

Association Between Sports Specialization and Risk of Musculoskeletal Injury in High School Athletes: A Critically Appraised Topic

Daniel Dopson, ATS,

Erik Arve, PT, DPT, CSCS, ATS,

Jennifer Volberding, PhD, LAT, ATC

Clinical Scenario

Sport specialization is defined as intensive, year-round training in a single sport to the exclusion of other sports.¹ Specialization is thought to be caused by the pressure to compete at elite levels in order to get athletic scholarships and/or advance to a higher level of a sport. The increased training and competition loads secondary to this trend have been hypothesized to contribute to psychological burnout and overuse injuries. High school athletes, in particular, are of interest due to the increased intensity and level of competition compared to youth sports. To better understand the relationship between sport specialization and musculoskeletal injuries, researchers have sought to identify the prevalence and severity of sport specialization in athletes. Utilizing a set of questions developed by Jayanthi et al, researchers have attempted to classify athletes as high, moderate, or low specialization.² Using these classifications and the injury history of subjects, correlations have been made to the relationship between sport specialization and the prevalence of musculoskeletal injuries in high school athletes. By making these connections, healthcare providers may be able to make recommendations to avoid these potentially negative consequences.

Focused Clinical Question

Is sport specialization association with an increased risk of musculoskeletal injury in high school athletes?

Search Strategy

A computerized search was completed in October/November 2019. The following search terms were used:

- Patient/client group: high school athletes OR secondary school athletes
- Intervention: sport specialization
- Comparison: none
- Outcome: musculoskeletal injury OR injury

The search was completed using:

- PubMed
- SPORTDiscus
- Medline

The criteria for study selection included the following:

Inclusion Criteria:

- Studies that investigated high school athletes
- Studies that investigated both male and female participants
- Level 3 evidence or higher
- Limited to English language
- Limited to the past 10 years (2009-2019)

Exclusion Criteria:

- Participants were too young to participate in high school sports
- Studies that investigated non-musculoskeletal injuries
- Studies that investigated a population from a single sport (ex: only baseball players)

Evidence Quality Assessment

The method used to assess the quality of evidence was with the “Checklist for Measuring Quality” by Downs and Black.⁹

Results of Search

Summary of Search, Best Evidence Appraised, and Key Findings

- Using the search strategy and listed databases, initial searches yielded 27 research articles.
- After applying the inclusion and exclusion criteria, 4 relevant research articles were included in this CAT.
- 3 cross-sectional studies and 1 cohort study were included in this CAT.
- 3 studies^{3,4,6} found positive correlations between moderate-to-high levels of specialization and musculoskeletal injuries in high school athletes while 1 study⁵ did not.
- All key findings can be found in Table 1.

Clinical Bottom Line

Sport specialization is associated with a higher risk of musculoskeletal injuries in high school athletes. Three studies analyzed in this appraisal found positive correlations between moderate and high levels of sport specialization and musculoskeletal injuries while one did not. However, other factors, such as training volume, competition volume, and club sport involvement may all also play a role in this relationship.

Strength of Recommendation

Level B evidence exists that sport specialization is associated with a higher risk of musculoskeletal injuries in high school athletes. The level B recommendation is based on the consistent of conclusions in one level 2 and three level 3 evidence studies included in this CAT.

Implications for Practice, Education, and Future Research

There are many factors that can contribute to musculoskeletal injuries, specifically in high school athletes. However, sport specialization is one of the factors that has attracted attention lately both in research and the media. Researchers have attempted to determine if early sport specialization is associated with an increased risk for musculoskeletal injuries in athletes. In order to determine the level of specialization in high school athletes and how it related to injury outcomes, researchers in all four studies utilized a three-question survey developed by Jayanthi et al. This survey included the following questions: (1) “Can you pick a main sport?” (2) Did you quit other sports to focus on a main sport?” and (3) “Do you train >8 months per year?”² By grading participants’ responses to these questions, researchers were able to sort them into either low, moderate, or highly specialized. Next, they took injury histories of the athletes, which were verified by athletic trainers, and found trends and correlations between the two factors.

Three studies used in this appraisal found a positive correlation between moderate-to-high specialization and musculoskeletal injury in high school athletes while one did not find any significant findings. While these correlations can be made, it is important to know other factors also play into the relationship between sport specialization and injuries in high school athletes. In the study that did not find a significant correlation between the two factors, researchers did find a positive relationship between time-loss injuries and participation in club sports.⁵ This finding was also found in Post et al’s⁶, where they also found that high school athletes with high (>60 primary sport competitions/year) or moderate (30-60 primary sport competitions/year) competition volume within the year were at higher risk for musculoskeletal injury.⁶ However, McGuine et al⁴ did not find a significant relationship between competition volume and injury rates. Additionally, another article not included in this appraisal found that 39.0 % of high school athletes sustained an injury that they attributed to specializing in one sport.⁷ These other factors, such as training and competition volume, club sport involvement, and cognitive perspectives on sport specialization should be considered, especially for health care providers making recommendation to youth athletes.

Healthcare providers, especially athletic trainers, should use this information in order to better inform and educate youth athletes about the dangers of early sport specialization. Recommendations should be made to delay specializing in a single sport in order to experience athletic diversification in young athletes. The demands of multiple sports are believed to facilitate skill transfer and balanced neuromuscular development.² This, in turn, could decrease the risk of athletic-related injuries in high school athletics and beyond. According to a recommendation from the NATA, they suggest that young athletes should not participate in a single sport for more than 8 months of the year in total and should not participate in multiple sports concurrently during a single season. Additionally, the NATA has proposed that the amount of training hours per week should not exceed the athlete’s age.¹⁰ Overall, in order to avoid the potential negative outcomes of athletics and sport specialization, it is likely young athletes need time to allow their bodies to recover from the stresses of sport. They also need to help their bodies to be exposed to the varying stresses and developmental cues offered by multiple sports in order to become more well-rounded athletes.

Future research is necessary to better determine if early sport specialization is causative of increased risk of musculoskeletal injuries in high school athletes. Three of the four studies used only surveyed high school athletes from Wisconsin high schools. Other states, demographics, and cultures should be analyzed to determine if other factors can play a role in this relationship. The three-question survey used may also want to be redeveloped in order to better classify athletes as high, moderate, or low specialized. In fact, Miller et al⁸ found that this scale can misclassify up to 30% of athletes and that a fourth question should be added to make it more effective: “Have you only ever played 1 sport?”. Additionally, it may be important to see how specialization in individual sports influences the risk for injury in these athletes compared to other sports. Future research should also focus on overall training and competition volume on yearly, monthly, and weekly intervals. It would be important to know whether overall stress on the body is an injury risk dependent on if the athlete is participating in multiple sports or not. Research focusing on the right age to specialize could also be beneficial for health care providers to make more informed recommendations. Finally, the long-term effects of specialization would be important to investigate, attempting to understand how early sport specialization can influence life-long functional and quality of life.

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Table 1

Author	Bell et al. ³	McGuine et al. ⁴	Dahab et al. ⁵	Post et al. ⁶
Study Title	<i>Prevalence of Sport Specialization in High School Athletics: A 1-Year Observational Study</i>	<i>A Prospective Study on the Effect of Sport Specialization on Lower Extremity Injury Rates in High School Athletes</i>	<i>Sport Specialization, Club Sport Participation, Quality of Life, and Injury History Among High School Athletes</i>	Association of Competition Volume, Club Sports, and Sport Specialization with Sex and Lower Extremity Injury History in High School Athletes
Participants	302 high school athletes from 2 high schools. (122 males, 180 females)	1544 high school athletes from 29 high schools. (764 males, 780 females)	97 high school athletes. (61 males, 36 females)	1544 high school athletes from 29 high schools (764 males, 780 females)
Inclusion and Exclusion Criteria	Included subjects if they participated in soccer, basketball, tennis, and/or volleyball, were between the ages of 13 and 18, and were a current player on a freshman, junior varsity, or varsity team.	Included subjects if a participant in an interscholastic sport, were in grades 9-12, and needed to be able to fully participate (no disabling injuries) in team activities on the first day of practice.	Included subjects if between the ages of 13 and 18 and received full clearance to participate in sport. Excluded any neurologic disorder, seizure disorder, and/or ongoing concussion symptoms.	Included if a participant in high school athletics, in grades 9-12.
Intervention Investigated	Subjects completed a sport specialization survey and a LE injury history survey. The sport specialization survey asked if they classified themselves as a "single-sport" or "multi-sport" athlete and 3 questions based on the definition of sport specialization. The LE injury history survey asked about any history of injury, mechanism of injury, and the number of days of sport participation missed because of injuries.	Subjects completed a sport participation and LE injury history questionnaire reporting their interscholastic and club sport involvement. They were asked to identify their training volume and answer the same 3 questions used in Bell <i>et al.</i> based on the definition of sport specialization. Finally, subjects were asked about their history of LE injuries that caused them to seek treatment from their AT or other medical provider, which was fact-checked by ATs.	Subjects filled out a questionnaire reporting their sex, age, grade, number of hours per week participating in their primary sport, and level of competition. Participants also completed a questionnaire determining their level of sport specialization and participation in club sports. Quality of life, depression, and injury history were determined through 3 separate questionnaires/patient-reported outcome scales.	Subjects completed a nonvalidated sports participation and LE injury questionnaire. Participants reported interscholastic and club sport participation, number of primary sport competitions within the last year, and history of LE injury (defined as an injury that occurred during sports and that caused the athlete to seek medical care from his or her school AT or other medical provider.)
Outcome Measures	Sport specialization level (low, moderate, or high); self-classification of sport specialization; LE injury history (body part, mechanism, and days missed)	Sport specialization level (low, moderate, or high); LE injury history by body part and type of injury	Sport specialization level (low, moderate, or high); quality of life; depression; injury history	Sport specialization level (low, moderate, or high); volume of competition; LE injury history

Main Findings	<p>Subjects classified as:</p> <ul style="list-style-type: none"> • 36.7% high specialization • 28.8% moderate specialization • 34.8% low specialization <p>Those with a history of overuse knee injuries were more likely to be in the high specialization group vs. low.</p> <p>Those who trained more than 8 months of the year in one sport were more likely to report any type of knee injury, overuse knee injury, and hip injury</p>	<p>Subjects classified as:</p> <ul style="list-style-type: none"> • 13.3% high specialization • 27.2% moderate specialization • 59.5% high specialization <p>Incidence of LE injury was greater in the high and moderate specialization groups compared to low specialization group.</p> <p>Higher incidence of non-acute LE injuries in high and moderate specialization groups compared to low specialization group.</p>	<p>Subjects classified as:</p> <ul style="list-style-type: none"> • 25% high specialization • 40% moderate specialization • 34% low specialization • 48% played club sports <p>No significant associated between sport specialization and the outcome measures.</p> <p>Higher proportion of prior time-loss musculoskeletal injuries and injuries requiring imaging, injection, cast, brace, or crutches in those who played club sports.</p>	<p>Subjects classified as:</p> <ul style="list-style-type: none"> • 13.4% high specialization • 27.1% moderate specialization • 59.5% high specialization <p>Large schools more likely to specialize.</p> <p>High or moderately specialized athlete were significantly more likely to sustain a LE injury.</p> <p>High to moderate competition volume and participation in club sport in addition to school sport also increased this likelihood.</p>
Level of Evidence	3	2	3	3
Evidence Quality Score*	17/25	17/25	17/25	17/25
Support for the Answer	Yes	Yes	No	Yes

*Based on Downs and Black Checklist