

A Measure of Burnout in Current NCAA Student-Athletes

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ABSTRACT

Introduction. The prevalence of athletes who specialize in sports has increased in recent years. Substantial literature on youth sports has linked early sport specialization to negative consequences, such as burnout and injury. However, empirical evidence comparing rates of burnout and specialization in NCAA athletes is limited. The purpose of this study was to survey current NCAA Division I student-athletes to compare levels of burnout to sex, year of NCAA eligibility, and age at the beginning of sport specialization.

Methods. A self-reported survey was distributed to student-athletes at two NCAA Division I institutions, which included demographics, sport specialization history, injury history, and the Athlete Burnout Questionnaire. Results from the three measures of the Athlete Burnout Questionnaire (reduced sense of accomplishment, exhaustion, sport devaluation) were compared to sex, year of NCAA eligibility, age of beginning sport specialization, and injury history.

Results. A total of 267 athletes (95 males and 172 females) completed the survey. Of those, 156 (58.4%) were in their first or second year of NCAA eligibility, and 111 (41.6%) were in their third, fourth, or fifth year. Of the total, 121 (46.4%) reported specializing before the age of 15, and 140 (53.6%) specialized at age 16 or older. Females reported significantly higher levels of exhaustion than males (Difference of means (M) = 0.43, 95% confidence interval (CI) = [0.20, 0.66], $p < 0.01$). Athletes in their third, fourth, or fifth year of eligibility reported significantly higher levels of sport devaluation (M = 0.27, 95% CI = [0.05, 0.48], $p < 0.05$) than athletes in their first or second year. Athletes who specialized before age 15 did not report significantly higher levels of burnout than athletes who specialized at age 16 or later. In total, 203 athletes (77.2%) reported experiencing any injury. Athletes who reported a history of experiencing any injury demonstrated significantly higher feelings of reduced sense of accomplishment than athletes with no injury history (Difference of means (M) = 0.24, 95% confidence interval (CI) = [0.03, 0.45], $p < 0.05$).

Conclusions. Athletes were more likely to experience elevated levels of burnout if they reported female sex, older NCAA eligibility, or a past injury history. However, athletes were not more likely to experience increased burnout based on age of beginning specialization. The results demonstrated a need to address burnout in athletes following

injury and to be aware that females and older athletes are more prone to burnout. *Kans J Med* 2022;15:325-330

INTRODUCTION

Over the past 15 to 20 years, sport participation has increased,¹ as has sport specialization among high school athletes.² However, this shift to early sport specialization and high training volume may lead to increased risks of overuse/overload injuries or acute injuries requiring surgery,³⁻⁵ as well as detrimental effects of the athletes' psychological and social well-being.^{1,6,7}

The topic of burnout and its effect on performance and psychological well-being has become a common theme within the literature. Burnout has been defined as "a syndrome of emotional exhaustion, depersonalization, and a sense of low personal accomplishment that leads to decreased effectiveness at work".⁸ Athlete burnout has been defined as a syndrome of emotional and physical exhaustion (resulting from training and/or competition), a reduced sense of accomplishment (negatively evaluating one's abilities and achievements), and sport devaluation (a cynical attitude towards sports participation).⁹ The Athlete Burnout Questionnaire (ABQ) was developed to study burnout in this specific population with questions specifically targeting athletics.^{9,10} Using this survey tool, the prevalence of burnout previously has been reported as between 6-11% of athletes;¹¹ however, this has been thought to be underreported as burnout was considered if the athlete scored high on a single component.

The primary purpose of this study was to identify the prevalence of burnout in current NCAA Division I student-athletes. Secondary aims included comparing burnout to (1) demographic characteristics of sex and year of eligibility, (2) sport specialization, and (3) injury history. Our primary hypothesis was that athletes who specialized at a younger age and had a more extensive injury history would experience higher levels of burnout.

METHODS

A self-reported survey was distributed to athletes from two NCAA Division I programs with multiple sports between August 9, 2019 and April 27, 2020. Institutional Review Board approval was obtained from the primary institution prior to participant recruitment and data collection. Subjects were eligible to participate in this study if they were enrolled in an NCAA Division I institution and were participating in varsity athletics for their institutions' athletic department. A standardized email explaining the purpose of the project and study procedures and requesting their athletes' voluntary participation was distributed to the head team physicians and athletic trainers of the two NCAA institutions. Participants were informed that their responses would remain confidential and would not be released to their coaches, trainers, physicians, or any other staff related to their institutions' athletic department. After obtaining informed consent, participants were asked to complete a standardized survey, which included the ABQ, as well as information regarding demographics, sport specialization history, and injury history.

Athlete Burnout Questionnaire. The ABQ is the most popular measure of sport burnout, and previous work supports its reliability and construct validity.^{9,10} The ABQ measures three dimensions of burnout (emotional/physical exhaustion, reduced sense of accomplishment, and sport devaluation) with five items each via a five-point Likert

scale. Athletes are presented with statements about their sport experiences and rate how often they feel that way from 1 (almost never) to 5 (almost always). Each athlete who takes the ABQ receives three scores. One score is the participant's mean response from the five statements measuring reduced sense of accomplishment, the second is their mean response from the five statements measuring exhaustion, and the third is their mean response from the five statements measuring sport devaluation. The three scores are means with ranges from 1-5, with lower scores representing low levels of burnout and higher scores representing higher levels of burnout. Mean scores and standard deviations were obtained for each subscale. A sample of the ABQ is shown in Figure 1.

	MOI	Almost Never	Rarely	Sometimes	Frequently	Almost Always
1 I am accomplishing many worthwhile things in my sport	RA	1	2	3	4	5
2 I feel so tired from my training that I have trouble finding energy to do other things	E	1	2	3	4	5
3 The effort I spend in my sport would be better spent doing other things	SD	1	2	3	4	5
4 I am not achieving much in my sport	RA	1	2	3	4	5
5 I feel overly tired from my sport participation	E	1	2	3	4	5
6 I don't care about my sport performance as much as I used to	SD	1	2	3	4	5
7 I am not performing up to my ability in my sport	RA	1	2	3	4	5
8 I feel "wiped out" from my sport	E	1	2	3	4	5
9 I am not into my sport like I used to be	SD	1	2	3	4	5
10 I feel physically worn out from my sport	E	1	2	3	4	5
11 I feel less concerned about being successful in my sport than I used to	SD	1	2	3	4	5
12 I am exhausted by the mental and physical demands on my sport	E	1	2	3	4	5
13 It seems that no matter what I do, I don't perform as well as I should	RA	1	2	3	4	5
14 I feel successful at my sport	RA	1	2	3	4	5
15 I have negative feelings toward my sport	SD	1	2	3	4	5

Note: Items 1 and 14 are reverse scored, MOI = measure of interest, RA = reduced accomplishment, SD = sport devaluation, E = exhaustion

Figure 1. Athlete Burnout Questionnaire administered to athletes. Items 1 and 14 are reverse scored. MOI = measure of interest, RA = reduced accomplishment, SD = sport devaluation, E = exhaustion

Data Extraction. Patient demographics included sex, age, sport of participation, year of NCAA eligibility, age of beginning specialization, and history of injury. Age of beginning sport specialization was determined by Jayanthi¹², which stated that an athlete is a sport specialist if he/she meets the following three criteria: (1) athletic participation is limited to one sport; (2) which is competed in over eight months in one year; (3) to the exclusion of all other sports.

The primary outcomes of interest for each group were scores from the ABQ. Injury history included history of experiencing any injury, history of experiencing an overuse injury (e.g., stress fracture, tennis elbow, shin splints, golfer's elbow, Achilles' tendonitis, swimmer's shoulder, little-league shoulder/elbow), or history of experiencing a significant injury. Significant injury was defined as an injury which resulted in the athlete missing competition and/or practice for over a two-week time period (anterior cruciate ligament tear, serious sprain, torn rotator cuff, concussion, broken bone, muscle strain). Responses from these demographic data were compared to the results from the ABQ.

Statistical Analysis and Measures of Interest. Survey responses were separated based on reported sex, age of sport specialization, and injury history. These groups were compared using average burnout scores for reduced sense of accomplishment, exhaustion, and sport devaluation. Athletes with a history of any injury, overuse injury, and significant injury were compared to a control group consisting of athletes with no significant injury history. All groups were compared

(males compared to females, underclassmen compared to upperclassmen, athletes with a history of injury were compared to athletes with no injury history) using average burnout scores for reduced sense of accomplishment, exhaustion, and sport devaluation. A difference of means report assessed for statistical significance in differences between the groups. Confidence intervals and p values were reported with a p value less than or equal to 0.05 being considered significant.

RESULTS

Participants. Between August 9, 2019 and April 27, 2020 data were collected from 306 participants from two Division I National Collegiate Athletic Association (NCAA) athletic programs. Incomplete responses were received from 41 participants, leaving 267 athletes for analysis. All 267 athletes competed solely in one sport for their respective school (Table 1). Participants ranged in age from 18 to 23 (M = 19.9 ± 1.43 years) with both males (n = 95) and females (n = 172). Year of NCAA eligibility consisted of 81 freshmen (30.3%), 75 sophomores (28.1%), 51 juniors (19.1%), 45 seniors (16.9%), and 15 graduate students (5.6%). The CONSORT 2010 Flow Diagram can be found in Figure 2 detailing the inclusion and specific grouping of participants.

Table 1. Sport of participation by athletes participating in survey.*

Sport of Participation (Sex)	n
Baseball (M)	17
Basketball (M)	2
Basketball (W)	3
Cross Country (M)	24
Cross Country (W)	43
Football (M)	38
Golf (W)	4
Gymnastics (W)	1
Rowing (W)	89
Soccer (W)	13
Softball	14
Swim and Dive (W)	10
Tennis (W)	2
Volleyball (W)	5
Not Reported	2

*(M) = Men's sport; (W) = Women's sport

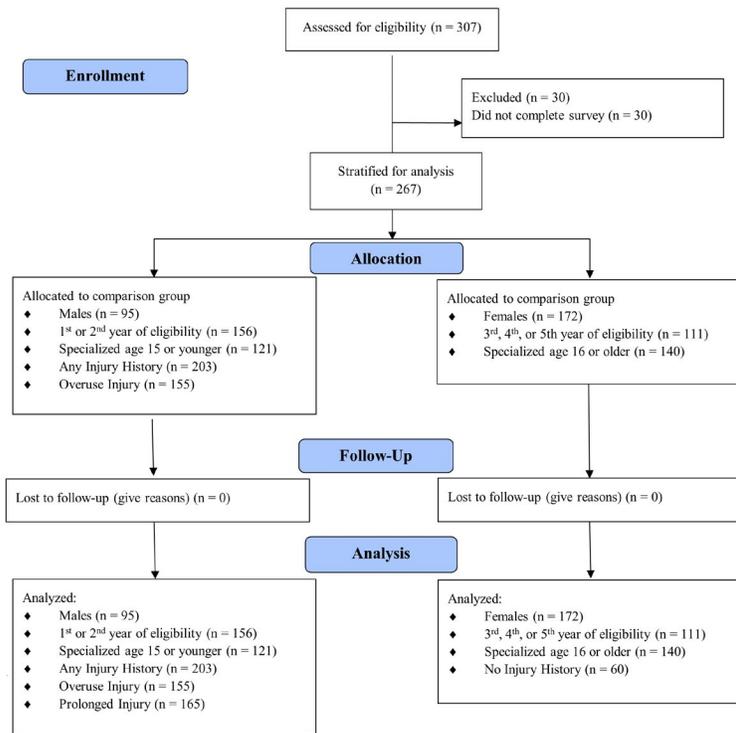


Figure 2. CONSORT 2010 Flow Diagram detailing the enrollment, allocation, follow-up, and analysis of athletes and separation of participants into statistical groups.

Burnout Profile by Sex. A total of 267 athletes filled out the ABQ to completion consisting of 95 males (35.6%) and 172 females (64.4%). Females reported significantly higher levels of exhaustion than males (Difference of means (M) = 0.43, 95% confidence interval (CI) = [0.20, 0.66], $p < 0.01$). However, females did not score significantly higher in regard to feeling a reduced sense of accomplishment (M = 0.17, 95% CI = [-0.03, 0.37], $p = 0.09$) or experiencing sport devaluation (M = 0.14, 95% CI = [-0.08, 0.36], $p = 0.14$). Results can be seen in Table 2.

Table 2. Statistical analysis of Athlete Burnout Questionnaire results compared to athlete sex.

Athlete Burnout Questionnaire Variable	Male (n = 95)	Female (n = 172)	Difference in Means (95% CI)	p
Reduced Sense of Accomplishment	2.23 ± 0.81	2.40 ± 0.76	0.17 (-0.03-0.37)	0.09
Exhaustion	2.52 ± 0.91	2.95 ± 0.91	0.43 (0.20-0.66)	< 0.01*
Sport Devaluation	1.98 ± 0.88	2.12 ± 0.90	0.14 (-0.08-0.36)	0.14

*Statistically significant difference between groups ($p < 0.05$).

Burnout Profile by Year of Eligibility. Of the 267 who completed the survey, 156 were in their first or second year of NCAA eligibility (58.4%), and 111 were in their third, fourth, or fifth year of eligibility (41.6%). Upperclassmen athletes in their third, fourth, or fifth year of NCAA eligibility reported significantly higher levels of sport devaluation (M = 0.27, 95% CI = [0.05, 0.48], $p < 0.05$) than underclassmen in their first or second year of eligibility. However, upperclassmen

athletes in their third, fourth, or fifth year did not report significantly higher feelings of reduced sense of accomplishment (M = 0.16, 95% CI = [-0.03, 0.35], $p = 0.11$) or significantly increased levels of exhaustion (M = -0.07, 95% CI = [-0.29, 0.15], $p = 0.54$) than athletes in their first or second year. Results can be seen in Table 3.

Table 3. Statistical analysis of Athlete Burnout Questionnaire results compared to year of NCAA eligibility.

Athlete Burnout Questionnaire Variable	1 st or 2 nd Year (n = 156)	3 rd , 4 th , or 5 th Year (n = 111)	Difference in Means (95% CI)	p
Reduced Sense of Accomplishment	2.27 ± 0.74	2.43 ± 0.83	0.16 (-0.03-0.35)	0.11
Exhaustion	2.27 ± 0.74	2.76 ± 0.92	-0.07 (-0.29-0.15)	0.54
Sport Devaluation	1.96 ± 0.90	2.23 ± 0.87	0.27 (0.05-0.48)	< 0.05*

*Statistically significant difference between groups ($p < 0.05$).

Burnout Profile by Age of Beginning Sport Specialization.

From the 267 athletes who completed the ABQ, 121 reported beginning sport specialization before the age of 15 (45.3%), 140 sport specialized at age 16 or older (52.4%), and 6 did not report an age of beginning specialization (2.2%). Athletes who reported specializing before age 15 did not report significantly higher levels of burnout than athletes who specialized at age 16 or older in reduced sense of accomplishment (M = 0.14, 95% CI = [-0.04, 0.33], $p = 0.14$), exhaustion (M = 0.09, 95% CI = [-0.14, 0.32], $p = 0.44$), or sport devaluation (M = 0.09, 95% CI = [-0.13, 0.31], $p = 0.43$). Results can be seen in Table 4.

Table 4. Analysis of Athlete Burnout Questionnaire results compared to year of beginning sport specialization.

Athlete Burnout Questionnaire Variable	Age 15 or Younger (n = 121)	Age 16 or Older (n = 140)	Difference in Means (95% CI)	p
Reduced Sense of Accomplishment	2.43 ± 0.76	2.29 ± 0.78	0.14 (-0.04-0.33)	0.14
Exhaustion	2.86 ± 1.00	2.77 ± 0.88	0.09 (-0.14-0.32)	0.44
Sport Devaluation	2.14 ± 0.95	2.05 ± 0.86	0.09 (-0.13-0.31)	0.43

*Statistically significant difference between groups ($p < 0.05$).

Comparing Levels of Athlete Burnout by Injury History.

There were 263 athlete responses to the injury survey. Of these, 203 (77.2%) reported experiencing any injury, 155 reported experiencing at least one overuse injury (58.9%), 165 reported at least one prolonged injury (62.7%), and 60 reported no significant injury history (22.8%).

Any Injury History Compared to No Injury History. Athletes who reported a history of experiencing any injury experienced significantly higher feelings of reduced sense of accomplishment than athletes with no injury history (M = 0.24, 95% CI = [0.03, 0.45], $p < 0.05$), but they did not score significantly higher in feelings of exhaustion (M = 0.10, 95% CI = [-0.15, 0.35], $p = 0.45$) or sport devaluation (M = 0.12, 95% CI = [-0.11, 0.35], $p = 0.31$). Results can be seen in Table 5.

Table 5. Analysis of Athlete Burnout Questionnaire results comparing history of any injury to no injury history.

Athlete Burnout Questionnaire Variable	Any Injury History (n = 203)	No Injury History (n = 60)	Difference in Means (95% CI)	p
Reduced Sense of Accomplishment	2.41 ± 0.79	2.17 ± 0.69	0.24 (0.03-0.45)	< 0.05*
Exhaustion	2.83 ± 0.95	2.73 ± 0.88	0.10 (-0.15-0.35)	0.45
Sport Devaluation	2.11 ± 0.93	1.99 ± 0.77	0.12 (-0.11-0.35)	0.31

*Statistically significant difference between groups (p < 0.05).

History of Overuse Injury Compared to No Injury History. Athletes who previously experienced an overuse injury scored significantly higher in feelings of reduced sense of accomplishment (M = 0.34, 95% CI = [0.12, 0.55], p < 0.001), but did not report significantly higher feelings of exhaustion (M = 0.19, 95% CI = [-0.07, 0.45], p = 0.16) or sport devaluation (M = 0.20, 95% CI = [-0.04, 0.45], p = 0.11) than athletes who had not experienced any injury. Results can be seen in Table 6.

Table 6. Analysis of Athlete Burnout Questionnaire results comparing history of overuse injury to no injury history.

Athlete Burnout Questionnaire Variable	Overuse Injury History (n = 155)	No Injury History (n = 60)	Difference in Means (95% CI)	p
Reduced Sense of Accomplishment	2.51 ± 0.79	2.17 ± 0.69	0.34 (0.12-0.55)	< 0.01*
Exhaustion	2.92 ± 0.93	2.73 ± 0.88	0.19 (-0.07-0.45)	0.16
Sport Devaluation	2.19 ± 0.94	1.99 ± 0.77	0.20 (-0.04-0.45)	0.11

*Statistically significant difference between groups (p < 0.05).

History of Prolonged Injury Compared to No Injury History. Finally, student-athletes who previously experienced a prolonged injury reported significantly higher levels of burnout in feelings of reduced sense of accomplishment (M = 0.21, 95% CI = [0.00, 0.42], p = 0.05) than athletes who had not experienced any injury. However, athletes with a history of prolonged injury did not experience significantly higher levels of exhaustion (M = 0.05, 95% CI = [-0.21, 0.32], p = 0.71) or sport devaluation (M = 0.11, 95% CI = [-0.13, 0.35], p = 0.38) than athletes who had no injury history. Results can be seen in Table 7.

Table 7. Analysis of Athlete Burnout Questionnaire results comparing history of prolonged injury to no injury history.

Athlete Burnout Questionnaire Variable	Prolonged Injury History (n = 165)	No Injury History (n = 60)	Difference in Means (95% CI)	p
Reduced Sense of Accomplishment	2.38 ± 0.80	2.17 ± 0.69	0.21 (0.00-0.42)	0.05*
Exhaustion	2.78 ± 0.94	2.73 ± 0.88	0.05 (-0.21-0.32)	0.71
Sport Devaluation	2.10 ± 0.95	1.99 ± 0.77	0.11 (-0.13-0.35)	0.38

*Statistically significant difference between groups (p < 0.05).

DISCUSSION

The results of this retrospective cohort did not support our primary hypothesis regarding age of specialization having an impact on symptoms of burnout. Instead, data showed that beginning sport

specialization before 15 years old did not have a significant change in burnout symptoms compared to specializing at age 16 or older. However, significant findings from this cohort included evidence that current NCAA Division I female athletes were more likely to experience burnout symptoms of exhaustion compared to males. Furthermore, NCAA Division I athletes later in their collegiate careers were more likely to experience burnout in terms of sport devaluation than athletes early in their collegiate careers. Finally, any injury, including prior injury, overuse injury, or prolonged injury in NCAA Division I student-athletes, significantly increased burnout symptoms, specifically a reduced sense of accomplishment compared with athletes with no injury history.

Burnout vs. Sex. The current study demonstrated that female NCAA Division I athletes were more likely to experience the symptoms of burnout (exhaustion) compared to male athletes competing at the same level. Previous studies have found a similar correlation between burnout and adolescent female athletes.^{13,14} In a study by Isoard et al.¹³, the authors demonstrated that female athletes experienced significantly higher levels of reduced sense of accomplishment than male athletes, but not significantly higher in exhaustion or sport devaluation. Meanwhile, Moen et al.¹⁴ found no significant difference in burnout scores between male and female athletes. These studies used adolescent athletes as their study subjects, which could cause differences in levels of burnout symptoms compared to the NCAA athletes used in this study. Our literature search did not find a study comparing burnout symptoms in NCAA athletes stratified by sex.

Confounding pathology within the female athlete could be an explanation for this difference in burnout between male and female athletes. Female athletes are more likely to experience a syndrome termed “Relative Energy Deficiency in Sport” (RED-S) than men and may be related to the previously described female athlete triad (eating disorder, low bone mineral density, and menstrual irregularities).¹⁵ Future research is needed to investigate RED-S as a possible factor affecting burnout in female athletes.

Burnout vs. Age of Specialization. There were very few studies^{13,16} which directly compared burnout levels in athletes who began specializing at different ages, and this is the first study which attempted to do so in high level collegiate athletes. A consensus statement by The American Orthopedic Society for Sports Medicine (AOSSM) was published in 2016 advising against early youth specialization due to increased levels of burnout and injury.¹⁷ In this statement, it was demonstrated that youth specialization before the age of 12 was associated with increased levels of burnout, higher dropout rates, and decreased athletic development over time.¹⁸ This was not consistent with our study which showed that athletes who specialized before the age of 15 were not significantly more or less likely to experience any symptoms of burnout, however, our sample size was relatively small and did not include enough athletes who specialized under age 12 for an analysis to be run.

Athletes who chose to specialize early did not necessarily increase their chances of becoming an NCAA Division I athlete and actually may have detrimental physical and psychosocial outcomes related to early sport specialization. In this study, 48 athletes (18.0%) reported specializing before the age of 12, and 122 athletes (45.7%) reported specializing at some point before college. These numbers were similar to a study performed by Bell et al.¹⁹ which reported that 36% of all high-school athletes were specializing. Taking this and previous studies into account, it did not appear that specializing in high school increases chances of becoming an NCAA Division I athlete.^{19,20} Additionally, because of the increased potential for injury, psychological burnout, and dropout among highly specialized athletes, those who chose to specialize early may increase their risk of a negative outcome without substantially increasing their chances of participating at the collegiate or professional levels.^{18,20} A study by Myer et al.⁶ reported that parents and coaches were large driving forces in an athlete's decision to specialize in hopes that their child or athlete will make it to the collegiate level or obtain a scholarship. This study found that 43.5% of athletes reported their parents being a major influence and 38.5% reported their coach being an influence on their decision to sport specialize. However, 64.9% of athletes reported that their decision to sport specialize was largely self-motivated, suggesting that there is a combination of factors that plays a part in an athlete's decision to sport specialize.

Multiple statements advising against specialization have been published^{15,21}; however, burnout levels in NCAA athletes have not been widely evaluated. Although our study did not show a significant difference in burnout levels based on age of specialization, future studies should continue to assess burnout levels in NCAA athletes to understand the causes and outcomes of this condition.

Burnout vs. Year of NCAA Eligibility. This study was the first to describe levels of burnout based on year of NCAA eligibility. Athletes in the second half of their eligibility (third, fourth, and fifth years) were found to have significantly higher scores in the sport devaluation subcategory of the ABQ compared to athletes in their first and second years of eligibility. Previous studies have shown that burnout occurs over a long period of time,^{16,22} so athletes in their later years of eligibility may fit this profile. As discussed above, age at beginning sport specialization can play a role in an athlete's levels of burnout. We found that 33.2% of athletes did not begin specializing until they started training at the NCAA level. Therefore, it was possible that these athletes in their third year of eligibility and beyond were beginning to experience the burnout symptoms associated with their transition to collegiate sport specialization.

Athlete burnout has been suggested to occur on a continuum.²² Exhaustion was thought to occur at the start of the burnout process and followed by a reduced sense of accomplishment and finally by sport devaluation.²² While no research has proven this "burnout continuum" phenomenon, it was interesting that athletes near the end of their NCAA careers reported burnout symptoms in the subcategory of

sport devaluation, which occurred at the end of the proposed "burnout continuum". Future research should be conducted at NCAA Division I institutions to assess burnout profiles for athletes based on year of eligibility. Furthermore, it would be interesting to compare these results based on sport of participation to find if certain sports increase likelihood of burnout throughout an athlete's collegiate career.

Burnout vs. Injury History. NCAA Division I athletes surveyed in this study demonstrated higher levels of burnout in the subcategory of a reduced sense of accomplishment if they had a history of injury, whether it be prolonged injury or overuse injury. Studies have reported that a history of multiple injuries has a correlation with increased levels of burnout.^{3,23} However, this was the first study to demonstrate that levels of burnout were consistent among types of injury, whether traumatic, prolonged, or overuse injuries. In a study by Grylls et al.²⁴, the authors demonstrated that athletes with current injury experienced lower levels of burnout compared to athletes with no injury. On the other hand, athletes with a past history of repeated injury experienced higher levels of burnout compared to athletes with no history. A possible explanation for this result may be due to the temporary break from intense sporting involvement that an injury provides, which may decrease levels of burnout. Multiple injuries, though, could have a cumulative effect, creating a lack of enjoyment leading ultimately to burnout. Furthermore, even though our study did not show that specialization leads to burnout, the results revealed that injury can lead to burnout. It could be inferred that early specialization leads to increased risk of injury, and injury leads to increased risk of burnout. Other studies could be conducted which compare injury rates from this cohort to other early sport specializers to see if they are similar.

Future studies should attempt to assess larger sample sizes to identify burnout patterns in athletes with injury history. Studies also could attempt to measure burnout levels before injury, immediately after injury, then at regular intervals during recovery and return to sport to assess an athlete's burnout patterns post-injury.

Limitations. As with most retrospective cohorts, a major limitation of this study was recall bias. Current collegiate athletes were asked to recall their sport participation history, specialization history, and injury history as far back as the age of 8 years old and in some cases as far back as they can remember participating in sports. Athletes from all years of NCAA eligibility were surveyed, including graduate students and athletes competing in a fifth year, which potentially could worsen recall among the oldest athletes in the sample. Another limitation was the unequal distribution of subjects between sports. This was largely the result of the inclusion of rowing, track and field, and football which have a much larger roster than other college sports. With a higher proportion of athletes in this study participating in rowing (n = 89), an attempt should be made to conduct a study among sports with higher levels of youth specialization. Furthermore, a sample size of 267 athletes may not be generalizable to the entirety of Division I NCAA athletics. Considering variability of institutions, coaches, sports, and time of year, there are many factors that can play a role in an athlete's current levels of burnout; however, this variability also can contribute to improved generalizability of the data found in this study. Future research should attempt to sample larger numbers of athletes from multiple institutions in an attempt to include more sports and athletes.

CONCLUSIONS

Overall, these results showed that females, athletes later in their careers, and athletes with injury history (specifically overuse injury) are most at risk for burnout. With these data, a population of athletes within athletic departments have been identified which should receive further counseling and attention in regard to mental health and burnout. Future studies should attempt to assess burnout in a large population of athletes, such as the NCAA, to understand predisposing factors to burnout better. Most importantly, future studies should attempt to find ways to prevent burnout as well as treat burnout once it begins to occur.

REFERENCES

- 1 Malina RM. Early sport specialization: Roots, effectiveness, risks. *Curr Sports Med Rep* 2010; 9(6):364-371. PMID: 21068571.
- 2 Buckley PS, Bishop M, Kane P, et al. Early single-sport specialization: A survey of 3090 high school, collegiate, and professional athletes. *Orthop J Sports Med* 2017; 5(7):2325967117703944. PMID: 28812031.
- 3 Fabricant PD, Lakomkin N, Sugimoto D, Tepolt FA, Straccolini A, Kocher MS. Youth sports specialization and musculoskeletal injury: A systematic review of the literature. *Phys Sportsmed* 2016; 44(3):257-262. PMID: 27121730.
- 4 Hall R, Barber Foss K, Hewett TE, Myer GD. Sport specialization's association with an increased risk of developing anterior knee pain in adolescent female athletes. *J Sport Rehabil* 2015; 24(1):31-35. PMID: 24622506.
- 5 Erickson BJ, Chalmers PN, Axe MJ, Romeo AA. Exceeding pitch count recommendations in little league baseball increases the chance of requiring Tommy John surgery as a professional baseball pitcher. *Orthop J Sports Med* 2017; 5(3):2325967117695085. PMID: 28451602.
- 6 Myer GD, Jayanthi N, DiFiori JP, et al. Sport specialization, Part I: Does early sports specialization increase negative outcomes and reduce the opportunity for success in young athletes? *Sports Health* 2015; 7(5):437-442. PMID: 26502420.
- 7 Côté J, Lidor R, Hackfort Dieter. ISSP position stand: To sample or to specialize? Seven postulates about youth sport activities that lead to continued participation and elite performance. *Int J Sport Exerc Psychol* 2009; 7(1):7-17.
- 8 Shanafelt TD, Sloan JA, Habermann TM. The well-being of physicians. *Am J Med* 2003; 114(6):513-519. PMID: 12727590.
- 9 Raedeke TD, Smith AL. Development and preliminary validation of an athlete burnout measure. *J Sport Exerc Psychol* 2001; 23(4):281-306. PMID: 28682196.
- 10 Li C, Wang CKJ, Pyun DY, Kee YH. Burnout and its relations with basic psychological needs and motivation among athletes: A systematic review and meta-analysis. *Psychol Sport Exerc* 2013; 14(5):692-700.
- 11 Cresswell SL, Eklund RC. Athlete burnout: A longitudinal qualitative study. *Sport Psychol* 2007; 21(1):1-20.
- 12 Jayanthi N, Pinkham C, Dugas L, Patrick B, Labella C. Sports specialization in young athletes: Evidence-based recommendations. *Sports Health* 2013; 5(3):251-257. PMID: 24427397.
- 13 Isoard-Gauthier S, Guillet-Descas E, Gaudreau P, Chanal J. Development of burnout perceptions during adolescence among high-level athletes: A developmental and gendered perspective. *J Sport Exerc Psychol* 2015; 37(4):436-448. PMID: 26442773.
- 14 Moen F, Myhre K, Sandbakk Ø. Psychological determinants of burnout, illness and injury among elite junior athletes. August 16, 2016. <https://thesportjournal.org/article/psychological-determinants-of-burnout-illness-and-injury-among-elite-junior-athletes/>.
- 15 Mountjoy M, Sundgot-Borgen J, Burke L, et al. The IOC Consensus Statement: Beyond the Female Athlete Triad--Relative Energy Deficiency in Sport (RED-S). *Br J Sports Med* 2014; 48(7):491-497. PMID: 24620037.
- 16 Isoard-Gauthier S, Guillet-Descas E, Gustafsson H. Athlete burnout and the risk of dropout among young elite handball players. *Sport Psychol* 2016; 30(2):123-130.
- 17 LaPrade RF, Agel J, Baker J, et al. AOSSM Early Sport Specialization Consensus Statement. *Orthop J Sports Med* 2016; 4(4):2325967116644241. PMID: 27169132.
- 18 Fraser-Thomas J, Côté J, Deakin J. Examining adolescent sport dropout and prolonged engagement from a developmental perspective. *J Appl Sport Psychol* 2008; 20(3):318-333.
- 19 Bell DR, Post EG, Trigsted SM, Hetzel S, McGuine TA, Brooks MA. Prevalence of sport specialization in high school athletics: A 1-year observational study. *Am J Sports Med* 2016; 44(6):1469-1474. PMID: 26920433.

²⁰ Post EG, Thein-Nissenbaum JM, Stiffler MR, et al. High school sport specialization patterns of current Division I athletes. *Sports Health* 2017; 9(2):148-153. PMID: 27807260.

²¹ DiFiori JP, Benjamin HJ, Brenner JS, et al. Overuse injuries and burnout in youth sports: A position statement from the American Medical Society for Sports Medicine. *Br J Sports Med* 2014; 48(4):287-288. PMID: 24463910.

²² Strachan L, Côté J, Deakin J. 'Specializers' versus 'samplers' in youth sport: Comparing experiences and outcomes. *Sport Psychol* 2009; 23(1):77-92.

²³ Jayanthi NA, Dugas LR. The risks of sports specialization in the adolescent female athlete. *Strength Cond J* 2017; 39(2):20-26.

²⁴ Grylls E, Spittle M. Injury and burnout in Australian athletes. *Percept Mot Skills* 2008; 107(3):873-880. PMID: 19235416.

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