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Student beliefs about what factors influence their GPA

An Honors College Project Presented to
the Faculty of the Undergraduate
College of Health and Behavioral Science
James Madison University

by Emma Rose Denelsbeck

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Accepted by the faculty of the Department of Psychology, James Madison University, in partial fulfillment of the requirements for the Honors College.

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Table of Contents

List of Tables	Page 3
List of Figures	Page 4
Acknowledgements	Page 5
Abstract	Page 6
Introduction	Page 7
Variables	Page 11
Current Investigation	Page 14
Hypotheses	Page 15
Methods	Page 15
Results	Page 18
Discussion	Page 25
Tables and Figures	Page 34
Appendix A	Page 44
Appendix B	Page 48
Appendix C	Page 51
References	Page 56

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

List of Tables

Table 1 *Population Demographic Information*.....34

Table 2 *Academic Performance Descriptive Statistics*.....35

Table 3 *Texas Evaluation of Concussion History Descriptive Statistics*.....36

Table 4 *Premorbid Conditions Descriptive Statistics*.....37

Table 5 *DASS-21 Descriptive Statistics*.....38

Table 6 *DASS-21 Score Overview*.....39

Table 7 *Descriptive Statistics for Significant Effect of Concussion Group*.....40

Table 8 *DASS-21 Scores for Significant Effect of Concussion Group*.....41

Table 9 *Mann-Whitney U Test Results*.....42

Table 10 *Mann-Whitney U Test Summary*.....43

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

List of Figures

Figure 1 *Correlation Between Number of Concussions Across Lifetime and Degree History Affected GPA*.....45

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STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Abstract

There are many different factors that contribute to grade point averages (GPAs) in college. Students may attribute their academic performance and GPAs to any number of different variables such as stress levels, sleep quality and alcohol use. The current study investigated what students believed had an effect on their GPA, and if these differed based on concussion history. This study examined if students thought that concussions affected their GPA. Participants were University students who completed an online survey consisting of the Texas Evaluation of Concussion History (TECH), and the Depression, Anxiety, and Stress Scale (DASS-21). The results of a Mann-Whitney U Test suggested that students with a history of concussion were more likely to report that their concussion history affected their GPA compared to students without a concussion history. But, this was only true for very few students with a history of concussions. Furthermore, there was no difference in the reporting between the two groups for the other variables as well, even among the subset of the population examined. Future research is needed to consider if there are differences between universities in what students report affect GPA. Further research is also needed to determine if interventions in areas students report as having negative effects on GPA are effective in helping students to cope with the factor they report as most influential. This could help to determine what assistance freshman need as they enter a university, and what measures can be taken to help with adjustment to college.

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Student beliefs about what factors influence their GPA

Introduction

Students cite numerous factors as to why their grades are the way they are. Whether a student believes that their test grade was low due to a lack of sleep the night before or due to stress from work the week of the exam, the relationship between academics and factors such as sleep quality and other variables appears to be important. This study aimed to explore what factors students think influence their grades by investigating some of the variables that are typically considered to be influential. A brief overview of these variables will be presented. By understanding which variables students think have a negative effect on their GPA, we could suggest possible interventions to help students in the future.

One of the main goals of this study was to determine if students who had experienced a concussion reported different variables as influential when compared to students who had not experienced a concussion by specifically looking at whether students with a concussion history thought that a past or current concussion was affecting their GPA.

Concussions are extremely frequent. The Center for Disease Control (CDC) estimated that traumatic brain injuries (TBIs), which includes concussions (mild TBIs or mTBIs), accounted for approximately 2.5 million emergency department visits, hospitalizations, and deaths in the U.S in 2010 (CDC, 2010). Concussions were defined as “a type of traumatic brain injury- or TBI- caused by a bump, blow, or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth. This sudden movement can cause the brain to bounce around or twist in the skull, creating chemical changes in the brain and sometimes stretching and damaging brain cells” (CDC, 2019). After a concussion, observers report that the

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

concussed individual often: (1) can't recall events prior to or after the injury, (2) appears dazed or stunned, (3) forgets an instruction, is unsure, (4) moves clumsily, (5) answers questions slowly, (6) loses consciousness (even briefly), and (7) shows mood, behavior, or personality changes (CDC, 2010). The CDC also lists common concussion symptoms that are reported by the concussed patient: (1) headache or "pressure" in head, (2) nausea or vomiting, (3) balance problems or dizziness, or double or blurry vision, (4) bothered by light or noise, (5) feeling sluggish, hazy, foggy, or groggy, (6) confusion, or concentration or memory problems, and (7) just not "feeling right" or "feeling down" (CDC, 2019).

Brain and head injuries are often hard to distinguish from one another. A brain injury is defined as injury to the brain itself that causes neurological dysregulation, such as a loss of consciousness, brain injury can often be the result of a head injury (Roberts & Stoler, 2014). On the other hand, a head injury is an injury to the scalp or skull. With no complications concussions typically resolve in a few weeks, but there can be complications that could cause the effects of concussions to last longer. "Second impact syndrome results from acute and often fatal brain swelling that occurs when a second concussion is sustained before complete recovery from a previous concussion" (Concussion, 2011). Unless someone has suffered a moderate or severe brain injury, the symptoms of concussion are typically gone within one month, and for some individuals symptoms may not last longer than a few days or a few weeks (CDC, 2010). A severe or moderate traumatic brain injury can cause long-term damage and long-term changes, whereas a mild traumatic brain, or concussion, has symptoms that resolve within a month or two at most when there are no other complications.

Despite the many symptoms that concussions can cause, research has revealed that a past concussion history does not directly relate to later academic difficulties and that there are likely

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

to be other factors influencing academic performance in students, such as playing contact sports where the stress associated with playing a contact sport seems to have a greater effect (Killiam et. al., 2005; Brooks et. al., 2016; Collie, McCrory & Makdissi, 2006; Belanger, Spiegel, & Vanderploeg, 2009; Brooks et. al., 2013). For example, Killiam and colleagues (2005) found that players were often stressed about succeeding in the sport, and this contributed to changes in academic performance. They also found that lowered GPA, issues with focus and school attendance, and difficulty concentrating have been correlated with a past concussion history in individuals playing contact sports. Killiam and colleagues suggested that this was due to the mental and physical demands of contact sports rather than the presence of current or past concussions themselves because the effects were present in both athletes with and without a history of concussions. They also discovered that in individuals who were recently concussed, there was a negative correlation between the severity of the Postconcussion Syndrome Checklist scores and the scores on Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) for attention in delayed memory; the more severe the symptoms that were reported, the more attention issues and delayed memory issues the individual had (2005). This could indicate that with more severe concussions or traumatic brain injuries there may be some effect on factors such as attention, but in concussions that are less severe, the effects to appear to come from the stress of the sports rather than the concussion itself (Killiam et. al., 2005).

Research has also shown that there appears to be a relationship between concussion history and symptom reporting, where people with more past concussions report more symptoms that lasted longer (Brooks et. al., 2016; Collie, McCrory & Makdissi, 2006; Belanger, Spiegel, & Vanderploeg, 2009; Brooks et. al., 2013). This could explain why some individuals believe that their past concussions, from years ago, affect their academic performance (GPA). Concussions

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

have been correlated with effects on cognition and memory (Killiam et. al., 2005), though these are usually short-term effects.

Research has also found that students can have a decrease in GPA for various reasons. However, there was a much larger decrease in GPA in students who experienced a concussion when comparing the academic year that the concussion occurred to the academic year prior to the concussion (Russell et. al., 2016; Ransom et. al., 2019; Kontos et. al., 2012; Wasserman et. al., 2016). Students who had yet to recover from a concussion reported higher levels of concern regarding the impact that the concussion and concussion symptoms were having on academic performance than recovered peers (Ransom et. al., 2019). However, researchers acknowledged that this decrease in GPA could also be due to other factors (Russel et. al., 2016).

As previously mentioned, head injury is extremely common, and many individuals experience at least one incident in their lifetime, however, concussion symptoms typically resolve fully within days, weeks, or a few months, as long as there are no other complications, such as second impact syndrome (CDC, 2010). So, head injury and/or concussion (particularly if they occurred more than a few months previously) may not actually significantly impact GPA. There may be many other factors that are more important. In order to explore the relationship between academic performance or GPA and the factors that participants thought may negatively affect their GPAs, there needs to be a general understanding of each variable being measured.

Variables

Concussion. Through the Texas Evaluation of Concussion History (TECH) (Cullum et. al., 2018) (Appendix A) the symptoms and prevalence of concussion for this sample were collected, as well as whether the participant was currently experiencing a concussion. This

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

measure is in development and has not yet been published. The primary developer of the TECH instrument has given permission for this measure to be used in this project, despite it not yet having been published. The TECH was also used to determine whether students who reported never having had a concussion had experienced some of the symptoms that are common with concussions as well as to assess premorbid conditions that participants may have experienced.

Anxiety and depression are extremely common today, and research has shown that after a concussion individuals with premorbid anxiety, depression often experience these symptoms to a stronger degree (Yang et. al., 2015). Though most physical and cognitive symptoms are gone by 90 days post injury (CDC, 2019), psychological distress (especially depression, anxiety, and post-traumatic stress disorder) can remain an issue in some patients (Yang et. al., 2015). One study revealed that the prevalence rates of psychological distress after TBI have been as low as 4-5% and as high as 49-63% (Cole & Bailie, 2016). There is little understanding as to whether mild traumatic brain injury (mTBI) can truly be the cause of psychological distress following concussion or mTBI, but there appears to be a connection based upon the discovery that anxiety and depression symptoms can be worsened after a TBI. Whether this is due to damage to certain brain areas or another factor is still unknown (Cole & Bailie, 2016). This study examined the relationship between anxiety and depression and concussions through the comparison of reports of how much of a negative effect these variables had on GPA from students with a concussion history to the reports of students without a concussion history.

Learning Disabilities and Attentional Disorders. Attention-Deficit/Hyperactivity Disorder (ADHD) is very common. The estimated number of children ever diagnosed is 9.4% (CDC, 2019). Research has found that boys are more likely to be diagnosed with ADHD than girls, 12.9% compared to 5.6% (CDC, October 2019). Individuals who are diagnosed with

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

predominantly inattentive ADHD may find it difficult to finish a task, to pay attention to details, or to follow instructions or conversations. On the other hand, individuals who are diagnosed with predominantly hyperactive-impulsive ADHD often fidget, talk a lot, find it hard to sit still, or interrupt others. There is also a third presentation of ADHD, and this is the combined type; the individual has both symptoms of inattentive and hyperactive-impulsive ADHD (CDC, August 2019). Research has found that ADHD can result in many academic difficulties (Gormley et. al., 2016). Gormley and colleagues (2016) found that college students with ADHD earned significantly lower GPAs when compared to students without ADHD. Schwanz and colleagues (2007) also suggested that attention problems and hyperactivity like those associated with ADHD are associated with lower GPAs. They measured attention problems and hyperactivity levels using the BASC-2 Self Report of Personality College Form and found that both attention problems and hyperactivity significantly impacted GPA. Attention scores on the BASC-2 explained 7% of the variability in GPAs. When hyperactivity was added the equation explained an additional 2% of variability (Schwanz et. al., 2007).

Attentional disorders such as ADHD are not the only type of developmental disability that can have an effect on GPA. One developmental disability that this study predicts will affect GPA are learning disabilities. The DSM-5 defines learning disabilities using the term “specific learning disorder” (American Psychiatric Association, 2013). Under the DSM-5 learning disabilities require persistent difficulties in reading, writing, arithmetic, or mathematical reasoning skills (American Psychiatric Association, 2013). Some symptoms may include inaccurate or slow reading, writing that lacks clarity, and difficulty remembering number facts. The National Center for Learning Disabilities (NCLD) reported in 2014 that 12% of people surveyed reported having a learning disability and 8% of the parents surveyed had a child with a

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

learning disability (National Center for Learning Disabilities, 2014). The National Center for Learning Disabilities (2014) also found that students with learning disabilities earn lower grades and experience higher rates of course failure in high school than students without a learning disability. A study at the University of Chicago Urban Education Institute (2009) found that students with a learning disability had an average GPA of 1.6 compared to a 2.1 for students with no identified learning disability.

Anxiety and Depression. Anxiety and depression are also very common in the general population; the CDC (2018) reports that 1 out of every 6 adults will have depression at some point in their lifetime, and the National Institute of Mental Health (2017) reports that an estimated 19.1% of U.S. adults had an anxiety disorder in the past year. These statistics support the idea that anxiety and depression are very common in the United States and the world.

Anxiety and depression also are highly prevalent in college students; the U.S. census bureau reported that of the more than 18 million students enrolled in college, nearly three out of four of them had reported experiencing “overwhelming anxiety” (American Institute of Stress, 2019). In contrast, a study by Beiter and colleagues (2015) found that at Franciscan University, of the 242 participants surveyed, 15% reported severe or extremely severe levels of anxiety.

Stress. Stress plays a large role in almost everyone’s lives whether it is due to school, work, or other factors. Most college students would probably report feeling stressed at some point during their academic careers, especially during certain parts of the year. Stress is the most commonly reported impediment to academic performance among college students. Frazier and colleagues (2018) found that students who reported that stress affected their performance had lower GPAs and reported more stress and lower coping self-efficacy, resilience, and social support. This

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

study is looking specifically at difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/ over-reactive and impatient (Lovibond & Lovibond, 1995).

The Current Investigation

This investigation examined the factors that participants believed affect their academic performance or GPA, such as stress levels, anxiety and depression, presence of learning disabilities or attentional disorders, and past concussion history. Two groups were compared in this investigation; students who had experienced a concussion and students who had not experienced a concussion. This research was conducted in order to determine if students believed that concussions affected their GPA. It also examined the differences between students with a concussion history who believed it affected their GPA compared to students with a concussion history who did not think it affected their GPA. Stress level, anxiety, concussion history, the presence of learning disabilities or attentional disorders, and depression were measured through various scales discussed later in the Methods section, in order to survey the prevalence of these factors and which variables students reported as having an effect on their GPA. This study also hypothesized that this information may be important to know in order to help students in the future.

Hypotheses

I predict that the students with a history of concussion(s) will report that a history of concussions, anxiety levels, stress levels, and the presence of a learning disability or attentional disorder have a negative effect on GPA.

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

I also predict that students who have not experienced a past concussion will report stress levels, anxiety levels, the presence of a learning disability or attentional disorder, and depression levels.

Methods

Participants

Participants were recruited from introductory-level psychology courses (Introduction to Psychology (PSYC 101) and Lifespan and Human Development (PSYC 160)) at James Madison University (JMU). Participants were recruited through Participant Pool, an online platform used at James Madison University where researchers are able to post research studies and students can complete online research surveys or register to go in person to participate in a study.

Introductory-level psychology courses require 3 credit units of participation in Participant Pool.

Materials

The survey materials used were created via Qualtrics, a user-friendly survey collection method that allows researchers to easily create different questionnaires and different question types within the survey. In addition to gathering demographic information about each participant, the online survey also assessed the following measures.

Academic Performance. Academic performance was measured by the participants' self-reported GPA at James Madison University. Students logged into their MyMadison accounts and reported the GPA listed there as given by the university.

Concussion and Presence of Other Diagnoses. To assess a history of concussions and mTBI, the TECH Measure (Cullum et. al., 2018), a nine-item questionnaire was used (see Appendix A).

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

This serves as a standardized measure of self-report for concussions. This instrument also was used to assess whether participants have ever been diagnosed with a variety of other illnesses and disorders, such as attentional disorders like ADHD or learning disorders.

Stress, anxiety, and depression. The Depression, Anxiety, and Stress Scale (DASS- 21) (Lovibond & Lovibond, 1995) was used to measure the stress, anxiety, and depression levels of participants. This measure consists of three self-report scales designed to measure anxiety, depression, and stress (see Appendix B). The stress scale consists of items 1, 6, 8, 11, 12, 14, and 18. The anxiety scale consists of items 2, 4, 7, 9, 15, 19, and 20. The depression scale consists of items 3, 5, 10, 13, 16, 17, and 21.

Procedure

Participants were able to complete the online survey anywhere they wanted to. The online survey could also be completed via a cellphone and laptop. The survey took approximately 20 minutes. All data were collected in February to April of 2020 (beginning of Spring semester 2020), after all students had completed at least their first academic semester, so all participants had a GPA at James Madison University. After the outbreak of COVID-19 participants were also recruited via posts on social media, because the Participant Pool system was no longer a requirement and had become an extra credit opportunity for university students.

Analysis

In order to examine the data, analyses were run through the IBM SPSS 26 statistical program. Descriptive statistics were performed on the data that was collected. Descriptive statistics were run in order to examine the means, standard deviations, and ranges of all the

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

variables. A correlation matrix was run in order to examine the relationships among the variables. A Mann-Whitney U Test was run in order to determine if there was a difference in the variables that students with a concussion history though negatively affected their GPA compared to students without a concussion history.

After the primary analysis revealed a subset of the population within the concussion group that reported they thought their concussions affected their GPA further analyses and descriptive statistics were conducted in order to further analyze this group of participants. Descriptive statistics were conducted on this subset in order to examine the frequencies, means, and ranges found. Correlations were conducted examining the relationships between concussion history and GPA, the number of concussions an individual reported and GPA, the degree to which students thought their concussion history affected their GPA and GPA, and the students rankings of stress, anxiety, learning disability, attentional disorder, and other conditions affected their GPA and GPA.

Results

Participants

Table 1 displays all the descriptive statistics for the current study's population. Responses from 252 participants were collected. Responses from 31 participants had to be removed for various reasons. Exclusion criteria included if participants did not complete the question asking if they had ever had a concussion, if their answers did not make sense, if multiple questions in a row were skipped, if participants only answered the first few questions and then stopped, and if participants skipped the final question ranking the various variables. The majority of the participants in this study were female, 71.0% were female, 27.2% of participants

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

were male, and one participant reported that they identified as other (0.4%). Of the individuals who participated the majority were freshman (57.6%). 13.8% of participants were sophomores, 5.4% of participants were juniors, 18.3% of participants were seniors, 1.8% of participants had been an undergraduate student for 5 or more years, and 1.8% of participants were graduate students. Participants' ages ranged from 18 to 23, with the average age being 19.52 years old.

Academic Performance

GPA ranged from 4.0-3.5 to below 1.5 (**Table 2**). Twenty-nine percent of participants reported that their MyMadison GPA fell between 4.0-3.5, 28.5% of participants reported that their MyMadison GPA fell between 3.5-3.0, 26.3% reported their GPA was between 3.0-2.5, 8.9% reported that their GPA fell between 2.5-2.0, 5.8% of participants reported their GPA fell between 2.0-1.5, and 0.4% of participants reported that their GPA reported by MyMadison fell below 1.5. There was some concern that self-report GPA was not always valid, as students are prone to over inflation of GPA (Kuncel et. al., 2005). However, in order to mitigate these affects, GPA was reported as a range to discourage students from over inflating or under inflating their GPA.

Participants were also asked to report the number of hours that they spent on homework or studying per night. Half of the students, exactly 50.0%, reported that they spent between 3-6 hours per night on their homework and studying. 3-6 hours was reported by 33.9% of participants, 6-9 hours was reported by 10.3% of participants, 9-12 hours was reported by 3.6% of students, and 12 or more hours was reported by 0.9% of students.

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

After reporting their GPAs and the amount of time spent studying or doing homework per night, participants were asked if they were happy with their GPAs. “Definitely yes” was reported by 20.4% of participants, “probably yes” was reported by 30.3% of participants, “might or might not” was reported by 11.2% of participants, “probably not” was reported by 14.3% of participants, and “definitely not” was reported by 23.3% of participants.

Participants were also asked if they were receiving any academic accommodations from James Madison University. Receiving accommodations from the university was reported by 9.4% of students.

TECH

The descriptive statistics pertaining to the TECH are presented in **Table 3**. Having had a concussion at some point in time was reported by 37.1% of participants, while the remaining 61.6% of participants reported never having had a concussion. Of the participants who reported having had a concussion, the average number of concussions experienced was 2.57, ranging from 1 concussion to 10 concussions. The average number of concussions reported before 15 years old was 1.20 concussions. The number of concussions before 15 years old ranged from 0 to 10. The average number of concussions in the last year was reported as 0.31, ranging from 0 to 2 concussions. Participants said that their multiple repeated hits to the head started on average at the age of 12.43 years old, ranging anywhere from 4 years old to 19 years old. Participants reported that their multiple repeated hit to the head ended on average at 16.80 years old, ranging from 12 years old to 20 years old.

The majority of concussions reported occurred during various contact sports. Contact sports were reported as having caused a concussion by 19.2% of participants, a fall was reported

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

as the cause by 7.1% of participants, a car accident was reported as the cause by 2.2% of participants, being struck by an object was reported as the cause by 3.6% of participants, physical assault or abuse was reported as the cause by 0.4% of participants, and another situation was reported as the cause by 3.1% of participants.

The individual sport most often reported was soccer (4.0%), however, though soccer was the most common individual sport reported, often participants reported that they had experienced concussions in multiple sports (5.4%). Football caused a concussion in 3.1% of participants, field hockey, basketball, and rugby caused a concussion in 0.4% of participants, volleyball, lacrosse, and cheerleading caused a concussion in 0.9% of participants, and softball caused a concussion in 1.3% of participants.

Being knocked unconscious was reported by 4.9% of the participants and 30.4% of participants reported that they had never been knocked unconscious, the remaining 64.7% of participants had not ever experienced a concussion. Participants were asked further details about being knocked unconscious, and this information can be found in **Table 3**. Though most participants were not knocked unconscious during their concussions or head injuries, some may have been dazed or confused. Participants reported that they had at some point been dazed and confused 24.1% of the time after a hit to the head. Participants said that the period they were dazed and confused lasted more than a day 5.4% of the time.

The participants who reported having had a concussion were also asked if their concussion had been diagnosed by a doctor. 21.9% reported that they had their concussion diagnosed by a doctor while the remaining 13.4% reported that they did not have their concussion diagnosed by a doctor. New issues were reported by 13.8% of participants. We found that 12.1% of participants said symptoms most often resolved within “more than a day but less

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

than a week”. Symptoms were reported as resolving in less than a day by 5.8% of participants. Symptoms were reported as resolving between a week and a year (or never fully recovered) by 8.4% of participants.

Premorbid Conditions

The TECH not only assessed the concussions themselves but also asked participants whether or not they had premorbid conditions. **Table 4** presents the descriptive statistics for the TECH question regarding premorbid conditions. Participants were asked if they had ever been diagnosed with ADD/ADHD, a learning disability, depression, anxiety, schizophrenia, bipolar disorder, a sleep disorder, migraines or chronic headaches, or alcohol/drug issues. ADD/ADHD was reported as a premorbid condition in 14.7% of participants, 4.5% said they had been diagnosed with a learning disability, and 21.0% said they were diagnosed with depression. Furthermore, 35.7% said they had been diagnosed with anxiety or an anxiety disorder, 0.4% said they had been diagnosed with schizophrenia, and 0.9% said they were diagnosed with bipolar disorder. Lastly, participants were asked about sleep disorders, substance use issues, and migraines and 6.7% reported they had been diagnosed with a sleep disorder, 3.1% had been diagnosed with an alcohol or drug issue, and 10.7% said they had previously been diagnosed with migraines or chronic headaches. **Table 4** displays the percentage of participants who reported having a premorbid condition and those who did not report having a premorbid condition. There were 50.4% of participants who reported not having a premorbid condition such as an anxiety disorder, depression, chronic headaches or migraines, or the others discussed.

DASS-21

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

After responding to the items on the TECH, participants were asked to respond to questions assessing their depression, stress, and anxiety levels. **Table 5** and **Table 6** displays all the DASS-21 data from the current study for the sample population a whole. The average total depression score was 5.13, falling in the normal category with scores ranging from 0 to 21. Scores between 0 and 9 fall into the normal category on the depression scale, scores between 10-13 fall in the mild category, scores between 14-20 fall in the moderate category, scores between 21-27 fall in the severe category, and scores above 28 fall into extremely severe. The average total anxiety score was 4.56, falling in the normal category with scores ranging from 0 to 19. Scores between 0 and 7 fall in the normal category on the anxiety scale, scores between 8 and 9 fall in the mild category, scores between 10 to 14 fall in moderate, scores between 15 to 19 fall in severe, and scores above 20 fall in extremely severe. The average total stress score was 7.80, also falling in the normal category, with scores ranging from 0 to 23. There were no students whose scores fell in the extremely severe category for anxiety, depression, or stress. Scores between 0 and 14 fall in the normal category on the stress scale, scores between 15 and 18 fall in mild, scores between 19 and 25 fall in moderate, scores between 26 and 33 fall in severe, and scores above 34 fall in extremely severe. The majority of students fell within the normal category in regard to their score in the stress measure of the DASS-21.

Similar to results of many other studies examining the effects of concussions on academics (Killiam et. al., 2005; Brooks et. al., 2016; Collie, McCrory & Makdissi, 2006; Belanger, Spiegel, & Vanderploeg, 2009; Brooks et. al., 2013), the current study indicated that though some students believe that past concussions do affect their GPA, most students do not believe this. A total of 83 students reported that at some point in time they had experienced a concussion, of these students 25.3% said that they thought that their concussion history did not

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

negatively affect their GPA. Of the students that reported that they thought a concussion history did negatively affect their GPA, only 8.4% of students reported that their GPA was affected “substantially” or drastically”. The remaining students said they thought their concussion history negatively affected their GPAs “not at all” (39.8%) or “just a little” (26.5%).

After comparing the students with a concussion history to the students without a concussion history and determining that of the 83 students who reported a concussion, only 8.4% of those students believed that their concussion had a “drastic” or “substantial” negative affect on their GPA. Descriptive statistics were run on the seven students who believed their concussion affected their GPA. The Mann Whitney U Test showed that there was a significant difference ($U= 1834.500$, $p= 0.000$) between rate concussion history was reported as negatively affecting GPA for the students with a history of concussion compared to the students without a history of concussion. The median rank order of concussion history was 0.48 for the group of students with a concussion history compared to 0.11 for the students without a concussion history, suggesting that students with a concussion history believe this affects their GPA to some degree. Seven students had reported that they thought that their concussions were negatively affecting their GPAs to a significant or drastic degree.

Table 8 displays all the descriptive statistics conducted for the group who reported a significant effect of concussion. GPA was spread among all values, ranging from 4.0-1.5. No students in this subset of the concussion group reported having a GPA below 1.5. Of these seven individuals five of them reported that they had at some point experienced multiple repeated hits to the head at one point in time. There was no significant differences in what types of situations these individuals reported getting their concussions. Of these seven students, 42.9% reported that they had at one point been unconscious due to a concussion, while the rest had never been

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

knocked unconscious. The students that reported being knocked unconscious said it was for five minutes or less. Though not all students in this subset had been knocked unconscious, they all reported feeling dazed and confused after a hit to the head. Furthermore, all individuals who said that their concussion affected their GPA reported that their concussion had been diagnosed by a doctor. All of these participants also reported multiple new issues or symptoms such as headaches and dizziness after their hit to the head. Of these 7 individuals one was currently suffering from a concussion and had been diagnosed by a doctor at the time this study was conducted, one participant reported currently suffering from a concussion but not having had it diagnosed by a doctor, and the rest were not currently suffering from a concussion. Furthermore, the average number of concussions reported for the seven individuals who reported that they thought their concussion affected their GPA was 4.86 concussions, approximately two concussions higher than the whole concussion population whose average was 2.57 concussions.

When examining premorbid conditions among these seven individuals who reported their concussion negatively affected their GPA there were a few notable conditions. Premorbid anxiety and depression rates were higher among these individuals than the whole population, 71.4% of participants reported premorbid depression and 85.7% reported premorbid anxiety. When examining all the participants who reported a history of concussions 28.9% reported having premorbid depression and 45.8% reported having premorbid anxiety.

Table 9 displays the DASS-21 scores for the students with a concussion who reported that they thought their concussion affected their GPA. The average scores on the DASS-21 for the seven participants reporting they thought their concussion negatively affected their GPA were higher than the scores reported for the whole population. The average anxiety scale score for this subset of the concussion group was 7.14, the average depression scale score was 9.00,

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

and the average stress scale score was 13.00. These scores were still lower than past research had found.

After looking at the descriptive statistics and frequencies for this subset of the concussion group, a correlation was run examining the relationship between the number of concussions and the GPA of these students. The correlation revealed that there was no correlation between GPA and the number of concussions ($r(7) = -0.490, p=0.265$) that this group of students had experienced, though the average number of concussions was slightly higher than the whole concussion group. A correlation between the number of concussions in their lifetimes and the degree to which the students reported concussion history was run. There was no significant relationship found between the number of concussions in a lifetime and the degree to which the students reported concussion history affecting their GPA ($r(7) = 0.250, p= 0.588$). **Figure 1** displays the relationship between the number of concussions within a lifetime and the degree to which the participants reported that their concussion history affected their GPA. This figure displayed that there did not appear to be a relationship between these two variables.

Discussion

This study explored if there were differences in what students with a concussion history thought negatively influenced their GPAs compared to students without a concussion history. I predicted that students with a past concussion history would think that their concussion history was negatively affecting their GPAs. I predicted that students without a concussion history would report variables such as stress and anxiety at higher rates than the concussion group, and this was found to not be true.

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

The current study aimed to expand knowledge on how concussions can affect a student's perception of their GPA, and specifically if there are differences between students with a history of concussions and those without. A small portion of students with a concussion history reported that they thought that their concussion was negatively affecting their GPA. A analyses revealed that there was no significant difference in the rate of reporting that the other variables, such as stress, anxiety, depression, and others affected GPA negatively.

Concussion. Previous research at another university found that of 466 participants, 51.7% reported a history of concussion or TBI (Meske et. al., 2019). The current study found that 31.7% of participants reported having had a concussion. There were many possible reasons for the discrepancy between the two concussion rates such as one study getting more participants who were student athletes. Another possible reason for the lower concussion rate in this sample is that students in past studies had potentially reported head injuries that were not severe enough to qualify as a concussion, thus inflating the concussion rate. This discrepancy could have also been do simply to the fact that students at James Madison University had not suffered from as many concussions as students in other research.

Past research into the effects of concussions on academic performance revealed that a past concussion history did not directly relate to academic difficulties and that there were likely other variables that could explain academic difficulties (Killiam et. al., 2005; Brooks et. al., 2016; Collie, McCrory & Makdissi, 2006; Belanger, Spiegel, & Vanderploeg, 2009; Brooks et. al., 2013). Killiam et. al. (2005) had previously found that lowered GPA, issues with focus and school attendance, and difficulty concentrating had been correlated with a past concussion history. Killiam and colleagues suggested that this was due to the mental and physical demands associated with playing a contact sport rather than the concussions themselves. However, the

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

current study did not find the same relationship between past concussion history and academic difficulties. The current study did not find that individuals with a concussion history had lower GPAs, the GPAs were divided relatively evenly among the different GPA ranges, with most falling between 4.0-2.5, with few falling between 2.5. Also, the GPA of the group reporting concussions did not significantly differ from the GPA of the group without a concussion history. Furthermore, Killiam et. al. (2005) reported that this correlation found between past concussion history and GPA could have been due to the stress that is often associated with playing a contact sport. The current study found that stress levels among the students who reported a concussion history were reported as normal, and that there was not a correlation between stress levels and a concussion history ($r = -0.125$, $p = 0.064$).

Past research had also shown that there appeared to be a relationship between concussion history and symptom reporting and length (Brooks et. al., 2016; Collie, McCrory & Makdissi, 2006; Belanger, Spiegel, & Vanderploeg, 2009; Brooks et. al., 2013). The current study found that most participants reported that though they did experience new symptoms after their concussion, they typically resolved in no more than 2 weeks. Symptom length of less than a day, between a day and a week, and one to two weeks was reported by 68.7% of participants. The difference between these two studies could have been because participants in past research had more severe concussions that took more time to recover from. It is possible that participants in the current study did not have as severe concussions as past research and this was why people were reported as recovering faster than past research has reported.

Learning Disabilities and Attentional Disorders. There was little to no difference in the rate of reporting for learning disabilities or attentional disorders between the students with a concussion history and the students without a concussion history, as revealed by a correlation.

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

This was interesting because previous research by Schwanz and colleagues (2007) that found that students with ADHD/ADD can often have more academic difficulties. However, James Madison University provides academic accommodations to students with conditions such as ADD/ADHD or a learning disability if they need it, and this option is made available to students upon their first semester at the university and through course syllabi.

Research by Gormley et. al. (2016) found that college students with ADD or ADHD earned significantly lower GPAs compared to students without ADD or ADHD. However, the current study did not find that there were any significant differences in GPA when comparing students that reported premorbid ADD or ADHD to students who did not report premorbid ADD or ADHD. In both groups the average GPA was in the range of 3.5-3.0. Previous research at the University of Chicago Urban Education Institute (2009) found that students with a learning disability had an average GPA of 1.6 compared to a 2.1 for students with no identified learning disability. The current study did not find that there was a significant difference between the GPAs of students that reported they suffered from a learning disability and students who did not report they had a learning disability, determined by comparing the mean GPA between the two groups. In both groups the GPA averaged between the range of 4.0-3.0. As discussed previously, this could have been due to accommodations that are available for students that suffered from a learning disability.

Anxiety and Depression. This study's population appeared to have lower rates of anxiety and depression than other college populations. Beiter and colleagues (2015) reported that of 231 participants, 8% of students ranked as extremely severe anxiety and 5% ranked as extremely severe rates of depression. The current study found that there were no participants in this study of 221 participants who reported extremely severe rates of anxiety or depression. Anxiety and

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

depression scores for this sample fell within the normal category. When comparing individuals with a concussion history to those without a concussion history there were also no differences in anxiety and depression levels reported after comparing means. When examining the depression and anxiety levels of the students with a concussion history who reported it having a negative effect there were slightly higher levels of anxiety and depression in this small subset of the sample. This could potentially have been due to the fact that these students reported having experienced more concussions, on average 4.86 concussions. This subset of the sample had higher anxiety and depression scores on the DASS-21. This potentially could have been correlated with the higher premorbid anxiety and depression levels that were also reported in this subset of the population. This reflects the previous research conducted by Yang et. al. (2015) which found that individuals with premorbid anxiety and depression tended to experience depression and anxiety after concussions to a greater extent. Psychological distress, typically depression, anxiety, and post-traumatic stress disorder, were reported as remaining an issue for patients long after their concussions. This same relationship found in Yang et. al. (2015) was also found in the current study in the seven participants that reported they thought their concussion history had a negative effect on their GPA. Furthermore, research by Cole and Bailie (2016) reported that the prevalence rates of psychological distress after TBI have varied greatly, from as low as 4-5% to as high as 49-63%.

Stress. Research by Frazier and colleagues (2018) has found that stress is the most commonly reported impediment to academic performance among college students. In the current study students did report that stress was playing some role in negatively affecting their GPA, but it was not significant based on correlations run. On the DASS-21 there were no scores that fell in the extremely severe category for stress, and there were no students who ranked stress as severe

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

as well. Beiter and colleagues (2015) found that 3% of students surveyed at Franciscan University ranked stress as extremely severe, and 6% ranked as severe stress levels. There was also no difference between students with or without a concussion history in the reporting of stress as negatively affecting their GPAs. Though when looking at the individuals who reported a history of concussions as a whole there was no significant level of stress reported, a subset of the population was also examined.

The seven students who reported a concussion history and reported they thought it affected their GPA had a higher average stress score on the DASS-21. The average score of this small subset was 13.00, falling in the moderate stress category on the DASS-21. Though this subset of students had a slightly higher average stress score their scores were still lower than past researchers have found at other universities and still did not have scores that fell in the severe or extremely severe categories.

There are many potential reasons for the lower stress levels among this group of students. One potential reason for the decreased level of stress among students at this time could be the COVID-19 pandemic. Due to the pandemic, classes were all moved online and students were able to go home. Many professors were no longer asynchronously giving lectures, instead requiring students to watch lectures at their convenience. This could have potentially reduced stress levels for many students. Furthermore, James Madison University decided during this period to give students the option to make any or all of their classes Pass/Fail if they chose to, and this could have also contributed to the lower stress, and anxiety, levels that students were reporting during the time period in which the current study collected data.

However, though this could have reduced stress levels, this also could have increased stress levels despite that they already appear lower. Another possible explanation is that James

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Madison University just had a lower level of stress, and also anxiety and depression, than other universities.

Another possible explanation for lower levels of stress connected with research conducted by Frazier et. al. (2018). Frazier and colleagues found that students who reported that stress affected their GPA had lower GPAs and reported higher levels of stress. The current studies participants reported that they were not experiencing significant stress and there was no relationship found between stress levels and a lower GPA. This reflected the opposing side to the relationship examined in the research by Frazier et. al.

Limitations

There are many limitations to this study that could have possibly affected results. The first possible limitation is that the study only examined on university. Each university environment is different and each functions in a different way. These differences in university environments could result in different discoveries at different universities examined in the future.

Another possible limitation of this study is that the data for this study ended up being collected during the COVID-19 pandemic, and students were not able to return to school. Because of this, the method that was used for recruiting participants, the Participant Pool, was made optional for the classes that typically require it at James Madison University. The Participant Pool became extra credit, potentially influencing who was taking the survey. Furthermore, because of the pandemic, students' lives were upended. It is possible that this influenced the results and the types of participants of this study. Also, due to these circumstances the study had to be posted on Facebook in order to attempt to get an appropriate number of participants, and this could mean that individuals who were not currently students participated in

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

the survey. It would be interesting to conduct this study again, once quarantine has ended and students return to school, and compare the results collected to see explore if there are differences between the two time periods.

Furthermore, another possible limitation of this study was the use of self-report methods. Self-report measures have a high possibility of error due to the ability of participants to make up answers if they choose to. There was no way to verify whether students were being truthful on any aspect of the current study or instruments used in the study, so all results have to be interpreted with the knowledge that participants could have falsified responses. Though this was possible, there was no requirement for students to respond to questions if they were not comfortable, and this would hopefully reduce the rates at which students were falsifying answers.

Future Research

There are many different avenues future research could take. Future research into academic accommodations that are available at universities and the role these play in the effect of learning disabilities on GPA will be important in determining if certain academic accommodations are better suited to reduce the negative effects that some research has found learning disabilities can have on GPA. By examining the relationship between learning disabilities and GPA it could also help to further define the relationship between the presence of a learning disability and GPA.

Future research into the stress, anxiety, and depression levels at James Madison University, and other universities, is also needed in order to determine if there appear to be any particular reasons that the anxiety, stress, and depression levels at JMU were lower than previous

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

research has found. This research could examine the presence of certain organizations on campus and also the resources that are available at JMU students compared to the resources available at other institutions. It would also be beneficial to look at differences in the methods with which the information regarding resources is disseminated across campuses.

Another possible study that needs to be conducted at some point in the future is looking more closely at the concussion prevalence at different universities throughout the country. It would also be beneficial to compare the concussion rates in student athletes to the rates in non-student athletes while also examining and comparing GPA between the two student populations. This would allow researchers to gain a better understanding of the relationship between concussions and academic performance. It would also allow researchers to get a bigger picture into the prevalence of concussions, head injury, or brain injury on college campuses in order to better help students in the future. Despite the limitations of the current study, it provides important information about the relationship between GPA, concussion history, anxiety levels, stress levels, depression, and various other variables. Further research into the areas discussed in the current study such as anxiety, depression, concussion rates, and GPA, and the relationships among these variables will be beneficial to students in the future when looking for ways to better help students succeed in academic settings.

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 1
Descriptive Statistics for Population (N=221)

	<i>M</i>	<i>SD</i>	Min	Max
Age	19.52	1.380	18	23
Gender	71.0% female	--	--	--
Year	57.6% Freshman	--	Freshman	Graduate Student

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 2

Descriptive Statistics for Academic Performance

	<i>M</i>	<i>SD</i>	Min	Max
GPA	54.8% 3.5-2.5	1.187	Below 1.5	4.0-3.5
Hours of HW Per Night	50.0% 3-6hrs	--	1-3hrs	12 or more hours
Happy with GPA	30.3% Probably Yes	--	--	--
Accommodations	89.3% No	--	--	--

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 3

Descriptive Statistics for the Texas Evaluation of Concussion History (N= 221)

	<i>M</i>	<i>SD</i>	Min	Max
Concussion?	61.6% No	--	--	--
Multiple Repeated Hits to Head?	36.1% Yes	--	--	--
Situation where Concussed	19.2% Contact Sports	--	--	--
Sport where Concussed	5.4% Multiple Sports	--	--	--
Unconscious?	30.4% No	--	--	--
Dazed/Confused	24.1% Yes	--	--	--
Longest Dazed/Confused	6.7% 5mins or less	--	--	--
Doctor?	21.9% Yes	--	--	--
New Symptoms?	19.2% No	--	--	--
Length Symptoms	12.1% 1 day to a week	--	--	--
Current Concussion?	91.9% No	--	--	--
# Concussions Total	2.57	2.269	1	10
# Concussions before 15yrs	1.20	1.799	0	10
# Concussions Past Year	0.31	0.491	0	2
Age @ Start of Multiple Repeated Hits	12.43	3.411	4	19
Age @ End of Multiple Repeated Hits	16.80	1.789	12	20
# Unconscious Total	1.55	0.820	1	3
# Unconscious Less Than 5mins	1.45	0.934	0	3
# Unconscious 5-30Mins	0	0	0	0
#Unconscious More Than 30mins	0	0	0	0

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 4

Descriptive Statistics for Premorbid Conditions (N=221)

ADD/ADHD	83.9% No
Learning Disability	93.8% No
Depression	77.7% No
Anxiety	62.9% No
Schizophrenia	98.2% No
Bipolar Disorder	97.8% No
Sleep Disorder	92.0% No
Alcohol/Drug Use	95.5% No
Migraine/Concussion	87.9% No
None	50.4%

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 5

Descriptive Statistics for the DASS-21 (N=221)

	<i>M</i>	<i>SD</i>	Min	Max
Anxiety Scale Total	4.56	4.834	0	19
Depression Scale Total	5.13	4.988	0	21
Stress Scale Total	7.80	5.787	0	23

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 6
Score Summary of the DASS-21

	Depression # Participants	Anxiety # Participants	Stress # Participants
Normal	175 (scores 0-9)	165 (scores 0-7)	189 (scores 0-14)
Mild	27 (scores 10-13)	12 (scores 8-9)	20 (scores 15-18)
Moderate	17 (scores 14-20)	33 (scores 10-14)	13 (scores 19-25)
Severe	2 (scores 21-27)	8 (scores 15-19)	0 (scores 26-33)
Extremely Severe	0 (scores 28+)	0 (scores 20+)	0 (scores 34+)

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 7

Descriptive Statistics for Significant Effect of Concussion Group (N=7)

GPA	42.9%	4.0-3.0
Multiple Repeated Hits to Head	71.4%	Yes
Situation where Concussed	42.9%	Contact Sports
Unconscious?	42.9%	Yes
Dazed/Confused?	100%	Yes
Doctor?	100%	Yes
New Symptoms?	100%	Yes
Current Concussion?	71.4%	No
Premorbid Depression	71.4%	Yes
Premorbid Anxiety	85.7%	Yes

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 8

Descriptive Statistics for Significant Effect of Concussion Group on DASS-21

	<i>M</i>	<i>SD</i>	Min	Max
Depression Scale Total Score	9.00	4.865	2	17
Anxiety Scale Total Score	7.14	6.230	0	17
Stress Scale Total Score	13.00	6.377	4	21

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Table 9

Mann-Whitney U Test Results

Null Hypothesis	The distribution of DegreeConcussHist is the same across categories of Concuss.
Sig.	0.000
Decision	Reject the Null Hypothesis

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

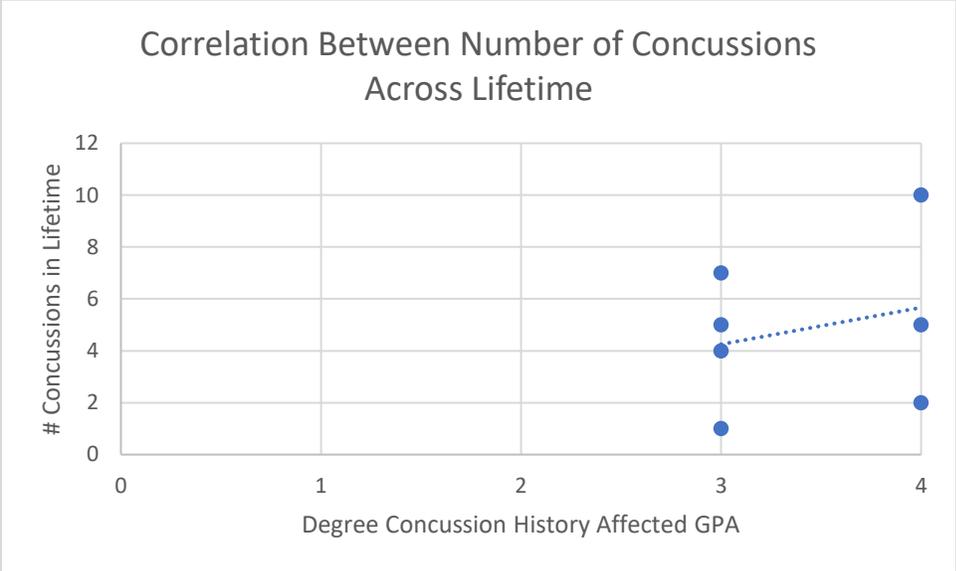
Table 10

Mann-Whitney U Test Summary

Total N	220
Mann-Whitney U	1834.500
Wilcoxon W	11287.500
Test Statistic	1834.500
Standard Error	381.203
Standardized Test Statistics	-10.102
Asymptomatic Sig	0.000

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

Figure 1



Appendices

Appendix A: The Texas Evaluation of Concussion History (TECH)

Name: _____ Today's Date: _____ Date of Birth: _____ Age: _____

Texas Evaluation of Concussion History (TECH)

Instructions: This questionnaire consists of 9 questions. Please read each part carefully. You may be asked to skip some of the questions. It is okay to provide approximate or estimated answers.

1. Who is filling out this form?

- Self Family member or other informant Research staff or clinician

2. Have you ever had a concussion or hit to your head that caused any of the following: Being knocked out or unconscious; headache; feeling lightheaded/dizzy; feeling sick/throwing up; feeling unsteady/off balance; changes with vision/eyesight; ringing in the ears; change in mood; difficulty paying attention, remembering, thinking clearly, or speaking clearly?

- Yes No Don't Know

If Yes,

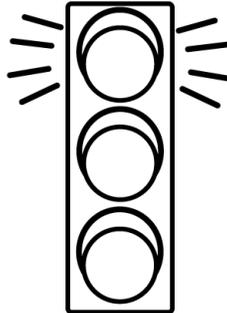
- a. About how many of these hits have you had in your lifetime? # _____
b. About how many happened before you turned 15 years old? # _____
c. Did any happen in the past year? Yes No

3. Have you ever had a period of time in which you experienced multiple, repeated hits to your head (for example, in sports like soccer or football, military duty, or abuse)?

- Yes No Don't Know

If Yes,

- a. About how old were you when this began and ended? Age began: _____ Age ended: _____



STOP HERE if you answered NO or Don't know to both Questions #2 and #3

Continue to next page

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

4. In which of the following situations have you ever had a concussion or repeated hits to your head? (Choose all that apply.)

- | | |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <input type="checkbox"/> A fall (for example, from a bike or horse) | <input type="checkbox"/> Physical assault or abuse |
| <input type="checkbox"/> A car accident (or motorcycle or ATV) | <input type="checkbox"/> Being near an explosion or blast |
| <input type="checkbox"/> Being struck by an object (for example, being hit by a rock) | <input type="checkbox"/> Contact sports (for example, football or soccer) |
| <input type="checkbox"/> A playground accident | |

5. At any time when you hit your head, were you knocked out or unconscious?

Yes No Don't Know

a. About how many times have you been knocked out/unconscious in your lifetime? # _____

b. What is the **longest** amount of time you were knocked out/unconscious for?

(Choose one, even if an estimate.)

- More than a day (24 hours)
- More than 30 minutes, but less than a day (24 hours)
- 30 minutes or less
- 10 minutes or less
- 5 minutes or less
- Don't know
- Does not apply; never been knocked out/unconscious

If more than 30 minutes,

i. About how many times were you knocked out/unconscious for longer than 30 minutes?

ii. Were you ever knocked out/unconscious longer than 30 minutes *before you turned 15 years old?*

Yes No Don't Know

c. At any other time when you hit your head, did you feel dazed or confused?

Yes No Don't Know

If Yes,

i. About how many times has this happened to you in your lifetime? # _____

ii. What is the **longest** amount of time you were dazed or confused ?

(Choose one, even if an estimate.)

- More than a day (24 hours)
- More than 30 minutes, but less than a day (24 hours)
- 30 minutes or less
- 10 minutes or less
- 5 minutes or less
- Don't know

Continue to next page

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

6. **At any time after you hit your head in one of these injuries, did you see a doctor?**
 Yes No Don't Know

If Yes,

- a. Did you go to the emergency room?
 Yes No Don't Know
- b. Did you stay in the hospital overnight?
 Yes No Don't Know
- c. Were you diagnosed by a doctor as having a concussion or brain injury at the time?
 Yes No Don't Know

7. **At any time after you hit your head, did you (or someone close to you) notice any new problems you were having?**

Yes No Don't Know

If Yes, check all that apply:

- | | | |
|----------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <input type="checkbox"/> Headache | <input type="checkbox"/> Feeling sad or down | <input type="checkbox"/> Difficulty getting tasks started |
| <input type="checkbox"/> Dizziness | <input type="checkbox"/> Feeling worried or nervous | <input type="checkbox"/> Thinking more slowly, feeling slowed down |
| <input type="checkbox"/> Nausea/vomiting | <input type="checkbox"/> Difficulty paying attention | <input type="checkbox"/> Changes in your speech or trouble finding words |
| <input type="checkbox"/> Balance problems | <input type="checkbox"/> Difficulty remembering or learning new things | <input type="checkbox"/> Ability to function at work or school |
| <input type="checkbox"/> Ringing in the ears | <input type="checkbox"/> Difficulty remembering how to do things | <input type="checkbox"/> Ability to care for yourself |
| <input type="checkbox"/> Difficulty sleeping | <input type="checkbox"/> Difficulty solving problems or making decisions | <input type="checkbox"/> Relationships with others |
| <input type="checkbox"/> Changes with vision or eyesight | | |
| <input type="checkbox"/> Irritability/anger | | |

8. **How long did it take for your symptoms to go away? If you have had multiple concussions, answer based on your worst injury (Choose one, even if an estimate).**

- Less than a day (24 hours)
 More than a day (24 hours), but less than a week (7 days)
 1-2 weeks (7-14 days)
 More than 2 weeks (14 days), but less than a month (4 weeks)
 1-6 months
 More than 6 months, but less than a year (12 months)
 More than a year (12 months) or I never fully recovered
 Don't Know

9. **Before your concussion, were you ever diagnosed with any of the following or suspected of having any of the following? (Choose all that apply.)**

- ADHD/ADD (attention deficit disorder with or without hyperactivity)
- Learning disability
- Depression
- Anxiety
- Bipolar disorder

STUDENT BELIEFS ABOUT WHAT FACTORS INFLUENCE GPA

- Schizophrenia
- Alcohol or drug abuse
- Sleep disorder
- Migraines/chronic headaches
- None of the about

You have reached the end of this questionnaire. Thank you for participating

Appendix B: The Depression, Anxiety, and Stress Scale

DASS21

Name: _____

Date: _____

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree or a good part of time
- 3 Applied to me very much or most of the time

1 (s) I found it hard to wind down	0	1	2	3
2 (a) I was aware of dryness of my mouth	0	1	2	3
3 (d) I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a) I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d) I found it difficult to work up the initiative to do things	0	1	2	3
6 (s) I tended to over-react to situations	0	1	2	3
7 (a) I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s) I felt that I was using a lot of nervous energy	0	1	2	3
9 (a) I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d) I felt that I had nothing to look forward to	0	1	2	3
11 (s) I found myself getting agitated	0	1	2	3
12 (s) I found it difficult to relax	0	1	2	3
13 (d) I felt down-hearted and blue	0	1	2	3

14 (s) I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a) I felt I was close to panic	0	1	2	3
16 (d) I was unable to become enthusiastic about anything	0	1	2	3
17 (d) I felt I wasn't worth much as a person	0	1	2	3
18 (s) I felt that I was rather touchy	0	1	2	3
19 (a) I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a) I felt scared without any good reason	0	1	2	3
21 (d) I felt that life was meaningless	0	1	2	3

DASS-21 Scoring Instructions

The DASS-21 should not be used to replace a face to face clinical interview. If you are experiencing significant emotional difficulties you should contact your GP for a referral to a qualified professional.

Depression, Anxiety and Stress Scale – 21 Items (DASS-21)

The Depression, Anxiety and Stress Scale – 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.

Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest / involvement, anhedonia and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient. Scores for depression, anxiety and stress are calculated by summing the scores for the relevant items.

The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and

clinical populations are essentially differences of degree. The DASS-21 therefore has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD.

Recommended cut-off scores for conventional severity labels (normal, moderate, severe) are as follows:

NB Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score.

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety & Stress Scales. (2nd Ed.)Sydney: Psychology Foundation.

**Appendix C: Grade Predictions and Attributions Questionnaire Questions (not included in
TECH or DASS-21)**

Q1 How old are you?

Q2 Please indicate your status at JMU:

- Freshman (1)
- Sophomore (2)
- Junior (3)
- Senior (4)
- 5 or more years (5)
- Graduate Student (6)

Q3 What is your gender?

- Male (1)
- Female (2)
- Other (3) _____
- Do not wish to answer (4)

End of Block: Demographics

Start of Block: Academic Performance

Q52 The next question is going to ask you to report your GPA. In order to do this please log into MyMadison. Once logged into MyMadison click the student tab, then go to the student center. Once you are in the student center you will see a box displaying your total GPA, please report your cumulative GPA.

Q8 What is your GPA?

- 4.0 - 3.5 (1)
- 3.5 - 3.0 (2)
- 3.0 - 2.5 (3)
- 2.5 - 2.0 (4)
- 2.0 - 1.5 (5)
- Below 1.5 (6)

End of Block: Academic Performance

Start of Block: Block 7

Q60 These next few questions are going to ask you about your academic performance and study habits.

WHAT DO STUDENTS ATTRIBUTE THEIR GRADES TO
AND ARE THESE ATTRIBUTIONS CORRECT?

54

Q61 One average, how many hours per night do you spend studying or doing homework?

- 1-3 hours (1)
- 3-6 hours (2)
- 6-9 hours (3)
- 9-12 hours (4)
- 12 or more hours (5)

Q62 Are you happy with your current GPA?

- Definitely yes (1)
- Probably yes (2)
- Might or might not (3)
- Probably not (4)
- Definitely not (5)

Q63 Are you currently receiving accommodations through the university in any capacity?

- Yes (1)
- No (2)

Q64 What are you receiving these accommodations for?

WHAT DO STUDENTS ATTRIBUTE THEIR GRADES TO AND ARE THESE ATTRIBUTIONS CORRECT?

Q58 There are many factors that can negatively affect a student's academic performance, as reflected in their GPA. How about you? To what degree do you think each of the following factors has brought down your GPA in any college semester?

	Drastically (4)	Substantially (3)	Just a little (2)	Not at all (1)	Doesn't apply to me (0)
Presence of a Learning Disability (1)	<input type="radio"/>				
ADHD/ADD (2)	<input type="radio"/>				
Concussion History (3)	<input type="radio"/>				
Stress level (4)	<input type="radio"/>				
Anxiety Level (5)	<input type="radio"/>				
Current concussion (during Fall 2019) (6)	<input type="radio"/>				
Depression Level (7)	<input type="radio"/>				

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