

[Athletic Training]



High School Sport Specialization Patterns of Current Division I Athletes

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Background: Sport specialization is a strategy to acquire superior sport performance in 1 sport but is associated with increased injury risk. Currently, the degree of high school specialization among Division I athletes is unknown.

Hypothesis: College athletes will display increased rates of specialization as they progress through their high school careers.

Study Design: Descriptive epidemiological study.

Level of Evidence: Level 4.

Methods: Three hundred forty-three athletes (115 female) representing 9 sports from a Midwest Division I University completed a previously utilized sport specialization questionnaire regarding sport participation patterns for each grade of high school. McNemar and chi-square tests were used to investigate associations of grade, sport, and sex with prevalence of sport specialization category (low, moderate, high) (a priori $P \leq 0.05$).

Results: Specialization increased throughout high school, with 16.9% ($n = 58$) and 41.1% ($n = 141$) of athletes highly specialized in 9th and 12th grades, respectively. Football athletes were less likely to be highly specialized than nonfootball athletes for each year of high school ($P < 0.001$). There was no difference in degree of specialization between sexes at any grade level ($P > 0.23$).

Conclusion: The majority of Division I athletes were not classified as highly specialized throughout high school, but the prevalence of high specialization increased as athletes progressed through high school. Nonfootball athletes were more likely to be highly specialized than football athletes at each grade level.

Clinical Relevance: Most athletes who are recruited to participate in collegiate athletics will eventually specialize in their sport, but it does not appear that early specialization is necessary to become a Division I athlete. Athletes should be counseled regarding safe participation in sport during high school to minimize injury and maximize performance.

Keywords: sport specialization; NCAA athlete; youth sports

Year-round participation in a single sport at the exclusion of other sports, or sport specialization, is an increasingly common component of youth sports participation.^{6,10}

One potential reason cited for specializing at an early age is that increased time spent training in a specific sport may increase the chances of obtaining a college scholarship or contract for that sport.¹⁶ Despite this perceived benefit, early sport specialization is associated with multiple adverse outcomes such

as psychological burnout, altered movement patterns, and injury.^{4,15} A sport specialization scale was recently developed to more accurately classify specialization along a spectrum from low to high. Using this scale, a high degree of specialization has been associated with injury, overuse in particular, independent of factors such as age.^{1,12} While early specialization may allow for the development of improved sport skills due to year-round training, elite athletes in certain sports actually specialize at a

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later age than nonelite athletes.^{9,14} Similarly, national team athletes in the United Kingdom were more likely to participate in multiple sports throughout adolescence than club team-level athletes.⁵ National Collegiate Athletic Association (NCAA) athletes often do not specialize until late adolescence and do not differ in their specialization patterns from undergraduate students at the same institution, indicating that early specialization may not be necessary for high-level athletics or for obtaining a college scholarship.^{7,11,17}

Limited data exist regarding the influence of sex and sport on sport specialization behavior. It seems plausible that specialization rates could be affected by the culture and off-season training demands of specific sports. For example, high school football in the United States does not utilize an off-season club team component. Therefore, football players may be less likely to be specialized compared with athletes of other sports that have opportunities for off-season club or travel teams, such as soccer or volleyball. Finally, several motivations for early specialization have been proposed, such as pressure from parents to obtain a college scholarship or professional contract.^{2,15} Professional baseball players rated themselves as being the most influential source and their parents as the second regarding specialization.⁹

The purposes of this study were to (1) determine the prevalence of sport specialization during high school in current NCAA Division I athletes from a single institution, (2) examine high school specialization patterns based on sport or sex, and (3) determine the contextual factors influencing the decision to specialize in 1 sport. We hypothesized that college athletes will display increased rates of specialization as they progress through their high school careers. Additionally, we hypothesized that female college athletes would be more specialized than male athletes throughout high school, and that college football athletes would report lower levels of specialization throughout high school than nonfootball athletes.

METHODS

The institutional review board at the University of Wisconsin-Madison approved this study and procedures. Three hundred forty-three current Division I athletes (115 females, 228 males) (Table 1) completed a sport specialization questionnaire as part of a larger battery of testing.

Degree of specialization was classified as low, moderate, or high using a previously published 3-point scale.^{1,12} The 3 questions of the scale were modified to retrospectively ask about each grade of high school. Athletes responded either “yes” or “no” to each question, which was scored as 1 or 0 points, respectively. Specialization was calculated for each grade, with scores of 0 or 1 indicating low specialization, a score of 2 indicating moderate specialization, and a score of 3 indicating high specialization. Once an athlete quit a sport to focus on their primary sport, that question was also marked “yes” for their subsequent grades in high school. The other 2 specialization questions were answered independently of

Table 1. Sport distribution of current Division I athletes

Men's Sports (n = 228)	Women's Sports (n = 115)
Basketball (n = 13) ^a	Basketball (n = 17) ^a
Golf (n = 7) ^a	Golf (n = 5) ^a
Ice hockey (n = 27) ^a	Ice hockey (n = 25) ^a
Soccer (n = 26) ^a	Soccer (n = 23) ^a
Tennis (n = 2) ^a	Tennis (n = 12) ^a
Football (n = 115)	Softball (n = 19)
Wrestling (n = 38)	Volleyball (n = 14)

^aIncluded in analysis of sex-equivalent sports.

responses for previous high school grades. Athletes were asked to select the single most important factor in their eventual specialization in their collegiate sport. Twenty-three subjects chose not to answer this question, leaving 320 total responses.

Sport specialization classification throughout high school for the entire sample and factors influencing specialization were summarized using frequencies and proportions (%). The McNemar test for paired categorical data was used to determine differences in specialization rates for all possible consecutive grade pairs (9th and 10th grade, 10th and 11th grade, 11th and 12th grade) with a Holm adjustment for 3 tests. Chi-square tests were used to investigate associations of sport and sex by specialization category for each grade of high school. Alpha was set a priori at $P < 0.05$. To investigate associations of sex, only sex-equivalent sports were examined (n = 157; 82 females, 75 males) (Table 1). All statistical analyses were performed using SPSS statistical software (v21.0; IBM Corp).

RESULTS

Overall, specialization increased throughout high school, with significant differences in the prevalence of specialization observed between all possible consecutive grade pairs ($P < 0.001$ to $P = 0.001$) (Figure 1). Among sex-equivalent sports, there was no detectable difference in degree of specialization between sexes at any grade level ($P = 0.23$ to $P = 0.69$) (Figure 2). Football athletes displayed different high school specialization patterns than nonfootball athletes during each grade of high school, with nonfootball athletes more likely to be highly specialized than football athletes in each grade (Figure 3).

The most common reason cited by athletes for choosing to specialize in their college sport was enjoying that sport the most. The second and third most frequent selections were having an opportunity to earn a scholarship to play in college and being the best at that sport, respectively. Only 9.9% (n = 34) of athletes cited parental influence as the most important factor in their decision to specialize in their college sport.

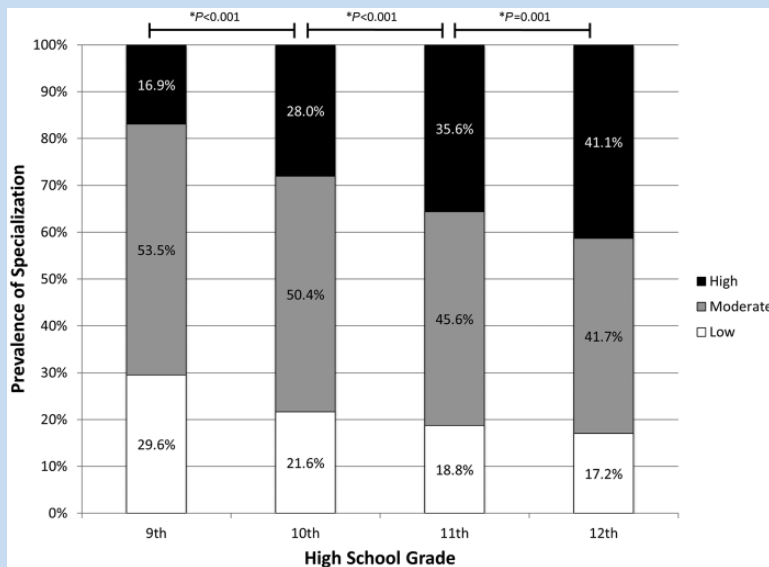


Figure 1. Prevalence of specialization category by high school grade. *P < 0.05.

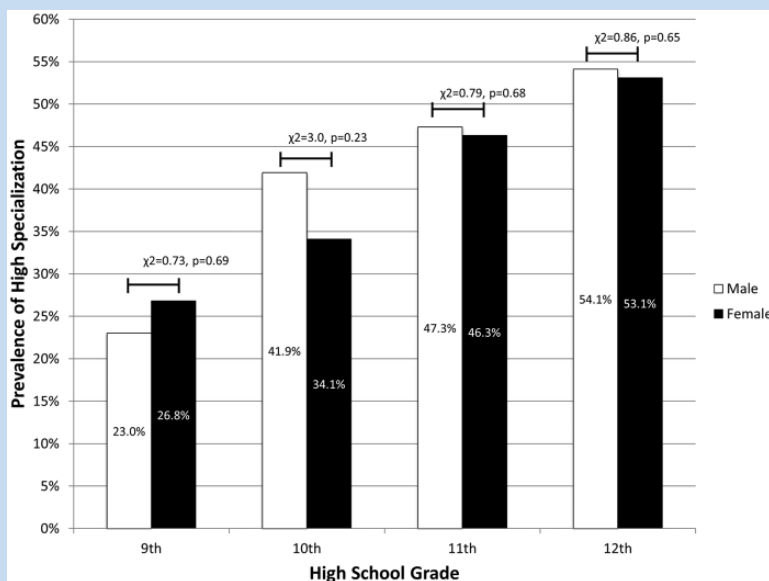


Figure 2. Differences in high specialization by high school grade between current Division I male and female athletes.

DISCUSSION

Overall, the findings of this study expand our understanding of the high school specialization patterns of current Division I athletes. The prevalence of high specialization among current Division I college athletes increased as athletes progressed through high school, football athletes were less likely to be highly specialized than nonfootball athletes, and there were no differences in specialization rates among sex-equivalent sports.

Previous research using the same 3-point specialization scale in a high school sample found that 36.4% of athletes overall were

highly specialized.¹ In a separate study, 28.1% of athletes aged 7 to 18 years who were seeking medical care for a sport-related injury or reporting for a sport preparticipation physical were classified as specialized.¹² In this study, specialization rates ranged from 17% to 41% depending on high school grade, with an overall mean prevalence of high specialization of 30.4%. Therefore, it does not appear that Division I athletes differ from more general samples of youth athletes in terms of their specialization rates. Increased specialization may provide increased opportunity for advancement to higher levels of sport. However, the similarity between the high school specialization

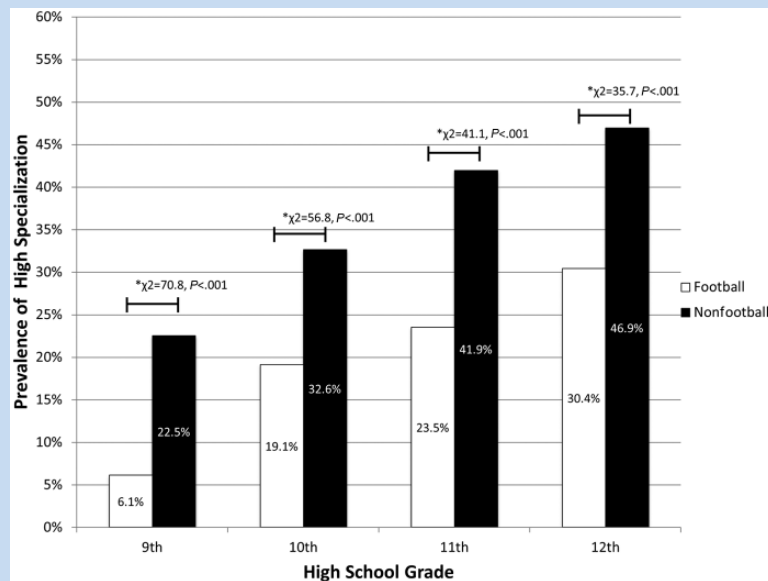


Figure 3. Differences in high specialization by high school grade between current Division I football and nonfootball athletes. * $P < 0.05$.

rates seen among college athletes in this study and previously reported rates in a high school sample suggests that factors other than specialization may play a larger role in the ability to advance to elite levels of sport competition. Elite and national team athletes specialize later and participate in more sports during the high school years than nonelite athletes.^{5,9,14} Additionally, because of the increased potential for injury, psychological burnout, and sport dropout among highly specialized athletes, it is likely that the vast majority of athletes who choose to specialize early increase their risk of a negative outcome without substantially increasing their chances of participating at the collegiate or professional levels.^{6,8,12}

Current Division I football athletes were less specialized throughout high school than Division I nonfootball athletes. This is possibly because of the fact that the American high school football competition schedule is restricted to the late summer and fall months, allowing for participation in other sports during the winter and spring. Anecdotally, sports such as basketball and soccer have off-season club travel teams in which athletes are encouraged to participate to advance their sport skills, resulting in year-round participation. While many high school football athletes are encouraged to perform strength training in the offseason, there is little availability of organized or structured off-season club or travel football teams in the United States. This affords these athletes the opportunity to participate in a different organized sport (eg, track and field), play a different sport recreationally (eg, “pick-up basketball” or intramurals), or rest during their offseason.

There were no sex differences in rates of specialization when sex-equivalent sports were examined. This is in contrast to a broad sample of more than 2000 athletes between 12 and 18 years old, which showed that females were more likely to be classified as highly specialized compared with males (Bell DR,

Post EG, Trigsted SM, Riekena JW, McGuine TA, Brooks MA. “The association of sport volume recommendations and history of injury in adolescent athletes.” Presented at Pediatric Research in Sports Medicine Society Annual Meeting, 2016). In the present study, football athletes, who had lower specialization rates than the other sports, were not included in the sex-equivalent analysis. As such, the inclusion of football athletes in the previous research may have accounted for the decreased prevalence of specialization in male athletes compared with female athletes.

Sport enjoyment was rated by current Division I athletes as the most important factor in their eventual decision to specialize in their collegiate sport. Enjoyment is the most important factor in sustained youth sport participation.¹⁸ Athletes ranked the opportunity to obtain a college scholarship as the second most important factor in eventual specialization; this was contrary to the expectation of obtaining a college scholarship being a noninfluential factor in specialization. However, the low rates of specialization during the early high school years may indicate that while the opportunity to receive a scholarship was an important deciding factor, it may not have become highly influential until late in high school. More than 20% of athletes selected “being the best at that sport” as the most important factor in their specialization. Perceived sport competence is an important factor in sustaining physical activity from childhood into adulthood.^{3,15}

The increasing trend of early sport specialization is believed to be largely driven by parents and coaches who hope to improve their child’s skills so they may receive a college scholarship or professional contract.^{2,15} However, the majority of elite college athletes in this study were not being influenced to specialize by their parents. Only 20% of professional baseball players listed their parents as the most influential factor in specializing.⁹ While parents may not have been an influential source of

encouragement to specialize in this study, college athletes are more likely to have parents or siblings who have participated in athletics at the collegiate or professional levels, implicating a genetic component to elite sport success.¹⁷ However, we did not examine the proportion of athletes who had a parent or sibling with elite sport experience in this study. It is also possible that factors that were not examined in this study, such as coach influence, play a large role in the decision to specialize.

A major limitation of this study is recall bias. Current college athletes were asked to recall their sport participation history as far back as the 9th grade. Athletes from all 4 years of college were surveyed, potentially increasing the difficulty of correctly recalling information among the oldest college athletes in the sample. Another limitation is the unequal distribution of subjects between sports. This was largely the result of the inclusion of football, which has a much larger roster than almost all other college sports. Additionally, no sample size estimation was carried out prior to the study, so statistically significant differences cannot be definitively stated. While we attempted to include as many sources of influence regarding specialization as possible, some potentially important sources, such as coach influence, were not examined. It should be noted that the 3-point specialization scale utilized in this study has not been formally validated; however, it has been previously utilized and associated with injury in research studies from 2 separate groups of researchers.^{1,12} Finally, injury risk or history was not examined in this study, so we were not able to determine whether specialization patterns during high school influence injury risk during college.

CONCLUSION

The majority of NCAA Division I athletes were not highly specialized throughout high school but the prevalence of high


specialization did increase as athletes progressed through high school. At each grade level, there was a significantly larger proportion of highly specialized nonfootball athletes than highly specialized football athletes. There were no differences in the degree of specialization between sexes at any grade level for sex-equivalent sports. Athletes cited enjoyment of their collegiate sport as the most important factor in their eventual decision to specialize in that sport, with the opportunity to play that sport in college being the second most influential factor regarding specialization. Parental influence was infrequently selected as being influential in the decision to specialize.

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Clinical Recommendations

SORT: Strength of Recommendation Taxonomy Grade

A: consistent, good-quality patient-oriented evidence
B: inconsistent or limited-quality patient-oriented evidence
C: consensus, disease-oriented evidence, usual practice, expert opinion, or case series

Clinical Recommendation	SORT Evidence Rating
Sport specialization during high school is not necessary for eventual participation in Division I athletics.	B

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