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Trends in Collegiate Student-Athlete Mental Health in the National College Health Assessment, 2011–2019

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Context: Recently, the athletic training community has paid increased attention to collegiate student-athlete mental health, mental health treatment-seeking behavior, and the effects of mental health factors on athletic and academic performance. Ongoing efforts to better educate and equip athletic trainers to help student-athletes in this regard should result in improved mental health–related outcomes.

Objective: To examine changes in the mental health of student-athletes over the past decade compared with that of nonathlete students.

Design: Cross-sectional study.

Setting: Colleges and universities in the United States.

Patients or Other Participants: Varsity athletes (athletes; n = 54 479) and nonathlete students (nonathletes; n = 448 301) who completed the National College Health Assessment between 2011 and 2019.

Main Outcome Measure(s): Surveys included responses (self-reported) to questions in 5 mental health–related categories: recent mental health symptoms, recent mental health diagnosis, mental health treatment-seeking behavior, receiving mental health information from the institution, and the recent effect of mental health factors on academic performance.

Results: Athletes consistently described lower symptom and diagnosis rates compared with nonathletes, except for attempted suicide, substance abuse, and eating disorders. Rates of diagnosis increased over time in both groups but remained lower in athletes. Treatment-seeking behavior and openness to future treatment increased over time in both groups but remained lower in athletes. Athletes received more information on stress reduction, substance abuse, eating disorders, and handling distress or violence compared with nonathletes. Both groups received information more frequently over time. Athletes reported fewer academic effects, especially for depression and anxiety, but these effects grew over time in both groups. The effects of injuries and extracurricular activities on academic performance were greater in athletes than in nonathletes.

Conclusions: Athletes described overall lower levels of mental health symptoms, diagnoses, and academic effects compared with nonathletes. Whereas the rates in nonathletes climbed over the past decade, the rates in athletes broadly remained flat or climbed less rapidly. Increasingly positive attitudes toward treatment were encouraging, but the deficit in athletes relative to nonathletes persisted. Ongoing efforts of athletic trainers to educate athletes and guide them to mental health resources are needed to continue, or better yet to accelerate, the observed positive trends in information dissemination and treatment-seeking behavior.

Key Words: college demographic, treatment seeking, national survey, time series analysis, health education

Key Points

- Student-athletes reported lower rates of most mental health symptoms, diagnoses, and effects on academic performance compared with nonathlete students.
- Self-reports of anxiety, mood disorders, and other mental health challenges increased over the past decade in nonathletes but remained largely flat or increased less rapidly in student-athletes.
- Treatment-seeking behavior and willingness to seek future treatment increased over time in student-athletes, which may have been related to increases in mental health information received from the institution, but their rates still lagged behind those of nonathletes.

The National Institute of Mental Health has estimated that 51.5 million adults in the United States live with a mental health condition.[1] Mental health conditions are particularly prevalent among young adults between 18 and 25 years of age (29.4%) compared with adults aged 26 to 40 years (25.0%) and adults aged ≥50 years (14.1%).[1] As young adults, collegiate student-athletes are not exempt from mental health conditions. Data from the 2011–2019 National College Health Assessment (NCHA) showed that of 55 369 varsity athletes responding to the survey, 19.0% (n = 10 520) indicated they had been diagnosed with a mental health condition.[2] Although it was encouraging that student-athletes self-reported mental health diagnoses at a lower rate than their peers, several aspects of collegiate student-athlete mental health remained understudied and may have acted as barriers to improvement.

One of the most important concerns in collegiate student-athlete mental health was the underuse of mental health services.[3] Barriers to seeking treatment included not only

limited time and a lack of services but also social and self-imposed stigmas for seeking treatment originating from family, community, teammates, and cultural contexts.[4] Such stigmas exist in the broader society but may be exacerbated among athletes, for whom concepts such as "mental toughness" contribute to a reluctance to address mental health conditions. These impediments to seeking the appropriate diagnosis and treatment can have detrimental effects on well-being and quality of life, as well as on athletic and academic performance.

Despite persistent barriers to treatment, recognition of the athlete's mental health and treatment needs has grown recently.[5] Many colleges and universities have become more aware and proactive in helping student populations, offering a variety of on- and off-campus counseling services. This is certainly a step in the right direction of offering primary preventive measures, but the stigma of mental health still exists and profoundly affects student-athletes. Therefore, secondary preventive measures need to be addressed. One of the most important and available secondary resources student-athletes can access is the athletic trainer (AT). The majority of intercollegiate athletic teams have a dedicated AT, meaning that each athlete has direct access to a trained medical professional. Although ATs are not typically licensed to practice counseling or psychotherapy, they are educated and trained in recognizing mental health conditions and referring athletes to appropriate mental health professionals.[5,6]

The roles and capabilities of ATs in promoting student-athlete mental health have expanded in recent years, with the intended effects of increasing awareness, reducing stigma, and improving treatment-seeking behavior. In 2011, the Commission on Accreditation of Athletic Training Education (CAATE) released a new set of 18 educational competencies for psychosocial intervention: 5 related to theoretical background, 5 related to psychosocial strategies, and 8 related to mental health referral.[7] These were revised and integrated into the 2020 CAATE standards.[5,8] In 2013, a group of leading experts from the National Athletic Trainers' Association (NATA) developed a consensus statement of best practices for managing mental health conditions among collegiate student-athletes.[9] This statement provided a blueprint for ATs to act as a resource for student-athletes living with mental health conditions, focusing on behaviors to monitor, the use of preparticipation physical examinations as an opportunity to assess student-athlete mental health, and tactics for approaching a student-athlete exhibiting symptoms of a mental health condition.[9] These NATA guidelines were subsequently the basis for the National Collegiate Athletic Association's 2016 mental health best-practices consensus document.[10]

The latest increase in awareness of student-athlete mental health, as well as increasing calls for an active role of the AT as the first order of intervention in student-athlete mental health conditions, is encouraging. As a consequence, it is reasonable to expect that student-athlete mental health and treatment-seeking behavior should be improving, as colleges or universities and their ATs provide athletes with more and easier avenues for accessing mental health resources. Whether this heightened emphasis on student-athlete mental health has produced the desired results, however, remains unclear. Therefore, the purpose of our study was to examine changes in the mental health of student-athletes over the past decade compared with that of nonathlete students. We used a retrospective cross-sectional design and 8 academic years of data from the NCHA (2011–2012 to 2018–2019) to test the hypothesis that matters related to student-athlete mental health have improved over the recent past. Time trends and differences between athletes and nonathlete students were analyzed in 5 categories: recent mental health symptoms, recent mental health diagnosis, mental health treatment-seeking behavior, receiving mental health information from the institution, and the recent effect of mental health factors on academic performance.

METHODS

Data Collection and Analysis

Data were obtained from the NCHA surveys IIb (2011–2015) and IIc (2015–2019) of the American College Health Association (ACHA; data file distributed February 10, 2020, by ACHA).[11] The NCHA survey was administered nationwide to students at participating institutions, with questions regarding health habits, health behaviors, and perceptions of health-related topics. The anonymous, self-reported data were meant to help college health service providers, educators, counselors, and administrators better understand the health of their students and the students at comparable institutions. The dataset also provided us with opportunities to study nationwide trends in student health. Survey reliability and validity were well documented.[11]

We accessed and analyzed the NCHA data under a data-sharing agreement with ACHA. The Wright State University Institutional Review Board determined this study's procedures were exempt from oversight. Data from the full national sample between fall 2011 and spring 2019 were accessed. To limit the analysis to full-time undergraduate students, we excluded respondents self-identifying as graduate, professional, non–degree-seeking, or part-time students. Observations from schools with Basic Carnegie Classifications of Special Focus Research Institutions or Miscellaneous/Not Classified were also excluded.

Of primary interest were the effects of 2 independent variables: time and athlete status. The NCHA was administered each semester, excluding summer semesters, and the dataset included a variable ("STUDY") coding for the semester in which responses were obtained. For ease of interpretation and to ensure consistency in ordinal time intervals, we created a dummy variable, grouping pairs of semesters into academic years. Thus, the time variable *academic year* consisted of 8 levels corresponding to academic years 2011 through 2012 to 2018 through 2019.

Athlete status was determined using the 3 parts of survey question 64: "In the last 12 months, have you participated in organized college athletics at any of the following levels?" with *yes* or *no* response options for *varsity*, *club sports*, and *intramurals*. Students responding *yes* to *varsity* were assigned to the category *athlete*, including students who also replied *yes* to *club sports* or *intramurals*. Students responding *no* to *varsity* but *yes* to *club sports*, *intramurals*, or both were excluded, as our focus was on scholarship athletes who routinely interacted with college-employed

Table 1. Study Outcomes

Category	Outcome	National College Health Assessment Question(s; NQ)[a]
1. Recent mental health symptoms (last 12 mo)	Felt things were hopeless	NQ30A
	Felt overwhelmed by all you had to do	NQ30B
	Felt exhausted (not from physical activity)	NQ30C
	Felt very lonely	NQ30D
	Felt very sad	NQ30E
	Felt so depressed that it was difficult to function	NQ30F
	Felt overwhelming anxiety	NQ30G
	Felt overwhelming anger	NQ30H
	Intentionally cut, burned, bruised, or otherwise injured yourself	NQ30I
	Seriously considered suicide	NQ30J
	Attempted suicide	NQ30K
2. Recent mental health diagnosis (last 12 mo)	Anxiety	NQ31A2, NQ31B1-3
	Mood	NQ31A4, NQ31A6
	Addiction	NQ31B5-6
	Eating	NQ31A1, NQ31A5
	Sleep difficulties	NQ31A7-8
	Other	NQ31A3, NQ31B4, NQ31B7
	Any	NQ31A1-8, NQ31B1-7
3. Recent mental health treatment-seeking behavior	Ever received psychological or mental health services from any provider	NQ34A-D, NQ35
	Consider seeking help from a mental health professional in the future	NQ36
4. Receiving mental health information from the institution	Alcohol and other drug use	NQ2A1
	Depression or anxiety	NQ2A3
	Eating disorders	NQ2A4
	Grief and loss	NQ2A5
	How to help others in distress	NQ2A6
	Relationship difficulties	NQ2B2
	Sexual assault or relationship violence prevention	NQ2B3
	Sleep difficulties	NQ2B5
	Stress reduction	NQ2B6
	Suicide prevention	NQ2B7
	Violence prevention	NQ2B9
5. Recent impact of mental health factors on academic performance (last 12 mo)	Anxiety	NQ45A3
	Depression	NQ45B4
	Substance use	NQ45A1, NQ45B6
	Eating disorders or problems	NQ45B7
	Sleep difficulties	NQ45D4
	Injury	NQ45C3
	Participation in extracurricular activities	NQ45C6

[a] All listed question numbers and wordings are the same for National College Health Assessment surveys IIb and IIc (data file distributed February 10, 2020, by the American College Health Association).[11]

ATs. Students responding *no* to all 3 choices were assigned to the category *nonathlete*. We recognized that students in the latter group may have been physically active or have competed athletically outside of college-organized structures, but that was beyond the ability of the survey to determine.

Outcomes were grouped into 5 categories: recent mental health symptoms, recent mental health diagnosis, mental health treatment-seeking behavior, receiving mental health information from the institution, and the recent effect of mental health factors on academic performance. Specific outcomes in each category are presented in Table 1. Questions in the category "receiving mental health information from the institution" were structured in the original survey as binary *yes* or *no* response choices and were thus used without recoding. Questions in the remaining categories had $\geq$3 response choices, which we recoded into binary *yes* or *no* answers to simplify interpretation.

Recent mental health symptoms responses were condensed into *no, not in the last 12 months*, or *yes, in the last 12 months*. Recent mental health diagnosis responses were condensed into *no, no diagnosis or treatment within the last 12 months*, or *yes, diagnosis and/or treatment within the last 12 months*. Mental health diagnoses were grouped into 6 larger categories corresponding to established mental health taxonomy: *addiction disorders* (substance abuse, other addiction), *anxiety disorders* (anxiety, obsessive-compulsive disorder, panic attacks, phobia), *eating disorders* (anorexia, bulimia), *mood disorders* (bipolar disorder, depression), *sleep disorders* (insomnia, other sleep disorders), and *other* (attention-deficit/hyperactivity disorder, schizophrenia, other mental health conditions).

For past mental health treatment-seeking behavior, responses were condensed to *no, never*, or *yes, ever*. For consideration of future mental health treatment-seeking behavior, the survey allowed only *yes* or *no* responses, so this variable was not recoded. Recent effect of mental

health factors on academic performance was chosen to correspond to the mental health diagnosis categories plus 2 factors expected to affect athletes more than nonathletes: injuries and extracurricular activities. Responses for each were condensed to *no, did not affect my academic performance in the last 12 months*, or *yes, affected my academic performance in the last 12 months*.

Gender and sexuality, race and ethnicity, age, and institutional attributes (public versus private, enrollment and campus size, and degrees awarded and level of research activity) all exerted influences on mental health symptoms, diagnoses, treatment-seeking behavior, and stigma.[12–18] To isolate the effects of time and athlete status independent of these influences, we included them as covariates in statistical analyses. Because gender-identity questions differed between NCHA-IIb and NCHA-IIc, we recoded responses into 3 mutually exclusive categories for consistency: cis-male (hereafter, *men*), cis-female (hereafter, *women*), and nonbinary (*anyone not a man or woman*). The nonbinary category incorporated a range of specific gender identities, reducing analytical granularity. We also did not consider sexual orientation or its relationship to gender. These were limitations to understanding the influences of gender and sexuality on student-athlete mental health, but this was beyond the scope of our work. The tripartite gender model was likely sufficient to control for gender as a covariate in this study's context. We intend to closely examine the influences of gender identity and sexual orientation on student-athlete mental health in future research.

The NCHA included multiple questions regarding racial and ethnic self-identification. We recoded data to create a single race–ethnicity variable, with 6 mutually exclusive categories: American Indian, Alaskan Native, or Native Hawaiian; Asian or Pacific Islander; Hispanic of any race; non-Hispanic Black; non-Hispanic White; and biracial or multiracial.[19] As with gender, this rubric oversimplified complex influences of racial or ethnic backgrounds on college experiences and relationships to mental health, stigma, and treatment-seeking behavior. However, for our purposes, this model was likely sufficient. We intend to conduct a finer-grained analysis of these effects in future investigations.

Age was used as a demographic descriptor, but years in college represented age in the study's models. Age and years in college were highly correlated (Spearman $\rho = 0.87$, $P < .001$), making the inclusion of both in statistical models redundant. We chose years in college because it largely accounted for the variation in age and was related to the length of time a student was exposed to (and could adjust to) college stressors, had access to college mental health information and services including ATs, and participated in athletics. Finally, institutional attributes were incorporated directly from the NCHA data, including dichotomous institutional control (public or private), total enrollment (<2500, 2500–4999, 5000–9999, 10 000–19 999, ≥20 000), and Basic Carnegie Classification (associate's colleges, baccalaureate colleges, master's colleges and universities, research institutions).

Statistical Analysis

Demographic data, academic information, and institutional attributes were compared between groups using independent-samples *t* tests for continuous variables and χ^2 tests for categorical or ordinal variables. Effect-size estimates for comparisons were derived using the Cohen *d* (standardized difference between means) for continuous variables and Cramer V for categorical or ordinal variables.[20,21] Effect sizes were interpreted as follows: *marginal* (<0.20), *small* (0.20–0.49), *medium* (0.50–0.79), or *large* (≥0.80).

The effects of time and athlete status on each mental health–related outcome were analyzed using binomial logistic regression analysis. The effect of primary interest for each outcome was the time-by-athlete status interaction. When this interaction was absent, we removed it from the model and analyzed the main effects of time and athlete status. All models included the demographic and institutional covariates detailed earlier. Odds ratios (ORs) with 95% CIs were calculated for interactions and main effects after adjustment for covariate effects. Interaction ORs expressed the log odds of each outcome in athletes relative to nonathletes (reference) on an academic-year-by-academic-year basis. The ORs for the main effect of athlete status expressed the log odds of each outcome in athletes relative to nonathletes (reference) across all academic years. The ORs for the main effect of time expressed the log odds of each outcome per academic year relative to the reference academic year of 2011–2012, across all students. The ORs for time were also extrapolated to express cumulative effects across the 8-year study period (ie, 2018–2019 versus 2011–2012). To aid in interpretation, we converted ORs to approximate values of Cohen *d* (following Hasselblad and Hedges[22]; Appendix Table).[21]

Statistical analysis was performed using SAS 9.4 (SAS Institute Inc). Given the large sample and statistical power to detect significance for even small effect sizes and to adjust for testing multiple hypotheses (Table 1), we set the α level at .001.

RESULTS

Sample Characteristics

After applying exclusion criteria, we analyzed a sample of 502 780 participants representing 607 unique institutions. The median of academic years per institution was 2 (interquartile range = 1–3, range = 0.5–8); the median of observations per institution was 540 (interquartile range = 225–1105, range = 1–8763). The sample consisted of 54 479 athletes and 448 301 nonathletes. Distributions for descriptive variables and institutional characteristics differed between groups (for each, $P < .001$), but the effect sizes were small to marginal except for age (Table 2).

Logistic Regression Analysis

Full logistic regression statistical results are presented in the Appendix Table. Overall models for each outcome were different (for each, $P < .001$). Detailed results for each outcome category follow.

Recent Mental Health Symptoms. We observed a time-by-athlete status interaction for feeling hopeless, overwhelmed, exhausted, very lonely, very sad, depressed to the point of functional difficulty, overwhelming anxiety, and overwhelming anger (for each, $P < .001$). In each case, the frequencies of *yes* responses were lower in athletes than in nonathletes for every year (Figure 1). For intentional

Table 2. Student and Other Characteristics

Variable	Athletes (n = 54 479)	Nonathletes (n = 448 301)	*t* Value (502,778)	*P* Value	Effect Size[a]
	Mean ± SD				
Age, y	19.7 ± 1.4	20.5 ± 2.3	79.4	<.001	0.65
Time in college, y	2.2 ± 1.2	2.5 ± 1.2	55.1	<.001	0.25
	Frequency, %		χ^2 (*df*) Value		
Gender[b]			2795.4 (2)	<.001	0.07
Women	62.4	72.1			
Men	36.7	26.2			
Nonbinary	0.9	1.7			
Race or ethnicity[c]			5643.9 (5)	<.001	0.09
American Indian, Alaskan Native, or Native Hawaiian	0.4	0.4			
Asian or Pacific Islander	4.7	11.6			
Biracial or multiracial	10.5	12.3			
Hispanic of any race	4.5	10.5			
Non-Hispanic Black	5.4	4.9			
Non-Hispanic White	74.5	60.3			
Institutional control, %			18 246.6 (1)	<.001	0.19
Public	40.3	69.3			
Private	59.7	30.7			
Total enrollment			28 235.1 (4)	<.001	0.24
<2500	28.7	9.6			
2500–4999	18.3	8.9			
5000–9999	20.1	16.9			
10 000–19 999	16.9	25.1			
≥20 000	16.0	39.4			
Basic Carnegie classification			16 923.2 (3)	<.001	0.18
Associate's colleges	3.8	5.2			
Baccalaureate colleges	31.9	12.7			
Master's colleges and universities	34.0	31.6			
Research institutions	30.3	51.5			

[a] Effect sizes are Cohen *d* for continuous variables[20] and Cramer V for categorical variables.[21]
[b] Self-descriptions of gender were recoded into 3 mutually exclusive categories for consistency: cis-male (*men*), cis-female (*women*), and nonbinary (*anyone not a man or woman*). See text for additional details.
[c] Racial and ethnic self-descriptions were condensed into 6 mutually exclusive categories. See text for additional details.

self-harm and considering suicide, we did not find interactions (for each, $P \geq .03$) but did find main effects of time and athlete status (for each, $P < .001$). For both outcomes, rates across groups increased over time (intentional self-harm = 6.4%–10.0%, considering suicide = 7.8%–15.0%) but remained slightly lower in athletes across the study period (intentional self-harm = 1–3 percentage points, considering suicide = 3–6 percentage points). For attempted suicide, we did not identify an interaction ($P = .40$) or main effect for athlete status ($P = .04$) but did note a time effect ($P < .001$); athletes and nonathletes alike described increased suicide attempts from approximately 2% during 2011–2012 to approximately 3% during 2018–2019.

Recent Mental Health Diagnosis. We found no interaction for any diagnosis category (for each, $P \geq .002$) but demonstrated a main effect of time for each category (for each, $P < .001$), with recent diagnoses increasing in all categories from 2011–2012 to 2018–2019 (Figure 2). Although some increases were small (eg, 1 percentage point for addiction disorders), substantial increases over time occurred for anxiety (13.0% to 25.4%), mood disorders (10.8% to 20.3%), and overall rates of any diagnosis (20.1% to 32.5%). We observed a main effect for athlete status for most of the mental health diagnosis categories (Figure 2) except for addiction and eating disorders (for each, $P \geq .13$). Athletes reported rates of anxiety, mood, sleep, other, and any mental health diagnoses that were 1 to 7 percentage points lower compared with nonathletes across all years. In particular, diagnosis rates were lower among athletes for anxiety (7 percentage points), mood disorders (6 percentage points), and overall (7 percentage points).

Mental Health Treatment-Seeking Behavior. We did not see an interaction for past mental health treatment ($P = .008$) or consideration of future treatment ($P = .97$). Main effects for time and athlete status were noted for each outcome (for each, $P < .001$; Figure 3). Among all students, the rates of treatment-seeking behavior increased from 37.8% during 2011–2012 to 45.9% during 2018–2019, as did consideration of future treatment (70.2% to 79.6%). Across all years, athletes displayed lower rates compared with nonathletes for past treatment (32.7% versus 42.0%) and consideration of future treatment (69.5% versus 74.6%).

Receiving Mental Health Information From the Institution. We identified an interaction only for information on stress reduction ($P < .001$; for each other outcome, $P > .001$). Athletes more frequently received information on stress reduction than nonathletes, but the gap narrowed slightly over the study period (65.7% versus 59.4% to 69.0% versus 65.9% respectively). For the remaining outcomes, main effects were present for time and athlete status (for each, $P < .001$). More students noted receiving mental health information in more recent years, except for information on eating disorders, which decreased by approximately 4% from 2011–2012 to

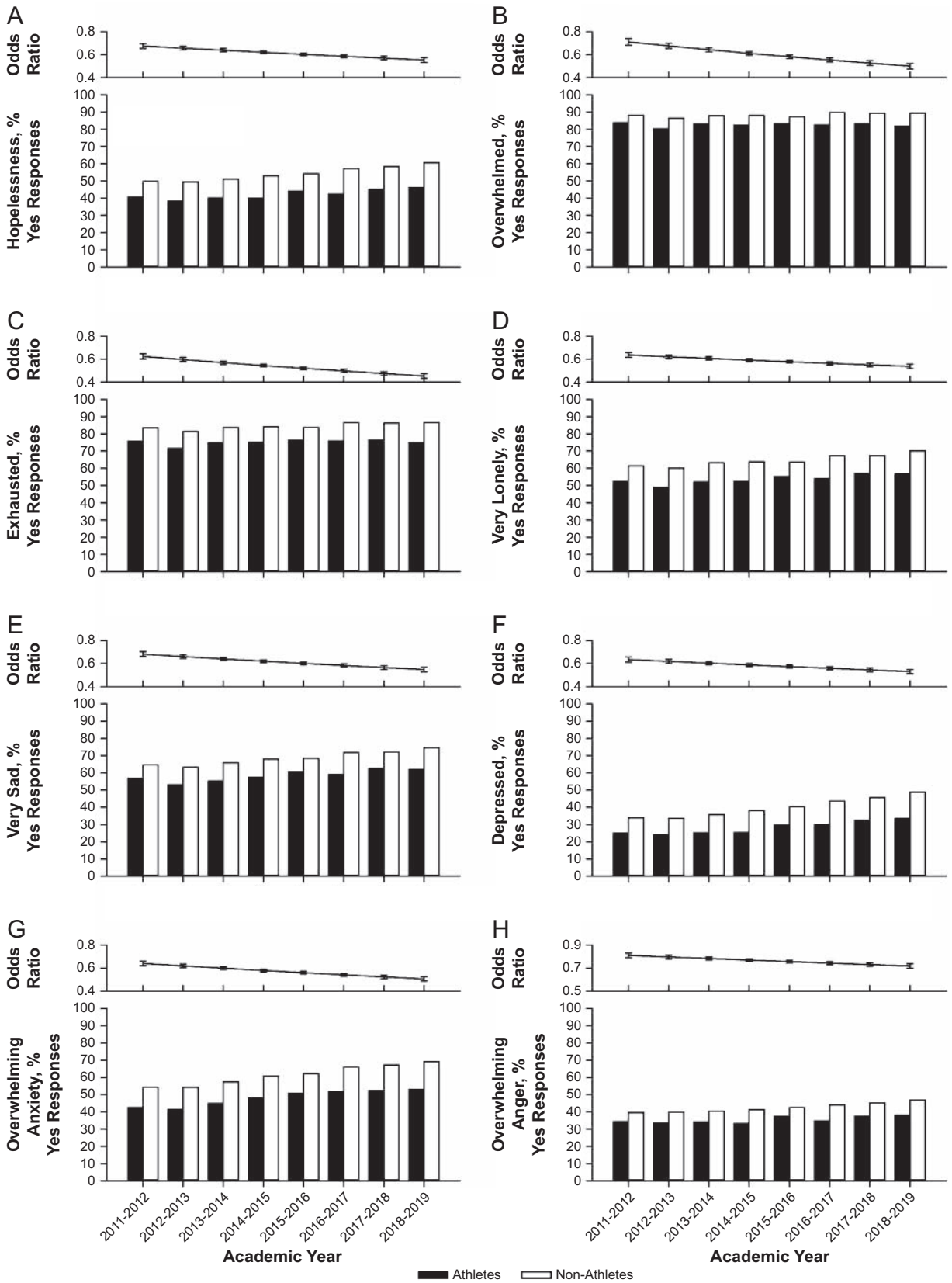

Figure 1. Frequencies of *yes* responses and odds ratios (ORs) for mental health symptoms in the past 12 months presented by academic year for A, hopelessness; B, overwhelmed; C, exhausted; D, very lonely; E, very sad; F, depressed; G, overwhelming anxiety; and H, overwhelming anger, where a time × athlete status interaction was found (for each, $P < .001$). The OR compares the log odds of an athlete's *yes* response to the nonathlete reference for each academic year, with dots representing the OR and error bars representing 95% CIs. An OR <1 means athletes were less likely than nonathletes to respond *yes* for a given mental health symptom in a given academic year, whereas an OR >1 means athletes were more likely than nonathletes to respond *yes* for a given mental health symptom in a given academic year. Where the 95% CI includes the value of 1, no difference occurred in the log odds between athletes and nonathletes.

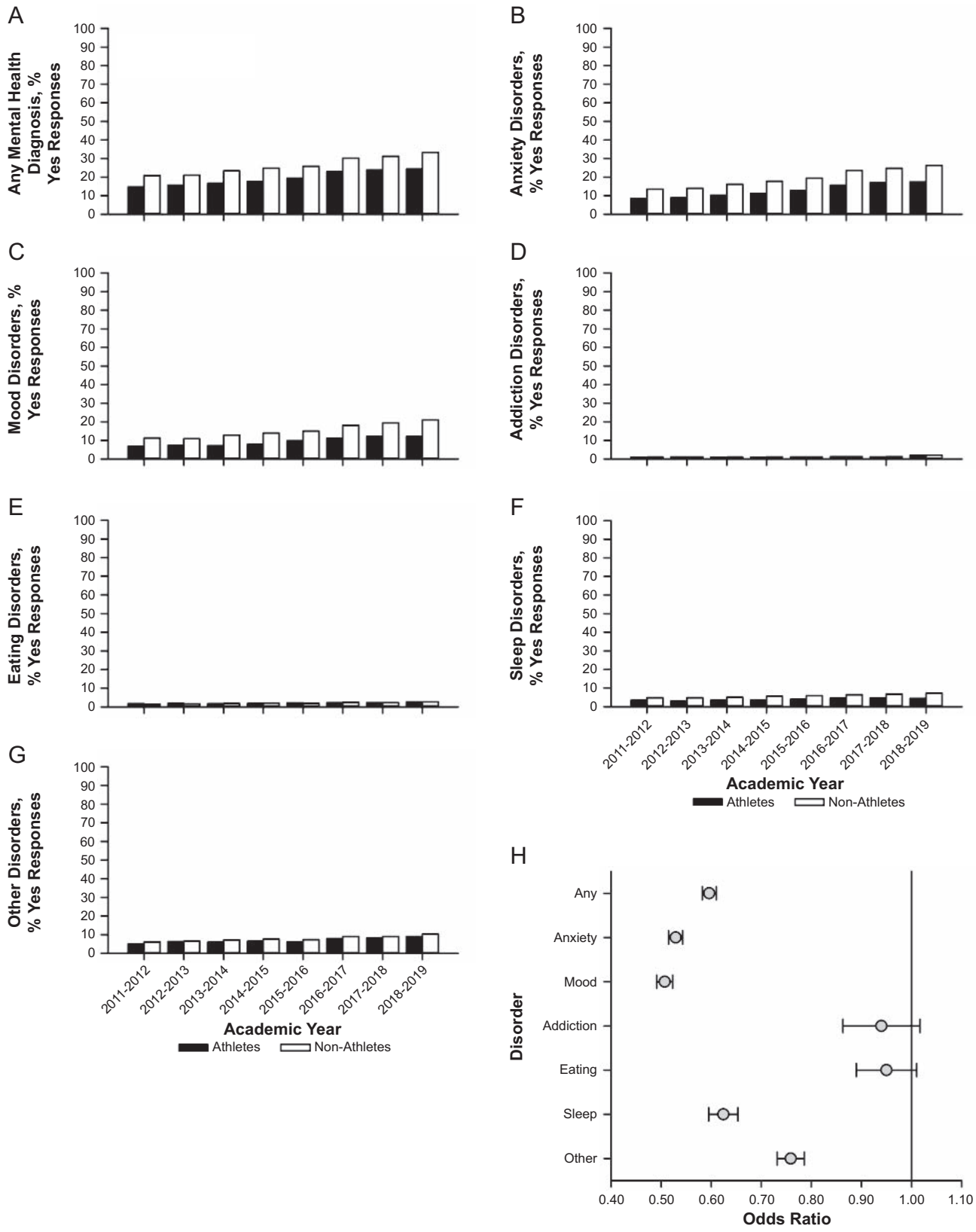

Figure 2. Frequencies of *yes* responses for mental health diagnosis categories in the past 12 months in athletes and nonathletes by academic year. Mental health diagnosis categories were as follows: A, any mental health diagnosis; B, anxiety disorders; C, mood disorders; D, addiction disorders; E, eating disorders; F, sleep disorders; and G, other disorders. A main effect of time was found for each category (for each, $P < .001$). H, odds ratios (ORs) for the main effect of athlete status. Circles represent the log odds of an athlete's *yes* response compared with the nonathlete reference across all academic years, and error bars represent 95% CIs. An OR <1 means athletes were less likely than nonathletes to respond *yes* to a given mental health diagnosis, whereas an OR >1 means athletes were more likely than nonathletes to respond *yes* to a given mental health diagnosis. Where the 95% CI includes the value of 1, no difference occurred in the log odds between athletes and nonathletes. A main effect of athlete status was found ($P < .001$) for each diagnosis category, except for addiction and eating disorders (for each, $P \geq .13$).

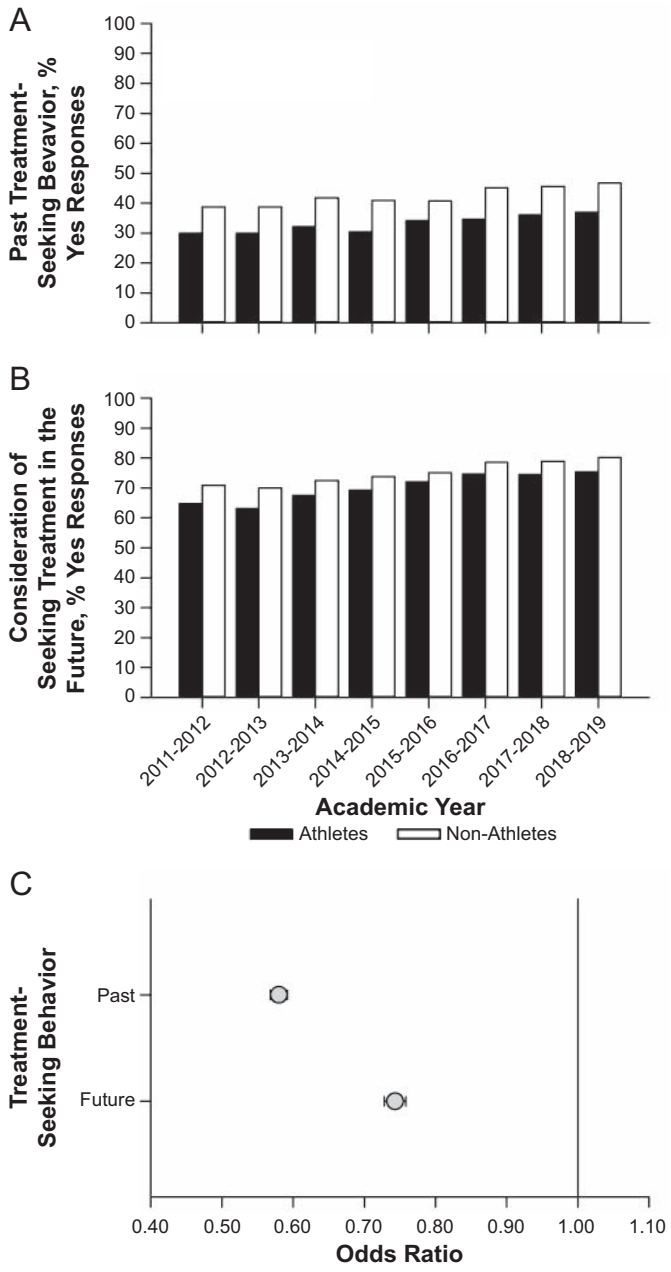

Figure 3. Frequencies of *yes* responses for A, mental health treatment-seeking behavior in the past, and B, consideration of seeking mental health treatment in the future in athletes and nonathletes by academic year. Main effects of time and athlete status were found ($P < .001$) for each question on treatment-seeking behavior. C, Odds ratios (ORs) for the main effect of athlete status. Circles represent the log odds of an athlete's *yes* response compared with the nonathlete reference across all academic years; error bars represent 95% CIs. An OR <1 means athletes were less likely than nonathletes to respond *yes* for treatment-seeking behavior, whereas an OR >1 means athletes were more likely than nonathletes to respond *yes* for treatment-seeking behavior. Where the 95% CI includes the value of 1, no difference occurred in the log odds between athletes and nonathletes.

2018–2019. Especially large increases in receiving information occurred for depression and anxiety (52.8% to 68.7%), helping others in distress (37.0% to 54.0%), sexual assault or relationship violence (65.5% to 82.5%), and suicide prevention (36.0% to 55.7%). Across all years, athletes reported receiving mental health information at rates 4.4 to 16.3 percentage points higher compared with nonathletes. Athletes were especially more likely than nonathletes to receive information about alcohol or drug use (87.8% versus 78.5%), eating disorders (42.9% versus 33.6%), helping others in distress (55.4% versus 46.4%), and violence prevention (71.1% versus 54.8%).

Recent Effects on Academic Performance. An interaction was evident for the academic effects of anxiety and participation in extracurricular activities (for each, $P < .001$) but not for any other factors (for each, $P \geq .01$). Nonathletes displayed increasing rates of anxiety affecting academic performance across the study period (21.9% to 30.4%), whereas athletes consistently showed lower rates of anxiety affecting academics, with a slight increase over time (16.1% to 20.7%; Figure 4). Nonathletes maintained steady rates of extracurricular activities affecting academic performance (8.1% to 9.4% across the study period), while athletes reported consistently higher effects, with a slight decrease over time (24.4% to 21.0%; Figure 4).

Of the remaining outcomes, the main effect of time was demonstrated for all ($P < .001$) but injuries ($P = .71$), as was the main effect of athlete status for all ($P < .001$) except eating disorders or problems ($P = .39$). Athletes consistently less frequently recounted the effects of depression compared with nonathletes (9.9% versus 17.0%), but rates increased over time in both groups (to 12.8% and 21.2%, respectively). For sleep disturbances, 18.0% of athletes acknowledged an effect on academic performance versus 22.9% of nonathletes, with only marginal increases over time across all students (from 22.0% to 23.8%). Injury effects were low in both groups but slightly higher among athletes (4.6% versus 1.8%). Overall rates were low in both groups for the effects of substance use (athletes = 5.1%, nonathletes = 4.5%) and eating disorders (athletes = 1.5%, nonathletes = 1.5%), with marginal changes over time (substance use = 5.2% to 4.1%, eating disorders = 1.1% to 1.9%).

DISCUSSION

We investigated trends from 2011 to 2019 in athlete and nonathlete college students' self-reported rates of mental health symptoms, diagnosis, treatment-seeking behavior, receiving information from institutions, and effects on academic performance. Overall, athletes reported mental health symptoms and diagnoses at lower rates compared with nonathletes across the study period. Nonathlete symptom-reporting rates increased over the study period, while athlete rates tended to remain flat. In contrast, both groups increasingly described mental health diagnoses over the study period, although athletes' rates were consistently lower than those of nonathletes. Both groups demonstrated increases in treatment-seeking behavior and openness to future treatment, but athletes continued to demonstrate treatment-positive attitudes at lower rates compared with nonathletes. The gap in treatment-seeking behavior was especially interesting considering that athletes received mental health information from their institutions at higher rates than nonathletes; both groups reported an increase over time in receiving such information. Finally, a nontrivial percentage of athletes and nonathletes observed the effects of anxiety on academic performance, yet the rate for athletes was lower and grew more slowly over time.

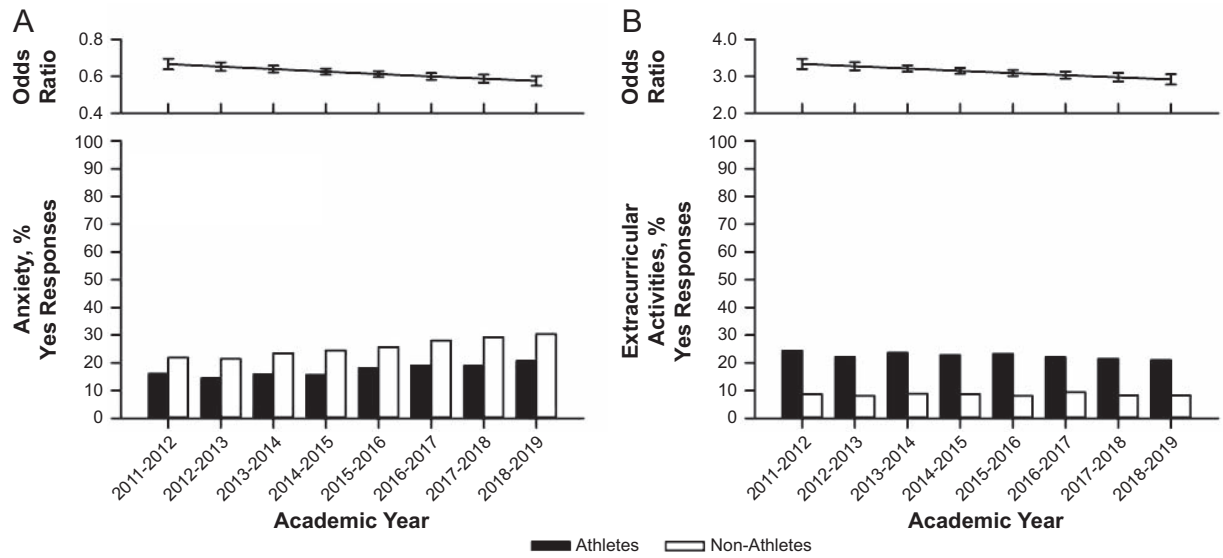

Figure 4. Frequencies of *yes* responses and odds ratios (ORs) for the effect of mental health and other factors on academic performance in the past 12 months presented by academic year for A, anxiety; and B, extracurricular activities, where a time × athlete status interaction was found (for each, $P < .001$). The OR compares the log odds of an athlete's *yes* response to the nonathlete reference for each academic year, with dots representing the OR and error bars representing 95% CIs. An OR <1 means that athletes were less likely than nonathletes to respond *yes* for a given effect on academic performance in a given academic year, whereas an OR >1 means athletes were more likely than nonathletes to respond *yes* for a given effect on academic performance in a given academic year. Where the 95% CI includes the value of 1, no difference occurred in the log odds between athletes and nonathletes.

Other factors (depression, sleep disturbances) also influenced academic performance in both groups but in a smaller proportion of athletes versus nonathletes.

Notably, although mental health symptoms remained relatively flat over time in athletes, diagnosis rates increased. Several factors may explain this increase, primarily the increased awareness was on the part of student-athletes promoted via either ATs or campus mental health services. Athletic trainers can play and have played a vital role as a resource for student-athletes regarding mental health concerns.[9] For the past decade, the governing bodies for athletic training (NATA, Board of Certification, and CAATE) have made great strides in educating new and experienced ATs on how to recognize and refer student-athletes with mental health symptoms.[5–9] A 2013 NATA consensus statement[9] clearly delivered evidence-based guidelines for ATs to provide the best possible care for student-athletes with any type of mental health condition. Therefore, we were not surprised to see an increase in student-athletes receiving information on mental health conditions and services, as well as an increase in treatment-seeking behavior among the same population. Athletic trainers are uniquely positioned as a first line of defense in the battle against mental health conditions among student-athletes.

Another factor could be the anonymity of the NCHA survey. In theory, anonymity should remove stigma from the accuracy of self-reporting, in which case the observed trends of rising mental health symptoms were cause for concern. Recent work[23] with the NCHA uncovered similar trends across all students but did not shed light on underlying explanatory factors. Despite anonymity, it was possible that stigma among athletes may have been powerful enough to drive untruthful responses. This concept was consistent with a study of anonymous survey respondents who showed a rise in the reporting of socially inappropriate attributes but also inconsistencies in the honesty of responses because of either stigma or a lack of accountability.[24] According to these findings, it was possible that student mental health was truly growing worse but also that student mental health self-reporting was simply becoming more forthcoming, open, and honest, such that previously unreported mental health conditions were exposed. In the latter case, the growth in reporting among nonathletes compared with the relatively flat rates in athletes could be cause for concern in that athletes may not have become more open in discussing their mental health challenges, even when they could do so anonymously. Determining whether this was the case was beyond the capacity of our study, but it should be addressed in future research.

Our results showed increased rates of treatment-seeking behavior and openness to future treatment among all students, which was encouraging. However, the deficit in athletes relative to nonathletes remained, which was discouraging. Ideally, efforts to reduce stigma and increase awareness among athletes should increase treatment-seeking behavior. Given that the questions about treatment-seeking behavior (no timeline) and about diagnosis or symptoms (timeline) lacked continuity among timeline comparisons, it was difficult to directly compare precisely how many students with mental health conditions were going untreated. Still, the high rates of some mental health symptoms during the previous 12 months far exceeded the rates of treatment-seeking behavior, suggesting that many college students, and perhaps athletes especially, were not seeking treatment when they needed to do so. For example, >50% of athletes indicated feeling overwhelming anxiety in the 2018–2019 academic year, but just under 35% stated

they had ever sought treatment for any mental health condition.

Of particular concern were the rise in attempted suicides over the study period and the much larger rise in consideration of suicide and self-harm among all college students, regardless of athlete status. Seeking the sources of these increases is vital to protecting students from self-harm. The phenomenon could be linked to using social media, which has expanded drastically over the past decade to become the preferred form of communication among college students. In a 2018 study of data from 2010 to 2015, Twenge et al[25] showed a correlation between the increased use of social media and larger numbers of suicides and suicide attempts in adolescents. Ways to limit social media use, or encourage its healthy as opposed to negative use, could be an important tool for ATs to help reduce self-harm and suicidal ideation among student-athletes. Another possible explanation for increased suicidal behavior over the past decade could be related to emotional exhaustion and cultural background. In a 2021 study, Lin et al[26] observed an increase in suicidal intent and attempts by African-American college students who had either emotional exhaustion or multiple psychiatric symptoms. The group with the second highest rate of suicidal intent in this study was Asian or Pacific Islanders.[26] These correlations merit future attention to the effect of mental health conditions in the context of ethnic and cultural backgrounds for collegiate student-athletes.

Limitations and Future Research

Our study had limitations. One limitation was that the study data were based on self-reporting a previous diagnosis and treatment seeking. These data may have thereby underestimated the real mental health burden in this population if misreporting occurred or if students had undiagnosed mental health disorders. However, anonymous surveys may encourage more accurate reporting than methods that are not anonymous, especially in individuals who attach a stigma to mental health conditions.[27] Another limitation was the potential for individual students to take the survey at the same institution in multiple academic years. Due to the anonymity of the survey, we had little ability to assess how often this may have happened; yet roughly half of the included schools administered the survey only once or administered it twice with a 4-year gap, meaning those students were likely not repeated in the sample. In terms of interpreting the results, incidental repeated measures in the dataset would mean that the reported 95% CIs were narrower than they would have been in a purely cross-sectional sample.

Two areas of future research that can provide additional benefits to students with mental health challenges include a better understanding of the effects of social media and a deeper understanding of individual and school factors that predict mental health symptoms, diagnoses, and treatment-seeking behavior. With the increased role of social media in the daily lives of students and more societal pressures placed on students via social media, social media may have played a role in the higher rates of suicide attempts demonstrated in this study.[28] In addition to social media exposure, little is known about how other factors such as race and ethnicity, gender, sexual orientation, or school type (eg, public versus private) individually and in combination affect the likelihood of experiencing mental health symptoms, being diagnosed with a mental health condition, or seeking treatment. Further analysis of the relative effects of these and other factors could help ATs develop screening and early warning tools to enhance their ability to intervene in athlete mental health conditions and promote early and effective treatment-seeking behavior.

CONCLUSIONS

We showed that student-athletes displayed an increase in treatment-seeking behaviors for mental health conditions, possibly related to increased exposure to information via their ATs. Increased knowledge among ATs related to recognizing mental health symptoms and referring student-athletes to appropriate medical professionals is necessary to continue this positive trend. Ongoing progress can perhaps help further reduce the number of student-athletes with untreated mental health challenges, despite their already lower rates compared with nonathlete students. Further reducing the effects of anxiety, depression, and other mental health factors on academic performance and overall well-being is important to promoting well-rounded, academically successful student-athletes. Athletic trainers are well positioned to continue playing an important and growing role in this pursuit.

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 ACHA. The ACHA does not warrant or assume any liability or responsibility for the accuracy, completeness, or usefulness of any information presented in this article.

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Appendix Table. Full Statistical Results of Logistic Regression Continued on Next Page

		Overall Model[a]		Interaction Effect[b]		Athlete Status Main Effect[c]					Time Main Effect[d]							
Category	Outcome	χ^2	*P*	χ^2	*P*	χ^2	*P*	OR	95% CI	Cohen d_{approx}	χ^2	*P*	OR_{unit}	95% CI	Cohen d_{approx}	OR_{range}	95% CI	Cohen d_{approx}
1. Recent mental health symptoms (last 12 mo)	Felt things were hopeless	8144.8	<.001	48.4	<.001	—[e]	—	—	—	—	—	—	—	—	—	—	—	—
	Felt overwhelmed by all you had to do	18659.4	<.001	80.7	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Felt exhausted (not from physical activity)	15663.0	<.001	87.3	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Felt very lonely	9892.5	<.001	34.5	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Felt very sad	11920.6	<.001	56.2	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Felt so depressed that it was difficult to function	8773.8	<.001	32.9	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Felt overwhelming anxiety	19195.5	<.001	66.5	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Felt overwhelming anger	3203.7	<.001	16.8	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Intentionally cut, burned, bruised, or otherwise injured yourself	2367.2	<.001	4.5	.03	474.9	<.001	0.658	0.634, 0.683	0.23	826.1	<.001	1.069	1.064, 1.074	0.04	1.705	1.643, 1.770	0.29
	Seriously considered suicide	4765.3	<.001	0.9	.36	967.4	<.001	0.574	0.554, 0.595	0.31	2727.1	<.001	1.112	1.108, 1.117	0.06	2.338	2.272, 2.423	0.47
	Attempted suicide	999.7	<.001	0.7	.40	4.4	.04	0.931	0.871, 0.995	0.04	134.0	<.001	1.053	1.043, 1.062	0.03	1.512	1.400, 1.618	0.23
2. Recent mental health diagnosis (last 12 mo)	Anxiety	18659.0	<.001	1.8	.19	1991.6	<.001	0.529	0.515, 0.544	0.35	7364.0	<.001	1.155	1.151, 1.158	0.08	3.167	3.080, 3.233	0.64
	Mood	11149.2	<.001	9.2	.002	1788.9	<.001	0.507	0.491, 0.523	0.37	4982.9	<.001	1.138	1.134, 1.142	0.07	2.813	2.735, 2.893	0.57
	Addiction	1030.3	<.001	0.3	.57	2.0	.16	0.940	0.863, 1.024	0.03	155.7	<.001	1.074	1.062, 1.086	0.04	1.770	1.618, 1.935	0.31
	Eating disorders	1361.0	<.001	3.4	.07	2.3	.13	0.950	0.890, 1.015	0.03	345.2	<.001	1.088	1.078, 1.098	0.05	1.964	1.824, 2.113	0.37
	Sleep difficulties	1488.3	<.001	0.3	.58	382.7	<.001	0.624	0.595, 0.654	0.26	685.3	<.001	1.075	1.069, 1.081	0.04	1.783	1.705, 1.865	0.32
	Other	4778.0	<.001	0.2	.70	214.3	<.001	0.759	0.732, 0.788	0.15	1261.3	<.001	1.089	1.084, 1.094	0.05	1.978	1.906, 2.052	0.38
	Any	15758.8	<.001	3.4	.07	1852.0	<.001	0.596	0.582, 0.610	0.29	5620.4	<.001	1.117	1.114, 1.121	0.06	2.423	2.372, 2.494	0.49
3. Mental health treatment-seeking behavior	Ever received psychological or mental health services from any provider	18799.5	<.001	7.0	.008	2845.9	<.001	0.580	0.569, 0.592	0.30	2095.6	<.001	1.062	1.059, 1.064	0.03	1.618	1.582, 1.643	0.27
	Consider seeking help from a mental health professional in the future	14447.5	<.001	0.0	.97	788.4	<.001	0.743	0.728, 0.759	0.16	3871.3	<.001	1.096	1.093, 1.100	0.05	2.082	2.037, 2.144	0.40
4. Receiving mental health information from the institution	Alcohol and other drug use	29538.7	<.001	0.0	.999	920.0	<.001	1.538	1.496, 1.581	0.24	2085.7	<.001	1.077	1.074, 1.081	0.04	1.810	1.770, 1.865	0.33
	Depression or anxiety	10934.5	<.001	0.2	.65	168.0	<.001	1.138	1.116, 1.161	0.07	5826.4	<.001	1.106	1.103, 1.109	0.06	2.239	2.191, 2.288	0.44
	Eating disorders	3207.7	<.001	0.6	.44	1207.5	<.001	1.399	1.373, 1.426	0.19	345.2	<.001	0.975	0.973, 0.978	0.01	0.817	0.803, 0.837	0.11
	Grief and loss	4268.8	<.001	10.3	.001	480.4	<.001	1.238	1.215, 1.262	0.12	472.9	<.001	1.029	1.027, 1.032	0.02	1.257	1.238, 1.287	0.13
	How to help others in distress	16119.8	<.001	1.9	.16	559.6	<.001	1.257	1.233, 1.281	0.13	7459.3	<.001	1.118	1.115, 1.121	0.06	2.441	2.389, 2.494	0.49
	Relationship difficulties	11071.6	<.001	0.4	.51	153.6	<.001	1.127	1.106, 1.149	0.07	4944.5	<.001	1.096	1.094, 1.099	0.05	2.082	2.052, 2.128	0.40
	Sexual assault or relationship violence prevention	31033.0	<.001	6.3	.01	278.1	<.001	1.228	1.199, 1.259	0.11	14373.5	<.001	1.212	1.209, 1.216	0.11	4.656	4.565, 4.780	0.85
	Sleep difficulties	4277.7	<.001	4.4	.04	641.9	<.001	1.299	1.273, 1.326	0.14	244.0	<.001	0.977	0.975, 0.980	0.01	0.830	0.817, 0.851	0.10
	Stress reduction	8233.4	<.001	26.6	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Suicide prevention	10734.9	<.001	0.3	.56	328.9	<.001	1.190	1.168, 1.213	0.10	8806.9	<.001	1.129	1.126, 1.131	0.07	2.640	2.584, 2.677	0.54
	Violence prevention	11900.0	<.001	8.7	.003	4091.2	<.001	1.930	1.891, 1.969	0.36	2478.6	<.001	1.066	1.064, 1.069	0.04	1.667	1.643, 1.705	0.28

Appendix Table. Continued From Previous Page

Category	Outcome	Overall Model[a]		Interaction Effect[b]		Athlete Status Main Effect[c]					Time Main Effect[d]							
		χ^2	*P*	χ^2	*P*	χ^2	*P*	OR	95% CI	Cohen d_{approx}	χ^2	*P*	OR_{unit}	95% CI	Cohen d_{approx}	OR_{range}	95% CI	Cohen d_{approx}
5. Recent impact on academic performance (last 12 mo)	Anxiety	7886.0	<.001	15.9	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—
	Depression	5914.4	<.001	6.4	.01	1551.6	<.001	0.542	0.526, 0.559	0.34	2872.6	<.001	1.097	1.094, 1.101	0.05	2.097	2.052, 2.159	0.41
	Substance use	2141.9	<.001	2.9	.09	89.9	<.001	1.228	1.177, 1.282	0.11	162.7	<.001	0.962	0.956, 0.968	0.02	0.734	0.698, 0.771	0.17
	Eating disorders or problems	337.2	<.001	2.6	.11	0.7	.39	1.035	0.958, 1.117	0.02	157.3	<.001	1.068	1.057, 1.080	0.04	1.693	1.558, 1.851	0.29
	Sleep difficulties	1055.9	<.001	2.3	.13	475.4	<.001	0.768	0.749, 0.786	0.15	100.7	<.001	1.015	1.012, 1.018	0.01	1.126	1.100, 1.153	0.07
	Injury	1635.7	<.001	0.3	.60	1663.1	<.001	2.769	2.636, 2.907	0.56	0.1	.71	1.002	0.993, 1.010	0.00	1.016	0.945, 1.083	0.01
	Participation in extracurricular activities	12848.9	<.001	13.7	<.001	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Likelihood ratio χ^2 and *P* values for the full models including all covariates (see text for details). Statistics are for models including the interaction effect where it was significant or excluding the interaction effect where it was not significant.

[b] Wald χ^2 and *P* values for the interaction effect. Interaction odds ratios (ORs) are presented for interactions in Figures 1 and 4.

[c] Wald χ^2 and *P* values for the main effect of athlete status (athletes vs nonathletes). Statistics reflect models with the interaction effect removed but with all covariates and both main effects included. The OR has also been converted into an approximation of the Cohen *d* effect size (d_{approx}) following Hasselblad and Hedges.[1]

[d] Wald χ^2 and *P* values for the main effect of time (academic year). Statistics reflect models with the interaction effect removed but with all covariates and both main effects included. The ORs are expressed in 2 ways to represent both the effect of a single academic year on the relative log odds of a given outcome (OR_{unit}) and the cumulative effect of all 8 academic years (OR_{range}). The ORs have also been converted into approximations of the Cohen *d* effect size (d_{approx}) following Hasselblad and Hedges.[1]

[e] Dashes indicate that analyses of main effects were not performed given that the interaction was statistically significant.

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