

Athletes' Self-Perceptions of Depression and Depressive Symptoms
Related to Athletic Injuries

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ABSTRACT

This study examines the relationship between athletic injury and levels of depression while controlling for athletic engagement. The participants in the study included 105 adults who recently or currently participated in sports at the high school varsity level or above. Levels of depression were analyzed using a modified version of the Zung Self-Rating Depression Scale (ZSDS) regarding the period of time either before/during injury or before/during athletic season (Zung, 1965). Demographic and self-perception questions were also asked using a survey. A two sample t-test for difference between means was performed to analyze the differences between change in Zung scores and the independent variables. The null hypothesis was rejected since a significant correlation was found between Zung scores for before/during injury and severity of injury, meaning that athletes were more likely to be depressed upon experiencing physical injury, especially if the injury was more severe.

TABLE OF CONTENTS

Page

LIST OF TABLES AND FIGURES..... iv

LIST OF APPENDICES.....v

I. INTRODUCTION1

 Statement of Purpose3

 Research Questions.....3

 Hypothesis.....4

 Definition of Terms.....4

 Significance of Study5

II. REVIEW OF LITERATURE.....6

 What is Depression?6

 Depression in Athletes9

 Severity of Injury11

 Sport Commitment.....13

 Mental Health Stigma15

 Self-Perception of Mental Health17

III. METHODS20

 Participants.....20

 Measures20

 Demographics21

 ZSDS.....21

 Procedures.....22

 Data Analysis.....23

IV. RESULTS25

 Demographics25

 Before vs. During Injury or Athletic Season28

 Change in Zung Score Compared to Independent Variables.....31

V. DISCUSSION36

 Injury Status and Depression36

 Findings.....37

 Final Thoughts38

REFERENCES41

APPENDICES50

LIST OF TABLES AND FIGURES

	Page
Table 1. Zung Score for Non-Injured Participants Before vs. During Athletic Season.....	28
Table 2. Zung Score for Injured Participants Before vs. During Injury	30
Table 3. Change in Zung Score for Male vs. Female	32
Table 4. Change in Zung Score for Injured vs. Non-Injured	32
Table 5. Change in Zung Score for Non-Severe vs. Severe Injury.....	33
Table 6. Change in Zung Score for Upper vs. Lower Body Injury	34
Figure 1. Participants by Gender	26
Figure 2. Participants by Age Group	26
Figure 3. Participants by Sport Level	27
Figure 4. Participants by Main Sport	27
Figure 5. Frequency of Self-Reported Depressive Symptoms for Non-Injured Participants Before and After Athletic Season	29
Figure 6. Frequency of Self-Reported Depressive Symptoms for Injured Participants Before and After Injury	30
Figure 7. Change in Zung Score Compared to Gender and Injury Status	33
Figure 8. Change in Zung Score Compared to Injury Severity	34
Figure 9. Change in Zung Score Compared to Level of Sport	35
Figure 10. Change in Zung Score Compared to Career Ending Injury Status.....	35

LIST OF APPENDICES

	Page
APPENDIX A. Consent Form	50
APPENDIX B. Modified ZSDS	54
APPENDIX C. Survey Content	57
APPENDIX D. IRB Approval	60

I. INTRODUCTION

Depression affects a large percentage of our country's population, but even more so for a specific subpopulation—athletes (Wolanin, 2015). Athletes face challenges that are unique to the rest of the population. The pressure to perform perfectly, pushing their bodies to the ultimate limit, and having everyone count on you to make the right play are just some of the difficulties that may raise mental health issues for athletes. Despite these struggles, athletes commit every minute of every day to becoming better players. For example, athletes wake up early to perform a morning lift, eat a breakfast approved by a nutritionist, attend practice, maybe complete a mental training activity, watch footage from the opposing team, make game plans, drive somewhere to compete, and work their body to the point of exhaustion. On top of this, student-athletes also must find the time to attend class and complete their homework. Given the crazy commitment of an athlete, imagine what happens when an athlete sustains an injury.

All of the sudden, an athlete's entire schedule and routine have changed. They seem to be letting down their teammates, they are no longer able to practice or become better performers, and on top of that they are experiencing physical pain. Athletes who dedicate all of their time to the sport that they love can have their lives flipped upside down in an instant. It is no wonder that this population is more susceptible to depression. However, this needs to be examined. Perhaps athletes experience more depression simply because of the craziness involved with being an athlete and not because they experience more physical injuries. There are many variables that may contribute to the depression experienced by athletes, and the current evidence on this topic will be discussed shortly.

The present study takes a look at how athletes' levels of depressive symptoms change before an athletic injury occurs and during the recovery period for an injury. Athletes who had not experienced an injury answered the same questions based on their experiences before their most recent athletic season and during their most recent season, to control for athletic participation as it may contribute to depressive symptoms. It is important to note that this study is comparing the level of depressive symptoms; it is not based on a clinical diagnosis of depression. The objective of the present study is to highlight the change in mental health that may occur to an athlete after an injury. A clinical diagnosis is not necessary to verify that an event has mentally impacted an individual. To further show the possible effects of injury on an athlete's mental health, participants in this study were asked for their perceptions regarding the mental impact caused by their injury and whether they believe that the injury had mentally affected them. An athlete's perception, a subjective response, pertaining to the level of impact of an injury is just as important as a clinical diagnosis since it reflects how the athlete feels he or she has personally been impacted. It is important to find out why athletes experience depression at a higher rate than their peers so that mental health clinicians and sports programs can better serve their athletes and treat their psychological symptoms. By understanding the causes, professionals can more efficiently find solutions. This study looks into the potential psychological impacts of athletic injury and its impact on athletes' lives.

Statement of Purpose

The goal of this research is to determine how specific depressive symptoms, along with overall depression levels, are affected by athletic injuries using self-reporting methods pertaining to the feelings and perceptions of athletes before and after an injury. The research was done by implementing a modified version of the Zung Self-Rating Depression Scale (ZSDS) to assess level of depressive symptoms in athletes before injury and during injury recovery (Appendix B). The study also conducted a survey completed by athletes who have not experienced injury to assess symptoms before and during their most recent athletic season. The control-group survey was done to evaluate the possible differences in depression levels due to athletic injury while controlling for engagement in sports. The independent variables of injury status, injury severity, injury location, and gender were assessed among injured participants in relation to their depressive symptoms. After the quantitative survey about depressive symptoms, participants were asked to qualitatively describe their perceived levels of depression and how injury may have impacted them psychologically.

Research Questions

The main research question of this study is, how do levels of depression change before and after an athletic injury has occurred? Also, how does injury status, injury severity, injury location, and gender impact these changes in depressive symptoms? How do athletes perceive their injuries to have impacted their mental health? Do depressive symptoms change during engagement in sports?

Hypothesis

When controlling for age, gender, and participation in sports, it is hypothesized that levels of depressive symptoms increase after an athletic injury has occurred, and even more so as severity of injury increases.

Definition of Terms

Zung Self-Rating Depression Scale (ZSDS): a valid survey tool used as a self-report method of depressive symptoms and overall level of depression (Zung 1965)

Depression: a mental health disorder in which patients experience persistent sadness that inhibits their ability to function normally

Depressed mood: a temporary state of extreme sadness often found in people with depression, but is not a clinical disorder

Injury: physical harm experienced by the body; athletic injury is harm that occurs during participation in sport

Injury severity: for this study, severity of injury is determined by the length of time an athlete was unable to participate in sport due to physical harm/pain; intensity of an injury

Clinical diagnosis: in the realm of mental health, a disorder determined by a mental health professional based on the qualifications in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013)

Diagnostic and Statistical Manual of Mental Disorders (DSM): a book created by mental health professionals that contains evidence-based symptoms of mental health disorders and determines the level and amount of symptoms that leads to diagnosis of a disorder (American Psychiatric Association, 2013)

Mental health: an individual's "emotional, psychological, and social well-being" (U.S. Department of Health and Human Services, 2020).

Stigma: social disapproval that has been engrained into society's view on others; in the mental health world, social disapproval towards those experiencing mental health symptoms or disorders

Self-perception: a subjective measure on how an individual feels they are affected

Significance of Study

The purpose of this study is to better understand the relationship between athletic injury and level of depressive symptoms. Since athletes are more susceptible to sustaining injuries, it is important to investigate the impact that athletic injuries may have on their mental health. Early detection of susceptibility to depression can allow mental health professionals to better treat their patients, which has an additional potential to decrease the amount of time spent in recovery as well. This study can bring awareness to the mental well-being of recovering athletes so that sports teams can provide the necessary care for both the minds and bodies of their athletes.

II. REVIEW OF LITERATURE

What is Depression?

Biological Basis

Depression is a mental health disorder that limits an individual's ability to function and diminishes quality of life (Malhi & Mann, 2018). Although it is primarily a psychological illness, depression has biological causes and biological symptoms associated with the disorder (MayoClinic, 2018). Some physical causes of depression include genetic vulnerability, improper mood regulation in the brain, and medications that alter the interactions between various neurotransmitters (Shrivastava et al., 2012). It has also been found that pregnant mothers who experience depressive symptoms will have babies with lower dopamine levels, higher levels of epinephrine and cortisol, and frontal EEG asymmetry, all of which are chemical components that lead to a depressed mood (Diego et al., 2005). There is also a neurologic pathway shared between pain and depression (Carter et al., 2002), which leads to a reduced pain tolerance during depressive episodes (Trivedi, 2004). Depression often generates reduced glucose metabolism and blood flow as well, a further connection between the mind and body (Glannon, 2002). It is clear that depression has various biological causes and symptoms, but psychologists today prefer to view the disorder through a biopsychosocial lens, meaning, psychologists will view the causes and symptoms of depression through a multiple-causal lens, examining the biological, psychological, and social sources of depression (Pomerantz, 2019).

Social Basis

Depression often arises when there is a contrast between one's self-image and objective facts regarding their life (Beck & Alford, 2009). Self-image can easily be altered through social standards about how one should look, comparing personal successes to the achievements of others, and seeing oneself as falling behind the imaginary timeline of where one should be in life. There are many other social causes of depression, an important one being major life events (Gotlib & Hammen, 2008). Losing a loved one, moving away from family, or struggling with an illness or injury are just a few examples of how life events can affect one's mood and ultimately lead to depression.

Symptoms and Characteristics

Psychologists use the Diagnostic and Statistical Manual of Mental Disorders (DSM) for official diagnoses of mental illnesses (Pomerantz, 2019). According to the DSM, the diagnostic criteria of depression include five or more of the following symptoms for at least two weeks: "depressed mood most of the day, markedly diminished interest or pleasure in usual activities, significant weight loss..., decrease or increase in appetite..., a slowing down of thought and a reduction of physical movement, fatigue or loss of energy, feelings of worthlessness or excessive guilt, diminished ability to think or concentrate, and recurrent thoughts of death" (American Psychiatric Association, 2013, p. 623). These are the official diagnostic criteria for the disorder of depression, but doctors have agreed upon various other characteristics that are also often displayed in those who are depressed. Some of these other consequences include anxiety, poor self-concept, regressive changes such as escape from normal life, and more (Beck & Alford, 2009). Depression is also associated with poor physical health and issues with interpersonal

relationships (Gotlib & Hammen, 2008). These physical symptoms can even increase the duration of depressive episodes (Trivedi, 2004). Depression has a way of impacting the mind, body, and brain, which can alter every aspect of one's life. People with depression feel, think, and act differently than they would without the disorder (Beck & Alford, 2009).

Prevalence

Currently, 2-3% of males and 5-9% of females in the world have depression (Beck & Alford, 2009). These percentages are likely greater since depression is a private disease from which people do not always seek help, for reasons that are discussed later. The World Health Organization (WHO) previously ranked major depression as the third cause of disease and projected that this ranking may become number one in the future (World Health Organization, 2008). Today WHO estimates 280 million people worldwide have depression (World Health Organization, 2021). In just the United States, 20% of the population will experience a clinically significant depressive episode during their lives, which would be over 65 million people (Gotlib & Hammen, 2008). Depression is a disorder that completely alters the life and causes persistent sadness in those impacted. It is hard to imagine that so many millions of people have struggled with this deadly disease. Of these, however, there is a large chunk of our population that has a higher risk of developing the disorder—athletes. In the U.S., 18–25 year olds have an elevated prevalence of depression often due to a multitude of life changes; the rate of depression among this age bracket is approximately 8.7%. For American athletes of the same age, the rate is 15.6-21% (Wolanin, 2015), clearly a markedly larger percentage of the same age cohort.

Depression in Athletes

Susceptibility

The nature of sports makes injury much more likely for athletes compared to the activities undertaken by the average person. This is due to the consistent physical demands placed onto the body (Saragiotto et al., 2014). When injured, athletes change their entire schedule and daily activity routine (Mainwaring et al., 2010). They also are unable to deal with these stressors as effectively since physical activity is often their primary coping mechanism (American College of Sports Medicine, 2006). Problems arise when athletes are unable to use this coping mechanism to the same extent as they normally would if they were not injured. This drastic change in lifestyle and the inability to cope with personal stresses often cause athletes to fall into depression, which has the potential to last long after the physical injury heals (Haluska, 2011).

Studies such as Leddy et al. (1954/2013) have shown that depression levels are elevated in athletes who experience physical injuries. Injury especially becomes a risk factor when the recovery period is longer or when athletes are unable to live up to their own performance expectations (Baron et al, 2009). Since these athletes cannot achieve the high standards they set for themselves while injured, they face a specific set of symptoms for depression including irritability, lack of motivation, decline in performance, and excessive self-criticism (Baron et al., 2009). A survey conducted by sports medicine physicians found that 80% of athletes who sustained a physical injury also discussed psychological issues pertaining to the injury with their physician (Mann et al., 2007) including emotional symptoms such as sadness, social isolation, frustration, anger, change in appetite, sleep disturbances, and feeling disengaged (American College

of Sports Medicine, 2006). Since such large percentages of athletes deal with physical injury, there is potential for elevated levels of depression in this population.

Athletic Injuries and Depression

Leddy et al. (1954/2013) conducted an experiment which found that 51% of athletes who sustained an injury had mild to severe symptoms of depression. The measurements of this study showed increased levels of depression and anxiety along with a significant decrease in self-esteem both immediately following injury and two months later at their check-up. It is clear that physical injuries impacted the psychological health in these athletes, although only male athletes participated in the study. Another study conducted by Appaneal et al. (2009) also investigated post-injury depression and found that depressive symptoms were elevated at one week and at one month after the injury occurred. Both studies effectively measure depression levels in injured athletes and show that these levels are significantly high. However, what these studies lack is a retrospective view in which their findings are compared to the athletes' levels of depression prior to physical injury. Perhaps the depressive symptoms of injured athletes are high simply because they are competitive athletes, not because they are injured. This is why studies that measure depression both before and after injuries occur are necessary. A study by Smith et al. (1993/2012) used this method of investigating mental health both before and after injury and found that there was a significant difference between pre-injury and post-injury moods. The world of sports has greatly evolved since the Smith et al. (1993/2012) study was conducted, and similar research is required to see what the results of this study would look like today. Along with understanding that depression levels may rise in injured athletes, it is necessary to discover why it occurs.

Hope for the Future

Currently, a lot of time and money is spent fixing the physical aspect of athletic injuries, while very little money is spent helping athletes recover mentally (Baron et al., 2009). Media rarely even mentions the mental health of athletes and tends to focus on the number of days left until the physical injury is healed. However, just because the physical injury has healed does not mean that the athlete is mentally ready to return to play (Golding et al., 2020). In more positive news, studies have shown that athletes who receive mental health therapy while injured actually return to play sooner than they are expected to based on the physical damage (Ross & Berger, 1996). This suggests that treating the mind will help the body recover better and could reduce the depressive symptoms that so often follow injury. Another study has found similar results when using cognitive behavioral therapy techniques for injured athletes, in which their athletes had a quicker physical and emotional recovery (Booth, 1987). Clearly therapy is an effective treatment method for the mind, but more and more studies are finding that it can help with the physical recovery of injuries as well. It is easy to understand why athletes are more likely to sustain injuries, but there are other factors that cause injuries to increase depressive symptoms.

Severity of Injury

It is important to note that severity of the injury plays a role in the intensity of depression for injured athletes, but extensive research has yet to be done on this subtopic. The study by Smith et al. (1993/2012) is one of the few that have separated their group of injured athletes by injury intensity. Their study found that the only significant predictor

of depression following injury was the severity. This finding is unusual because other studies have concluded that women are more likely to have elevated levels of depression (Albert, 2015), yet Smith et al. (1993/2012) did not find gender to be an indicator. However, only 36 injured athletes participated in the Smith et al. (1993/2012) study, 27 with minor/moderate injuries and 9 with severe injuries. The researchers determined intensity of the injury by the amount of time athletes were unable to participate in their sport, which seems to be a valid determinant.

A more recent study has investigated how location and severity of injury affect depression levels (Baecher et al., 2018). Like the Smith et al. (1993/2012) study, the Baecher et al. (2018) researchers also found that as the severity of the injury increases, so does the level of depressive symptoms. Along with this finding, the researchers found that more visible injuries, or injuries that are clearly seen by other people, led to reduced depressive symptoms, presumably since lack of sport participation was more excusable to those around them. Another finding of this study showed that lower body injuries were associated with increased depressive symptoms, likely due to an impairment in walking ability. These findings are significant since a much larger population of athletes participated in this study and the researchers used an evidence-based method called the Injury Severity Score (Baecher et al., 2018). Although severity may be subjective, the researchers have operationally defined this term for the purposes of their study.

A final study looking into the effect of injury severity on depression found that patients with severe injuries were 2x more likely to experience depressive symptoms compared to those with moderate injuries (Han et al, 2011). This study is significant since its researchers compared a large population of severely injured athletes to moderately

injured athletes. Both populations experienced an elevation in depressive symptoms, but the more severe injuries experienced depression at a higher rate. Han et al. (2011) particularly focused on injured adolescents since adolescents are already at a higher risk for depression.

Depressive symptoms are particularly high in athletes when symptoms do not get better or get worse over time and when the injury is more severe than injuries experienced by other athletes around them (American College of Sports Medicine, 2006). When symptoms do not improve, optimism and hope toward recovery decreases, and the athlete will become discouraged. When an athlete's injury is worse than others' injuries around them, the injured athlete feels more isolated and feels that their family and friends are unable to understand what the athlete is going through. These studies have found that as severity of athletic injuries increases, so does the intensity of depressive symptoms. Along with severity, studies have found that an athlete's level of commitment can impact depressive levels.

Sport Commitment

Scanlan et al. (1993, p.1) defines sport commitment as "a psychological state representing the desire or resolve to continue sport participation." There have been various tools used to demonstrate level of sport commitment, the most prominent being the Sport Commitment Model and the Athletic Identity Measurement Scale (Good et al., 1993). These models consider athletes' enjoyment of their sport, involvement with other activities, and social constraints. While it may seem positive to be so dedicated to a sport that one loves, there can be detrimental consequences when that sport is taken away from

the individual (Brewer, 1993). Competitive athletes dedicate a large portion of their time to the sport that they love (Hodge et al., 2009), which means that when physical injury does occur, suddenly an athlete's entire world has changed in a matter of seconds (Valvovich McLeod et al., 2009).

Brewer et al. (1993) conducted four different studies pertaining to athletic identity and depression upon time away from sport. All of these studies found two similar results: 1) if individuals define themselves by their sport, any life event that disrupts participation will lead to an increase in depressive symptoms and 2) individuals who define themselves as athletes had more negative responses to a hypothetical injury than those who do not. These Brewer et al. (1993) studies are notable because they measure a response to an injury that has not actually occurred to the individual. This suggests that athletes are more emotionally impacted by physical injuries than their non-athlete peers. These participants even experienced a depressed mood when simply thinking about sustaining an injury since they know the consequences that a physical injury could bring to their athletic participation and career.

Athletic identity increases with level of sport participation, meaning that college varsity athletes are more likely to have a higher identity level with their sport than college intramural athletes (Brewer et al, 1993). Studies have also found that athletic identity is positively correlated to severity of depression upon experience of injury. One study in particular found that as athletic identity increases, so does the likelihood of playing through pain along with the intensity of depression during injury (Renton et al, 2021). This finding suggests that athletes who are highly dedicated to their sport will play through pain for which less-committed athletes would seek medical help. By doing this,

the athletes will only experience worse injuries down the road, which will lead to depression. This study should be repeated in the future using a more varied range of participants since most of these athletes were male Caucasians.

Sitting out from the sport that one loves is not an easy thing to do. Many doctors think nothing of telling their patients to sit out for a month since their bodies are damaged, but this is easier said than done for an athlete. One study asked competitive runners to not run for only two weeks and then measured psychological changes before and during this two-week period (Chan & Grossman, 1988). This “short” period of time away from the sport that they love caused great psychological distress and elevated levels of depression in all participants. All in all, the more committed athletes are to their sport, the greater their levels of depression will be when forced not to participate, which is often due to physical injury.

Mental Health Stigma

Athletes are taught from a very young age to be tough and always have a winning attitude (Gucciardi et al, 2009). Even the slightest hint of doubt, sadness, or a mental health issue was seen as a sign of weakness in the sports world. Despite 1/3 of elite athletes struggling with mental illness every year, many are discouraged from seeking help (Castaldelli-Maia et al., 2019). A stigma surrounding mental health issues has persisted in society for decades and although progress is being made, there is a long way to go (Shrivastava et al., 2012). A lack of education and persistent outdated viewpoints of the mentally ill are the leading causes of the stigma to this day (Shrivastava et al., 2012). A meta-analysis of studies trying to discover why athletes do not seek help for their

mental health symptoms found that the social stigma surrounding mental health is the number one reason (Castaldelli-Maia et al., 2019). The mental health stigma has been found to be amplified in the world of sports, further discouraging athletes from seeking help or even discussing with loved ones the symptoms they are experiencing (Glick & Horsfall, 2009).

Notable progress has been made, especially this year, when two of the world's most prominent athletes decided to sit out of their prospective sports during huge events. Simone Biles made the decision to sit out some of her Olympic competitions in Japan (Siemaszko & Helsel, 2021), and Naomi Osaka decided to sit out of the Wimbledon tennis tournament (Hart, 2021). Each of these individuals received a lot of hate for making these decisions, but many people have also stepped up to commend them for making such difficult decisions that will ultimately benefit them in the long run. These athletes are encouraging others to recognize the prevalence of mental health issues in the world of sports; however, many athletes have also reported their understanding of how prevalent the stigma is (Lebrun et al., 2018). There has been a noticeable increase in athletes speaking out against the stigma, but there has also been an increase in the stereotyping against those who speak out (Bauman, 2016). There are various treatment methods that can help a large range of mental health problems, including counseling, medication, and psychotherapy, but the social stigma prevents athletes from seeking out these treatments despite their likelihood of benefiting athletic performance (Glick & Horsfall, 2009). The combination of the social stigma and the toughness mentality engraved into the minds of athletes since the start of their careers join together in

preventing athletes from seeking help for mental health symptoms and disorders (Castaldelli-Maia et al., 2019).

Self-Perception of Mental Health

Most of the current research surrounding depression in athletes focuses on the clinical diagnosis of depression. Specific symptoms of depression are rarely mentioned, and the opinions of athletes suffering from injuries are completely ignored. The personal feelings of the athlete should be considered as well since many feelings are unobservable to anyone other than the individual (Garcia & Gustavson, 1997). An athlete does not need a clinical diagnosis of depression to be negatively affected by depressive symptoms (Ghio et al., 2014). While the opinions of the athletes may not be a clinical standard in determining levels of depression, their opinions do matter in determining what impact a physical injury may or may not have on their mental health.

Multitudes of studies have been conducted to find the relationship between perceived stress on depression related to work. These studies can be useful for research on athletes since the time commitment that athletes give to their sport and the way they participate are very similar to a job (Mutz et al., 2020). Athletes show up for training every day and work in order to improve results of the team/company. These studies consistently produce similar results in which perceived stress was positively correlated to depression and negatively correlated to self-esteem (Lee et al., 2012). Many studies have included demands of the job as a factor in the study and found that the higher perceived demands of the job, the higher the incidence of depression (Rusli et al., 2008). It would make sense for athletes to perceive high demands from their job since they push their

bodies' limits every single day and have a lot of pressure put on them to win (Waldron & Krane, 2005). Due to the similarities of jobs and athletic participation, more recent studies have been conducted pertaining to the perceived stresses of athletes and the corresponding relationship to depressive symptoms.

A study by Francisco et al. (2016) found that perceived stress was an antecedent of both burnout and depression in a large group of Spanish athletes. Their hypothetical model indicates that high perceived stress will either lead to depression directly or lead to burnout, which will then cause depression. It is important to note that these studies investigate levels of perceived stress because an individual can undergo a multitude of stressful or life-altering events but not feel stressed at all due to compromising factors. These factors are not relevant to the study at hand, but these studies focus on how much stress the individuals perceive themselves to have. This distinction is important because measuring stress subjectively is more likely to accurately predict the impact of stress on the individual (Britton et al., 2017).

Athlete burnout is an athlete's physical and psychological exhaustion from training demands, which is often a reaction to chronic stress (Chyi et al., 2018). Burnout makes injury from sport much more likely to occur since athletes are unable to concentrate on their actions as much as they normally would (Cresswell & Eklund, 2007). A meta-analysis of studies has concluded that perceived stress is positively correlated to athlete burnout and its following consequences (Chyi et al., 2018). A study by Simms et al. (2020) found that overall perception of one's own mental health is a significant component in determining performance abilities. The better one perceives their own mental health, the better their athletic performance. However, Simms et al.

(2020) also found the opposite to be true. If athletes perceive their mental health as negative or believe they are struggling, their athletic performance will suffer. This study has huge implications regarding the necessity of mental health resources in the sports world (Simms et al., 2020). Whether an athlete is suffering from a clinical disorder or just feeling down, this negative perception of the individual's own mental health will result in poor athletic performance (Storch et al., 2005). Not only would treatment help the individual athlete feel better, but this implies that sport organizations should invest in these types of services to improve performance of their team and increase the likelihood of a win. Better assistance for team mental health services can be done through investment in mental health services and continued persistence against the social stigma.

III. METHODS

The current study attempts to observe the effect of athletic injury on level of depressive symptoms, while controlling for depressive symptom levels during athletic participation. Gender, injury status, severity of injury, and injury location were also compared to depression level. This survey contains demographic information, perceived levels of depressive symptoms, and a modified version of the Zung Self-Rating Depression Scale (ZSDS). It is hypothesized that level of depressive symptoms is positively correlated to presence of an athletic injury.

Participants

Participation in this study was both voluntary and anonymous. 105 people participated in this study, all having athletic experience at the high school varsity level or above. 84 participants reported having experienced an athletic injury and 21 had not. The participants consisted of 72 females, 32 males, and 1 participant who identified as “other.” A large range of sports was covered by the participants in this study, which will be shown in the results section. The participants include 30 current/former NCAA athletes.

Measures

Presence of injury and level of depressive symptoms were the primary variables assessed in this study. Another important variable of this study was severity of injury, which was determined based on how long the recovery time lasted or was projected to last. Levels of depressive symptoms were assessed using the ZSDS which was modified

to better serve the athlete population. These questions were answered for the period of time before and during an athletic injury was present. For athletes who had not experienced an athletic injury, these questions were answered for the period of time before and during their most recent athletic season. This was done to control for levels of depressive symptoms that may have changed due to participation in sport rather than due to an injury.

Demographics

After obtaining consent for the study, participants were asked to fill out a short demographic survey that included age, gender, sport, level of sport participation, and history of athletic injury. Severity of injury was also included to see if severity had a potential effect on level of depressive symptoms. The demographics were included to see how these levels varied by demographic group.

ZSDS

The Zung Self-Rating Depression Scale (ZSDS) was used to provide an objective measure of depressive symptoms in a relatively short period of time. Two questions were omitted due to irrelevance to the study. Calculations were adjusted accordingly. This modified version of the ZSDS contained 18 questions. A four-point Likert scale was used to rank each response which included a little of the time, some of the time, a good part of the time, and most of the time. Each response was given a value of 1-4 to create a summated response for each participant on overall level of depressive symptoms. This scale has proven to be a valid measurement tool in various studies that compared the

scores of the assessments to clinical diagnosis results (Biggs et al., 1978). Other studies have found this tool to have high sensitivity, reliability, and a positive predictive value at 93% (Agrell & Dehlin, 1989). The ZSDS has proven to have high sensitivity and reliability in more recent studies as well (Dunstan et al., 2017).

Procedures

After creating the survey, approval was given for distribution by the university's Institutional Review Board (Appendix D). An email was sent from Middle Tennessee State University's College of Behavioral and Health Sciences to students within these majors. The researcher also received permission to send out a link to the survey using various social media platforms. The participants were informed about the purpose of the study, rights as participants, risks, benefits, and researcher contact information if they had further questions. Consent was obtained prior to access of the survey's content. Written consent also ensured that participants understood that their responses would remain confidential and could not be used to identify any participant.

The strengths of this survey include time, convenience, control, and additional opinions. The survey was short enough such that it would only take 10-20 minutes to complete. It was a convenient survey to take since it could be taken on the participants' cellphone, laptop, or other electronic device wherever they decided to take it. The questions allowed for control of multiple variables including demographic information and participation in sport that could unintentionally alter levels of depressive symptoms. By allowing for additional opinions and containing questions pertaining to perception of depression, the researcher was able to understand how injury or athletic participation

mentally impacted the individuals without needing to know if the individuals had a clinical diagnosis. Knowing this information is important because a clinical diagnosis is not necessary to determine if a variable had a mental impact on the participants—only their perception of whether they believe themselves to be impacted.

The weaknesses of this survey include the dependence on past self-reflection, sample size, and lack of a longitudinal approach. The researcher valued having a retrospective viewpoint before injury occurred and before one's most recent athletic season. Because of this, participants were asked to reflect on a time of their lives that may not have been very recent. To control for this, an age maximum was placed on participants to ensure that there were no participants who had to reflect on their feelings from multiple years in the past, however the length of time could still be great enough to provide inaccuracies in responses. The sample size was large enough to obtain reliable data, however it is always useful to obtain a larger sample size when possible. A larger sample would provide a greater extent of external validity. Also, using a longitudinal approach would have been preferred, but would not have been very feasible. Especially since this project was done during the Covid-19 pandemic, it would not have been possible to meet with teams and survey them before and after an injury occurs, or before and during their athletic seasons. Many teams were unable to have athletic seasons in the first place.

Data Analysis

Data were collected through an online survey and converted into Microsoft Excel for analysis. Zung scores were calculated in Excel along with the difference of scores

between before/during injury and before/during athletic season. The equation was set up so that the higher the difference score, the more elevated the level of depression in the second stage. This value will be negative for cases in which level of depression decreased. A descriptive analysis was conducted for the dependent variable, change in Zung score, and the independent variables—gender, injury status, severity of injury, and injury location. Descriptive analysis was also conducted to compare injured participants' scores for before and during injury recovery and for non-injured participants' scores for before and during their most recent athletic season. A two-sample t-test for difference in means was calculated to determine these correlational relationships.

IV. RESULTS

This study was performed to assess levels of depression and depressive symptoms for athletes who both have and have not experienced athletic injuries. These levels, scored using the Zung Self-Rated Depression Scale (ZSDS), were calculated before vs. during injury for injured athletes and before vs. during most recent athletic season in non-injured athletes. The difference between these two scores for each participant served as the dependent variable and was compared to the athlete's gender, injury status, severity of injury, and injury location. The results of the study found a statistically significant correlation between the difference in Zung scores and injury status, severity of injury, and injury location, but not for gender. There also was a significant difference between Zung scores before an injury occurred and during the injury recovery period.

Demographics

The study consisted of 105 participants. There were 72 females, 32 males, and 1 who identified as "other" who was therefore excluded from the gender analysis but not from the other comparisons that involved injury information. The average age of the participants was 21.83 years old. When asked for their highest level of sport participation, 51 responded with high school varsity, along with 18 college club athletes, and 34 college varsity athletes. Two participants were put into the "other" category for sport level since they had competed professionally. The main sport for each participant was recorded and contained a wide variety, which can be seen in Figure 4. Visual aids for the remaining demographic data can be found in Figure 1 for gender, Figure 2 for age, and Figure 3 for highest sport level.

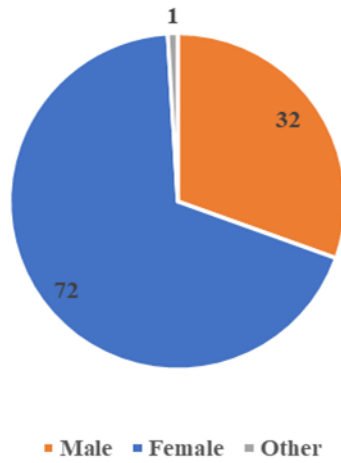
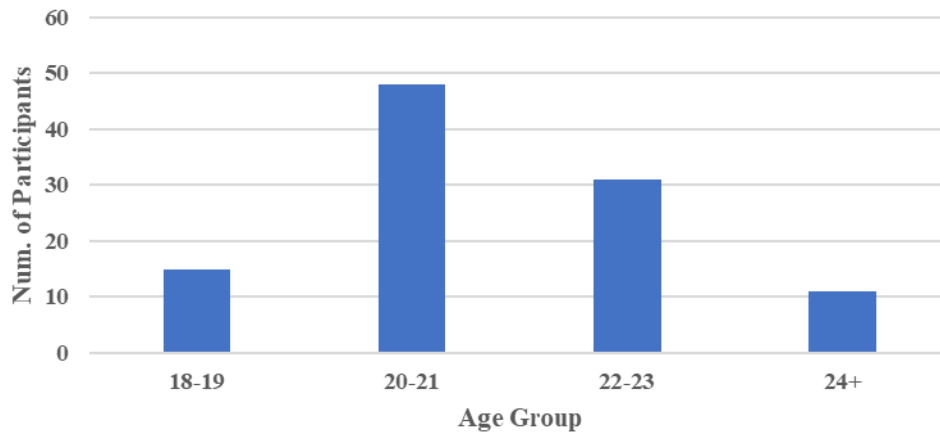
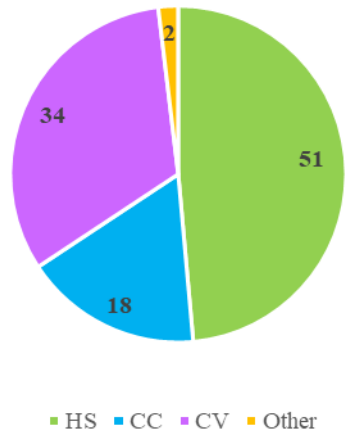
Figure 1*Participants by Gender***Figure 2***Participants by Age Group*

Figure 3

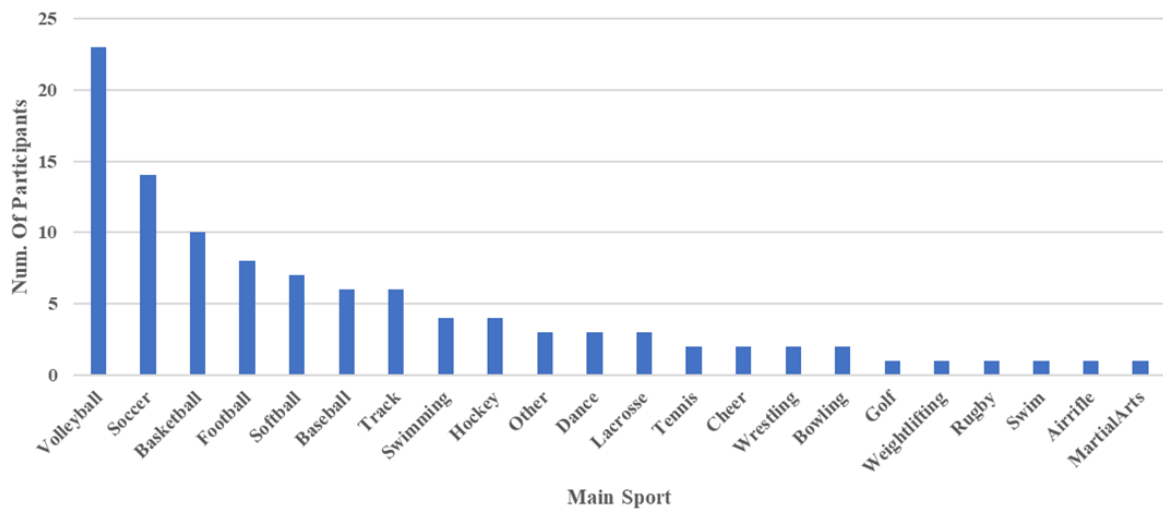
Participants by Sport Level



Notes: HS (High School Varsity), CC (College club), CV (College Varsity)

Figure 4

Participants by Main Sport



Before vs. During Injury or Athletic Season

Since previous studies have found that athletes have a higher incidence of depression than their non-athlete counterparts (Wolanin, 2015), the non-injured participants served as a control group to see if change in depressive levels were altered simply due to athletic engagement or if more variance could potentially be given to injury status. There was no significant difference between levels of depression in non-injured participants before and during their most recent athletic season ($p = 0.606$), which can be seen in Table 1. An alternate visual aid has been provided using Figure 5 to see how athletes self-reported their frequency of depressive symptoms before and during their athletic season.

Table 1

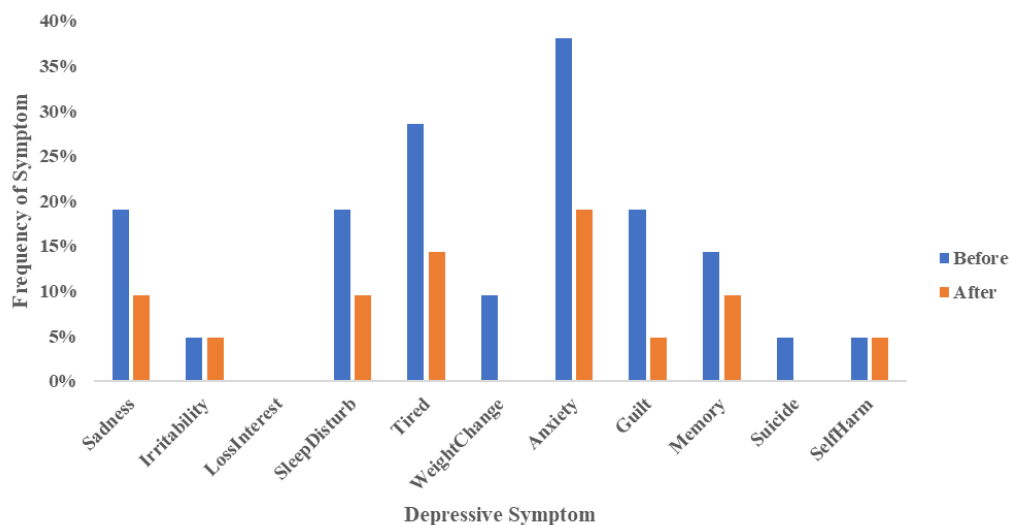
Zung Score for Non-Injured Participants Before vs. During Athletic Season

	<i>Before</i>	<i>After</i>
Mean	32.667	31.333
Variance	33.333	44.788
Observations	12	12
Pooled Variance	39.061	
Hypothesized Mean Difference	0	
df	22	
t Stat	0.523	
P(T<=t) one-tail	0.303	
t Critical one-tail	1.717	
P(T<=t) two-tail	0.606	
t Critical two-tail	2.074	

*Notes: * (<0.1) ** (<0.05) *** (<0.01)*

Figure 5

Frequency of Self-Reported Depressive Symptoms for Non-Injured Participants Before and After Athletic Season



Next, the Zung scores were calculated for injured participants regarding the period of time prior to injury and during the recovery period. A statistically significant difference was found between Zung scores before and during injury period ($p < 0.01$), which can be seen in Table 2. These participants also self-reported their frequency of depressive symptoms for each time period as shown in Figure 6.

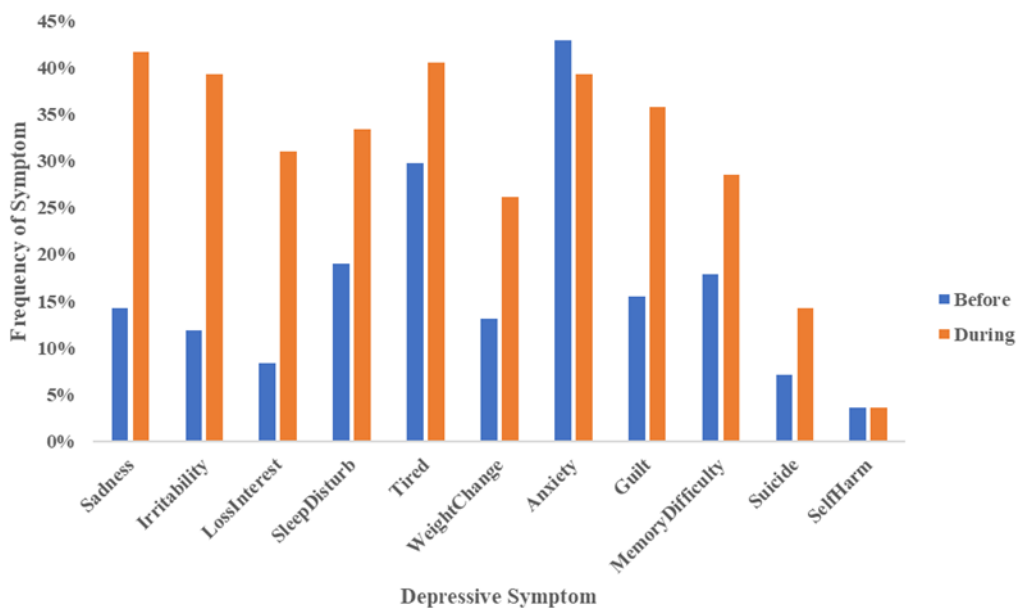
Table 2*Zung Score for Injured Participants Before vs. During Injury*

	<i>Before</i>	<i>During</i>
Mean	29.982	38.455
Variance	114.759	97.660
Observations	55	55
Pooled Variance	106.209	
Hypothesized Mean Difference	0	
df	108	
t Stat	-4.311	
P(T<=t) one-tail	0.000	***
t Critical one-tail	1.659	
P(T<=t) two-tail	0.000	***
t Critical two-tail	1.982	

Notes: * (<0.1) ** (<0.05) *** (<0.01)

Figure 6

Frequency of Self-Reported Depressive Symptoms for Injured Participants Before and After Injury



Change in Zung Score Compared to Independent Variables

The difference in Zung scores (before vs. during) were calculated for each participant so that the higher the score, the more depressed the individual was in the “during” stage. If the difference is a negative value, then the individual’s level of depression decreased in the “during” stage. The difference scores were statistically compared to the independent variables of gender, injury status, injury severity, and injury location. This section includes visual aids to represent these results along with figures representing how the difference in Zung scores varied by sport level and career-ending status of injury, all of which can be found at the end of the section.

No significant difference was found between the change in Zung scores and gender ($p = 0.382$). The results of this t-test can be seen in Table 3. A statistically significant difference was found between change in Zung scores and injury status (injured vs. non-injured participants) ($p < 0.01$), which can be seen in Table 4. A breakdown comparing the change in Zung scores to both gender and injury status can be seen in Figure 7. As seen in Table 5, a significant difference was found between change in Zung score and injury severity ($p = 0.037$), and Figure 8 provides a visual aid for these findings, broken down by each level of severity.

Table 3*Change in Zung Score for Male vs. Female*

	<i>Male</i>	<i>Female</i>
Mean	4.588	7.440
Variance	70.632	153.639
Observations	17	50
Pooled Variance	133.207	
Hypothesized Mean Difference	0	
df	65	
t Stat	-0.880	
P(T<=t) one-tail	0.191	
t Critical one-tail	1.669	
P(T<=t) two-tail	0.382	
t Critical two-tail	1.997	

Notes: * (<0.1) ** (<0.05) *** (<0.01)

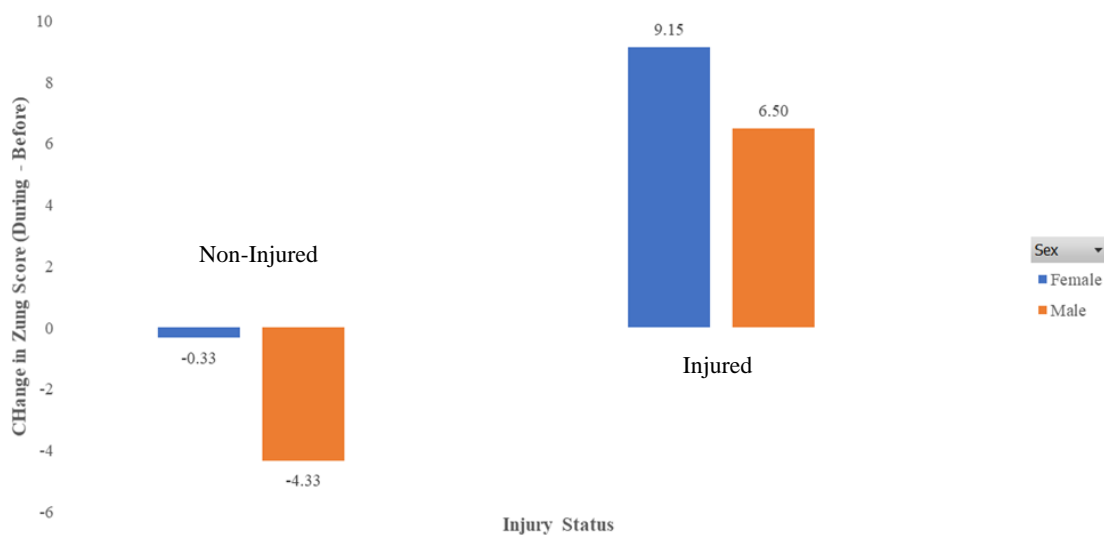
Table 4*Change in Zung Score for Injured vs. Non-Injured*

	<i>Injured</i>	<i>Non-Injured</i>
Mean	8.473	-1.333
Variance	136.328	41.152
Observations	55	12
Pooled Variance	120.221	
Hypothesized Mean Difference	0	
df	65	
t Stat	2.807	
P(T<=t) one-tail	0.003	***
t Critical one-tail	1.669	
P(T<=t) two-tail	0.007	***
t Critical two-tail	1.997	

Notes: * (<0.1) ** (<0.05) *** (<0.01)

Figure 7

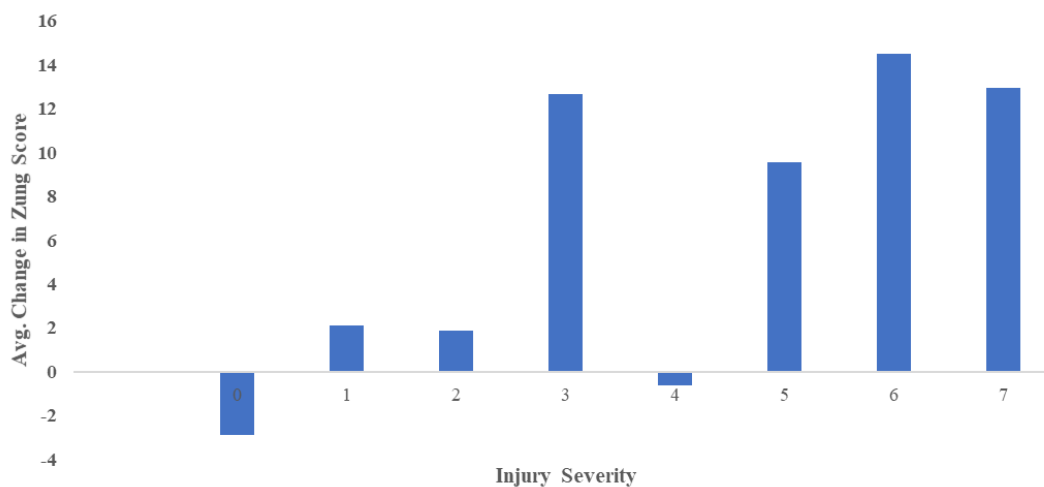
Change in Zung Score Compared to Gender and Injury Status

**Table 5**

Change in Zung Score for Non-Severe vs. Severe Injuries

	Severity: 1-3	Severity: 4-7
Mean	3.684	10.410
Variance	53.561	160.827
Observations	19	39
Pooled Variance	126.349	
Hypothesized Mean Difference	0	
df	56	
t Stat	-2.139	
P(T<=t) one-tail	0.018	**
t Critical one-tail	1.673	
P(T<=t) two-tail	0.037	**
t Critical two-tail	2.003	

Notes: * (<0.1) ** (<0.05) *** (<0.01)

Figure 8*Change in Zung Score Compared to Injury Severity*

Finally, a statistically significant difference was found between change in Zung score and injury location ($p = 0.097$), as shown in Table 6. Also, although no statistical tests were performed, there are figures to represent the possible relationship between change in Zung score and sport level along with career ending status of injury. These results are found in Figure 9 and Figure 10.

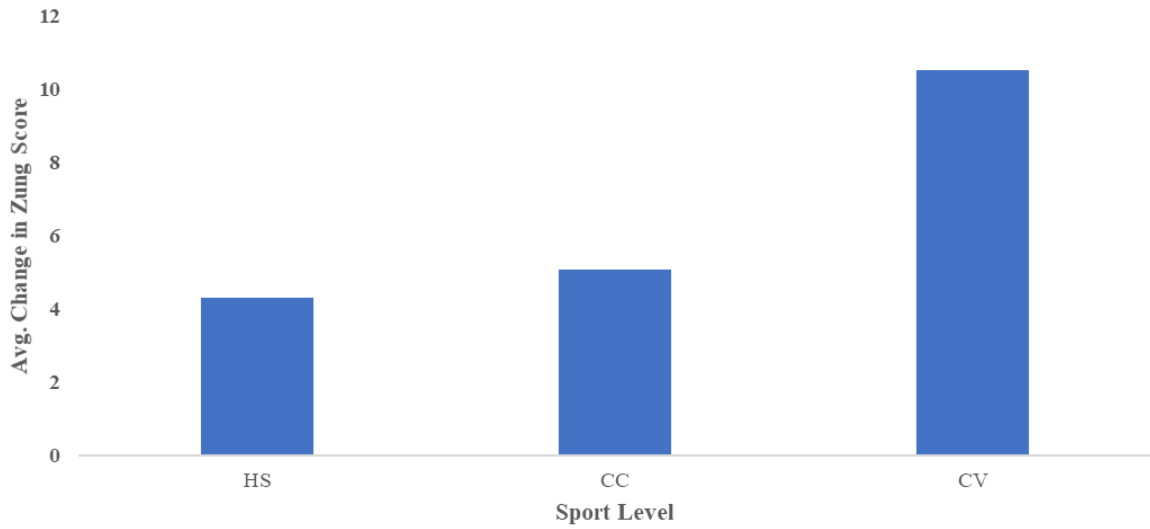
Table 6*Change in Zung Score for Upper vs. Lower Body Injury*

	<i>Upper</i>	<i>Lower</i>
Mean	6.318	10.786
Variance	136.703	145.952
Observations	22	28
Pooled Variance	141.906	
Hypothesized Mean Difference	0	
df	48	
t Stat	-1.316	
P(T<=t) one-tail	0.097	*
t Critical one-tail	1.677	
P(T<=t) two-tail	0.194	
t Critical two-tail	2.011	

Notes: * (<0.1) ** (<0.05) *** (<0.01)

Figure 9

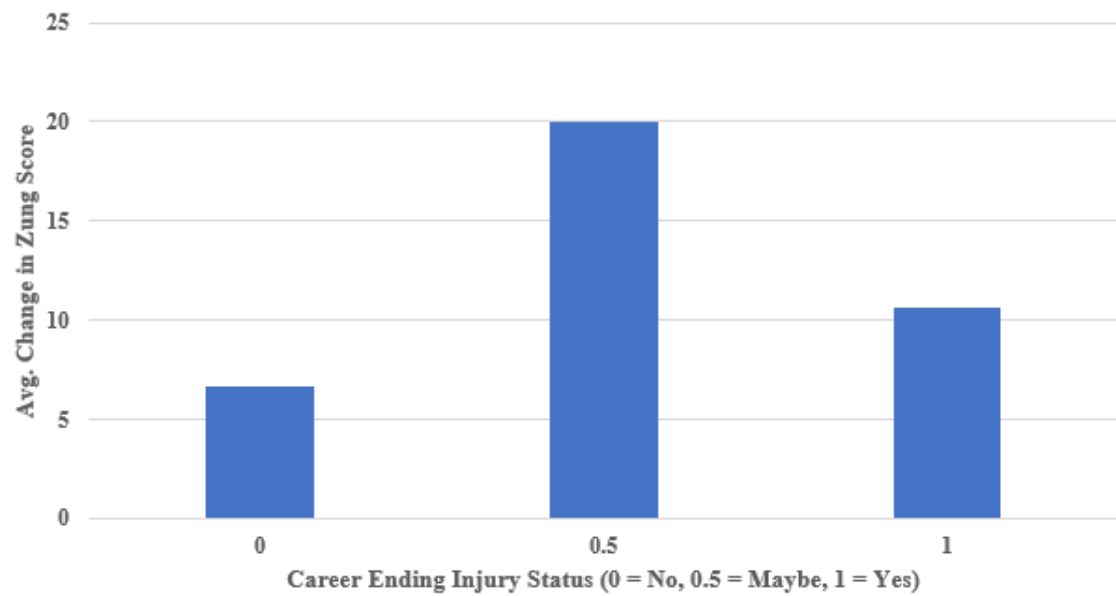
Change in Zung Score Compared to Level of Sport



Notes: HS (High School Varsity), CC (College club), CV (College Varsity)

Figure 10

Change in Zung Score Compared to Career Ending Injury Status



V. DISCUSSION

Injury Status and Depression

Based on the results of the study, the hypothesis was proven to be correct. When controlling for engagement in sports, levels of depression and depressive symptoms were positively correlated to injury status and severity (Tables 4, 5). This means that the injured participants had higher depression levels than non-injured participants. Also, the more severe the injury, the higher their level of depression (Table 5, Figure 8). The results suggest that athletic injury does result in an increase in depressive symptoms.

For non-injured participants, there was no significant correlation between the Zung scores before and during their most recent athletic season (Table 1). Despite the increased pressures and time constraints faced by athletes during their season, Figure 7 suggests that Zung scores decreased during season, especially for males. These results propose that participation in sports can lower levels of depressive symptoms, even more so in males than females. Injured participants had the opposite effect. A significant relationship was found between injured participants' Zung scores for before and after an injury occurs (Table 2). This relationship suggests that a physical injury can increase depressive symptoms in athletes. This specific result is vital to investigate in the future using studies that measure depression in real-time rather than through a retrospective design. Injured athletes are potentially at an elevated vulnerability for depressive symptoms and these symptoms can be intervened or managed through methods such as therapy. Injured participants also had higher frequencies of self-reported symptoms (Figures 5, 6).

Findings

Another finding from this study's data displays an elevated level of depression upon injury as level of sport participation increases (Figure 9). This would mean that college varsity athletes experience a higher elevation in depressive symptoms when experiencing injury than high school varsity athletes. The data suggests that athletic identity plays a role in depression severity upon injury. It would make sense that the more dedication one has to their sport, the more detrimental an athletic injury would be for mental health, but further study is needed to prove this.

This study did not find a significant difference between depression levels and gender. Current research suggests that females have higher rates of depression than males (Albert, 2015), but perhaps there is another variable that contributes to this fact. Perhaps the rates are more similar than researchers think, and males are less likely to show or admit depressive symptoms due to social stigmas surrounding the male identity. This finding requires future investigation to evaluate the true rate of depression in male athletes. Men need just as much mental health support as females do, no matter the results of these future studies, but perhaps these studies can find out the different causes and symptoms in depression for each gender.

Data from this survey also found that the change in Zung scores varied by career-ending injury status (Figure 10). Participants who responded with "maybe" when asked if their injury ended their sports career had much higher depressive levels than the "yes" or "no" respondents. The "maybe" group had 2x higher levels of depression than the "yes" group. Future research should study if these findings are consistent with other populations, but perhaps this is true due to the uncertainty these athletes experience

regarding their career termination. Athletes who responded with “no” have clearly recovered and can continue playing their sport, while athletes who responded with “yes” have already come to terms with the fact that they will not be able to play their sport again. However, the “maybe” group may be struggling to remain optimistic through recovery since they are unsure if they will ever be able to play the sport that they love again.

The data also proposes that lower body injuries are associated with elevated depression levels, more so than upper body injuries (Table 6). This finding is consistent with current research (Baecher, 2018) but would require further study to see if this finding remains true across populations and with variable operational definitions of upper and lower body injuries. These studies would have to include similar severity for injuries which would be difficult to operationalize in itself. However, this finding does suggest that impairment in walking ability may affect depression levels. Even with similar pain levels, lower body injuries may cause more difficulty in day-to-day life since the injured athletes are unable to even walk properly to where they need to be, which may require crutches or a wheelchair that would not be used with an upper body injury.

Final Thoughts

An important aspect of this study was to include the perceptions of athletes who have struggled with injury regarding how their injury has impacted their mental health. This question was asked at the end of the survey to ensure that it did not affect the answers to the objectively measured questions. This question was asked to let the voices of the athletes be heard, so this section will be dedicated to quotes from survey

participants, all of whom are and will remain anonymous. Let it be known that not all participants reported final thoughts consistent with the following quotes, but the following specific athletes gave thoughts that were made to be heard in order to better the mental health care that athletes receive. Here are their final thoughts regarding how injury has impacted their mental health...

- “I constantly think of how if I never had the injury, how good of a player could I have been”
- “My concussion very much impacted my mental health. I felt like I would never get better and I could no longer enjoy the things I used to enjoy and I felt hopeless as though my head would hurt forever”
- “Every time it starts to hurt again, I tend to go back to the same feelings I had when I was injured”
- “I consider this event to be the catalyst of enhancing preexisting anxiety and depression. After injury my mental health has not been the same and my clinical diagnoses of both anxiety and depression impact me several years later”
- “It just made me feel really useless and not needed by my teammates around me. I was fortunate to not be out for a very long period of time, but in those 2-2.5 weeks it was a big struggle for me”
- “I was impacted both by my own thoughts, but also how the coach and the players treated me after: they treated me poorly and exaggerated those awful feelings I had”
- “It caused me to gain weight due to poor food choices and lack of ability to exercise and this caused body image issues and led to an eating disorder”

- “I feel utterly useless and I feel mentally numb”
- “It made me constantly feel like I wasn’t as good as I once was”
- “I feel like there is stigma towards students who get injured. People sometimes think they do it for attention and that can be negative on the students’ health. Also, from experience many coaches don’t care about minor things and they don’t give you the time to heal so a minor injury then becomes worse. They make you feel guilty”

These athletes clearly had negative experiences due to athletic injury, but not every athlete does. The data from this study do suggest that athletic injuries elevate depression levels, especially for more severe injuries. These findings propose that future studies should be conducted to target the injured athlete population and treat their mental health along with their physical injury.

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APPENDIX A

Athlete's Self-Perception of Depression and Depressive Symptoms Related to Athletic Injuries

The following information is provided to inform you about the research project in which you have been invited to participate. Please read this disclosure and feel free to ask any questions. The investigators must answer all of your questions and please save this page as a PDF for future reference.

- Your participation in this research study is voluntary.
- You are also free to withdraw from this study at any time without loss of any benefits.

For additional information on your rights as a participant in this study, please contact the Middle Tennessee State University (MTSU) Office of Compliance (Tel 615-494-8918 or send your emails to irb_information@mtsu.edu. (URL: <http://www.mtsu.edu/irb>.)

Please read the following and respond to the consent questions in the bottom if you wish to enroll in this study.

1. **Purpose:** This research project is designed to evaluate the impact that athletic injuries may have on overall levels of depression as well as depressive symptoms. The project will also be assessing the impact that athletic seasons may have on overall levels of depression and depressive symptoms for athletes who have not experienced injury.

2. **Description:** There are several parts to this project. They are:

- Background and demographic information
- Level of athletic participation and experience

- Evaluating depressive symptoms prior to injury and during the recovery period OR prior to most recent athletic season and during most recent athletic season for athletes who have not experienced injuries

- Opinions regarding how injury or participation in athletics affects your mental health

3. **IRB Approval Details**

o Protocol Title: Athlete's Self-Perception of Depression and Depressive Symptoms Related to Athletic Injuries

o Primary Investigator: Kylie Dykgraaf

o PI Department & College: College of Behavioral and Health Sciences at Middle Tennessee State University

o Faculty Advisor (if PI is a student): Colby Jubenville, PhD

o Protocol ID: 21-2155 7q Approval Date: 04/22/2021, Expiration Date: 04/30/2022

4. **Duration:** The whole activity should take about 20 minutes. The subjects must take at least 10 minutes to complete the study.

5. **Here are your rights as a participant:**

- Your participation in this research is voluntary.
- You may skip any item that you don't want to answer, and you may stop the experiment at any time (but see the note below)
- If you leave an item blank by either not clicking or entering a response, you may be warned that you missed one, just in case it was an accident. But you can continue the study without entering a response if you didn't want to answer any questions.
- Some items may require a response to accurately present the survey.

6. **Risks & Discomforts:** If you have experienced mental health issues in the past, some questions may ask you to reflect on these difficult situations which may be uncomfortable for you. If this is the case, remember that you can leave and end the survey at any time.

7. **Benefits:**

- a. Benefits to you that you: There are no direct benefits to you as a participant.
- b. Benefits to the field of science or the community: By understanding the impact that athletic injury may have on mental health, professionals can better treat the mind of their patients.

8. **Identifiable Information:** You will NOT be asked to provide identifiable personal information.

9. **Compensation: There is no compensation for participating in this study**

10. All efforts, within reason, will be made to keep your personal information private but total privacy cannot be promised. Your information may be shared with MTSU or the government, such as the Middle Tennessee State University Institutional Review Board, Federal Government Office for Human Research Protections, if you or someone else is in danger or if we are required to do so by law.

11. **Contact Information:** If you should have any questions about this research study or possible injury, please feel free to contact Kylie Dykgraaf by telephone 916-225-9797 or by email kld7k@mtmail.mtsu.edu OR my faculty advisor, Colby Jubenville, at colby.jubenville@mtsu.edu and 615-498-6802. You can also contact the MTSU Office of compliance via telephone (615 494 8918) or by email (compliance@mtsu.edu). This contact information will be presented again at the end of the experiment.

You are not required to do anything further if you decide not to enroll in this study. Just quit your browser. Please complete the response section below if you wish to learn more or you wish to part take in this study.

- I have read this informed consent document pertaining to the above identified research (NO/Yes)
- The research procedures to be conducted to me are clear (NO/Yes)
- I confirm I am 18 years or older (NO/Yes)
- I am aware of the potential risks of the study (NO/Yes)
- By clicking the “Yes” answer choice, I affirm that I freely and voluntarily choose to participate in this study. I understand I can withdraw from this study at any time without facing any consequences (NO/Yes)

APPENDIX B

The Zung Self-Rating Depression Scale was modified for the study to better suit the athlete population. Two questions regarding sex and constipation were deemed irrelevant to the research questions at hand. The score calculation was adjusted so that omitting these questions did not change the test results.

Non-Injured ZSDS Questions

- Please answer the following questions in regards to the period of time BEFORE your most recent or your current athletic season. Read the wording of each question carefully. If the statement has never occurred to you, please select "A Little of the Time,"
- Please answer the following questions in regards to the period of time DURING your most recent or your current athletic season. Read the wording of each question carefully. If the statement has never occurred to you, please select "A Little of the Time."

Injured ZSDS Questions

- Please answer the following questions in regards to the period of time BEFORE your most severe athletic injury that occurred at a high school varsity level or above. Read the wording of each question carefully. If the statement has never occurred to you, please select "A Little of the Time."
- Please answer the following questions in regards to the period of time DURING the RECOVERY period of your most severe athletic injury that occurred at a high school varsity level or above. Read the wording of each question carefully. If the statement has never occurred to you, please select "A Little of the Time."

	A Little of the Time	Some of the Time	A Good Part of the Time	Most of the Time
How often did you feel downhearted and blue?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel best in the morning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel like having crying spells?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you have trouble sleeping at night?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you eat a regular diet?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much did your weight change or tend to vary?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you experience a faster heartbeat than usual?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often did you get tired for no reason?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did your mind feel jumbled or unclear?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you find it easy to do the things you normally did?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel restless or find it difficult to sit still?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel worried about the future?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel more irritable than usual?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you find it difficult to make decisions?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel useful and needed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you enjoy your normal activities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did you feel as though your life was full of productivity and purpose?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often did a suicidal thought cross your mind?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX C

General Survey Content

- What is your sex? (Male, Female, Non-Binary / Third Gender, Prefer Not to Say, Other)
- What year were you born?
- To what sport did you or do you currently dedicate your most time to?
- What is your highest level of sport participation? (High school varsity, college club, college varsity, etc)
- In what division of college athletics do you participate in? (D1, D2, D3, NAIA, Other, N/A)
- Have you ever been injured during an athletic season? (Yes, No)
- Please indicate the level of severity of your worst athletic injury that occurred at a high school varsity level or above (such as college club or college varsity): 0- No injury at all, 1- Unable to participate in sport for 0-1 week, 2- Unable to participate in sport for 1-2 weeks, 3- Unable to participate in sport for 2-3 weeks, 4- Unable to participate in sport for 3-4 weeks, 5- Unable to participate in sport for 4-6 weeks, 6- Unable to participate in sport for 6-8 weeks, 7- Unable to participate in sport for 2+ months

Non-Injured Survey Content:

- Please select all of the following that you experienced in the period of time before your most recent athletic season: Persistent feelings of sadness, exaggerated irritability, loss of interest or pleasure in normal activities, sleep disturbances, tiredness or lack of energy, large change in appetite or weight, anxiety, feelings of

worthlessness or guilt, trouble with concentration / decision making / memory, suicidal thoughts, self-harm, none

- Please select all of the following that you believe worsened during your most recent athletic season: Persistent feelings of sadness, exaggerated irritability, loss of interest or pleasure in normal activities, sleep disturbances, tiredness or lack of energy, large change in appetite or weight, anxiety, feelings of worthlessness or guilt, trouble with concentration / decision making / memory, suicidal thoughts, self-harm, none
- Do you believe that your depressive symptoms have worsened during your most recent athletic season? (Yes, No, Maybe)
- Any final thoughts regarding how your athletic season has impacted your mental health?

Injured Survey Content

- What was/is your most severe injury that occurred at a high school varsity level or above? (What specific body part and type of injury?)
- Was/is your injury a career ending injury? (Yes, No, Maybe)
- Has your injury altered your ability to play your sport? (Yes, No, Maybe)
- Please select all of the following that you experienced in the period of time before your injury: Persistent feelings of sadness, exaggerated irritability, loss of interest or pleasure in normal activities, sleep disturbances, tiredness or lack of energy, large change in appetite or weight, anxiety, feelings of worthlessness or guilt, trouble with concentration / decision making / memory, suicidal thoughts, self-harm, none

- Please select all of the following that you believe worsened during your injury/recovery period: Persistent feelings of sadness, exaggerated irritability, loss of interest or pleasure in normal activities, sleep disturbances, tiredness or lack of energy, large change in appetite or weight, anxiety, feelings of worthlessness or guilt, trouble with concentration / decision making / memory, suicidal thoughts, self-harm, none
- Do you believe that your injury worsened any depressive symptoms? (Yes, No, Maybe)
- Any final thoughts regarding how your injury has impacted your mental health?

APPENDIX D

IRB
INSTITUTIONAL REVIEW BOARD
 Office of Research Compliance,
 010A Sam Ingram Building,
 2269 Middle Tennessee Blvd
 Murfreesboro, TN 37129
 FWA: 00005331/IRB Regn. 0003577



IRBN001 - EXPEDITED PROTOCOL APPROVAL NOTICE

Thursday, April 22, 2021

Protocol Title **Athlete's Self-Perceptions of Depression and Depressive Symptoms Related to Athletic Injuries**

Protocol ID **21-2154 7q**

Principal Investigator **Kylie Dykgraaf (Student)**

Faculty Advisor **Colby Jubenville**

Co-Investigators **NONE**

Investigator Email(s) **kid7k@mtmail.mtsu.edu; colby.jubenville@mtsu.edu**

Department **Health and Human Performance**

Funding **NONE**

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU IRB through the **EXPEDITED** mechanism under 45 CFR 46.110 and 21 CFR 56.110 within the category (7) *Research on individual or group characteristics or behavior*. A summary of the IRB action is tabulated below:

IRB Action	APPROVED for ONE YEAR		
Date of Expiration	4/30/2022	Date of Approval: 4/22/21	Recent Amendment: NONE
Sample Size	FIVE HUNDRED (500)		
Participant Pool	Target Population: Primary Classification: Healthy Adults (18 or older) Specific Classification: Athlete		
Type of Interaction	<input type="checkbox"/> Non-interventional or Data Analysis <input checked="" type="checkbox"/> Virtual/Remote/Online interaction <input type="checkbox"/> In person or physical interaction – Mandatory COVID-19 Management		
Exceptions	Online informed consent is permitted followed by a Qualtrics survey		
Restrictions	1. Mandatory ACTIVE Informed Consent. 2. Other than the exceptions above, identifiable data/artifacts, such as, audio/video data, photographs, handwriting samples, personal address, driving records, social security number, and etc., MUST NOT be collected. Recorded identifiable information must be deidentified as described in the protocol. 3. Mandatory Final report (refer last page). 4. The protocol details must not be included in the compensation receipt. 5. NOT APPROVED for in person data collection		
Approved Templates	IRB Templates: Informed Consent Non-MTSU Templates: Recruitment Script		
Research Inducement	NONE		
Comments	NONE		

Post-approval Requirements

The PI and FA must read and abide by the post-approval conditions (Refer "Quick Links" in the bottom):

- **Reporting Adverse Events:** The PI must report research-related adversities suffered by the participants, deviations from the protocol, misconduct, and etc., within 48 hours from when they were discovered.
- **Final Report:** The FA is responsible for submitting a final report to close-out this protocol before **4/30/2022** (Refer to the Continuing Review section below); **REMINDERS WILL NOT BE SENT. Failure to close-out or request for a continuing review may result in penalties** including cancellation of the data collected using this protocol and/or withholding student diploma.
- **Protocol Amendments:** An IRB approval must be obtained for all types of amendments, such as: addition/removal of subject population or investigating team; sample size increases; changes to the research sites (appropriate permission letter(s) may be needed); alternation to funding; and etc. The proposed amendments must be requested by the FA in an addendum request form. The proposed changes must be consistent with the approval category and they must comply with expedited review requirements
- **Research Participant Compensation:** Compensation for research participation must be awarded as proposed in Chapter 6 of the Expedited protocol. The documentation of the monetary compensation must Appendix J and MUST NOT include protocol details when reporting to the MTSU Business Office.
- **COVID-19:** Regardless whether this study poses a threat to the participants or not, refer to the COVID-19 Management section for important information for the FA.

Continuing Review (The PI has requested early termination)

Although this protocol can be continued for up to THREE years, The PI has opted to end the study by **4/30/2022**. The PI must close-out this protocol by submitting a final report before **4/30/2022**. Failure to close-out may result in penalties that include cancellation of the data collected using this protocol and delays in graduation of the student PI.

Post-approval Protocol Amendments:

The current MTSU IRB policies allow the investigators to implement minor and significant amendments that would fit within this approval category. **Only TWO procedural amendments will be entertained per year** (changes like addition/removal of research personnel are not restricted by this rule).

Date	Amendment(s)	IRB Comments
NONE	NONE	NONE

Other Post-approval Actions:

The following actions are done subsequent to the approval of this protocol on request by the PI/FA or on recommendation by the IRB or by both.

Date	IRB Action(s)	IRB Comments
NONE	NONE	NONE

COVID-19 Management:

The PI must follow social distancing guidelines and other practices to avoid viral exposure to the participants and other workers when physical contact with the subjects is made during the study.

- The study must be stopped if a participant or an investigator should test positive for COVID-19 within 14 days of the research interaction. This must be reported to the IRB as an "adverse event."
- The MTSU's "Return-to-work" questionnaire found in Pipeline must be filled by the investigators on the day of the research interaction prior to physical contact.
- PPE must be worn if the participant would be within 6 feet from the each other or with an investigator.
- Physical surfaces that will come in contact with the participants must be sanitized between use
- **FA's Responsibility:** The FA is given the administrative authority to make emergency changes to protect the wellbeing of the participants and student researchers during the COVID-19 pandemic. However, the FA must notify the IRB after such changes have been made. The IRB will audit the changes at a later date and the FA will be instructed to carryout remedial measures if needed.

Data Management & Storage:

All research-related records (signed consent forms, investigator training and etc.) must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data must be stored for at least three (3) years after the study is closed. Additional Tennessee State

Institutional Review Board, MTSU

PWA: 00005331

IRB Registration: 0003571

data retention requirement may apply (refer "Quick Links" for MTSU policy 129 below). The data may be destroyed in a manner that maintains confidentiality and anonymity of the research subjects.

The MTSU IRB reserves the right to modify/update the approval criteria or change/cancel the terms listed in this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University

Quick Links:

- Post-approval Responsibilities: <http://www.mtsu.edu/irb/FAQ/PostApprovalResponsibilities.php>
- Expedited Procedures: <https://mtsu.edu/irb/ExpeditedProcedures.php>
- MTSU Policy 129: Records retention & Disposal: <https://www.mtsu.edu/policies/general/129.php>