

Abstract

Transition periods in athletics can be potentially detrimental to the psychiatric health and identity of student-athletes in the college environment. Currently, minimal research is available that investigates the changes in psychiatric symptomology and identity during sports transitions such as following an injury, during the athletic off-season, and after retirement from collegiate sports. This study uses a cross-sectional survey to investigate the relationship between these transition periods and psychiatric symptomology in Division 1 NCAA athletes. The survey employed questions regarding depression, anxiety, and disordered eating symptomology in addition to athletic identity and was administered electronically to a sample of current and recently retired student-athletes across a number of sports and disciplines. Significant differences appeared in a number of psychiatric assessments between groups of athletes who differ in injury status (depression score, anxiety score, disordered eating global score, weight concern score, shape concern score), sport type (depression score), and sex (anxiety score, disordered eating global score, weight concern score, shape concern score). Additionally, each possible combination of the four variables of interest (depression score, anxiety score, athletic identity score, and disordered eating global score) were significantly positively correlated. Based on these results, we will be better prepared to understand and potentially mitigate the harmful psychiatric effects of athletic transition periods on collegiate athletes.

Introduction

The shift to collegiate sports marks a prodigious transition in an adolescent athlete's life. For many athletes, this is the first time that they must balance an extremely high level of both academics and athletics. Moreover, this transition occurs in a brand-new environment without the parental supervision and guidance they likely had during high school. Due to these factors, among others, student-athletes are considered an at-risk group for alcohol use and abuse, stress, sleep deprivation, and injury while participating in collegiate sports.¹ Additionally psychological disorders such as depression, anxiety, and eating disorders impact the athlete population.²⁻⁵ While there are marked differences in prevalence depending on gender, race, ethnicity, and sport, all collegiate athletes are potentially susceptible to these disorders due to the inherent stress of collegiate sports culture.^{2,5,6}

Even though collegiate sports may increase stress for athletes by virtue of time commitment and pressure to excel, research indicates that NCAA athletes tend to score lower on assessments of depression and anxiety, indicating decreased symptomology, than their non-athlete classmates.^{4, 6-8} The evidence is conflicting in regards to the prevalence of disordered eating behavior in student-athletes, with some studies reporting increased prevalence in collegiate athletes⁹ and others reporting lower prevalence.^{2,6,8,10} However, the prevalence of disordered eating behavior and threshold eating disorders among elite professional athletes is significantly elevated over non-athlete controls, especially those in sports that emphasize thinness or leanness.^{3,10,11} The trend of lower prevalence of psychological disorders (e.g., depression and anxiety) in collegiate athletes compared to their non-athlete peers has been attributed to a number of factors. First, there is an inherent social support system that athletes find with their teams on campus.^{6,7} Additionally, academic support (tutors, etc.) is provided

specifically to athletes at most universities.⁶ Furthermore, there are direct and indirect benefits associated with an athletic lifestyle including increased self-esteem and lower body dissatisfaction.⁶⁻⁸ The NCAA has also recently begun increasing awareness and funding towards mental health resources as well. The NCAA Sports Science Institute and NCAA Student Athlete Advisory Committees are working together to provide proper education and support to athletes and athletic staff. These factors, among others, may help to ease student-athletes' college experience and likely support mental health while they are in school.

However, despite the mental health protections offered by college athletics and an elevated self-esteem for most athletes, there are often unpredictable transition periods associated with sport that can negatively impact athletes' mental health. These harmful transition periods could be initiated by season-ending injury, termination from the team, or the unanticipated end of a season.¹² Research documents that these periods of time can be highly stressful for student-athletes.¹¹⁻¹⁵

Retirement from sport demonstrates another type of transition period for student-athletes. Research establishes that retirement from collegiate sports can be either positive or negative in terms of mental health depending on a number of factors. First, retirement can either be planned (occurring after the season of an athlete's final year of eligibility) or unplanned (a result of injury, etc.). Retirement that is planned tends to be much less stressful to former collegiate athletes than that which is unplanned.^{12,13} In fact, though sample sizes have been low, preliminary research suggests that current collegiate-athletes have higher levels of depression than recently retired collegiate-athletes.¹⁶ This demonstrates that a healthy transition out of sports can potentially be therapeutic for former athletes' mental health. On the other hand, the loss of athletic identity, social support, and even purpose that accompanies sports retirement can also

cause the transition to be particularly trying for student-athletes' mental and physical health.¹⁶ In fact, research shows that higher levels of athletic identity are associated with higher levels of anxiety following collegiate sports retirement, indicating that a perceived loss of identity can be highly traumatic.¹⁷ Additionally, athletes who have higher athletic identity have increased psychological, occupational, and psychosocial difficulties upon retirement.^{18,19} Furthermore, athletic identity ideals that are tied to body image could lead to changes in eating behaviors and weight control practices upon retirement. Overall, reactions to transitions in sport are highly individualized and are dependent on a number of factors including voluntariness, personal athletic achievements, athletic identity, and educational status.^{11,13,19}

Minimal research is available that investigates changes in psychiatric symptomology and identity during sports transitions (e.g., as a result of an injury), during the transition into the athletic off-season, and during the transition into retirement from collegiate sports. Furthermore, little is known regarding the association between psychiatric disorders, eating behaviors, and athletic identity in student-athletes. The goal of the current study is to document how injury, time off from sports, and athletic retirement influence depression, anxiety, athletic identity, body dissatisfaction, and disordered eating behaviors by comparing Division 1 NCAA athletes across a number of sports and disciplines.

Methods

Participants

Participants invited to join the study were all Division 1 NCAA athletes at a large, public, southeastern university. Senior and junior fall-sport athletes and all winter-sport athletes were invited

to participate in the study. All athletes were contacted via email during a period of time that was one month after the completion of the fall-sport season and during the winter-sport season. This timing ensured that responses provided occurred while fall-sport athletes were no longer competing and winter-sport athletes were still actively competing. An individual electronic link sent to each athlete's email directed participants to an electronic consent page. Once the athlete provided consent, the survey launched. The study received ethical approval from the University of North Carolina at Chapel Hill (UNC) Biomedical Institutional Review Board.

Measures

Eating Disorder Examination Questionnaire-6.0 (EDE-Q)

The Eating Disorder Examination Questionnaire-6.0 (EDE-Q) is an assessment used to evaluate disordered eating symptomology and to derive tentative eating disorder diagnoses.²⁰ This 22-question assessment measures eating disorder pathology on four subscales—eating restraint, shape concern, dietary concern, and weight concern. The questionnaire prompts participants to report on their eating attitudes and behaviors over the prior 28 days. The EDE-Q global score and all four subscales were separately considered and assessed in the present study, with higher scores indicating increased severity of symptoms. Previous studies have indicated that the EDE-Q has a high level of internal consistency in the athlete population.²¹

Patient Health Questionnaire-9 (PHQ-9)

The Patient Health Questionnaire-9 (PHQ-9) is a nine-item assessment that evaluates the frequency with which participants experience the core symptoms of depression over the previous two weeks.²² Response options for the nine items are 'Not at All' (0), 'Several Days' (1), 'Over

Half of the Days' (2), or 'Nearly Every Day' (3). The sum of the responses to the nine items reflects an overall score that reflects total depressive symptomology. Higher scores reflect higher symptomology on a scale from 0 to 27. Cumulative scores from 0 to 4 indicate 'Minimal' depression severity, scores from 5 to 9 indicate 'Mild' depression severity, scores from 10 to 14 indicate 'Moderate' depression severity, scores from 15 to 19 indicate 'Moderately Severe' depression severity, and scores from 20 to 27 indicate 'Severe' depression severity. However, PHQ-9 scores in this study were used as a continuous variable and not interpreted by diagnostic level.

General Anxiety Disorder-7 (GAD7)

The General Anxiety Disorder-7 (GAD-7) is a seven-item assessment used to quantify general anxiety disorder and anxiety symptomology with questions addressing the frequency of anxiety-related symptoms over the previous two weeks.²³ Like the PHQ-9, the GAD-7 item responses range from 'Not at All' (0) to 'Nearly Every Day' (3). The summation of the seven responses indicate the severity of anxiety symptomology with higher scores reflecting more severe anxiety on a scale from 0 to 21. Cumulative scores from 5 to 9 indicate 'Mild' anxiety symptom severity, scores from 10 to 14 indicate 'Moderate' symptom severity, and scores from 15 to 21 indicate 'Severe' anxiety symptom severity. GAD-7 scores in this study were assessed as a continuous variable.

Athletic Identity Measurement Scale (AIMS)

The Athletic Identity Measurement Scale (AIMS) is a ten-item assessment used to investigate the scope of an individual's athletic identity.²⁴ Examples of statements comprising the AIMS include, "I spend more time thinking about sport than anything else," and "I feel bad about

myself when I do poorly in sport.” Participants can respond to these statements using a seven-point Likert scale ranging from Strongly Disagree (0) to Strongly Agree (6). The summation of points equates to an overall level of athletic identity on a scale from 0 to 60, with higher scores representing a higher athletic identity. Once again, AIMS cumulative scores were used as a continuous variable in statistical analyses.

Statistical Analysis

In this study, two statistical approaches were applied. First independent samples t-tests were used to evaluate differences between active and non-active athletes, between injured and non-injured athletes, between individual sport and team sport athletes, and between male and female athletes. Differences in PHQ-9, GAD-7, AIMS, and EDE-Q (both global and all four subscales) scores were analyzed in these groups. Additionally, Pearson correlation coefficients were calculated to determine relationships among the PHQ-9, GAD-7, AIMS, and EDE-Q scores. Since multiple tests from the same groups were being performed, the Benjamini-Hochberg Procedure for false discovery rates was utilized with an alpha level of 0.05 to decrease the likelihood of false positive p-values.²⁵ This correction is displayed in the results section and indicated that significance levels have been adjusted based on the numbers of tests being performed on each group. All data were analyzed using SAS 9.4 software.

Results

Descriptive Statistics

Across the two sports seasons and sixteen teams contacted, there was a response rate of 24.5% resulting in a total sample size of $N = 90$. While the overall turnout was low, representation

across variables was complete across sex (32 males, 58 females), academic year (14 first years, 21 second years, 28 third years, and 27 fourth years), and type of sport (59 from individual sports, 31 from team sports). Participants were also asked about the season in which they participated, plans to participate in a second collegiate sport, plans to play sport professionally, sport type, as well as their injury status (See Table 1). From this information, participants were further categorized into an active and inactive group (70 and 20 participants, respectively). Retirement was not analyzed since the majority of the senior fall sport participants planned to play their sport professionally and/or to participate in second collegiate sports season. This rendered the retirement group too small ($N = 4$) for meaningful analysis. Means and standard deviations were calculated for variables including PHQ-9 score, GAD-7 score, AIMS score, and EDE-Q global scale and subscales, based on the different groupings analyzed.

Table 1: Demographic distribution of participants

Sex		
Male	32	35.55
Female	58	64.44
Total	90	100
Year		
First Year	14	15.56
Second Year	21	23.33
Third Year	28	31.11
Fourth Year	27	30
Total	90	100
Season		
Fall	27	70
Winter	63	30
Total	90	100
Athletic Status		
Active	70	77.78
Inactive	20	22.22
Total	90	100
Type of Sport		
Individual	59	65.56
Team	31	34.44
Total	90	100
Injury Status		
Injured	9	10
Not Injured	81	90
Total	90	100
BMI Range (kg/m ²)		
Underweight (<18.5)	1	1.11
Normal (18.5-24.9)	74	82.22
Overweight (25-29.9)	11	12.22
Obese (>30)	2	2.22
Total	90	100

Athletic Status

Athletic status was determined by examining season, year, professional status, plans to play a second sport, and injury status. Inactive players were those who were in the offseason, those who were retired, and/or those who were injured such that they were unable to practice and compete. Independent t-tests revealed no significant differences between active and inactive athletes for depression, anxiety, disordered eating, or athletic identity after accounting for false discovery rate with the Benjamini-Hochberg procedure (Table 2).²⁵

Table 2: Descriptive Comparison of Variable Means and Athletic Status

Current Athletic Status				
	Active N=70 (mean \pm SD)	Inactive N=20 (mean \pm SD)	t Value	p
PHQ-9	6.45 \pm 6.59	4.09 \pm 4.14	1.95	0.054
GAD-7	6.96 \pm 5.82	3.91 \pm 4.45	2.50	0.014
AIMS	42.05 \pm 10.45	39.63 \pm 8.39	1.08	0.29
EDE-Q-Global	1.41 \pm 1.63	1.12 \pm 1.28	0.81	0.42
EDE-Q- Restraint	1.31 \pm 1.74	1.29 \pm 1.63	0.03	0.97
EDE-Q-Eating Concern	.87 \pm 1.27	.55 \pm .98	1.20	0.23
EDE-Q-Shape Concern	1.86 \pm 1.92	1.42 \pm 1.55	1.03	0.31
EDE-Q-Weight Concern	1.59 \pm 1.95	1.23 \pm 1.57	0.88	0.38

PHQ-9 refers to the cumulative score in the Patient Health Questionnaire, GAD-7 refers to the cumulative score in the General Anxiety Disorder assessment, AIMS refers to the cumulative score in the Athletic Identity Measurement Scale, EDE-Q-Global refers to the total Eating Disorder Examination Questionnaire score, and the EDE-Q-Restraint, EDEQ-Eating Concern, EDE-Q-Shape Concern, and EDE-Q-Weight Concern refer to the total scores for the four subscales on the Eating Disorder Examination Questionnaire

** designates statistical significance, after enacting the Benjamini-Hochberg Procedure

Injury Status

The injured and non-injured athlete groups differed significantly on PHQ-9 score, GAD-7 score, EDE-Q-Global score, as well as on the EDE-Q Shape Concern and Weight Concern subscales after accounting for the false discovery rate (Table 3).²⁵ The injury group was small, but an F-test revealed no significant difference in variance between the injured and non-injured groups ($F=2.41$). No significant differences were observed between the two groups across the AIMS, EDE-Q Restraint subscale, or the EDE-Q Eating Concern subscale.

Table 3: Descriptive Comparison of Variable Means and Injury Status

Injury Status				
	Injured N=9 (mean \pm SD)	Not Injured N= 81 (mean \pm SD)	t Value	p
PHQ9	10.89 \pm 6.33	3.80 \pm 3.94	5.46	<.001**
GAD7	10.44 \pm 5.94	3.94 \pm 4.37	4.08	<.001**
AIMS	46.11 \pm 7.74	39.51 \pm 8.80	2.16	0.034
EDEQ-Global	2.19 \pm 1.67	1.07 \pm 1.28	2.41	0.018**
EDEQ- Restraint	2.09 \pm 2.04	1.21 \pm 1.58	1.65	0.13
EDEQ-Eating Concern	1.33 \pm .46	.54 \pm .98	2.21	0.030
EDEQ-Shape Concern	2.82 \pm 1.92	1.37 \pm 1.54	2.61	0.011**
EDEQ- Weight Concern	2.51 \pm 1.96	1.17 \pm 1.48	2.49	0.015**

PHQ-9 refers to the cumulative score in the Patient Health Questionnaire, GAD-7 refers to the cumulative score in the General Anxiety Disorder assessment, AIMS refers to the cumulative score in the Athletic Identity Measurement Scale, EDEQ-Global refers to the total Eating Disorder Examination Questionnaire score, and the EDE-Q-Restraint, EDE-Q-Eating Concern, EDE-Q-Shape Concern, and EDE-Q-Weight Concern refer to the total scores for the four sub scales on the Eating Disorder Examination Questionnaire

** designates statistical significance, after enacting the Benjamini-Hochberg Procedure

Sport Type

Individual sport athletes differed significantly in PHQ-9 score only (2.71 ± 3.42 , 5.61 ± 5.20) with individual sport athletes showing higher levels of depressive symptoms. GAD-7 scores and EDE-Q global and subscale scores were not significantly different, though they were numerically lower for team sport athletes in all cases (Table 4).

Table 4: Descriptive Comparison of Variable Means and Sport Type

Sport Type				
	Team Sport N=31 (mean \pm SD)	Individual Sport N=59 (mean \pm SD)	t Value	P
PHQ-9	2.71 ± 3.42	5.61 ± 5.20	-2.80	0.0063**
GAD-7	3.48 ± 4.14	5.17 ± 5.22	-1.56	0.12
AIMS	38.87 ± 9.77	40.85 ± 8.39	-1.00	0.32
EDE-Q-Global	1.06 ± 1.48	1.25 ± 1.30	-.62	0.54
EDE-Q- Restraint	1.07 ± 1.45	1.41 ± 1.73	-0.90	0.37
EDE-Q-Eating Concern	$.52 \pm 1.10$	$.67 \pm 1.03$	-0.63	0.53
EDE-Q-Shape Concern	1.50 ± 1.87	1.52 ± 1.52	-0.07	0.94
EDE-Q-Weight Concern	1.14 ± 1.79	1.39 ± 1.47	-0.70	0.48

PHQ-9 refers to the cumulative score in the Patient Health Questionnaire, GAD-7 refers to the cumulative score in the General Anxiety Disorder assessment, AIMS refers to the cumulative score in the Athletic Identity Measurement Scale, EDE-Q-Global refers to the total Eating Disorder Examination Questionnaire score, and the EDE-Q-Restraint, EDEQ-Eating Concern, EDE-Q-Shape Concern, and EDEQ-Weight Concern refer to the total scores for the four sub scales on the Eating Disorder Examination Questionnaire

** designates statistical significance, after Benjamini-Hochberg Procedure

Sex

GAD-7 scores, EDEQ-Global scores, and the EDE-Q subscales of Shape Concern, and Weight Concern scores differed significantly between male and female athletes with males having lower scores across all assessments (Table 5). There was no significant difference between males and females on the PHQ-9, AIMS, or on the EDE-Q-Restraint or Eating Concern subscales, although males did have lower mean numeric scores in each of those as well.

Table 5: Descriptive Comparison of Variable Means and Sex

Sex				
	Male N=32	Female N=58	t Value	p
PHQ-9	3.94± 3.92	4.98 ± 5.29	-.98	0.33
GAD-7	3.00 ± 4.59	5.66 ± 4.91	-2.33	0.022**
AIMS	36.66 ± 9.15	40.45 ± 8.80	-.40	0.68
EDE-Q-Global	.69 ± .86	1.46 ± 1.51	-2.66	0.0093**
EDE-Q-Restraint	1.03 ± 1.50	1.44 ± 1.71	-1.13	0.26
EDE-Q-Eating Concern	.31 ± .71	.79 ± 1.16	-2.15	0.035
EDE-Q-Shape Concern	.070 ± .035	1.97 ± 1.79	-3.78	0.0003**
EDE-Q-Weight Concern	.72 ± .97	1.64 ± 1.76	-2.72	0.0079**

PHQ-9 refers to the cumulative score in the Patient Health Questionnaire, GAD-7 refers to the cumulative score in the General Anxiety Disorder assessment, AIMS refers to the cumulative score in the Athletic Identity Measurement Scale, EDE-Q-Global refers to the total Eating Disorder Examination Questionnaire score, and the EDE-Q-Restraint, EDE-Q-Eating Concern, EDE-Q-Shape Concern, and EDE-Q-Weight Concern refer to the total scores for the four sub scales on the Eating Disorder Examination Questionnaire

** designates statistical significance, after Benjamini-Hochberg Procedure

Pearson Correlations

Pearson's correlations were calculated to explore associations among continuous variables of interest. Table 5 presents positive significant correlations between depression and anxiety ($r=0.80$, $p<0.0001$), depression and athletic identity ($r=0.33$, $p=0.0013$), depression and disordered eating ($r=0.48$, $p<0.0001$), anxiety and athletic identity ($r=0.23$, $p=0.026$), anxiety and disordered eating ($r=0.44$, $p<0.0001$), and athletic identity and disordered eating ($r=.25$, $p=.019$). The Benjamini-Hochberg Procedure was run to account for potential false positives, but all findings remained statistically significant after correction for multiple comparisons.

Figure 5: A Pearson Correlational Analysis of PHQ9, GAD7, AIMS, and EDEQ-Global

		PHQ9	GAD7	AIMS	EDEQ Global
PHQ9	Pearson Correlation Coefficient	1	-	-	-
	p value				
	N				
GAD7	Pearson Correlation Coefficient	0.80**	1	-	-
	p value	<.0001			
	N	90			
AIMS	Pearson Correlation Coefficient	0.33**	0.23**	1	-
	p value	.0013	.026		
	N	90	90		
EDEQ Global	Pearson Correlation Coefficient	0.48**	0.44**	0.247**	1
	p value	<.0001	<.0001	.019	
	N	89	89	89	

PHQ-9 refers to the cumulative score in the Patient Health Questionnaire, GAD-7 refers to the cumulative score in the General Anxiety Disorder assessment, AIMS refers to the cumulative score in the Athletic Identity Measurement Scale, EDE-Q-Global refers to the total Eating Disorder Examination Questionnaire score

** designates statistical significance, after enacting the Benjamini-Hochberg Procedure

Discussion

The purpose of this study was to investigate the psychiatric dimensions of depression, anxiety, athletic identity, and disordered eating among different cohorts of collegiate athletes and to explore their interrelationship. While previous research did give some indication of trends in group differences and comorbidities, other questions that were investigated were novel.

A key finding of this study was that the injured group (although small) had significantly higher levels of depression, anxiety, and disordered eating behaviors compared to the non-injured group. These results concur with prior research identifying an array of emotional effects following sports injury.^{26,27} It is also well established that emotional changes stemming from sports injury can lead to potentially harmful reactions such as changes in appetite, irritability, lack of motivation, pain behaviors, substance abuse, etc.²⁷ Injured athletes have also been previously been found to have higher levels of depression compared to their non-injured counterparts.²⁷ Thus, it was not surprising that the present study showed similar findings. Alarming,ly, athletics is associated with a number of barriers to seeking help for psychological disorders, which can further exacerbate problems for athletes.²⁷⁻²⁹ Clearly, based on this research and prior research, injuries significantly impact emotional and psychiatric dimensions and should be attended to in collegiate athletes.

Contrary to expectations, we did not detect any significant differences between inactive and active student-athletes on the psychological dimensions of interest. The reasons for this are not entirely clear; however, as noted, the inactive group included injured athletes, off-season athletes, and those who had fully retired from collegiate sports. The heterogeneity of the group could have obscured results and subgroups were too small for meaningful comparisons. One potential explanation is the extent to which inactivity is voluntary. Voluntariness positively

benefits feelings towards athletic retirement.^{11,13,19} Thus, while injury, which causes unexpected time away from athletics, negatively impacts the psychological symptoms such as depression, anxiety, and disordered eating, planned absence from athletics may not cause the same effects. Intentional retirement from sports, with preparation and planning, may lead to a departure from athletics that leads to less mental distress. Our small subsample size does not allow us to test this hypothesis, though prior research supports this theory.¹⁶

Analysis of sports type (individual versus team sport) also revealed a significant difference in depression symptomology with higher depression scores in those participating in individual sports. Evidence supports that participation in team sports enhances the psychiatric and physical benefits of physical activity in the general population, but similar studies have not been completed in high levels of athletics.³⁰ Our results suggest potential benefits for team sports, or risks for individual sport participation. Further investigation is needed to determine the exact mechanism for this effect. Certainly, social support inherent in team sports may be one of the means by which team sports lessen risk for psychiatric symptoms. It is well documented that social support can aid in the deterrence of depression and anxiety in a number of groups such as cancer patients, HIV patients, those going through cardiac rehabilitation, and patients with schizophrenia.³¹⁻³⁴ Perhaps the social support of competing together operates similarly in college athletes to reduce depressive symptomatology. Conversely, the personal stress of competing individually and the lack of team social support may increase risk for depressive symptoms.

Clear gender differences emerged in the present study with female athletes scoring higher on the GAD-7, EDE-Q Global Score, and EDE-Q Shape Concern and Weight Concern subscales. The gender differences are not entirely surprising based on previous research looking into mental health sex differences in athletes. One such study found that elite female athletes

were 1.3 times more likely to be diagnosed with a psychiatric disorder than male elite athletes.¹¹

This trend is also apparent in the general population where women are more likely to be diagnosed with depression and/or anxiety disorders than are men.³⁵ While the mechanism of effect remains unknown, the overall trend is well established. Our data suggest that the observed gender differences in the population are mirrored in student-athletes. Additionally, in the general population, women have been shown to have higher weight and shape concerns than males.³⁶ This trend was observed in the student-athlete sample as well.

Of interest, significant positive correlations were observed across depression, anxiety, athletic identity, and disordered eating behaviors (See Appendix A). This significant positive correlation between athletic identity and depression, anxiety, and disordered eating may seem surprising since athletics often acts as a protection against psychiatric disorders.^{4, 6-8} However, a high athletic identity in this sample was associated with greater psychological symptomology. It is possible that athletes who associate themselves too closely with their sport may judge themselves by their sports performance. This can be problematic as student-athletes' identity should be built on more than just their sport. The current study, along with others preceding it, indicate that a high athletic identity can be associated with psychiatric problems, especially during transition periods in sport.^{17,18,24} While a certain degree of athletic identity can boost an athlete's self-esteem and self-worth, an overreliance on athletic identity can lead to anxiety, depression, and disordered eating behaviors, especially if performance is less than desired, injury occurs, or retirement from sport nears.

Limitations

The findings from this study should be viewed as preliminary. Although significant differences were observed for injured versus non-injured athletes, individual versus team sports, and males versus females, our statistical power was limited by small sample size. Moreover, our design is unable to make causal inferences. Several specific limitations should be mentioned. First, the response rate was low, which not only led to a small sample size, but might also have introduced bias. Future studies should include incentives to encourage participation. Second, all of the participants came from a single athletic program at a large Division I Southeastern University that may not be representative of other colleges, regions, or NCAA divisions. Third, sports were unevenly represented. In order to generalize findings to a national audience, it will eventually be necessary to sample a larger, more diverse group that includes student-athletes from across the country and across sports. Finally, the timing of the study was a limitation since it would have been preferred to complete a longitudinal design sampling all Division-1 sports offered at the sampled university at two different times- in-season and during the off-season. Due to time constraints, however, our design was cross sectional, and could only review two seasons of sport.

Conclusion

In this cross-sectional study, depression, anxiety, athletic identity, and disordered eating behavior were investigated in a collegiate student-athlete population. Based on the current findings, injured athletes, female athletes, and athletes competing in individual sports may be at greater risk for psychological symptoms. Additionally, we saw positive associations among athletic identity, depression, anxiety, and disordered eating in the student-athlete sample.

Coaches and trainers should be more aware of these close relationships as to be able to look for warning signs and situations (such as injury) that could spark the development of psychiatric disorders. During their college experience, student-athletes should be encouraged to incorporate more than just sports performance into their self-identity. Institutions should work to create well-rounded athletes who base their self-worth on more than just their sports performance. This development could come in the form of interventions by sports psychologists and athletic departments ensuring that athletes are introduced to opportunities outside of sports.¹⁷ This expansion of identity will help athletes be more robust mentally and be better suited psychologically to adapt to both foreseen and unforeseen athletic transitions during their careers. Furthermore, it will better prepare student-athletes for a career and a life outside of sports.

Overall, this study gives researchers suggestions for future investigations. Of course, these future studies will have to be larger and more powerful to support the types of culture shifts necessary in collegiate sports to encourage a more positive and healthier competitive environment. Any measures taken should consider means to support athletes in transitions, make it easier for student-athletes to ask for mental health resources, and protect the emotional wellbeing and mental health of student-athletes all across the NCAA.

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Appendix A

Figure 1: Scatterplots demonstrating the distribution and line-of-fit of variables of interest

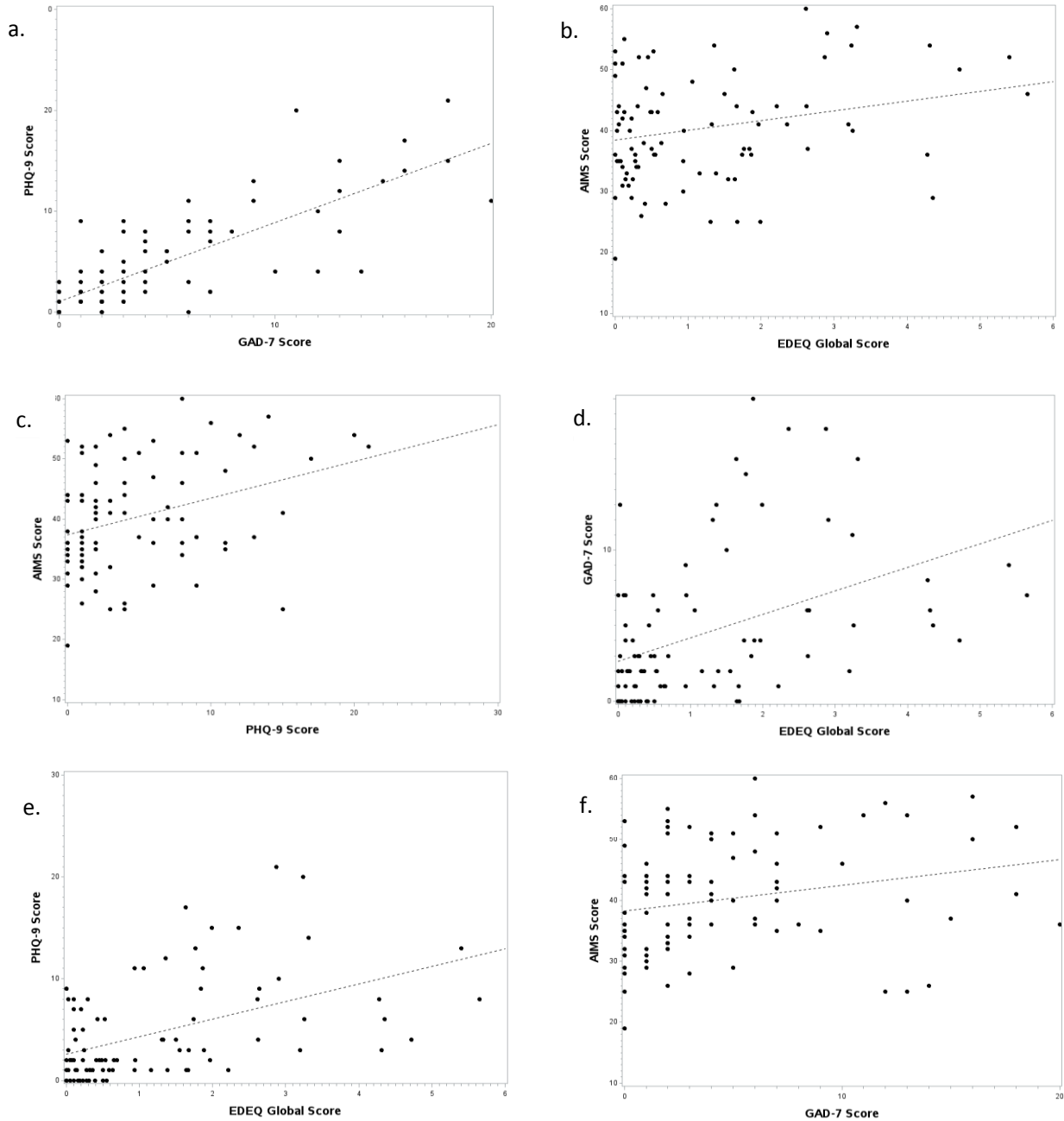


Figure 1 a. shows the PHQ9 on the y-axis and the GAD7 on the x-axis ($r=.80$), **figure 1 b.** shows the AIMS on the y-axis and the EDEQ-Global on the x-axis ($r=.25$), **figure 1 c.** shows the AIMS on the y-axis and the PHQ9 on the x-axis ($r=.33$), **figure 1 d.** shows the GAD7 on the y-axis and the EDEQ-Global on the x-axis ($r=.44$), **figure 1 e.** shows the PHQ9 on the y-axis and the EDEQ-Global on the x-axis ($r=.48$), **figure 1 f.** shows the AIMS on the y-axis and the GAD7 on the x-axis ($r=.23$).