



Mental Health Symptoms, Diagnoses, Treatment-Seeking, and Academic Impacts in Student-Athletes and Non-Athlete College Students Using the National College Health Assessment

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The purpose of this study was to compare college student-athletes to non-athlete students for self-reported mental health symptoms, diagnoses, treatment, and impediments to academic performance. Participants were 508,672 varsity athletes and non-athletes from the 2011-2019 U.S. National College Health Assessment (NCHA). Outcomes included rates of specific mental health symptoms and untreated diagnoses, treatment rates in relation to diagnoses and symptoms, and rates at which specific mental health factors negatively affected academic performance. Logistic regression and odds ratios were used to compare outcome frequencies. Compared to non-athletes, athletes reported significantly lower rates of most mental health symptoms, diagnoses, and treatment. Among those receiving diagnosis or treatment, athletes and non-athletes were treated at similar rates. However, more athletes reported anxiety- and depression-related symptoms without corresponding diagnosis/treatment. Anxiety, depression, and sleeplessness were less often impediments to academic performance in athletes versus non-athletes. All students receiving treatment for specific mental health issues reported that they were academic impediments more frequently than untreated students. Student-athletes have overall better mental health than non-athletes, receiving treatment at similar rates following diagnosis. However, symptomatic athletes less frequently obtain diagnosis/treatment than non-athletes. Both groups may seek treatment in response to negative impacts of mental health issues on academic performance.

The American Psychological Association defines mental health as a state of mind characterized by emotional well-being, good behavioral adjustment, relative freedom from anxiety and disabling symptoms, and a capacity to establish constructive relationships and cope with the ordinary demands and stresses of life (VandenBos, 2007). Mental health issues affect hundreds of thousands of people on a daily basis worldwide, and an estimated 20% of adults will experience some form of mental illness in any given year. The highest percentage of new mental health diagnoses occurs in the 18-25 age group, which includes college-aged students (Kroshus, 2016; National Institute of Mental Health, 2021). There has been growing concern in the past several years with regard to a sharp increase in the number of college students specifically who experience serious mental health problems (Auerbach et al., 2016; Goebert et al., 2009; Kroshus, 2016; Vazquez & Blanco, 2008). This finding should come as no surprise, as college-related stressors (i.e. academics, new surroundings, social, and spiritual) appear to be higher than in the past, creating mental health concerns in the lives of college students (Neal et al., 2013). Moreover, while college-related stressors can trigger a variety of mental health symptoms, it should be noted that some students arrive on campus with a pre-existing mental health condition caused by childhood experiences (Brown et al., 2020). Aside from their effects on general wellbeing, mental health issues can have serious negative impacts on college entry, academic performance, and attrition (Auerbach et al., 2016; Hysenbegasi et al., 2005).

Although academic performance is important for any college student, the pressure to maintain grades is elevated among student-athletes. Negative effects of untreated mental health issues can challenge the ability of student-athletes to maintain their scholarships and thus, in many cases, their access to higher education. Despite recent advances (Brown et al., 2020; Halterman et al., 2020; Hatteberg, 2020; Wilkerson et al., 2020), student athlete mental health remains understudied. More information is still needed about the types and rates of mental health problems faced by college athletes, how those problems impact academic performance, and the rates at which student-athletes seek diagnosis and treatment for mental health disorders. The aim of the present study was therefore to investigate rates of mental health symptoms, untreated diagnoses, treatment, and impacts on academic performance in a large sample of student athletes, compared to non-athlete college students.

Review of Literature

Student-athletes, similar to other college students, find themselves adapting to a new environment, have to learn to be responsible for managing their time, balance their extra-curricular activities with the demands of college coursework, explore their new-found freedom, and make choices in their personal behavior regarding sexuality, alcohol, and drug use. However, participation in intercollegiate athletics imposes additional demands on student-athletes. The typical day of a student-athlete is fully scheduled, whether they are in or out of season. Demands within the academic portion of a student-athletes' day consist of classes, tutors, study tables, and class projects (Neal et al., 2013). In addition, there are physical demands that are placed on the student-athlete, such as conditioning, practice sessions, games, treatment and injury rehabilitation (Neal et al., 2013). Community and media obligations can also add social demands that can become taxing for the student athlete (Neal et al., 2013). Conversely, high levels of habitual physical activity and access to a built-in social support system in the form of

teammates, coaches, and team health care providers (e.g., athletic trainers) could be assumed to reduce mental health burden among athletes (Downs & Ashton, 2011).

To better understand how various factors influence student-athlete mental health, a greater focus has recently been placed on comparing aspects of mental health between college student-athletes and the general college student population (Brand et al., 2013). The full range of mental health concerns found in the general student population can also be found in student-athletes (Neal et al., 2013). National data suggest, for example, that between 17% and 21% of the college student-athlete population suffers from depression (Kroshus, 2016; Weigand et al., 2013; Yang et al., 2007). Another recent study found that college athletes tend to report worse scores than non-athlete students on quality of life assessments (Patient-Reported Outcomes Measurement Information System: PROMIS), particularly for depression (Simon & Docherty, 2014). Still other research indicates that between 10-15% of student-athletes have clinical needs significant enough to warrant counseling services (Watson & Kissinger, 2007).

Directing student-athletes to appropriate treatment services can be complicated by a variety of barriers unique to the student-athlete population. Practical limitations such as demands of academic schedules, travel, practices, and game preparation can significantly restrict opportunities for student-athletes to seek services (Watson, 2006, Halterman et al., 2020). One study suggested a tailored website for student-athletes as a solution to potentially increase mental health knowledge and referrals (Brewer & Petrie, 2013). Student-athletes may also experience a sense of celebrity status due to their participation in athletics, and thus may avoid seeking support from campus resources for fear of jeopardizing their image (Etzel et al., 2006). Related to this and perhaps most significantly, stigma associated with counseling services by student-athletes can be significant barriers to accessing support systems (Watson, 2006). Athletes often fear a loss of confidentiality when meeting with a mental health professional, or they feel that their needs or interests are not being understood. (Hatteberg, 2020). In some cases, athletes will turn to familiarity when seeking help. Hatteberg's study revealed that 80% of athletes reported that a source of institutional help was their coaches (Hatteberg, 2020). However, there are limitations to the use of coaches for mental health services. While coaches understand the stigma of mental health issues, they are not entirely aware of the role counseling services can provide (Halterman et al., 2020). Coaches also seem to misunderstand confidentiality issues surrounding mental health, which adds to fear by student athletes of their information being revealed (Halterman et al., 2020). Cultural experiences can also interact with the above factors to exacerbate a student-athlete's reluctance to seek mental health treatment. For example, a phenomenological study of Black student-athletes found that these students are more comfortable discussing mental health issues with family, but are reluctant to do so with others, including mental health professionals (Wilkerson et al., 2020).

In order to further investigate student athlete mental health burden, the present study analyzes self-report data from the National College Health Assessment (NCHA), a large, national health survey of United States college students. This dataset is powerful from a statistical perspective due to its large sample size, and because it asks numerous questions about mental health-related symptoms and experiences, diagnoses, treatment, and the role of mental health issues as impediments to academic performance. The survey format allows the researcher to compare information across these domains within individuals, as well as between student-athletes and non-athlete students.

We use these data to test four related hypotheses: 1. Student-athletes report lower rates of mental health symptoms, diagnoses, and treatment than non-athlete students. 2. Treatment rates

are lower among athletes, even after controlling for their lower overall mental health burden. 3. Student-athletes report lower rates of mental health issues as impediments to academic performance compared to non-athletes, after controlling for student-athletes' lower overall mental health burden. 4. Students receiving treatment for a mental health disorder less frequently report that it is an impediment to academic performance, and this effect is stronger in student-athletes. The investigation of these hypotheses will assist in more fully understanding the overall mental health burden on student athletes, their relative openness or resistance to treatment, and the degree to which mental health issues put student-athletes at risk of losing scholarships through impediments to academic performance.

Method

Survey and Sample

Data for this study were obtained from the American College Health Association-National College Health Assessment (ACHA-NCHA). The ACHA-NCHA is a national research survey organized to help college health service providers, health educators, counselors, and administrators collect data about their students' health habits, behaviors, and perceptions, as well as student health status. The reliability and validity of the survey are well-established (ACHA, 2013).

All available data from all participating institutions during the survey periods noted above were included in the initial dataset. Responses from graduate, professional, non-degree seeking students, and part-time students were then excluded from the dataset, limiting the data to only degree-seeking, full-time, undergraduate students. Observations were also excluded if they had incomplete data for any of the study variables. Remaining subjects were then stratified according to how they answered Question 64: "Within the last 12 months, have you participated in organized college athletics at any of the following levels?" with levels "Varsity", "Club sports", and "Intramurals" and [Yes/No] response choices for each. Any student who responded "No" to all three options was assigned to the category: Non-Athlete. Any student who replied "Yes" to "Varsity", whether or not they also played club or intramural sports, was assigned to the category: Varsity Athlete. Because our aim was specifically to investigate mental health in Varsity Athletes while using Non-Athletes as controls, we excluded any students who responded "No" to "Varsity", but answered "Yes" to "Club sports" and/or "Intramurals". Therefore, all comparisons in this study are between Varsity Athletes and Non-Athletes as defined above.

Demographic Variables

Student age and gender were included in the analysis. Responses to questions regarding gender were condensed into three categories: male (cis-male), female (cis-female), and non-binary (anyone who was not cis-male or cis-female). This was done to merge data from the NCHA-IIb and NCHA-IIc datasets since gender assessment changed from the former to the latter. The NCHA IIb asked a single question on gender with three options: male, female, or transgender. In contrast, the NCHA-IIc asked three questions about sex and gender: "What sex were you assigned at birth?" [Female/Male]; "Do you identify as transgender?" [Yes/No]; and, "Which term do you use to describe your gender identity?" [Woman, Man, Trans woman, Trans man, Genderqueer, another identity (please specify)]. Despite the additional information,

however, the gender category variable in the NCHA-IIc dataset was limited to three values of male, female, or non-binary. We thus assigned all students identified as cis-male in either survey to the category “male”, all students identified as cis-female in either survey to the category “female”, and all students identified as transgender in the NCHA-IIb or identified as gender non-binary in the NCHA-IIc to the category “non-binary”.

Mental Health Outcomes

The NCHA includes a section on mental health, from which we drew data in three major outcome categories: symptoms; diagnoses and treatment; and impediments to academic performance. Specific NCHA questions and this study’s outcomes are described within each category below, and the Appendix includes a tabulation of all outcome variables and their outcome levels.

Symptoms. The NCHA addresses mental health symptoms without reference to diagnosis or treatment in a series of questions using the language, “Have you ever:” followed by a list of 11 mental health-related symptoms: 1. Felt things were hopeless; 2. Felt overwhelmed by all you had to do; 3. Felt exhausted (not from physical activity); 4. Felt very lonely; 5. Felt very sad; 6. Felt so depressed it was difficult to function; 7. Felt overwhelming anxiety; 8. Felt overwhelming anger; 9. Intentionally cut, burned, bruised, or otherwise injured yourself; 10. Seriously considered suicide; and 11. Attempted suicide. For each symptom, the student provided one answer from among the following five choices: 1. “No, never”; 2. “No, not in the last 12 months”; 3. “Yes, in the last 2 weeks”; 4. “Yes, in the last 30 days”; or 5. “Yes, in the last 12 months”. We condensed answers for each symptom into mutually exclusive binary outcomes: choices 1 and 2 were combined into “No, not in the last 12 months” whereas choices 3-5 were combined into “Yes, in the last 12 months”. We also created a global “any symptom(s)” variable with two levels: “Experienced no mental health symptoms in the last 12 months” vs. “Experienced at least one mental health symptom in the last 12 months”.

Mental Health Diagnosis and Treatment. The survey also asks about diagnosis and treatment for a series of specific mental health conditions, which we condensed into six mental health domains corresponding to established mental health taxonomy: 1. Addiction disorders (substance abuse, other addiction); 2. Anxiety disorders (anxiety, obsessive compulsive disorder, panic attacks, phobia); 3. Eating disorders (anorexia, bulimia); 4. Mood disorders (bipolar disorder, depression); 5. Sleep disorders (insomnia, other sleep disorders); and 6. Other mental health diagnoses (ADHD, schizophrenia, other mental health conditions). We also created a seventh, global mental health domain “any disorder” which included a diagnosis or treatment in any of the above domains. Levels for each domain were constructed based on answers to the question: “Within the last 12 months, have you been diagnosed or treated by a professional for any of the following?” For each condition, students chose one of the following responses: 1. “No”; 2. “Yes, diagnosed but not treated”; 3. “Yes, treated with medication”; 4. “Yes, treated with psychotherapy”; 5. “Yes, treated with medication and psychotherapy”; or 6. “Yes, other treatment”. We retained answer choices 1 and 2 as independent outcome levels, and then condensed choices 3-6 into a single “Yes, any treatment” level. Thus, for each of the above mental health domains there were three possible outcomes: 1. “No, not diagnosed or treated with this disorder in the last 12 months”; 2. “Yes, diagnosed with this disorder in the last 12 months

but not treated”; or 3. “Yes, received treatment of any type for this disorder in the last 12 months”.

Diagnosis and/or treatment were also analyzed in the context of two specific symptoms that corresponded closely to mental health diagnosis/treatment domains: depression and anxiety. For students who reported that in the last 12 months they had felt so depressed it was difficult to function, we determined the proportions of those students who in the last 12 months: 1. Were neither diagnosed nor treated for mood disorders, 2. Were diagnosed but not treated, or 3. Were treated. The same approach was used for the symptom of overwhelming anxiety and the anxiety disorders domain, as well as for the global any symptoms/any disorder variables. We also analyzed binary yes/no answers to the following question: “If in the future you were having a personal problem that was really bothering you, would you consider seeking help from a mental health professional?”

Mental Health and Other Impediments to Academic Performance. The NCHA includes a section titled “Impediments to Academic Performance” which asks the overarching question: “Within the last 12 months, have any of the following affected your academic performance?” Students are prompted to select the most serious outcome they experienced from among the following choices: 1. “This did not happen to me/not applicable”; 2. “I have experienced this issue but my academics have not been affected”; 3. “Received a lower grade on an exam or important project”; 4. “Received a lower grade in the course”; 5. “Received an incomplete or dropped the course”; and 6. “Significant disruption in thesis, dissertation, research, or practicum work”. We recoded these into the binary outcomes: “No, not an impediment” (including choices 1 and 2) and “Yes, an impediment” (including choices 3-6). Of the 31 factors included under this question in the NCHA, we chose to analyze five corresponding closely to the mental health domains described above (alcohol use/drug use, anxiety, depression, eating disorder/problem, and sleep difficulties) and two of relevance to student-athletes (injury, and participation in extracurricular activities). To evaluate relationships between academic performance and mental health diagnosis and/or treatment, we also analyzed proportions of students reporting specific academic impediments (e.g. anxiety) within those students reporting either diagnosis or treatment for the corresponding mental health domain (anxiety disorders).

Statistical Analysis

All statistical analysis was performed in SAS 9.4 (SAS Institute Inc., Cary, NC). Because this study relied on a very large sample and thus had high statistical power to identify even small effects as statistically significant, we set the criterion for statistical significance to $\alpha=0.001$. In addition, measures of effect size were included to provide further interpretation of observed between-groups differences. Age distributions between groups were compared using an independent samples t-test, and gender distributions were compared using a chi square test. Logistic regression analysis was used to test for the effects of athlete group (“exposure”) on the primary outcomes. Odds ratios (OR) and their 95% confidence intervals were also calculated for all statistically significant effects, which provides effect size estimates for logistic regression in retrospective study designs (Ranganathan et al., 2015). For all logistic regression analyses and ORs, the Non-Athlete group was considered the reference group in order to test the overarching hypothesis that Varsity Athletes differed from Non-Athletes for mental health outcomes.

Symptoms were tested as a simple binary outcome as described above. Diagnosis and

treatment rates were analyzed in two sub-steps, first comparing athlete groups for no diagnosis or treatment vs. reported diagnosis or treatment, and then, within those reporting diagnosis or treatment, comparing rates of diagnosis without treatment vs. receiving any type of treatment. Initial logistic regression models for relationships between academic impediments, diagnosis and/or treatment, and athlete status included the main effects of athlete status and diagnosis/treatment, as well as their interaction. Where the interaction was not statistically significant, it was removed, and the main effects were tested.

Disclaimer

The opinions, findings, and conclusions reported in this article are those of the authors and are in no way meant to represent the corporate opinions, views, or policies of the American College Health Association (ACHA). ACHA does not warrant nor assume any liability or responsibility for the accuracy, completeness, or usefulness of any information presented in this article.

Results

After applying exclusion criteria, the total sample included $n=508,672$ observations, with $n=55,369$ Varsity Athletes and $n=453,303$ Non-Athletes. Sample size and demographic information for each group are presented in Table 1. Non-Athletes were slightly older and had a wider age distribution than Varsity Athletes ($p<0.001$), and Non-Athletes included a higher percentage of female students ($p<0.001$). Across both groups, 469,309 students (92.3%) reported experiencing at least one mental health symptom in the last 12 months. Rates of reported mental health symptoms within groups are presented along with ORs in Figure 1. Non-Athletes reported experiencing mental health symptoms significantly more often, and at slightly-to-substantially higher rates, than Varsity Athletes (for each, $p<0.001$) with the exception of attempted suicide ($p=0.023$).

Table 1
Sample Description by Athlete Category

	Non-Athlete	Varsity Athletes	P^b	ES ^c
N	453,303	55,369	---	---
Age (y: mean \pm SD)	20.5 \pm 2.3	19.7 \pm 1.4	<0.001	0.42
Gender (F% / M% / NB%) ^a	72.1% / 26.2% / 1.7%	62.3% / 36.8% / 0.9%	<0.001	0.08

a. F = female, M = male, NB = non-binary (see Methods text for gender category details).

b. P -values for statistical comparisons between groups: t-test for age, and chi square tests for gender.

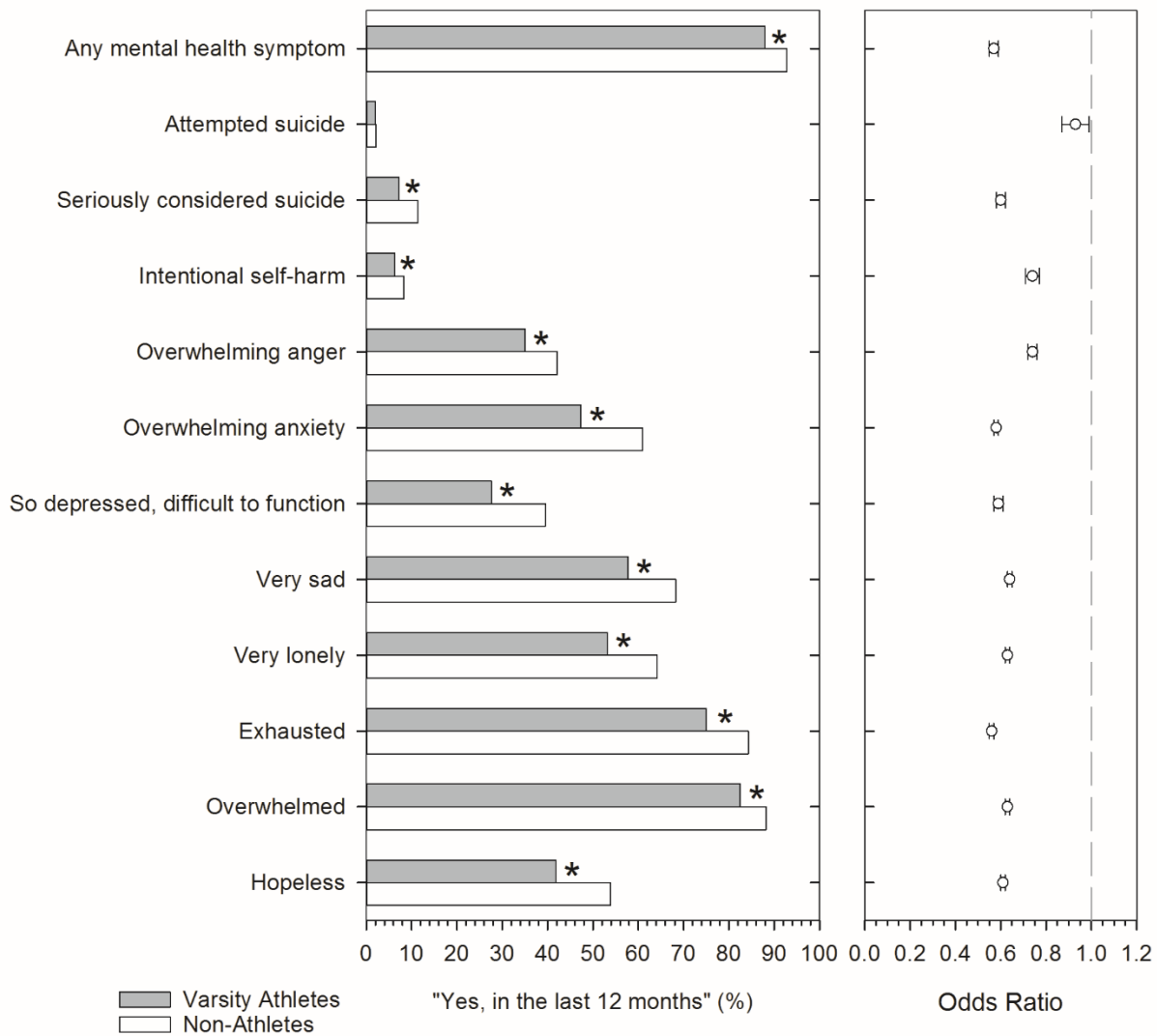


Figure 1. Frequencies of students responding “Yes, in the last 12 months” to the question of whether they had experienced specific mental health symptoms. Gray bars represent Varsity Athlete response frequencies, and white bars represent Non-Athletes. Open circles are odds ratios (ORs) with 95% CIs (error bars) for the odds that Varsity Athletes reported they had experienced a given symptom, compared to the Non-Athlete reference group. An asterisk next to a Varsity Athlete bar indicates a significant between-groups difference in response frequencies for that symptom (for each, $P < 0.001$). Symptom labels are abbreviated. For full survey question and symptom wording see the text and Appendix.

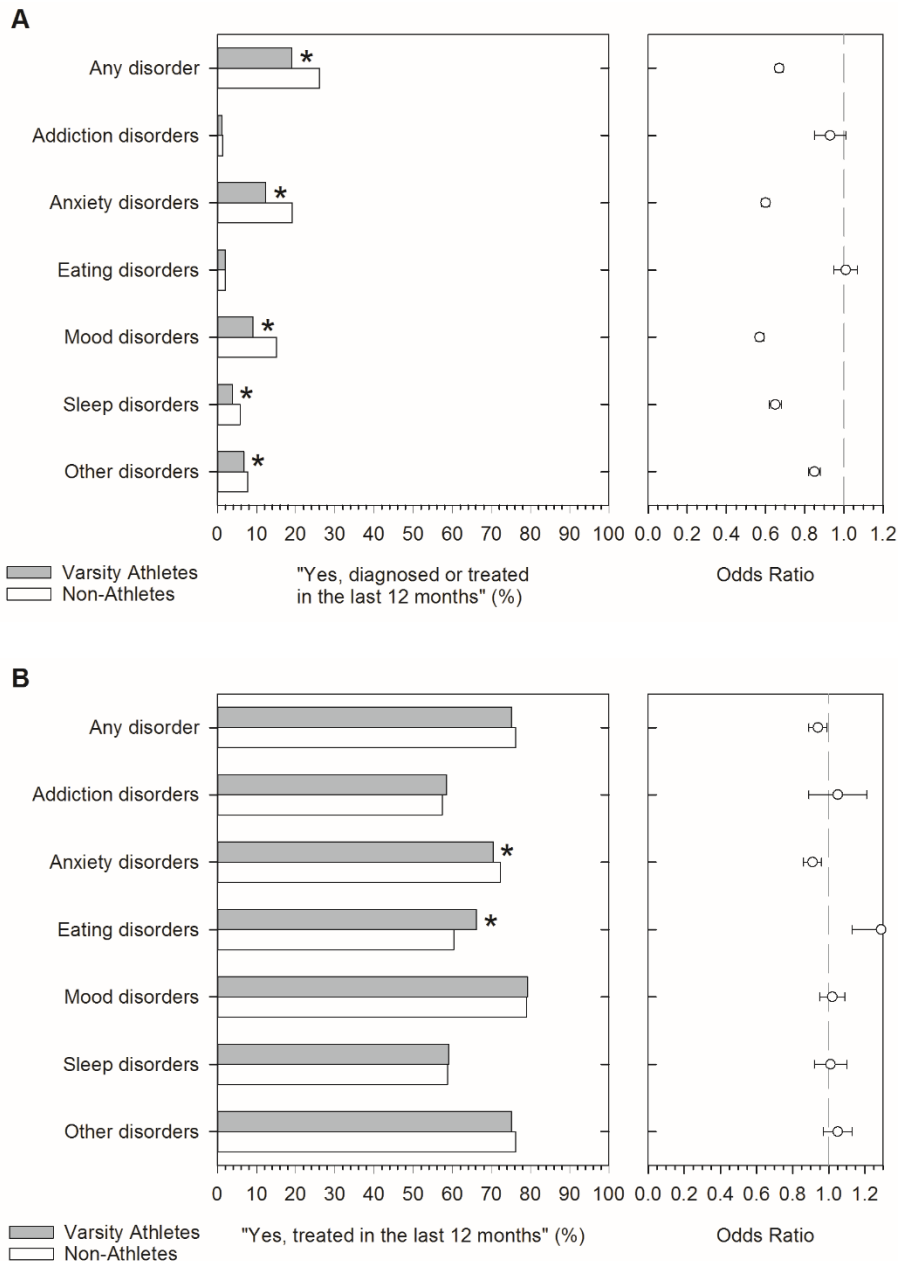


Figure 2.

A. Frequencies of students responding “Yes, in the last 12 months” to the question of whether they had been diagnosed or received treatment for specific mental health disorders. B. Within students responding that they had either been diagnosed or treated for a mental health disorder in the last 12 months, bars represent the frequencies of students who reported that they had been treated. In this sub-analysis, anyone not reporting treatment was diagnosed but not treated, accounting for the difference between the displayed frequencies and 100%. For both panels, gray bars represent Varsity Athlete response frequencies, and white bars represent Non-Athletes. Open circles are odds ratios (ORs) with 95% CIs (error bars) for the odds that Varsity Athletes reported they had been diagnosed or treated for a given disorder, compared to the Non-Athlete reference group. An asterisk next to a Varsity Athlete bar indicates a significant between-groups difference in response frequencies for that symptom (for each, $P < 0.001$).

In total, 128,379 students (25.2%) reported receiving a diagnosis or treatment for at least one mental health disorder in the last 12 months. Within groups, 26.0% of Non-Athletes and 19.0% of Varsity Athletes reported being either diagnosed or treated for any mental health disorder in the last 12 months ($p < 0.001$). Diagnosis and treatment rates for each mental health domain along with ORs comparing Non-Athletes and Varsity Athletes are presented in Figure 2. Varsity Athletes significantly less frequently reported receiving a diagnosis or treatment for anxiety disorders, mood disorders, sleep disorders, and other mental health disorders (for each, $p < 0.001$). Varsity Athletes and Non-Athletes did not differ for rates of diagnosis or treatment of eating disorders ($p = 0.658$) or addiction disorders ($p = 0.058$).

Excluding students who reported neither a diagnosis nor treatment within each mental health domain, the remaining Varsity Athletes and Non-Athletes generally did not differ in terms of the proportions of student who were diagnosed but not treated, vs. those reporting having received treatment. This pattern was observed for mood disorders, sleep disorders, addiction disorders, other disorders, and reporting of any disorder/treatment overall (for each, $p \geq 0.016$). Significantly more Varsity Athletes reported receiving treatment for eating disorders than in Non-Athletes ($p < 0.001$). In contrast, anxiety disorders were diagnosed but untreated significantly more frequently in Varsity Athletes than in Non-Athletes ($p < 0.001$). A large proportion of each group reported that they would consider seeking mental health treatment in the future, although the rate was significantly lower in Varsity Athletes than in Non-Athletes (69.6% vs. 74.6%, respectively; $p < 0.001$).

Pairing self-reported symptoms, diagnoses, and treatment, among students who reported having felt overwhelming anxiety in the last 12 months, most received neither a corresponding diagnosis or treatment for an anxiety disorder (71.3% of Non-Athletes and 77.2% of Varsity Athletes). Compared to Non-Athletes, a significantly smaller proportion of Varsity Athletes reporting this symptom received a diagnosis without treatment ($p < 0.001$) or received treatment ($p < 0.001$) for anxiety disorders. See Figure 3 for frequencies and ORs). Similarly, most students who reported in the last 12 months that they felt so depressed it was difficult to function received neither a diagnosis nor treatment for a mood disorder (68.7% of Non-Athletes and 74.1% of Varsity Athletes). Again, compared to Non-Athletes, Varsity Athletes less frequently received a mood disorder diagnosis without treatment ($p < 0.001$) or treatment for a mood disorder ($p < 0.001$). The same pattern was found for “any mental health symptom variable”: 72.7% of Non-Athletes and 79.4% of Varsity Athletes reported neither diagnosis nor treatment, and Varsity Athletes had lower overall rates of both diagnosis and treatment than Non-Athletes (for each, $p < 0.001$).

In terms of academic impediments, Non-Athletes significantly more frequently reported that anxiety, depression, and disrupted sleep were impediments to academic performance than did Varsity Athletes (for each, $p < 0.001$; see Figure 4 for frequencies and ORs). On the other hand, Varsity Athletes reported significantly more frequently than Non-Athletes that injuries, extracurricular activities, and substance use/abuse were impediments to their academic performance (for each, $p < 0.001$). Groups did not differ for rates of eating disorders impeding academic performance ($p = 0.621$). Among only those students who had reported being diagnosed or treated for a mental health disorder, reported academic impact rates were overall considerably higher than for the full sample. In this sub-sample, diagnosed/treated Non-Athletes continued to report rates higher than those of diagnosed/treated Varsity Athletes for anxiety and sleep disorders impeding academic performance (for each, $p < 0.001$). Rates of academic impediments due to depression and substance use/abuse did not differ between groups (for each, $p \geq 0.133$). For

eating disorders, however, Varsity Athletes with a diagnosis or treatment reported a higher rate of academic impediment than did Non-Athletes ($p < 0.001$).

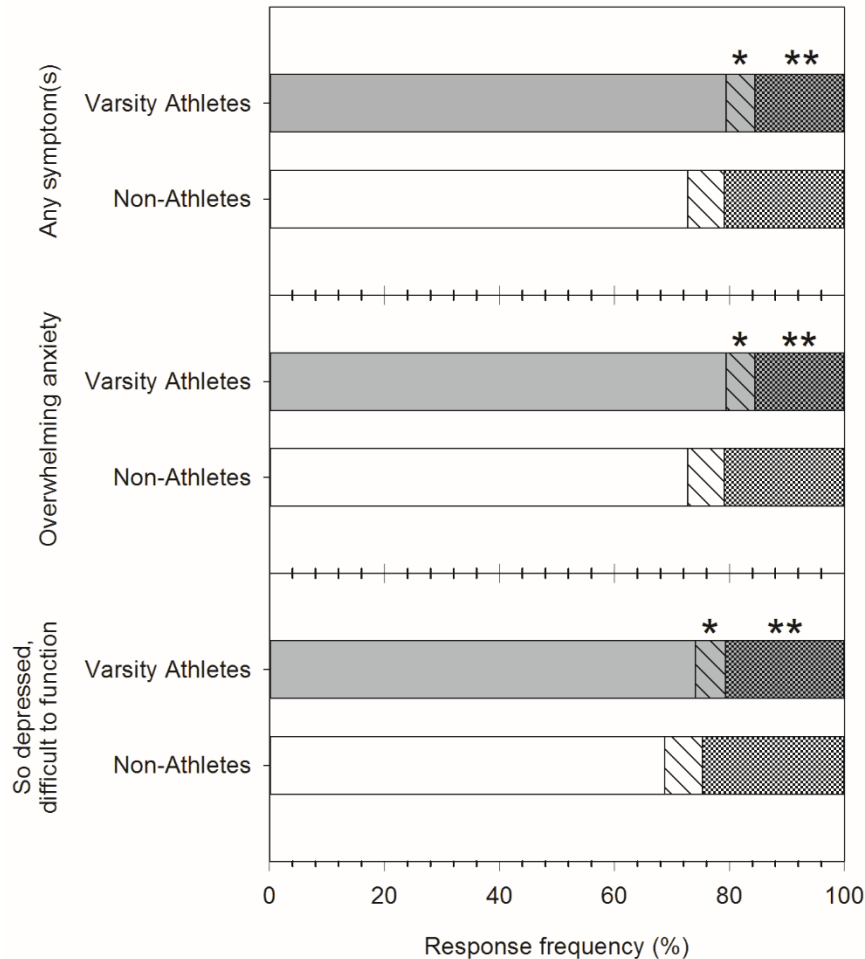


Figure 3.

Corresponding mental health diagnosis or treatment response frequencies within those students who reported experiencing specific mental health symptoms: **A.** Diagnosis/treatment: any disorder. Symptom: any symptom. **B.** Diagnosis/treatment: anxiety disorders. Symptom: felt overwhelming anxiety. **C.** Diagnosis/treatment: mood disorders. Symptom: felt so depressed that it was difficult to function. For all panels, gray bars represent Varsity Athletes and white bars represent Non-Athletes. Solid bar sections represent students who reported the symptom but received neither a diagnosis nor treatment. Diagonally-stripped bar sections represent students who reported the symptom and were diagnosed but not treated. Shaded bar sections represent students who reported the symptom and reported receiving treatment. *Significant difference between Varsity Athletes and Non-Athletes for frequency of diagnosed but not treated. **Significant difference between Varsity Athletes and Non-Athletes for frequency of treated. See text for ORs and 95% confidence intervals.

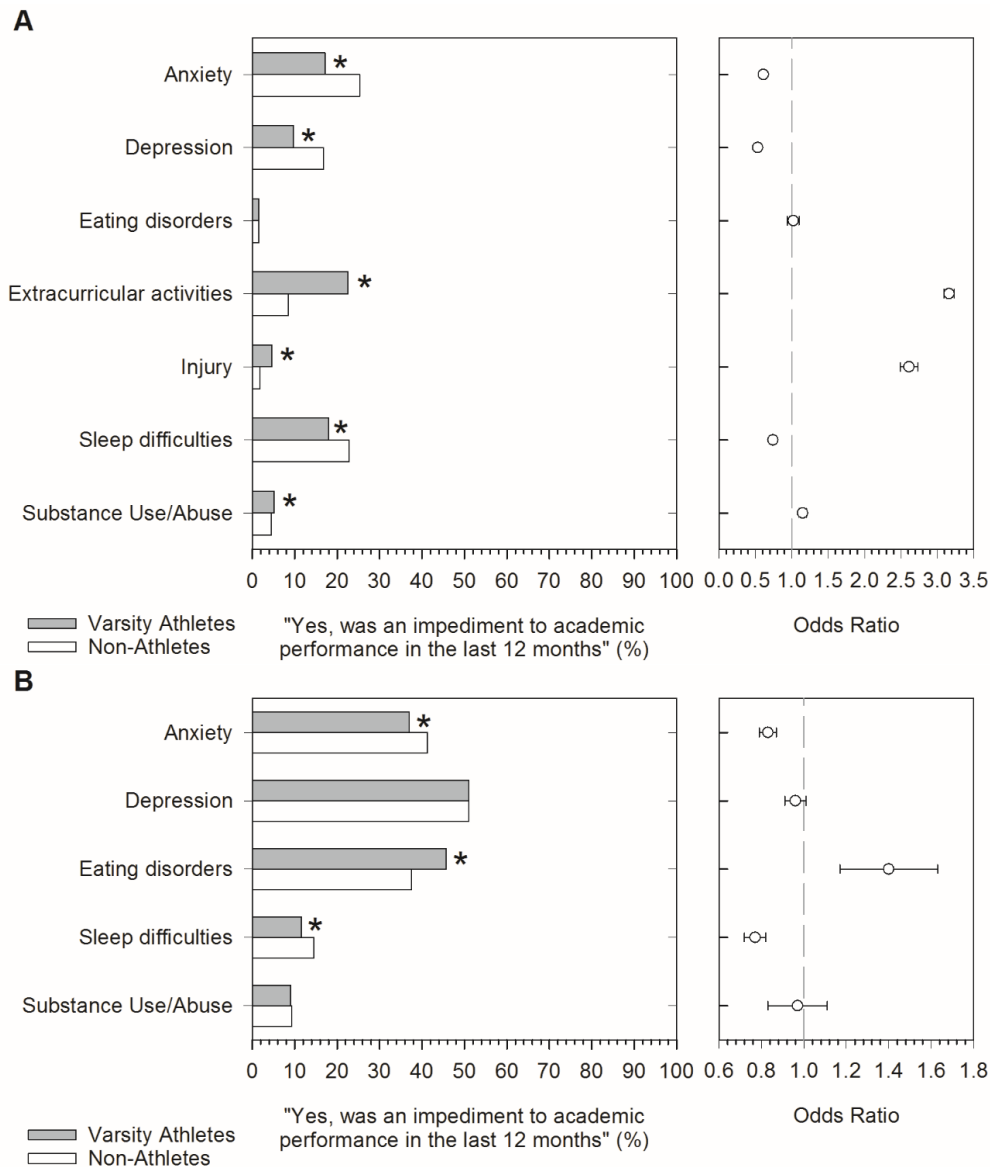


Figure 4.

A. Frequencies of students responding “Yes, in the last 12 months” to the question of whether each of the listed factors was an impediment to academic performance. B. Within students responding that they had either been diagnosed or treated for the corresponding mental health disorder in the last 12 months, bars represent the frequencies of students who reported that the related factor was an impediment to academic performance. For both panels, gray bars represent Varsity Athlete response frequencies, and white bars represent Non-Athletes. Open circles are odds ratios (ORs) with 95% CIs (error bars) for the odds that Varsity Athletes reported that a given factor was an impediment to academic performance, compared to the Non-Athlete reference group. An asterisk next to a Varsity Athlete bar indicates a significant between-groups difference in response frequencies for that impediment to academic performance (for each, $P < 0.001$).

Among students reporting either an untreated diagnosis or treatment for a specific mental health domain, students who reported receiving treatment as opposed to having an untreated diagnosis more frequently reported that the same factor was an impediment to academic performance. This pattern was observed for anxiety, depression/mood disorders, eating disorders, and substance use/abuse (for each, $p < 0.001$). The interaction between athlete group and treatment was not significant for anxiety ($p = 0.005$), depression ($p = 0.148$), or eating disorders ($p = 0.041$), but was significant for substance use/abuse ($p < 0.001$). Both groups were more likely to report substance use/abuse as an academic impediment if they were also receiving treatment for it, versus having been diagnosed but not treated. In Varsity Athletes, however, this effect was roughly double the size of the effect in Non-Athletes (OR: 2.53 vs. 1.35, respectively). See Figure 5. There was no significant effect of treatment on sleep as an academic impediment ($p = 0.713$).

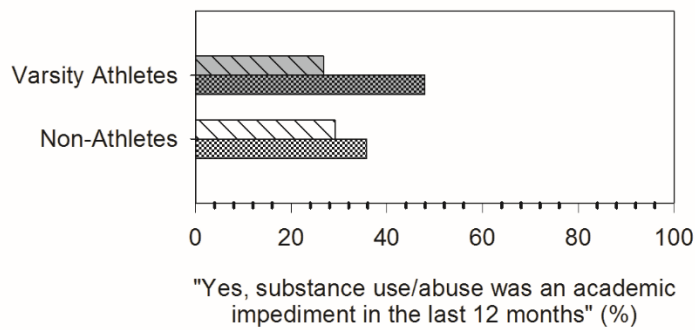


Figure 5.

Frequencies of Varsity Athletes (gray bars) and Non-Athletes (white bars) reporting that substance use/abuse was an academic impediment, within only those students who also received either a corresponding diagnosis or treatment for an addiction disorder. Responses are grouped by whether the students received a diagnosis but were not treated (diagonally-striped bars), or were treated (shaded bars).

Discussion

The present study analyzed national college student survey data on mental health diagnoses, treatment-seeking behavior, and impacts of mental health issues on academic performance, comparing Varsity Athletes to Non-Athletes. Overall, the study's hypotheses were supported. Aside from addiction and eating disorders, Varsity Athletes had significantly lower rates of mental health diagnoses than Non-Athletes, and aside from attempted suicide, rates of mental health symptoms were also lower in Varsity Athletes. Although Varsity Athletes and Non-Athletes diagnosed with a mental health disorder sought subsequent treatment at similar rates, Varsity Athletes who reported symptoms related to anxiety and depression less often sought treatment than did Non-Athletes. Finally, Varsity Athletes experienced a lower impact of anxiety and depression on academic performance compared to Non-Athletes, but the impacts of alcohol and drugs, extracurricular activities, and injuries on academic performance were significantly more common in Varsity Athletes. The one hypothesis that was not supported was

that students who received mental health treatment would report less effect of mental health issues on academic performance. Contrary to this expectation, both Athletes and Non-Athletes reporting that they had received treatment for a specific mental health disorder were *more* likely to report that the same disorder had negatively affected their academic performance in the last 12 months. Each of these results is discussed in more detail below.

With regard to symptoms, there are several interacting explanations for the observation that Varsity Athletes reported symptoms significantly less frequently than did Non-Athletes (with the exception of attempted suicide). For instance, lower reporting rates may be the result of discomfort expressing that one has experienced serious mental health symptoms. Fear of public judgement and the stigma that comes with discussing mental health may impede individuals from getting the help they need. This fear may be amplified in Varsity Athletes, who have more notoriety placed on them compared to Non-Athletes and thus more perceived risk of public humiliation (Mahr, 2021). However, the anonymous nature of the NCHA survey may serve to reduce this effect on reporting rates. Alternatively, Varsity Athletes may report mental health symptoms less often due the impact of higher physical activity levels in Varsity Athletes compared to Non-Athletes. While some Non-Athletes certainly exercise at varying intensity levels and frequencies, their overall level of physical activity is likely less than that of Varsity Athletes. Various studies have demonstrated that aerobic and anaerobic (high intensity strength training) exercise can have a positive impact on depression and other mental health symptoms (Blumenthal et al., 2007; Dunn et al., 2005; Singh et al., 2005). Social factors such as access to coaches, trainers, and teammates may also provide Varsity Athletes with a more extensive and intimate social network compared to Non-Athletes, which can also support better mental health (Graupensberger et al., 2021).

In addition to Varsity Athletes reporting mental health symptoms less frequently, the results also showed that diagnosis rates among Varsity Athletes are significantly lower than the Non-Athletes regardless of corresponding treatment. This particular outcome raises concerns but may also provide an opportunity to help those who are experiencing symptoms. In the aforementioned sub-sample of students who received a diagnosis/treatment, the same proportion of Varsity Athletes and Non-Athletes received treatment. This means that Varsity Athletes are as likely as Non-Athletes to receive a diagnosis and then pursue treatment (or put another way, are no more likely to receive a diagnosis and then choose not to receive treatment). However, when symptoms related to anxiety and depression were analyzed in relation to corresponding diagnoses and/or treatment, Varsity Athletes more frequently reported the symptom but then reported neither a diagnosis nor treatment. This suggests that when Varsity Athletes struggle with anxiety and depression, they less frequently take the opportunity to visit the appropriate mental health professional to receive a diagnosis or treatment, compared to Non-Athletes.

Therefore, while we see a similar frequency between Varsity Athletes and Non-Athletes from a diagnosis to treatment transitions, Varsity Athletes may still be worse off because they less frequently take the step from symptom to diagnosis. This observation points to an area of emphasis and screening that needs to be augmented on college campuses, in particular in athletic departments. The goal should be to get the students to the appropriate mental health professional as quickly as possible, particularly given no between-groups difference between in attempted suicide despite a lower overall mental health burden in Varsity Athletes. Recognition and referral by athletic trainers, coaches and other support staff within the athletic department can provide those Varsity Athletes struggling with mental health symptoms an opportunity to receive the help they need from the appropriate mental health professional (Neal et al, 2013).

In terms of academic impediments, studies have shown a direct relationship between mental health and academics, demonstrating for example that depression has a significant negative impact on academics comparable to a physical illness (Bostani et al., 2014). Our results agree, showing that a substantial proportion of both Varsity Athletes and Non-Athletes find that mental health issues have negative effects on academic performance. These rates are lower in Varsity Athletes for anxiety, depression, and sleep disorders, corresponding to their overall lower reported mental health burden, and corroborating previous studies' findings (Wyatt & Oswalt, 2012). In contrast, a significantly higher proportion of Varsity Athletes reported negative academic impacts of substance use/abuse, extracurricular activities, and injuries. The latter two are not surprising, in that Varsity Athletes devote an enormous amount of time to extracurricular athletics and are more likely than Non-Athletes to suffer injuries due to their very high physical activity levels. The increased impact of substance use/abuse on academics among Varsity Athletes is of concern, although is not a novel observation. Previous studies have shown that Varsity Athletes use alcohol and other drugs at higher rates than other college students (Ford, 2007). Prevention efforts should be increased to minimize the effect of athlete substance use on academic performance and other mental health factors.

One of the more interesting results of this study was that among students reporting a recent mental health diagnosis, those who were being treated tended to more frequently report that the condition also negatively impacted their academic performance, compared to those who were diagnosed but not treated. One particularly illustrative example was the significant interaction effect of athlete status and treatment in the context of substance use/abuse as an impediment to academic performance. Varsity Athletes and Non-Athletes alike who were being treated for addiction disorders were much more likely to report substance abuse as an academic impediment than those who had received a diagnosis but no treatment. Among Varsity Athletes, the size of this effect was almost double that observed in Non-Athletes. Again, given that athletes have been repeatedly shown to use and abuse substances more often than non-athletes, particularly in the form of binge drinking (Ford, 2007), it stands to reason that substance abuse is more likely to affect their ability to perform academically, which may spur them to seek treatment to protect their scholarships.

This finding was the reverse of what we had hypothesized. The original hypothesis was based on the rationale that treatment should lessen symptoms and thus the degree to which they hinder academic performance. However, there are several possible explanations for the observed relationship, although they remain speculative in the narrow context of this study's data. On the one hand, it is plausible as suggested above that students who ended up seeking diagnosis and treatment did so more often specifically because the issue was causing academic difficulties. In other words, the negative effect of a mental health issue on academic performance may be a driver of treatment-seeking in some students. This driving force may be stronger in Varsity Athletes who have academic-performance-dependent athletic scholarships to maintain, and among whom certain symptoms/disorders such as substance abuse pose a significant challenge. Alternatively, the correlation between academic impacts and treatment-seeking may relate to factors such as personality traits, exposure to health education, or even socioeconomic factors such as parents' educational attainment, which influence individual relationships to institutions such as education and health care (i.e., institutional trust; Power et al., 2005). Individuals who are more prone to recognizing that their academic performance is slipping and are motivated to reverse the trend, may also be more cognizant of their own mental health and have an inclination toward, and comfort level with, treatment-seeking. It is not possible in this dataset to distinguish

between these competing explanations, largely because the study reveals correlation and not causation. Still, the association between receiving treatment for a mental health issue and a higher propensity to report it as an academic impediment is a potentially important finding. This observation has possible implications for teaching students how to self-screen for mental health issues, and for identifying those individuals who may be less motivated to seek treatment, warranting further study.

Limitations

A limitation in this study is that all data are self-reported, introducing the potential for some error due to dishonest answers. However, the anonymous nature of the survey minimizes this effect, and the sample is likely large enough to “wash out” a low rate of dishonest responses. We recognize that the non-binary category incorporates a considerable diversity of specific gender identities, with possibly varying levels of challenges to mental health. Moreover, we do not consider sexuality or its intersection with gender in our analyses. These are potential limitations in our analyses, but are beyond the scope of the present study. We aim to address these issues in future studies. Another possible limitation is survey non-response, to the extent that the sample may not be fully representative of any of the defined student groups if large numbers of students simply refused to complete the survey. It is possible that survey non-response would be biased toward those with prior mental health diagnoses or Varsity Athletes, but we have no way of determining whether this is in fact true. Finally, there is slight potential that individual students took the survey in multiple semesters, and thus multiple responses from the same individuals may be included in the data. There were no available documented procedures to prevent this occurrence at any of the included institutions, nor is there any way to identify serial entries in an anonymous survey. If in fact the survey dataset contains large numbers of repeated measures (which is unlikely), then the confidence intervals reported for this study are artificially narrow. Thus, the reader is cautioned to interpret the results while considering the possibility that the analyzed sample is not truly randomly generated with respect to the study variables, and that a likely low rate of repeated observations may have produced marginally narrowed confidence intervals.

Conclusion

In conclusion, the results of this study point to specific areas for institutions to consider in developing policies and procedures for promoting mental health. The findings are relevant to all student populations but identify particular areas of emphasis for Varsity Athletes. Perhaps most important for Varsity Athletes is the development of anonymous treatment opportunities that will encourage students with symptoms to seek treatment. Helping Varsity Athletes feel safe and removing the stigma of mental health disorders and their treatment is key to this effort. Ideally, increased treatment-seeking as a result of lessening stigmas will curb higher levels of substance abuse as a possible coping mechanism in Varsity Athletes, as well as reduce the probability of attempted suicide.

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