

Sport Specialization Characteristics Between Rural and Suburban High School Athletes

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Background: Sport specialization has been associated with overuse injuries and is more common in larger high schools, which are often located in more urban/suburban settings. However, sport participation characteristics have not been compared between suburban and rural high schools.

Purpose/Hypothesis: The purpose of this study was to examine the differences in sport participation characteristics between athletes at suburban and rural high schools. It was hypothesized that suburban high school students would be more likely to be highly specialized, participate in more athletic competitions per year, and play in a league outside of school. We also hypothesized that suburban high school students would start playing their primary sport at a younger age, would have participated in their primary sport for longer, and would play more months per year and hours per week.

Study Design: Cross-sectional study.

Methods: High school athletes from 4 high schools (2 suburban and 2 rural) participated in this study (N = 354 [222 females]; mean age, 15.7 ± 1.2 years). Athletes were on a school-sponsored athletic team in 1 of 4 sports (volleyball, tennis, basketball, soccer). The suburban schools (study enrollment, n = 226) had total school enrollments of 2271 and 622 students, while the rural schools (study enrollment, n = 128) had total school enrollments of 443 and 297. Participants completed a questionnaire prior to the start of their high school sport season. The questionnaire consisted of demographic information, a sport specialization scale, and sport participation information. Primary sport competition volume in the previous 12 months was classified as high (>60 primary sport competitions), moderate (30–60), or low (<30). Sport specialization status was classified via a 3-point scale as low, moderate, or high.

Results: As compared with athletes at rural schools, athletes at suburban schools started playing their primary sport at a younger age (suburban, 7.8 ± 2.9 years; rural, 9.7 ± 3.2 years; $P < .001$) and participated for more years (suburban, 7.9 ± 3.1 years; rural, 6.1 ± 3.3 years; $P < .001$), more months per year (suburban, 7.6 ± 3.6 months; rural, 5.6 ± 2.8 months; $P < .001$), and more hours per week (suburban, 15.2 ± 5.1 hours; rural, 12.9 ± 3.3 hours; $P < .001$). Athletes at suburban schools were more likely than rural athletes to be classified as highly specialized ($\chi^2 = 52.5$, $P < .001$), participate in more competitions ($\chi^2 = 16.5$, $P < .001$), play in a league outside of school ($\chi^2 = 18.4$, $P < .001$), and train in their primary sport for >8 months per year ($\chi^2 = 27.8$, $P < .001$) and >16 hours per week ($\chi^2 = 15.0$, $P < .001$).

Conclusion: High school athletes at suburban schools are more likely to exhibit sport participation patterns that are associated with increased risk of overuse injury. These include being classified as highly specialized, playing their primary sport >8 months per year and >16 hours per week, engaging in a high competition volume, and participating in a sport league (eg, club) outside of school. Efforts aimed at safe sport participation should target these groups, as they seem more likely to violate safe sport recommendations.

Keywords: sport specialization; club; sport safety

Sport specialization is commonly defined as year-round participation in sport at the exclusion of other sports.^{1,11} While anecdotal evidence has linked specialization with increased risk of musculoskeletal injury, only recently have investigations actually documented this relationship.^{1,7,10}

Jayanthi et al⁷ observed that high levels of sport specialization is an independent risk factor for injury, after accounting for age and hours/week in sports activity. These findings were replicated in a diverse sample of adolescent athletes.¹¹ Additionally, Bell et al¹ observed that highly specialized high school athletes were more likely to report a history of a knee or hip overuse injury. These findings support the notion that sport specialization increases the risk of injury in youth athletes.

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The prevalence of sport specialization among youth athletes is unknown; however, recent reports have estimated that 17% to 41% of athletes are highly specialized, and these rates are dependent on a number of factors, including sex, age, and sport.^{1,10,11} School size may influence sport specialization prevalence, with athletes at larger high schools more likely than those at smaller schools to be classified as highly specialized.¹ Only 1 study has examined this factor, but the small high school investigated was actually quite large by many standards (n = 603 for high school population). This leads us to speculate what the prevalence is in smaller schools and how this may influence other sport participation characteristics.

General recommendations for safe participation in sport exist to ensure an appropriate volume of participation in athletic activity. These recommendations include limiting the hours/week and months/year of participation in a single or organized sport activity. The specific recommendations include not participating in organized sport more hours/week than a child's age or 16 hours/week and not participating in a single sport for >8 months/year.^{7,11}

Increased competition for high school roster spots may result in behavior that is inconsistent with safe sport recommendations (hours/week and months/year). For example, a high school with 2000 student enrollees has the same varsity basketball roster size as a small high school with 300 student enrollees. Theoretically, students at the large school might be more likely to specialize early because of increased pressure to make their high school team. Investigating how athletes at rural and suburban high schools differ on sport participation patterns may provide evidence to support or refute this difference. In theory, suburban areas may have access to resources that rural communities do not, which may increase the opportunity for professionalization of these populations. If we are to fully address the issue of sport specialization, then it is important to understand the effects of community location. Therefore, the purpose of this investigation was to examine differences in sport participation patterns between high school athletes at suburban and rural schools. We hypothesized that suburban high school students would be more likely to be classified as highly specialized, participate in more athletic competitions per year, and play in a league outside of school. We also hypothesized that suburban high school students would start playing their primary sport at a younger age, would have participated in their primary sport for longer, and would play more months/year and hours/week versus high school students in a rural setting.

METHODS

Participants

Participants were recruited from 4 high schools in Wisconsin during the 2015-2016 academic year: 1 large suburban high school (n = 2271), 1 small suburban high school (n = 622), 1 small rural high school (n = 297), and 1 large rural high school (n = 443). These schools were selected per their location relative to the research site and for their total population. Additionally, for a school to participate, it was required to have (1) an athletic trainer to coordinate study logistics, (2) support from the principal and athletic director, and (3) the sports of interest. Athletes were recruited from 4 sports: basketball, soccer, volleyball (female only), and tennis. These sports were selected because they are some of the most popular high school sports in the United States and they have high risk of lower extremity injury.⁶ To be eligible for the study, athletes had to participate in 1 of these teams on a freshman, junior varsity, or varsity level and had to be between 13 and 18 years of age. This study was approved by the Institutional Review Board at the University of Wisconsin–Madison. Informed written assent/consent was obtained from the athlete and parent or guardian prior to participation.

Survey

Participants completed a self-administered questionnaire prior to the start of their high school sport season. The questionnaire consisted of demographic information, a sport specialization scale, and sport participation information. The questionnaire took approximately 10 minutes to complete and was in a hard-copy format. Respondents were asked, "For your primary sport, how many competitions did you participate in during the previous 12 months?" Individuals were provided ranges from 0 to >101 in bands of 10 (0-10, 11-20, etc). These categories were reduced to 3 classifications to streamline the analysis: high, >60 primary sport competitions; moderate, 30-60 competitions; low, <30 competitions. Sport specialization status was classified as low, moderate, or high per a 3-point specialization scale.⁷ In most cases, responses were limited to the past 12 months to minimize the effects of recall bias. To ensure accuracy of the responses, a member of the research team reviewed questionnaire responses in person with the athlete at the time of administration. Additionally, the questionnaire was reviewed for best-practice standards by the University of Wisconsin–Madison Survey Center, an organization internationally recognized for its expertise with survey research.

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Ethical approval for this study was obtained from the University of Wisconsin–Madison Minimal Risk Institutional Review Board (No. 2015-0388).

TABLE 1
Descriptive Information Among Schools^a

	Suburban School		Rural School	
	Large	Small	Large	Small
No. of participants	101	125	63	65
Male:female	23:78	66:59	15:48	28:37
Age, y	15.5 ± 1.3	15.7 ± 1.1	15.7 ± 0.9	15.9 ± 1.1
Specialization level				
Low	24 (23.8)	58 (46.4)	44 (69.8)	44 (67.7)
Moderate	28 (27.7)	31 (24.8)	16 (25.4)	17 (26.2)
High	49 (48.5)	36 (28.8)	3 (4.8)	3 (4.6)

^aValues represent No. (%) or mean ± SD.

Statistical Analysis

Data were summarized as means ± SD, frequencies, and proportions. Chi-square tests were used to calculate odds ratios to investigate differences in suburban versus rural settings in (1) sport specialization classification (high, moderate, and low), (2) likelihood of playing on a team outside of high school, (3) number of primary sport competitions (low, moderate, high), and (4) likelihood of exceeding recommendations of 8 months/year and 16 hours/week of primary sport participation. Independent *t* tests were used to compare rural and suburban high school athletes on continuous variables. Statistical significance was set a priori at *P* ≤ .05, and all analyses were performed using SPSS statistical software (v 22.0; SPSS Inc).

RESULTS

A total of 354 participants (222 females) enrolled in the study (Table 1). Occasionally, a participant chose not to answer a question. In most instances, this was due to time constraints on the athlete (ie, needed to attend practice). For most variables, this resulted in 1 or 2 missing cases per variable, with the number of years of participation in the primary sport missing 8 cases. Cases were included in all analyses in which data were available. The overall specialization rates were highest in soccer (n = 120; high, n = 44, 36.7%; moderate, 30.0%; low, 33.3%), followed by volleyball (n = 102; high, n = 23, 22.5%; moderate, 27.5%; low, 49.5%), tennis (n = 51; high, n = 10, 19.6%; moderate, 21.6%; low, 58.8%), and basketball (n = 77; high, n = 13, 16.9%; moderate, 20.8%; low, 62.3%).

Suburban high school students started their primary sport at a younger age (*t*_{1,351} = 6.2) and thus had more years of participation in their primary sport overall (*t*_{1,344} = 4.9) (Table 2). They also participated in their primary sport more months/year (*t*_{1,350} = 6.3) and hours/week (*t*_{1,349} = 3.5). Suburban high school students were more likely to be classified as highly specialized ($\chi^2 = 52.5, P < .001$) and more likely to participate in a league outside of school ($\chi^2 = 18.4, P < .001$) as compared with rural students (Table 3). Suburban high school students were more likely than rural high school students to participate in a high

TABLE 2
Comparisons Between High School Athletes in Suburban and Rural High Schools

	Schools, Mean ± SD		<i>P</i> Value	Effect Size
	Suburban	Rural		
Primary Sport				
Age at start, y	7.8 ± 2.9	9.7 ± 3.2	<.001	0.62
Participation				
Years	7.9 ± 3.1	6.1 ± 3.3	<.001	0.56
Months	7.6 ± 3.6	5.6 ± 2.8	<.001	0.65
Hours per week	15.2 ± 5.1	12.9 ± 3.3	.001	0.53

TABLE 3
Chi-square Analyses Between Suburban and Rural High Schools

	Schools, No. (%)		<i>P</i> Value
	Suburban	Rural	
Level of specialization ^a			<.001
Low	82 (36.3)	88 (69.3)	
Moderate	59 (26.1)	33 (26)	
High	85 (37.6)	6 (4.7)	
No. of competitions (previous 12 mo) ^b			<.001
Low (0-30)	103 (45.8)	87 (68.0)	
Moderate (30-60)	82 (36.4)	30 (23.4)	
High (>60)	40 (17.8)	11 (8.6)	
Participate in a league outside of school ^c			<.001
No	66 (29.3)	67 (52.3)	
Yes	160 (70.8)	61 (47.7)	
Single sport >8 mo/y ^d			<.001
No	86 (38.0)	86 (67.2)	
Yes	140 (62.0)	42 (32.8)	
Sports >16 h/wk ^e			<.001
No	141 (62.9)	105 (82.7)	
Yes	83 (37.1)	22 (17.3)	

^aOdds ratio: moderate (reference low) = 1.9, high (reference low) = 15.2.

^bOdds ratio: moderate (reference low) = 2.3, high (reference low) = 3.1.

^cOdds ratio = 2.6.

^dOdds ratio = 3.3.

^eOdds ratio = 2.8.

number of competitions in the previous 12 months ($\chi^2 = 16.5, P < .001$), play their primary sport >8 months/year ($\chi^2 = 27.8, P < .001$), and exceed 16 hours/week of primary sport participation recommendation ($\chi^2 = 15.0, P < .001$). Finally, 10% of high school athletes in this sample reported participation in >80 competitions in the previous year (Figure 1).

DISCUSSION

This study found important differences in sport participation patterns between high school athletes in rural and suburban settings. Specifically, athletes in suburban high

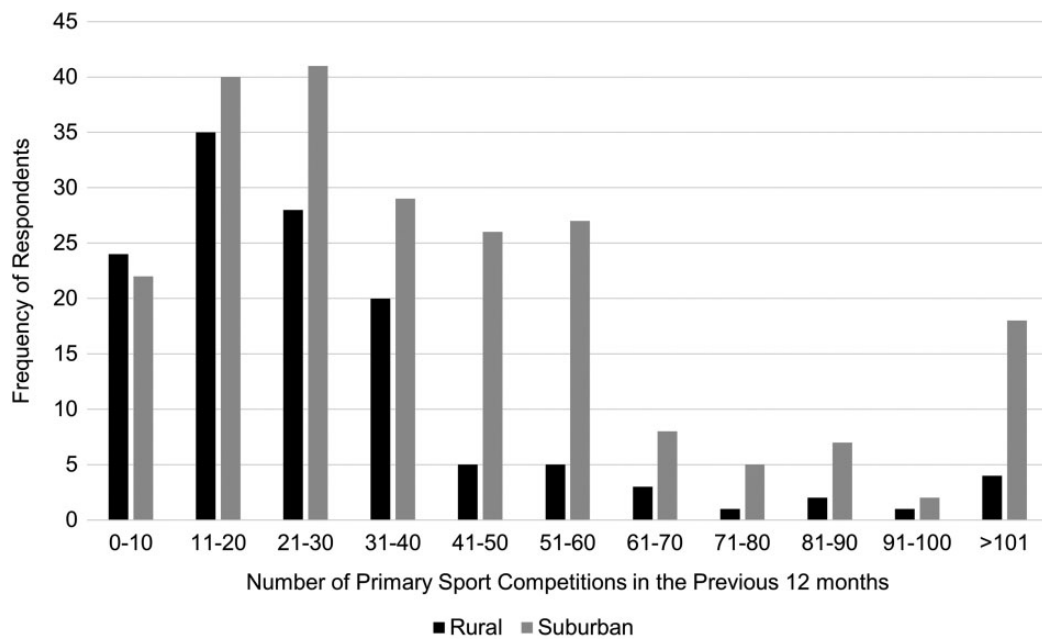


Figure 1. Frequency of respondents selecting the range of competitions completed in their primary sport during the previous 12 months.

schools were more likely to exhibit sport participation patterns that are associated with increased risk of overuse injury. These include being classified as highly specialized, playing their primary sport >8 months/year and >16 hours/week, engaging in a high competition volume, and participating in a sport league (ie, club) outside of school. Additionally, as compared with rural high school athletes, suburban athletes started playing their primary sport at a younger age, had more years of participation in their primary sport, and participated in their primary sport more months/year and hours/week. This study adds to the body of knowledge regarding sport participation patterns of youth athletes and how location may influence these results.

Sport participation behaviors are driven by a variety of factors. Claims in support of early sport specialization and year-round participation include gaining a competitive edge, faster skill development, and increased opportunity to make a high school team or achieve a college scholarship.⁵ However, there is evidence that sport specialization is not necessary for reaching elite levels in sport.¹⁰ Claims against early sport specialization include preventing burnout, precluding social isolation, and enabling diverse skill development.⁵ However, medical experts are concerned about sport specialization from an overuse perspective.³ Sport specialization increases the risk of overuse injury in young athletes. Jayanthi et al⁷ observed that athletes reporting to a sports medicine clinic with an injury or overuse injury were more likely to be highly specialized than healthy athletes reporting for a preparticipation physical examination. In a separate sample of >2000 youth sport participants, highly specialized athletes were more likely to report a history of injury and overuse injury than were athletes classified as having low levels of specialization.¹¹

Various recommendations related to time (months/year or hours/week) exist to help guide athletes, parents, and coaches to mitigate excessive injury risk. In this study, the recommendations that we focused on were months/year, hours/week greater than age, and >16 total hours of organized sport per week. Previous research identified meaningful associations between injury and all of these recommendations.^{7,8,11,13} For example, adolescent pitchers who participated in baseball competitively for >8 months out of the year were 5.05 times more likely to sustain an arm injury than pitchers who competed <8 months out of the year.⁸ Research has also established a linear relationship between hours of organized sport exposure and risk of injury, with the risk of injury peaking for athletes who participate >16 total hours/week.¹³ Youth athletes who played more hours per week than their age were more likely to report sustaining an injury of any kind, an overuse injury, or a lower extremity overuse injury in the previous year.¹¹ Suburban athletes in our sample were more likely to exceed all these safe sport recommendations. Sport participation patterns of suburban athletes may place them at increased risk of injury; however, this is theoretical since we did not assess risk. Additionally, while these volume recommendations may serve as good general guidelines for youth sport, it is unclear how well-known they are to athletes, coaches, or parents who interact with youth sport athletes.

Another interesting finding of this study is that suburban high school athletes were more likely than rural athletes to participate in a high volume of sport competition. In fact, suburban athletes were 3 times more likely than rural athletes (odds ratio = 3.1) to report playing >60 primary sport competitions per year and twice as likely (odds ratio = 2.31) to report playing 30 to 60 primary sport competitions

per year. Competition injury rates are higher than practice injury rates; therefore, suburban athletes might be at increased risk of injury owing to their participation in more yearly competitions.^{2,14} When we restricted the sample to only athletes who reported playing in >60 competitions per year, 49% reported volleyball as their primary sport, 23.5% soccer, 19.6% basketball, and 7.8% tennis. These sports may be a potential target for interventions and awareness campaigns, as they had the highest proportion of high-competition athletes. Note, however, that tennis is not as popular in the north, and so we urge caution in interpretation of these individual sport findings. Additionally, this analysis may be limited in that competitions may not be equivalent among sports (eg, 40 tennis matches may not be equal to 40 soccer games). However, it should be alarming that approximately 10% of high school athletes in this sample reported participation in >80 competitions in the previous year (Figure 1).

One in 20 rural athletes was classified as highly specialized, as opposed to 7 of 20 suburban athletes. The proportion of highly specialized athletes in this study ranged between 4.0% in the rural setting and 37.6% in the suburban setting. Overall, 25.6% of participants were highly specialized, which is slightly lower than the 36.4% that a report on the specialization rates of high school athletes cited for highly specialized athletes.¹ However, in that study, the high schools were all located in suburban settings, so community demographics may explain the differences in results between the current study and previous research. Regardless, approximately 1 in 4 athletes were classified as highly specialized, which is concerning because this represents a large number of athletes who are participating in sports and are, theoretically, at increased risk of injury.

As compared with rural athletes, suburban athletes in our study started playing their primary sport at a younger age and as a result had more years of primary sport participation. Some of these differences in sport participation may be explained by access to club teams outside of school, which are often started at young ages and may not be available in rural areas. We observed that athletes at suburban schools were 2.6 times more likely to belong to a sport league outside of school in their primary sport. In rural communities, the high school team may represent the only opportunity for sport participation and competition. Conversely, suburban communities may have access to other clubs and leagues beyond the high school team. In fact, in many suburban/urban communities, there is a trend toward participating exclusively in club sports, which are started at a young age and continue into high school sports. Anecdotally, one of the selling points of club team sport participation is increased exposure to college coaches through showcases and travel tournaments. Health outcomes are related to a variety of factors, including demographic factors (eg, sex and ethnicity) and socioeconomic factors (eg, education level and income). These factors are also related to overall health.⁴ Residents of rural areas have barriers to physical activity, which include decreased proximity to sports facilities.¹² However, there are many aspects of rural life that are beneficial to health, including strong social networks and high quality of life.⁹ Additionally, factors outside of sport, such as work responsibilities,

may affect sport participation and were not investigated in this study. It is beyond the scope of this project to dive into the complex relationship between health and community location. However, it is important to establish differences in sport participation patterns based on community location, as these may indicate places where increased education and awareness of safe sport participation are needed.

Limitations

Several limitations in this study should be noted. We did not prospectively track hours/week or months/year of sport participation, and so our results might be influenced by recall bias. Additionally, we attempted to recruit a large rural school; however, the school successfully recruited was still smaller than our small suburban school in terms of total population. Another limitation is that the participants were recruited from the same geographic area, from limited sports, and from only 4 schools, which may restrict our generalizability. Sport specialization rates and sport participation patterns may differ by region and/or socioeconomic background as well as sport. Future research should investigate sport-specific specialization rates to better understand how they are affected by location. Finally, we did not record response rate in this study, so we cannot compare response rates among schools.

CONCLUSION

High school athletes at suburban schools are more likely than high school students at rural schools to exhibit characteristics associated with year-round, high-volume, specialized sport participation. Efforts aimed at safe sport participation may need to be targeted to these groups, as they seem more likely to exceed safe sport recommendations.

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