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Original article

High school sports programs differentially impact participation by sex

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Abstract

Background: Among numerous health benefits, sports participation has been shown to reduce the risk of overweight and obesity in children and adolescents. Schools represent an ideal environment for increasing sports participation, but it is unclear how access and choice influence participation and whether characteristics of the school sports program differentially influence boys' and girls' participation. The purpose of this study was to evaluate the characteristics of high school athletic programs and determine the extent to which these characteristics influenced boys' and girls' sports team participation.

Methods: Longitudinal telephone surveys were conducted with 1244 New Hampshire and Vermont students. Students self-reported their sports team participation at baseline (elementary school) and follow-up (high school). High school personnel were surveyed to assess sports opportunities, which were defined for this analysis as the number of sports offered per 100 students (i.e., choice) and the percent of sports offered that did not restrict the number of players (i.e., access).

Results: Approximately 70% of children participated on at least one sports team, including 73% of boys and 66% of girls. We detected statistically significant interactions between sex and two school opportunity variables: 1) the number of sports offered per 100 students (i.e., choice) and 2) the percent of sports offered that did not restrict the number of players (i.e., access). After controlling for children's baseline sports participation and other covariates, boys were more likely to play on at least one sports team per year if their school did not restrict participation in the most popular sports (relative risk, RR = 1.12, $p < 0.01$); in contrast, girls were more likely to play on at least one sports team per year if their school offered a wider variety of sports (RR = 1.47, $p < 0.001$).

Conclusion: Sports participation has previously been shown to confer a number of health benefits; as such, school sports programs may be an important, effective, and underused target for public health efforts, including obesity prevention programs. Efforts to increase physical activity among youth should consider both access and choice in school athletic programs. Schools may need to use different strategies to increase sports participation in boys and girls.

Keywords: Adolescents; Gender equity; High school students; School athletic programs; Sex differences; Sports participation

1. Introduction

Sports participation in children and adolescents confers numerous health benefits, including increased physical activity (PA) and physical fitness;[1,2] improved academic performance,[3] social adjustment,[4] and psychological well-being;[5]

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and decreased alcohol/drug use,[6,7] teen pregnancies,[8] and crime.[8] Youth sports participation is one of the few early predictors of an active adulthood.[9,10]

Sports participation has been shown to reduce children and adolescents' body mass index (BMI) and risk of overweight and obesity.[2,11−15] In a previously published analysis, we examined the association between different types of PA and weight status among adolescents in this sample.[11] We found that sports participation was the strongest and most consistent predictor of weight status. Our attributable risk estimates indicated that if all adolescents played on at least two sports teams per year, the prevalence of overweight/obesity would decrease 10.6% (i.e., from 28.8% to 25.7%). Despite this and other studies demonstrating the value of sports participation,[2,11−15] relatively few obesity prevention efforts have attempted to increase sports participation among children and adolescents.

In the US, high schools offer both interscholastic sports, which are generally competitive, and intramural sports, which tend to be less competitive than interscholastic sports. The variety of sports offered at U.S. high schools typically depends on the schools' size, budget, and geographic location. Because different sports are offered in each season, students have the opportunity to participate on several sports teams throughout the year. Even students who play only one sport may participate on multiple teams throughout the year if the sport is offered in more than one season or if they participate on both interscholastic and intramural teams. For example, a student in the US might play golf in the fall, interscholastic basketball in the winter, and intramural basketball in the spring. Participation generally declines through high school, but sports participants who attend small schools have a lower risk of dropout compared to participants attending large schools.[16]

Schools represent an ideal environment for increasing PA and participation in sports because the vast majority of youth are enrolled in school and new policies can be adopted quickly.[17] Schools have the potential to influence students' participation and enjoyment of sports through the structure of their athletic programs and related policies. Some schools charge fees for participation or restrict participation in the most popular sports; both of these policies could negatively impact participation rates. Among similarly sized schools, the number of sports high schools offer has been positively associated with sports participation and overall PA among students.[8,18]

Prior to the 1970s, most U.S. high school sports programs provided many more opportunities for boys than girls.[19] In 1972, a federal law (Title IX of the Education Amendments) was passed in the US mandating that school programs and activities funded by the Department of Education could not discriminate based on sex.[19,20] Title IX forced schools to shift resources from boys' to girls' athletic opportunities, dramatically influencing sex-specific sports participation rates. After its passage, girls' sports participation increased by over 600% and boys' sports participation decreased slightly.[20] Although the gap in participation decreased greatly after Title IX's passage, boys continue to participate on more sports teams and have more opportunities available to them compared to girls.[21] Sports opportunities still differ by sex in that boys and girls play on separate interscholastic teams and some opportunities are traditionally sex specific (e.g., football). However, scant research has investigated whether characteristics of the school athletic environment differentially impact participation by sex.

The objective of this study was to examine the extent to which different school sports opportunities influenced high school students' sports participation. We hypothesized that both the variety of interscholastic and intramural sports offered at school (i.e., choice) and the extent to which schools restricted sports (i.e., access) would be independently associated with adolescent sports team participation, even after adjusting for adolescent-, parent-, and school-level covariates. We also explored whether the association between school opportunities and adolescent sports participation was moderated by sex.

2. Methods

2.1. Participants and procedure

Our sample consisted of 1244 adolescents from 23 high schools within 21 towns in New Hampshire and Vermont. The data originated from a longitudinal study of adolescent health that has been previously described.[22,23] Briefly, we conducted five waves of adolescent and parent telephone surveys between 2002 and 2009. This study used parent and adolescent data collected at baseline (2002−2003), wave four (2007−2008), and wave five (2008−2009). We also collected school-level data between October 2007 and February 2008 from high schools attended by adolescent participants. The Dartmouth Committee for the Protection of Human Subjects approved all aspects of this research.

In 2002−2003, we surveyed 87% ($n = 3705$) of students enrolled in grades 4−6 at 26 randomly selected New Hampshire and Vermont public elementary schools. Subsequently, we enrolled 71% ($n = 2631$) of these students and one of their parents into a longitudinal telephone survey. We preferentially surveyed mothers for consistency across waves; if no mother lived in the household, we surveyed the adolescent's primary caregiver instead. We completed telephone surveys at either wave four or five with 2009 adolescents. Because the majority of adolescents were enrolled in high school, and athletic programs differed significantly between middle and high schools, we confined our analysis to high school students ($n = 1804$). If both wave four and five surveys were available, we used whichever survey was conducted closest to the date of school-level data collection (59.4% from wave four).

Trained interviewers administered surveys to adolescents and their mothers using a computer assisted telephone interviewing system. Interviewers obtained parent consent and adolescent assent before each survey. In all but a few instances, we surveyed the adolescent before his/her mother. There was no mother or step-mother living in 60 households; in these instances, we surveyed the adolescent's primary caregiver.

The majority of adolescents in our sample tracked into district-associated catchment high schools. We asked 29 of these high schools to participate in a school-based environmental assessment. Three high schools refused; another three

agreed, but never mailed back the written questionnaires. For the 23 participating high schools, athletic directors completed a questionnaire about the school's athletic program, and physical education (PE) instructors completed a questionnaire about the school's PE program. Schools were not compensated, but received a summary research report for their participation.

From the 1804 high school participants, we further confined our analysis to 1244 adolescents based on the availability of school athletic/PE program data. Our final sample resembled the wave one sample in the percentage of males (49.0% *vs.* 51.5%), white/Caucasians (91.2% *vs.* 89.9%), and baseline sports participation (72.5% *vs.* 68.6%).

2.2. Measures

Telephone surveys were pre-tested for telephone administration and comprehension. Athletic and PE program questionnaires were pre-tested for comprehension and face validity with school personnel from five non-study schools and modified based on their feedback.

2.2.1. Outcome: sports team participation

The primary outcome measure for this analysis was sports team participation in high school. We assessed this by asking high school students, "In the past 12 months, on how many sports teams did you play?" Responses were dichotomized into a dummy variable (i.e., 0 = 0 sports teams, 1 = 1 or more sports teams).

2.2.2. Exposures: school sports opportunities

Sports offered per 100 students. Based on information from the New Hampshire Interscholastic Athletic Association[24] and school websites, we created a comprehensive list of interscholastic and intramural sports and asked school personnel to indicate which sports their school offered for boys and girls. We used these responses to create a sex-specific index reflecting the number of sports available per 100 students for each school (i.e., by sex: ((number of interscholastic + intramural sports offered)/number of students × 100)). We used this metric to standardize sport availability across schools of different sizes. We dichotomized responses into two groups: less than one sport per 100 students and at least one sport per 100 students.

Percent of unrestricted sports. We defined unrestricted sports as sports in which there was no limit to the number of students who could participate. Because intramural sports are unlimited by design, we counted all the intramural sport opportunities as unrestricted. For interscholastic sports, we determined whether or not participation was limited by asking school personnel to "list any (interscholastic) sport for which participation is limited (i.e., the number of players per sport is capped)" and to specify whether boys and/or girls teams were limited. We then calculated the percent of unrestricted sports separately (i.e., by sex: (number of unrestricted sports offered/(number of unrestricted + restricted sports offered) × 100)). We categorized responses into three groups of unrestricted sports based on the distribution of the data: less than 85%, 85%−99.9%, and 100%.

2.2.3. Covariates

We measured and adjusted for a number of potential confounders. Adolescent-level covariates measured concurrent with the outcome included sex, grade in school, ethnicity, and overweight/obese status. Overweight/obese status was based on self-reported height and weight and sex-specific Centers for Disease Control and Prevention BMI-for-age growth charts.[25,26] We also adjusted for sports participation at baseline, when adolescents were in elementary school. This was assessed by asking, "In the past year, did you participate in any of the following things? Team sports (yes/no)?"[27] Parent/household level covariates measured through parent surveys included education, income, and single *vs.* two parent household. School and school-town covariates included school enrollment, town median household income, and school town population. We obtained each school's total enrollment from the New Hampshire and Vermont Departments of Education.[28,29] School town population and median household income were obtained from the U.S. Census.[30]

2.3. Data analysis

We used Poisson regression to estimate the unadjusted and adjusted likelihood of sports team participation for levels of the independent variables. We also examined interactions between sex and school sports opportunity variables. We used generalized estimating equations[31] with an exchangeable correlation matrix and robust variance estimates[32] to account for clustering of students within schools. We did not account for additional town level clustering because only two pairs of schools were nested within the same town. We included each variable listed in Table 1 in the multivariate models. To maximize the sample size, we used multiple imputation by chained equations[33] to impute values for all variables in the multivariate models with missing data (0 for school variables, <1% for adolescent variables, and 2%−9% for maternal variables). All analyses were conducted in STATA version 11 (StataCorp LP, College Station, TX, USA).

3. Results

About half (49.0%) the adolescents were boys, most were in the 9th (53.8%) or 10th (32.4%) grades, 91.6% were white, and 28.3% were overweight/obese (Table 1). Overall, during wave four/five, 69.5% of adolescents participated on a sports team during the preceding 12 months: 18.1% (n = 225) participated on one sport team, 18.2% (n = 226) participated on two, and 33.2% (n = 413) participated on three or more sports teams. In bivariate comparisons, overweight/obese status was inversely related to adolescent sports team participation for both boys and girls (Table 1). Participation in team sports at baseline, parental education, household income, and living in a two-parent household were positively related to adolescent sports team participation for boys and girls.

Student enrollment of the 23 high schools varied; seven schools had fewer than 500 students, five had 500−999 students, four had 1000−1399 students, and seven had 1400−3400

Table 1
Unadjusted association between adolescent sports participation and adolescent, parent, and school/school-town level characteristics.

	Boys			Girls		
	Total (*n*)	Row (%)	RR (95%CI)	Total (*n*)	Row (%)	RR (95%CI)
Total	609	73		635	66	
Adolescent characteristics						
Grade						
9th	327	74	Reference	342	70	Reference
10th	203	73	1.00 (0.92, 1.08)	200	63	0.89 (0.75, 1.06)
11th−12th	79	71	1.00 (0.86, 1.07)	93	57	0.81 (0.63, 1.04)
Ethnicity						
Not white	46	80	Reference	59	66	Reference
White	563	73	0.90 (0.80, 1.02)	576	66	1.00 (0.81, 1.22)
Overweight/obese						
No	406	78	Reference	486	70	Reference
Yes	203	64	0.82 (0.73, 0.93)***	149	53	0.76 (0.64, 0.90)***
Baseline team sports participation[a]						
No	135	42	Reference	205	43	Reference
Yes	472	82	1.95 (1.51, 2.51)***	422	77	1.80 (1.53, 2.11)***
Parent characteristics						
Education						
High school or less	132	60	Reference	141	57	Reference
Some college or associate's	187	74	1.23 (0.98, 1.55)	212	67	1.16 (1.03, 1.31)*
Bachelor's or graduate degree	234	83	1.39 (1.16, 1.66)***	218	74	1.29 (1.06, 1.56)**
Household income						
≤US$50,000	173	62	Reference	212	56	Reference
US$50,000−US$100,000	280	77	1.23 (1.12, 1.35)***	298	71	1.28 (1.08, 1.51)***
>US$100,000	111	86	1.37 (1.20, 1.56)***	93	78	1.41 (1.19, 1.67)***
Two parent household						
No	107	65	Reference	112	57	Reference
Yes	468	76	1.16 (1.03, 1.31)**	499	69	1.20 (1.08, 1.34)***
School characteristics						
Enrollment size						
<500	135	75	Reference	150	71	Reference
500−999	143	78	1.04 (0.92, 1.17)	129	63	0.88 (0.62, 1.26)
1000−1399	193	70	0.93 (0.85, 1.02)	187	72	1.00 (0.89, 1.14)
≥1400	138	72	0.96 (0.84, 1.09)	169	57	0.80 (0.60, 1.05)
Sports offered per 100 students[b]						
<1	108	69	Reference	155	52	Reference
≥1	501	74	1.07 (0.98, 1.16)	480	70	1.36 (1.09, 1.71)**
Percent of unrestricted sports[b]						
<85%	161	68	Reference	157	70	Reference
85%−99%	134	73	1.07 (0.95, 1.20)	114	71	1.01 (0.88, 1.17)
100%	314	76	1.11 (1.03, 1.19)**	364	62	0.89 (0.72, 1.10)
School-town characteristics						
Town median household income						
<US$42,000	211	69	Reference	240	64	Reference
US$42,000−<US$49,999	285	76	1.11 (1.03, 1.19)**	254	74	1.17 (0.95, 1.44)
≥US$50,000	113	73	1.05 (0.93, 1.18)	141	54	0.85 (0.62, 1.15)
Town population						
<5000	214	76	Reference	210	74	Reference
5000−12,999	209	73	0.97 (0.88, 1.06)	201	70	0.95 (0.85, 1.07)
≥13,000	186	70	0.93 (0.86, 1.01)	224	54	0.74 (0.56, 0.96)*

Note: The sample for each variable does not always add up to the sample total because of missing data.
[a] Baseline sports participation measured 5−6 years prior to the other variables in this table.
[b] Sports offered per 100 students and percent of unrestricted sports are sex specific.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Abbreviations: RR = risk ratio for participating on ≥1 sports team in the past 12 months; 95%CI = 95% confidence interval.

students. On average, schools offered 13.3 ± 4.5 (mean ± SD) interscholastic and intramural sports for boys, and 13.6 ± 4.7 sports for girls (Table 2). Twelve schools (52.2%) did not restrict participation in any boys' sports and 13 schools (56.5%) did not restrict participation in any girls' sports. Five schools (21.7%) restricted participation in at least 20% of the sports they offered for both sexes. In bivariate comparisons, boys' sports team participation was positively related to the percent of unrestricted sports offered at school, as well as the median household income of the town (Table 1). Girls' sports team participation was

Table 2
Number of schools offering unrestricted interscholastic sports, restricted interscholastic sports, and intramural sports ($n = 23$).

	Interscholastic				Intramurals[a] offered
	Boys		Girls		
	Unrestricted	Restricted	Unrestricted	Restricted	
Baseball/ softball	23	0	23	0	0
Soccer	16	7	17	6	2
Basketball	12	11	13	10	2
Cross country	21	0	21	0	0
Outdoor track	21	0	21	0	0
Golf	18	2	16	0	0
Tennis	14	3	13	2	0
Indoor track	16	0	15	0	0
Lacrosse	16	0	14	0	0
Football	16	0	0	0	0
Field hockey	0	0	16	0	0
Cheerleading/ spirit	0	0	12	3	0
Alpine skiing	14	0	14	0	0
Ice hockey	14	0	10	0	0
Nordic skiing	11	0	11	0	0
Volleyball	1	1	8	3	0
Wrestling	10	0	0	0	0
Swimming/ diving	9	0	9	0	0
Gymnastics	1	0	8	0	0
Skiing (unspecified)	0	0	0	0	8
Snow boarding	0	0	0	0	8
Frisbee	0	0	0	0	8
Dance	0	0	0	0	7
Ski jumping	3	0	3	0	0
Yoga	0	0	0	0	2
Fencing	0	0	0	0	2
Biking	0	0	0	0	1
Martial arts	0	0	0	0	1

[a] All intramural sports were offered to boys and girls and were unrestricted.

Table 3
Adjusted risk ratio[a] of adolescent sports participation by adolescent, parent, and school/school-town level characteristics.

	RR (95%CI)	
	Boys ($n = 609$)	Girls ($n = 635$)
Adolescent characteristics		
Grade	1.01 (0.96, 1.05)	0.90 (0.83, 0.98)*
White	0.87 (0.79, 0.97)**	0.90 (0.73, 1.10)
Overweight/Obese	0.90 (0.80, 1.01)	0.80 (0.70, 0.93)**
Participated in sports team at baseline[b]	1.85 (1.42, 2.41)***	1.67 (1.44, 1.93)***
Parent characteristics		
Education	1.05 (1.01, 1.09)*	1.04 (0.94, 1.11)
Household income	1.05 (0.97, 1.15)	1.05 (1.00, 1.24)
Two-parent household	1.01 (0.88, 1.15)	1.05 (0.80, 1.13)
School characteristics		
Enrollment (100's of students)	1.00 (0.99, 1.01)	1.02 (1.01, 1.03)*
Sports offered per 100 students[c]		
<1	Reference	Reference
≥1	1.01 (0.91, 1.12)	1.47 (1.20, 1.81)***
Percent of unrestricted sports[c]		
<85%	Reference	Reference
85%–99%	1.09 (1.00, 1.19)	1.09 (0.92, 1.38)
100%	1.12 (1.03, 1.22)**	0.96 (0.85, 1.26)
School town characteristics		
Median household income (US$1000s)	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)
Log population[d]	1.02 (0.97, 1.07)	0.91 (0.83, 0.99)*

[a] RRs are adjusted for all other variables in the table.
[b] Baseline sports participation measured 5–6 years prior to the other variables in this table.
[c] Sports offered per 100 students and percent of unrestricted sports are sex specific.
[d] Population transformed to the log scale to normalize the distribution.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Abbreviations: RR = risk ratio for participating on ≥1 sports team in the past 12 months. 95%CI = 95% confidence interval.

inversely related to town population and positively related to the number of sports offered per 100 students.

In adjusted analyses, interactions between sex and both school sports opportunity variables were statistically significant ($p < 0.001$ for sports offered per 100 students and $p < 0.048$ for the percent of unrestricted sports). Table 3 presents results from adjusted analyses stratified by sex. Girls who attended schools offering one or more sports per 100 students were 47% more likely to participate in sports than girls who attended schools offering fewer sports. However, this was not significant in the boys' model. In contrast, the percent of unrestricted sports offered at school was positively related to boys' sports team participation, such that boys who attended schools with 100% of the sports unrestricted were 12% more likely to participate in sports compared to boys who attended schools with less than 85% of the sports unrestricted. This association was also significant when the percent of unrestricted sports was treated as a continuous variables (test of trend, $p = 0.005$). The percent of unrestricted sports was not significantly related to girls' sports team participation (test of trend, $p = 0.570$).

4. Discussion

Our results indicate that, in the US, high school sports opportunities differentially affect boys' and girls' sports participation. Specifically, we found that the variety of choice in school sports offered predicted girls' sports participation, whereas the percent of unrestricted sports (access) predicted boys' sports participation. These effects were statistically significant even after adjusting for adolescent-, parent-, and school/town-level covariates, including adolescents' previous participation in sports and overweight/obese status.

Our finding that girls played on more sports teams if they had a wider variety of options to choose from is consistent with Cohen et al.'s[8] finding for both sexes. In contrast, we did not find that boys' participation was related to the variety of sports teams offered at school. Instead, boys played on more sports teams if their school did not restrict participation in the most popular sports (e.g., soccer, basketball). This sex difference could reflect different motivations among boys' and girls' for participating in sports. A prior study found that boys were generally most interested in competitive aspects of specific sports;[34] thus, they may be less willing to switch sports if blocked from participating in their preferred sport. It is possible that girls were more

willing to participate in a variety of different sports because they are interested in the social and physical benefits of sports as well as the competitive aspects.[34,35] Alternatively, girls may have broader exposure to different sports at an early age and so they feel more comfortable taking advantage of different sport opportunities compared to boys. Future qualitative research is needed to explore the differential motivations, barriers, and facilitators to boys' and girls' participation in sports to help contextualize our findings.

School-based obesity prevention intervention studies have demonstrated that comprehensive programs that address multiple components of the school environment are most successful.[36,37] Not all school sports teams provide rigorous enough exercise to influence participants' health. However, overall sports participation has previously been shown to reduce children's and adolescents' risk of overweight and obesity;[2,11−15] as such, school sports programs may be an important, effective, and underused target for obesity prevention efforts. This study is the first to highlight that the structure of school sports programs exerts a differential impact on girls *vs*. boys. Specifically, our results suggest two strategies for increasing sports participation: increasing the number of sports teams available to girls, and not restricting the most popular sports among boys.

Increasing sports participation in adolescents who do not play sports or only play on one sports team may be challenging. Adolescents who are already overweight, not naturally athletic, or not comfortable with the competitive nature of many sports may not enjoy participating on competitive sports teams and could be harmed by forced participation. A general shift from offering a small number of exclusive, competitive sports to offering a larger variety of inclusive sports may help attract adolescents who are not already participating in competitive athletics. For example, this might mean offering more individual and non-traditional sports (such as dance, cross-country skiing, or martial arts), or having a greater number of teams−including less competitive teams−for the most popular sports so that everyone can participate. Such changes might help prioritize wellness as a goal of school sports programs and could also decrease the negative aspects associated with sports, including injuries and performance enhancing drug use.[38,39] These alternative opportunities should be studied further to determine which would have the greatest impact on increasing participation in adolescents at risk of overweight and obesity. Additionally, it is important to note that baseline participation in sports was also significant predictor of sports participation in high school among both boys and girls. This highlights the importance of engaging students in sports at a young age.

The data for this study were primarily cross-sectional; however, our adjustment for adolescents' previous participation in sports was measured 5−6 years before other study variables. This longitudinal component strengthens our study, and indicates that the associations we found are not merely a consequence of athletic students self-selecting into schools that offer more opportunities (i.e., reverse causality). Instead, our findings indicate that school sports characteristics appear to influence adolescent sports participation even when their prior participation in sports is held constant.

This study had several limitations. Although our sample included more than 1200 adolescents, they were clustered within only 23 schools. This may have limited our ability to detect school level effects. Our measures relied on adolescent, parent, and school personnel self-report. Although adolescents reported their sports participation with accuracy in prior research,[1] the validity of other reported measures was unknown and could potentially bias our results. We did not examine athletic opportunities offered by community organizations, which may have had similar effects as school opportunities. Our survey question about sports participation was not limited to school sports and so we do not know whether adolescents were reporting their participation in school, community, or other types of sports teams. However, the majority of sports opportunities for Vermont and New Hampshire high school students are offered through schools. Future research should examine whether characteristics of community-based sports programs yield similar findings. We were not able to examine the impact of fees on sports participation because there was little variation by school. It is possible that the associations we observed might be different at a school where the cost of sports participation is prohibitive. Lastly, the rate of participation in sports (69.5%) was higher in our sample compared to national data (60.3%).[40] Future research should explore whether our findings could be replicated in geographic regions with lower overall sports participation.

Schools provide an accessible location for promoting sports participation and a safe environment for adolescents to be physically active. Sports participation and PA generally declines as adolescents age,[15,35,41] and so it is particularly important to understand factors influencing participation during high school. Our results provide valuable information for schools and public health efforts aimed at increasing adolescent PA through sports participation. Specifically, because variety of sports influences girls and unlimited participation in popular sports influences boys, both choice and access should be considered when planning a comprehensive school athletic program.

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