRIT-S). *Journal of Personality Assessment*, 91(2), 166-174.
- Dyson, R., & Renk, K. (2006). Freshmen adaptation to university life: Depressive symptoms, stress, and coping. *Journal of Clinical Psychology*, 62(10), 1231-1244.
- Eaton, W., Smith, C., Ybarra, M., Muntaner, C., & Tien, A. (2004). Center for epidemiologic studies depression scale: Review and revision (CESD and CESD-R).
- Ebrecht, M., Hextall, J., Kirtley, L., Taylor, A., Dyson, M., & Weinman, J. (2004). Perceived stress and cortisol levels predict speed of wound healing in healthy male adults. *Psychoneuroendocrinology*, 29(6), 798-809.
- Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Prevalence and correlates of depression, anxiety, and suicidality among university students. *American Journal of Orthopsychiatry*, 77(4), 534.
- Epel, E. S., Blackburn, E. H., Lin, J., Dhabhar, F. S., Adler, N. E., Morrow, J. D., & Cawthon, R. M. (2004). Accelerated telomere shortening in response to life stress. *Proceedings of the National Academy of Sciences of the United States of America*, 101(49), 17312-17315. doi:0407162101.
- Eskreis-Winkler, L., Duckworth, A. L., Shulman, E. P., & Beal, S. (2014). The grit effect: Predicting retention in the military, the workplace, school and marriage. *Frontiers in Psychology*, 5, 36.

- Etzel, E. F. (2006). Understanding and promoting college student-athlete health: Essential issues for student affairs professionals. *NASPA Journal*, 43(3), 518-546.
- Everson, S. A., Maty, S. C., Lynch, J. W., & Kaplan, G. A. (2002). Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. *Journal of Psychosomatic Research*, 53(4), 891-895. doi:S0022399902003033.
- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, 50(5), 992.
- Ford, J. A. (2007). Alcohol use among college students: A comparison of athletes and nonathletes. *Substance use & Misuse*, 42(9), 1367-1377.
- Ford, J. A. (2008). Nonmedical prescription drug use among college students: A comparison between athletes and nonathletes. *Journal of American College Health*, 57(2), 211-220.
- Ford, J. A., & Pomykacz, C. (2016). Non-medical use of prescription stimulants: A comparison of college students and their same-age peers who do not attend college. *Journal of Psychoactive Drugs*, 48(4), 253-260.
- Frank, R., Nixdorf, I., Beckmann, J., Kramer, U., Mangold, S., Krumm, P., . . . Claussen, C. (2013). Depression among elite athletes: Prevalence and psychological factors. *Deut Z Sportmed*, 64, 320-326.
- Frazier, P., Anders, S., Perera, S., Tomich, P., Tennen, H., Park, C., & Tashiro, T. (2009). Traumatic events among undergraduate students: Prevalence and associated symptoms. *Journal of Counseling Psychology*, 56(3), 450.
- Galli, N., & Gonzalez, S. P. (2015). Psychological resilience in sport: A review of the literature and implications for research and practice. *International Journal of Sport and Exercise Psychology*, 13(3), 243-257.
- Gallucci, A. R., & Martin, R. J. (2015). Misuse of prescription stimulant medication in a sample of college students: Examining differences between varsity athletes and non-athletes. *Addictive Behaviors*, 51, 44-50.
- Gallucci, A. R., Martin, R. J., & Morgan, G. B. (2016). The consumption of energy drinks among a sample of college students and college student athletes. *Journal of Community Health*, 41(1), 109-118.
- Gallucci, A. R., Usdan, S. L., Martin, R. J., & Bolland, K. A. (2014). Pill popping problems: The non-medical use of stimulant medications in an undergraduate sample. *Drugs: Education, Prevention and Policy*, 21(3), 181-188.

- Gallucci, A. R., Wynveen, C., Hackman, C., Meyer, A., & Usdan, S. (2014). An examination of the situational factors associated with the misuse of prescription analgesics among college students. *Journal of Drug Education, 44*(3-4), 116-136.
- Garofalo, C., & Wright, A. G. (2017). Alcohol abuse, personality disorders, and aggression: The quest for a common underlying mechanism. *Aggression and Violent Behavior, 34*, 1-8.
- Gaudreau, P., & Blondin, J. (2002). Development of a questionnaire for the assessment of coping strategies employed by athletes in competitive sport settings. *Psychology of Sport and Exercise, 3*(1), 1-34.
- Giacobbi Jr, P. R., Lynn, T. K., Wetherington, J. M., Jenkins, J., Bodendorf, M., & Langley, B. (2004). Stress and coping during the transition to university for first-year female athletes. *The Sport Psychologist, 18*(1), 1-20.
- Gilchrist, J. D., Fong, A. J., Herbison, J. D., & Sabiston, C. M. (2018). Feelings of pride are associated with grit in student-athletes and recreational runners. *Psychology of Sport & Exercise, 36*, 1-7. doi:10.1016/j.psychsport.2017.12.009.
- Glick, I. D., Stillman, M. A., Reardon, C. L., & Ritvo, E. C. (2012). Managing psychiatric issues in elite athletes. *The Journal of Clinical Psychiatry, 73*(5), 640-644. doi:10.4088/JCP.11r07381.
- Gouttebauge, V., Frings-Dresen, M. H., & Sluiter, J. K. (2015). Mental and psychosocial health among current and former professional footballers. *Occupational Medicine (Oxford, England), 65*(3), 190-196. doi:10.1093/occmed/kqu202.
- Grant, B. F. (1997). The influence of comorbid major depression and substance use disorders on alcohol and drug treatment: Results of a national survey. *Treatment of Drug-Dependent Individuals with Comorbid Mental Disorders. NIDA Research Monograph, 172*, 4-15.
- Greeley, J., & Oei, T. (1999). Alcohol and tension reduction. *Psychological Theories of Drinking and Alcoholism, 2*, 14-53.
- Green, G. A., Uryasz, F. D., Petr, T. A., & Bray, C. D. (2001). NCAA study of substance use and abuse habits of college student-athletes. *Clinical Journal of Sport Medicine, 11*(1), 51-56.
- Greenberg, P. E., Fournier, A., Sisitsky, T., Pike, C. T., & Kessler, R. C. (2015). The economic burden of adults with major depressive disorder in the united states (2005 and 2010). *The Journal of Clinical Psychiatry, 76*(2), 155-162.

- Griffin, M. L., McDermott, K. A., McHugh, R. K., Fitzmaurice, G. M., & Weiss, R. D. (2016). Grit in patients with substance use disorders. *The American Journal on Addictions*, 25(8), 652-658.
- Grindstaff, J. S., Wrisberg, C. A., & Ross, J. R. (2010). Collegiate athletes' experience of the meaning of sport injury: A phenomenological investigation. *Perspectives in Public Health*, 130(3), 127-135.
- Grove, J., Stewart, R., & Gordon, S. (1990). Emotional reactions of athletes to knee rehabilitation. Paper presented at the *Annual Meeting of the Australian Sports Medicine Federation*, Alice Springs.
- Gucciardi, D. F., Hanton, S., Gordon, S., Mallett, C. J., & Temby, P. (2015). The concept of mental toughness: Tests of dimensionality, nomological network, and traitness. *Journal of Personality*, 83(1), 26-44.
- Gucciardi, D. F., Peeling, P., Ducker, K. J., & Dawson, B. (2016). When the going gets tough: Mental toughness and its relationship with behavioural perseverance. *Journal of Science and Medicine in Sport*, 19(1), 81-86. doi:10.1016/j.jsams.2014.12.005.
- Gulliver, A., Griffiths, K. M., & Christensen, H. (2012). Barriers and facilitators to mental health help-seeking for young elite athletes: A qualitative study. *BMC Psychiatry*, 12(1), 157.
- Gulliver, A., Griffiths, K. M., Mackinnon, A., Batterham, P. J., & Stanimirovic, R. (2015). The mental health of Australian elite athletes. *Journal of Science and Medicine in Sport*, 18(3), 255-261.
- Gulliver, A., Griffiths, K. M., Christensen, H., Mackinnon, A., Cascar, A. L., Parsons, A., . . . Stanimirovic, R. (2012). Internet-based interventions to promote mental health help-seeking in elite athletes: An exploratory randomized controlled trial. *Journal of Medical Internet Research*, 14(3), e69. doi:10.2196/jmir.1864 [doi]
- Hamdi, N. R., & Iacono, W. G. (2014). Lifetime prevalence and co-morbidity of externalizing disorders and depression in prospective assessment. *Psychological Medicine*, 44(2), 315-324.
- Hammond, T., Gialloreti, C., Kubas, H., & Hap Davis, H., 4th. (2013). The prevalence of failure-based depression among elite athletes. *Clinical Journal of Sport Medicine : Official Journal of the Canadian Academy of Sport Medicine*, 23(4), 273-277. doi:10.1097/JSM.0b013e318287b870.
- Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., & Angell, K. E. (1998). Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*, 107(1), 128.

- Hildebrand, K. M., Johnson, D. J., & Bogle, K. (2001). Comparison of patterns of alcohol use between high school and college athletes and non-athletes. *College Student Journal*, 35(3), 358-366.
- Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*.
- Houston, M. N., Hoch, M. C., & Hoch, J. M. (2016). Health-related quality of life in athletes: A systematic review with meta-analysis. *Journal of Athletic Training*, 51(6), 442-453.
- Humphrey, J. H., Yow, D. A., & Bowden, W. W. (2000). *Stress in college athletics: Causes, consequences, coping*. Florence: Routledge Ltd.
- Hutchison, M., Mainwaring, L. M., Comper, P., Richards, D. W., & Bisschop, S. M. (2009). Differential emotional responses of varsity athletes to concussion and musculoskeletal injuries. *Clinical Journal of Sport Medicine : Official Journal of the Canadian Academy of Sport Medicine*, 19(1), 13-19. doi:10.1097/JSM.0b013e318190ba06.
- Hysenbegasi, A., Hass, S. L., & Rowland, C. R. (2005). The impact of depression on the academic productivity of university students. *Journal of Mental Health Policy and Economics*, 8(3), 145.
- Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research*, 47(3), 391-400. doi:10.1016/j.jpsychires.2012.11.015.
- Jaeger, B., Freeman, S., Whalen, R., & Payne, R. (2010). Successful students: Smart or tough. Paper presented at the *Proceedings, ASEE Annual Convention, Paper AC,1033*.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. (2016). Monitoring the future national survey results on drug use, 1975-2015: Volume II, college students and adults ages 19-55.
- Jones, G. (2002). What is this thing called mental toughness? an investigation of elite sport performers. *Journal of Applied Sport Psychology*, 14(3), 205-218.
- Kahn, J. H., Kasky-Hernández, L. M., Ambrose, P., & French, S. (2017). Stress, depression, and anxiety among transitioning college students: The family as a protective factor. *Journal of the First-Year Experience & Students in Transition*, 29(2), 11-25.

- Kaier, E., Cromer, L. D., Johnson, M. D., Strunk, K., & Davis, J. L. (2015). Perceptions of mental illness stigma: Comparisons of athletes to nonathlete peers. *Journal of College Student Development, 56*(7), 735-739.
- Kannangara, C. S., Allen, R. E., Waugh, G., Nahar, N., Khan, S. Z. N., Rogerson, S., & Carson, J. (2018). All that glitters is not grit: Three studies of grit in university students. *Frontiers in Psychology, 9*.
- Kelly, D. R., Matthews, M. D., & Bartone, P. T. (2014). Grit and hardiness as predictors of performance among west point cadets. *Military Psychology, 26*(4), 327-342.
- Kendler, K. S., Karkowski, L. M., & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of major depression. *American Journal of Psychiatry, 156*(6), 837-841. doi:10.1176/ajp.156.6.837.
- Kessler, R. C., & Bromet, E. J. (2013). The epidemiology of depression across cultures. *Annual Review of Public Health, 34*, 119-138.
- Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry, 62*(6), 617-627.
- Kessler, R. C., Zhao, S., Blazer, D. G., & Swartz, M. (1997). Prevalence, correlates, and course of minor depression and major depression in the national comorbidity survey. *Journal of Affective Disorders, 45*(1-2), 19-30.
- Keyes, K. M., Hatzenbuehler, M. L., & Hasin, D. S. (2011). Stressful life experiences, alcohol consumption, and alcohol use disorders: The epidemiologic evidence for four main types of stressors. *Psychopharmacology, 218*(1), 1-17.
- Kobasa, S. C. (1979). Stressful life events, personality, and health: An inquiry into hardiness. *Journal of Personality and Social Psychology, 37*(1), 1.
- Kobasa, S. C., Maddi, S. R., & Courington, S. (1981). Personality and constitution as mediators in the stress-illness relationship. *Journal of Health and Social Behavior, 368-378*.
- Kohler Giancola, J., Grawitch, M. J., & Borchert, D. (2009). Dealing with the stress of college: A model for adult students. *Adult Education Quarterly, 59*(3), 246-263.
- Kohn, P. M., Lafreniere, K., & Gurevich, M. (1990). The inventory of college students' recent life experiences: A decontaminated hassles scale for a special population. *Journal of Behavioral Medicine, 13*(6), 619-630.

- Kontos, A. P., Covassin, T., Elbin, R., & Parker, T. (2012). Depression and neurocognitive performance after concussion among male and female high school and collegiate athletes. *Archives of Physical Medicine and Rehabilitation*, 93(10), 1751-1756.
- Kubany, E. (2004). Traumatic life events questionnaire and PTSD screening and diagnostic scale. *Los Angeles, CA: Western Psychological Services*.
- Lanier, C. A., Nicholson, T., & Duncan, D. (2001). Drug use and mental well being among a sample of undergraduate and graduate college students. *Journal of Drug Education*, 31(3), 239-248.
- Lazarus, R. S., & Launier, R. (1978). Stress-related transactions between person and environment. *Perspectives in interactional psychology* (pp. 287-327) Springer.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer Pub. Co.
- Leddy, M. H., Lambert, M. J., & Ogles, B. M. (1994). Psychological consequences of athletic injury among high-level competitors. *Research Quarterly for Exercise and Sport*, 65(4), 347-354.
- Leichliter, J. S., Meilman, P. W., Presley, C. A., & Cashin, J. R. (1998). Alcohol use and related consequences among students with varying levels of involvement in college athletics. *Journal of American College Health*, 46(6), 257-262.
- Lenore, S. R. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1(3), 385-401. doi:10.1177/014662167700100306.
- Levine, M., & Perkins, D. V. (1980). Tailor making life events scale. Paper presented at the 88th Annual Convention of the American Psychological Association, Montreal, Quebec, Canada.
- Li, H., Moreland, J. J., Peek-Asa, C., & Yang, J. (2017). Preseason anxiety and depressive symptoms and prospective injury risk in collegiate athletes. *The American Journal of Sports Medicine*, 45(9), 2148-2155.
- Lisha, N. E., & Sussman, S. (2009; 2010). Relationship of high school and college sports participation with alcohol, tobacco, and illicit drug use: A review. *Addictive Behaviors*, 35(5), 399-407. doi:10.1016/j.addbeh.2009.12.032
- Magrys, S., & Olmstead, M. (2015). Acute stress increases voluntary consumption of alcohol in undergraduates. *Alcohol and Alcoholism*, 50(2), 213-218.

- Mainwaring, L. M., Hutchison, M., Bisschop, S. M., Comper, P., & Richards, D. W. (2010). Emotional response to sport concussion compared to ACL injury. *Brain Injury*, 24(4), 589-597.
- Malinauskas, R. (2010). The associations among social support, stress, and life satisfaction as perceived by injured college athletes. *Social Behavior and Personality: An International Journal*, 38(6), 741-752.
- Mann, J. B., Bryant, K. R., Johnstone, B., Ivey, P. A., & Sayers, S. P. (2016). Effect of physical and academic stress on illness and injury in division 1 college football players. *Journal of Strength and Conditioning Research*, 30(1), 20-25. doi:10.1519/JSC.0000000000001055.
- Martens, M. P., Dams-O'Connor, K., & Beck, N. C. (2006). A systematic review of college student-athlete drinking: Prevalence rates, sport-related factors, and interventions. *Journal of Substance Abuse Treatment*, 31(3), 305-316. doi:S0740-5472(06)00144-9.
- Martin, M. (2018). Comparing stress levels and coping styles in college athletes and non-athletes. *Honors Thesis*.
- Mastroleo, N. R., Barnett, N. P., & Bowers, K. M. (2018). Association between sex, Race/Ethnicity, season, day of week and alcohol use and related risks in college student athletes and nonathletes. *Journal of American College Health*, (just-accepted), 1-36.
- Matud, M. P. (2004). Gender differences in stress and coping styles. *Personality and Individual Differences*, 37(7), 1401-1415.
- McCabe, S. E. (2008). Misperceptions of non-medical prescription drug use: A web survey of college students. *Addictive Behaviors*, 33(5), 713-724.
- McCabe, S. E., Cranford, J. A., Boyd, C. J., & Teter, C. J. (2007). Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. *Addictive Behaviors*, 32(3), 562-575.
- McCabe, S. E., Morales, M., Cranford, J. A., Delva, J., McPherson, M. D., & Boyd, C. J. (2007). Race/ethnicity and gender differences in drug use and abuse among college students. *Journal of Ethnicity in Substance Abuse*, 6(2), 75-95.
- McCabe, S. E., Schulenberg, J. E., Johnston, L. D., O'malley, P. M., Bachman, J. G., & Kloska, D. D. (2005). Selection and socialization effects of fraternities and sororities on US college student substance use: A multi-cohort national longitudinal study. *Addiction*, 100(4), 512-524.



- McCabe, S. E., & Teter, C. J. (2007). Drug use related problems among nonmedical users of prescription stimulants: A web-based survey of college students from a midwestern university. *Drug and Alcohol Dependence*, 91(1), 69-76.
- McCabe, S. E., Teter, C. J., Boyd, C. J., Knight, J. R., & Wechsler, H. (2005). Nonmedical use of prescription opioids among US college students: Prevalence and correlates from a national survey. *Addictive Behaviors*, 30(4), 789-805.
- McCabe, S. E., West, B. T., Teter, C. J., & Boyd, C. J. (2014). Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. *Addictive Behaviors*, 39(7), 1176-1182.
- McCabe, S. E., Teter, C. J., & Boyd, C. J. (2005). Illicit use of prescription pain medication among college students. *Drug and Alcohol Dependence*, 77(1), 37-47. doi:S0376-8716(04)00205-4.
- McNair, D. M. (1971). *Manual profile of mood states*. Educational & Industrial testing service.
- Merikangas, K. R., He, J. P., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., . . . Swendsen, J. (2010). Lifetime prevalence of mental disorders in U.S. adolescents: Results from the national comorbidity survey replication--adolescent supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry*, 49(10), 980-989. doi:10.1016/j.jaac.2010.05.017.
- Miech, R. A., Patrick, M. E., O'Malley, P. M., & Johnston, L. D. (2017). The influence of college attendance on risk for marijuana initiation in the united states: 1977 to 2015. *American Journal of Public Health*, 107(6), 996-1002.
- Miller, B. E., Miller, M., Verhegge, R., Linville, H., & Pumariega, A. (2002). Alcohol misuse among college athletes: Self-medication for psychiatric symptoms? *Journal of Drug Education*, 32(1), 41-52.
- Miller, P. S., & Kerr, G. (2002). The athletic, academic and social experiences of intercollegiate student-athletes. *Journal of Sport Behavior*, 25(4), 346.
- National Collaborating Centre for Mental Health (UK). (2010). Depression: The NICE guideline on the treatment and management of depression in adults. doi:NBK63748
- National Collegiate Athletic Association. (2014). NCAA student-athlete substance use study: Executive summary august 2014.
- Nelson, T. F., & Wechsler, H. (2001). Alcohol and college athletes. *Medicine and Science in Sports and Exercise*, 33(1), 43-47.

- Newman, H. J., Howells, K. L., & Fletcher, D. (2016). The dark side of top level sport: An autobiographic study of depressive experiences in elite sport performers. *Frontiers in Psychology*, 7, 868.
- Nguyen-Michel, S. T., Unger, J. B., Hamilton, J., & Spruijt-Metz, D. (2006). Associations between physical activity and perceived stress/hassles in college students. *Stress and Health: Journal of the International Society for the Investigation of Stress*, 22(3), 179-188.
- Nicholls, A. R., Holt, N. L., Polman, R. C., & Bloomfield, J. (2006). Stressors, coping, and coping effectiveness among professional rugby union players. *The Sport Psychologist*, 20(3), 314-329.
- Nixdorf, I., Frank, R., & Beckmann, J. (2016). Comparison of athletes' proneness to depressive symptoms in individual and team sports: Research on psychological mediators in junior elite athletes. *Frontiers in Psychology*, 7, 893.
- Nixdorf, I., Frank, R., Hautzinger, M., & Beckmann, J. (2013). Prevalence of depressive symptoms and correlating variables among german elite athletes. *Journal of Clinical Sport Psychology*, 7(4), 313-326.
- Nixon, H. L. (1996). Explaining pain and injury attitudes and experiences in sport in terms of gender, race, and sports status factors. *Journal of Sport and Social Issues*, 20(1), 33-44.
- Nolen-Hoeksema, S., & Harrell, Z. A. (2002). Rumination, depression, and alcohol use: Tests of gender differences. *Journal of Cognitive Psychotherapy*, 16(4), 391-404.
- Nolen-Hoeksema, S., Larson, J., & Grayson, C. (1999). Explaining the gender difference in depressive symptoms. *Journal of Personality and Social Psychology*, 77(5), 1061.
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3(5), 400-424.
- O'Brien, M. C., McCoy, T. P., Rhodes, S. D., Wagoner, A., & Wolfson, M. (2008). Caffeinated cocktails: Energy drink consumption, high-risk drinking, and alcohol-related consequences among college students. *Academic Emergency Medicine*, 15(5), 453-460.
- O'Connell, S., & Manschreck, T. C. (2012). Playing through the pain: Psychiatric risks among athletes. *Current Psychiatry*, 11(7), 16-20.
- Oglesby, L. W., Amrani, K. A., Wynveen, C. J., & Gallucci, A. R. (2018). Do energy drink consumers study more? *Journal of Community Health*, 43(1), 48-54.

- Olpin, M., & Hesson, M. (2015). *Stress management for life: A research-based experiential approach* Nelson Education.
- O'Malley, P. M., & Johnston, L. D. (2002). Epidemiology of alcohol and other drug use among american college students. *Journal of Studies on Alcohol, Supplement*, (14), 23-39.
- Pace, C. R., & Kuh, G. D. (1998). College student experiences questionnaire. *Center for Postsecondary Research and Planning, Indiana University, Bloomington*.
- Papanikolaou, Z., Nikolaidis, D., Patsiaouras, A., & Alexopoulos, P. (2003). The freshman experience: High stress-low grades. *Athletic Insight: The on-Line Journal of Sport Psychology*, 5(4), 1-8.
- Parrish, B. P., Cohen, L. H., & Laurenceau, J. (2011). Prospective relationship between negative affective reactivity to daily stress and depressive symptoms. *Journal of Social and Clinical Psychology*, 30(3), 270-296. doi:10.1521/jscp.2011.30.3.270.
- Pearlin, L. I., Menaghan, E. G., Lieberman, M. A., & Mullan, J. T. (1981). The stress process. *Journal of Health and Social Behavior*, 22(4), 337-356. doi:10.2307/2136676.
- Pedrelli, P., Farabaugh, A. H., Zisook, S., Tucker, D., Rooney, K., Katz, J., . . . Fava, M. (2011). Gender, depressive symptoms and patterns of alcohol use among college students. *Psychopathology*, 44(1), 27-33. doi:10.1159/000315358.
- Petrie, T. A. (1992). Psychosocial antecedents of athletic injury: The effects of life stress and social support on female collegiate gymnasts. *Behavioral Medicine*, 18(3), 127-138.
- Pilling, S., Anderson, I., Goldberg, D., Meader, N., Taylor, C., & Two Guideline Development Groups. (2009). Depression in adults, including those with a chronic physical health problem: Summary of NICE guidance. *Bmj*, 339(27), b4108-b4108.
- Price, E. L., McLeod, P. J., Gleich, S. S., & Hand, D. (2006). One-year prevalence rates of major depressive disorder in first-year university students. *Canadian Journal of Counselling*, 40(2), 68.
- Prinz, B., Dvořák, J., & Junge, A. (2016). Symptoms and risk factors of depression during and after the football career of elite female players. *BMJ Open Sport & Exercise Medicine*, 2(1), e000124.
- Pritchard, M. E., Wilson, G. S., & Yamnitz, B. (2007). What predicts adjustment among college students? A longitudinal panel study. *Journal of American College Health*, 56(1), 15-22. doi:10.3200/JACH.56.1.15-22

- Proctor, S. L., & Boan-Lenzo, C. (2010). Prevalence of depressive symptoms in male intercollegiate student-athletes and nonathletes. *Journal of Clinical Sport Psychology, 4*(3), 204.
- Putukian, M. (2016). The psychological response to injury in student athletes: A narrative review with a focus on mental health. *British Journal of Sports Medicine, 50*(3), 145-148. doi:10.1136/bjsports-2015-095586.
- Radloff, L. S. (1977). The CES-D scale a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385-401.
- Radloff, L. S. (1991). The use of the center for epidemiologic studies depression scale in adolescents and young adults. *Journal of Youth and Adolescence, 20*(2), 149-166.
- Reardon, C. L., & Creado, S. (2014). Drug abuse in athletes. *Substance Abuse and Rehabilitation, 5*, 95-105. doi:10.2147/SAR.S53784.
- Reed, J. (2014). A survey of grit and exercise behavior. *Journal of Sport Behavior, 37*(4), 390.
- Roberti, J. W., Harrington, L. N., & Storch, E. A. (2006). Further psychometric support for the 10-item version of the perceived stress scale. *Journal of College Counseling, 9*(2), 135-147.
- Rohde, P., Lewinsohn, P. M., Klein, D. N., Seeley, J. R., & Gau, J. M. (2013). Key characteristics of major depressive disorder occurring in childhood, adolescence, emerging adulthood, and adulthood. *Clinical Psychological Science, 1*(1), 41-53.
- Roiger, T., Weidauer, L., & Kern, B. (2015). A longitudinal pilot study of depressive symptoms in concussed and injured/nonconcussed national collegiate athletic association division I student-athletes. *Journal of Athletic Training, 50*(3), 256-261. doi:10.4085/1062-6050-49.3.83 [doi]
- Ross, S., Niebling, B., & Heckert T. (1999). Sources of stress among college students. *College Student Journal, 33*(2), 312.
- Ruiz, R. J., Fullerton, J., Brown, C. E., & Schoolfield, J. (2001). Relationships of cortisol, perceived stress, genitourinary infections, and fetal fibronectin to gestational age at birth. *Biological Research for Nursing, 3*(1), 39-48.
- Salles, A., Cohen, G. L., & Mueller, C. M. (2014). The relationship between grit and resident well-being. *American Journal of Surgery, 207*(2), 251-254. doi:10.1016/j.amjsurg.2013.09.006.
- Sarkar, M., & Fletcher, D. (2014). Psychological resilience in sport performers: A review of stressors and protective factors. *Journal of Sports Sciences, 32*(15), 1419-1434.

- Sawyer Radloff, L., & Teri, L. (1986). 6/Use of the center for epidemiological studies-depression scale with older adults. *Clinical Gerontologist*, 5(1-2), 119-136.
- Schaal, K., Tafflet, M., Nassif, H., Thibault, V., Pichard, C., Alcotte, M., . . . Simon, S. (2011). Psychological balance in high level athletes: Gender-based differences and sport-specific patterns. *PLoS One*, 6(5), e19007.
- Schönfeld, P., Brailovskaia, J., Bieda, A., Zhang, X. C., & Margraf, J. (2016). The effects of daily stress on positive and negative mental health: Mediation through self-efficacy. *International Journal of Clinical and Health Psychology*, 16(1), 1-10.
- Schulenberg, J., Johnston, L., O'Malley, P., Bachman, J., Meich, R., & Patrick, M. (2017). Monitoring the future national survey results on drug use, 1975-2016: Volume 2, college students and adults ages 19-55.
- Selye, H. (1956). *The stress of life*. New York: McGraw-Hill.
- Selye, H. (1973). The evolution of the stress concept: The originator of the concept traces its development from the discovery in 1936 of the alarm reaction to modern therapeutic applications of syntoxic and catatoxic hormones. *American Scientist*, 61(6), 692-699.
- Selye, H. (1983). "The stress concept: past, present, and future" in Cooper, C.L. (Ed.), *Stress Research*, Wiley, New York, NY, pp. 1-20.
- Shim, R. S., Baltrus, P., Ye, J., & Rust, G. (2011). Prevalence, treatment, and control of depressive symptoms in the united states: Results from the national health and nutrition examination survey (NHANES), 2005-2008. *Journal of the American Board of Family Medicine : JABFM*, 24(1), 33-38.  
doi:10.3122/jabfm.2011.01.100121.
- Smarr, K. L., & Keefer, A. L. (2011). Measures of depression and depressive symptoms: Beck depression Inventory-II (BDI-II), center for epidemiologic studies depression scale (CES-D), geriatric depression scale (GDS), hospital anxiety and depression scale (HADS), and patient health Questionnaire-9 (PHQ-9). *Arthritis Care & Research*, 63(S11), S454-S466.
- Smith, A., Stuart, M., Wiese-Bjornstal, D., Milliner, E., O'Fallon, W., & Crowson, C. (1993). Competitive athletes: Preinjury and postinjury mood state and self-esteem. Paper presented at the *Mayo Clinic Proceedings*, 68(10), 939-947.
- Snyder, T. D., De Brey, C., & Dillow, S. A. (2018). Digest of education statistics 2016, NCES 2017-094. *National Center for Education Statistics*.

- Soderstrom, M., Dolbier, C., Leiferman, J., & Steinhardt, M. (2000). The relationship of hardiness, coping strategies, and perceived stress to symptoms of illness. *Journal of Behavioral Medicine*, 23(3), 311-328.
- Spitzer, R. L., Kroenke, K., Williams, J. B., & Patient Health Questionnaire Primary Care Study Group. (1999). Validation and utility of a self-report version of PRIME-MD: The PHQ primary care study. *Jama*, 282(18), 1737-1744.
- Storch, E. A., Storch, J. B., Killiany, E. M., & Roberti, J. W. (2005). Self-reported psychopathology in athletes: A comparison of intercollegiate student-athletes and non-athletes. *Journal of Sport Behavior*, 28(1)
- Substance Abuse and Mental Health Services Administration. (2013). Results from the 2012 national survey on drug use and health: Summary of national findings, NSDUH series H-46, HHS publication no. (SMA) 13-4795.
- Substance Abuse and Mental Health Services Administration. (2017). *Key substance use and mental health indicators in the united states: Results from the 2016 national survey on drug use and health (HHS publication no. SMA 17-5044, NSDUH series H-52)*. (). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration.
- Suls, J., & Fletcher, B. (1985). The relative efficacy of avoidant and nonavoidant coping strategies: A meta-analysis. *Health Psychology*, 4(3), 249.
- Tavolacci, M. P., Ladner, J., Grigioni, S., Richard, L., Villet, H., & Dechelotte, P. (2013). Prevalence and association of perceived stress, substance use and behavioral addictions: A cross-sectional study among university students in france, 2009–2011. *BMC Public Health*, 13(1), 724.
- Van Dam, N. T., & Earleywine, M. (2011). *Validation of the center for epidemiologic studies depression Scale—Revised (CESD-R): Pragmatic depression assessment in the general population* doi:<https://doi.org/10.1016/j.psychres.2010.08.018>.
- Vargas, G., Rabinowitz, A., Meyer, J., & Arnett, P. A. (2015). Predictors and prevalence of postconcussion depression symptoms in collegiate athletes. *Journal of Athletic Training*, 50(3), 250-255. doi:10.4085/1062-6050-50.3.02.
- Velazquez, C. E., Poulos, N. S., Latimer, L. A., & Pasch, K. E. (2012). Associations between energy drink consumption and alcohol use behaviors among college students. *Drug and Alcohol Dependence*, 123(1-3), 167-172.
- Vollrath, M., & Torgersen, S. (2000). Personality types and coping. *Personality and Individual Differences*, 29(2), 367-378. doi:10.1016/S0191-8869(99)00199-3.

- Vredenburg, K., O'brien, E., & Krames, L. (1988). Depression in college students: Personality and experiential factors. *Journal of Counseling Psychology*, 35(4), 419.
- Watson, D., & Hubbard, B. (1996). Adaptational style and dispositional structure: Coping in the context of the five-factor model. *Journal of Personality*, 64(4), 737-774. doi:10.1111/j.1467-6494.1996.tb00943.
- Wechsler, H. (2005). *Harvard school of public health college alcohol study, 2001* Inter-university Consortium for Political and Social Research.
- Wechsler, H., Davenport, A. E., Dowdall, G. W., Grossman, S. J., & Zanakos, S. I. (1997). Binge drinking, tobacco, and illicit drug use and involvement in college athletics: A survey of students at 140 american colleges. *Journal of American College Health*, 45(5), 195-200.
- Weigand, S., Cohen, J., & Merenstein, D. (2013). Susceptibility for depression in current and retired student athletes. *Sports Health: A Multidisciplinary Approach*, , 1941738113480464.
- Weight, E., Navarro, K., Huffman, L., & Smith-Ryan, A. (2014). Quantifying the psychological benefits of intercollegiate athletics participation. *Journal of Issues in Intercollegiate Athletics*, 7, 390-409.
- Weigold, I. K., & Robitschek, C. (2011). Agentic personality characteristics and coping: Their relation to trait anxiety in college students. *American Journal of Orthopsychiatry*, 81(2), 255-264. doi:10.1111/j.1939-0025.2011.01094.
- Weiss, M., & Troxel, R. (1986). Psychology of the injured athlete. *Athletic Training*, 21, 104-111.
- Weitzman, E. R. (2004). Poor mental health, depression, and associations with alcohol consumption, harm, and abuse in a national sample of young adults in college. *The Journal of Nervous and Mental Disease*, 192(4), 269-277. doi:00005053-200404000-00003.
- Weyandt, L. L., Janusis, G., Wilson, K. G., Verdi, G., Paquin, G., Lopes, J., . . . Dussault, C. (2009). Nonmedical prescription stimulant use among a sample of college students: Relationship with psychological variables. *Journal of Attention Disorders*, 13(3), 284-296.
- Wiese-Bjornstal, D. M., Smith, A., & LaMott, E. (1995). A model of psychologic response to athletic injury and rehabilitation. *Athletic Training: Sports Health Care Perspectives*, 1(1), 17-30.

- Wiese-Bjornstal, D. M., Smith, A. M., Shaffer, S. M., & Morrey, M. A. (1998). An integrated model of response to sport injury: Psychological and sociological dynamics. *Journal of Applied Sport Psychology*, 10(1), 46-69.
- Wilson, G. S., Pritchard, M. E., & Schaffer, J. (2004). Athletic status and drinking behavior in college students: The influence of gender and coping styles. *Journal of American College Health*, 52(6), 269.
- Wilson, G., & Pritchard, M. (2005). Comparing sources of stress in college student athletes and non-athletes. *Athletic Insight: Online Journal of Sport Psychology*, 7(1) 1-8.
- Wolanin, A., Gross, M., & Hong, E. (2015). Depression in athletes: Prevalence and risk factors. *Current Sports Medicine Reports*, 14(1), 56-60.  
doi:10.1249/JSR.0000000000000123.
- Wolanin, A., Hong, E., Marks, D., Panchoo, K., & Gross, M. (2016). Prevalence of clinically elevated depressive symptoms in college athletes and differences by gender and sport. *British Journal of Sports Medicine*, 50(3), 167-171.  
doi:10.1136/bjsports-2015-095756.
- Woolsey, C. L., Williams Jr, R. D., Jacobson, B. H., Housman, J. M., McDonald, J. D., Swartz, J. H., . . . Davidson, R. T. (2015). Increased energy drink use as a predictor of illicit prescription stimulant use. *Substance Abuse*, 36(4), 413-419.
- World Health Organization. (2017). Depression and other common mental disorders: Global health estimates.
- Yang, J., Peek-Asa, C., Lowe, J. B., Heiden, E., & Foster, D. T. (2010). Social support patterns of collegiate athletes before and after injury. *Journal of Athletic Training*, 45(4), 372-379.
- Yang, J., Peek-Asa, C., Corlette, J. D., Cheng, G., Foster, D. T., & Albright, J. (2007). Prevalence of and risk factors associated with symptoms of depression in competitive collegiate student athletes. *Clinical Journal of Sport Medicine : Official Journal of the Canadian Academy of Sport Medicine*, 17(6), 481-487.  
doi:10.1097/JSM.0b013e31815aed6b.
- Young, V., Lin, Y., & Duckworth, A. (2015). Associations between grit and subjective well-being in a large sample of US adults. Paper presented at the *Poster Presented at the 16th Annual Convention of the Society for Personality and Social Psychology*, Long Beach, CA.
- Yusko, D. A., Buckman, J. F., White, H. R., & Pandina, R. J. (2008a). Alcohol, tobacco, illicit drugs, and performance enhancers: A comparison of use by college student athletes and nonathletes. *Journal of American College Health*, 57(3), 281-290.



- Yusko, D. A., Buckman, J. F., White, H. R., & Pandina, R. J. (2008b). Risk for excessive alcohol use and drinking-related problems in college student athletes. *Addictive Behaviors*, 33(12), 1546-1556.
- Zullig, K. J., & Divin, A. L. (2012). The association between non-medical prescription drug use, depressive symptoms, and suicidality among college students. *Addictive Behaviors*, 37(8), 890-899.