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Gender, Academics and Interscholastic Sports Participation at the School Level: A Gender-specific Analysis of the Relationship between Interscholastic Sports Participation and AP Enrollment

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Abstract

While literature demonstrates that interscholastic sports participation is associated with positive academic outcomes, this relationship is rarely analyzed at a macro-level (the school-level). To date, there is no research examining whether increases in schools' female and male interscholastic sports participation rates is associated with increases in female and male AP enrollment rates. Using a national sample of 4,644 public high schools during the 2009-2010 school year, we test several gender-specific hypotheses linked with the association between schools' sport participation rates and advanced placement enrollment rates (AP math, AP science, AP foreign language, and overall AP enrollment). The findings reveal that schools' female and male sports participation rates have a positive association with schools' female and male AP math, AP science, AP foreign language, and overall AP enrollment rates. Moreover, the findings suggest that females benefit more than males in regard to the positive relationship between interscholastic sports and AP enrollment.

Understanding whether sport has a positive or negative social influence on academic achievement has been debated extensively by scholars since the inception of the field of sport sociology (Coakley 2010). While a consensus agrees that sport participation is likely to demonstrate positive influences on many academic outcomes, there is debate surrounding whether sports participation differentially affects individuals based on demographic factors like gender (Barron, Ewing, and Waddell 2000; Braddock 1981; Broh 2002; Eccles and Barber 1999; Fejgin 1994; Hanks and Eckland 1976; Hanson and Kraus 1998; Hanson and Kraus 1999; Hauser and Lueptow 1978; Holland and Andre 1987; Howell, Miracle, and Rees 1984; Mahoney and Cairns 1997; Marsh 1992; Marsh 1993; Marsh and Kleitman 2003; McNeal 1995; Otto 1976; Pearson, Crissey, and Riegle-Crumb 2009; Picou 1978; Rehberg and Schafer 1968; Spady 1971; Spreitzer 1994; Spreitzer and Pugh 1973; Stegman and Stephens 2000; Videon 2002). Although the findings are mixed in relation to whether the association between sports participation and academic outcomes is stronger for male or female participants, these studies tend to find that males and females who participate in

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sports have better academic outcomes compared to their peers who do not participate in these activities (Hanks 1979; Hanks and Eckland 1976; Hanson and Kraus 1998; Hanson and Kraus 1999; Marsh 1993; Marsh and Kleitman 2002; Marsh and Kleitman 2003; Pearson et al. 2009; Sabo, Melnick, and Vanfossen 1993; Spreitzer 1994; Spreitzer and Pugh 1973; Stephens and Schaben 2002; Videon 2002). Unfortunately, these studies that have examined the relationship between gender, sports, and academic outcomes have focused on the individual, with little empirical or theoretical consideration on the mechanisms that drive this relationship at the macro—the school—level.

The mechanisms through which sport has been described as influencing academic outcomes are traditionally explained through theoretical perspectives that can be classified as rooted in either functionalist or conflict theories (Coakley 2010). While studies using functionalist perspectives generally focus on the positive social experiences provided by sport itself and how those experiences teach skills and values which foster an individual's academic success (Marsh 1992; Marsh 1993; Marsh and Kleitman 2002; Marsh and Kleitman 2003), conflict perspective views sport as negative and detracting from the time an individual might spend on academics (Braddock 1981; Braddock et al. 1991; Coleman 1961a; Zeiser 2011).

More contemporary studies, which have found that female athletes are most likely to show gains in male-dominated academic areas such as math and science, have used a combination of functionalism and critical feminist theories to interpret why females in sport perform better academically in male-dominated educational domains. These studies argue that participating in sport, a "male-dominated" domain, teaches female athletes not only skills and values necessary for success in academics, but also provides a social environment which challenges gender stereotypes about female limitations in other primarily "masculine domains" such as math and science (Hanson and Kraus 1998; Hanson and Kraus 1999; Pearson et al. 2009). In other words, these studies theorize that sports participation provides a unique cultural environment for female athletes to challenge stereotypical assumptions about femininity (e.g., men are innately better at math than women).

It is important to assess the influence of sport on academics, particularly with an eye to how these findings might vary by gender at the school level. As female and male participation rates in interscholastic sports continue to rise (Sabo and Veliz 2011; Sabo and Veliz 2012), examining how sports participation influences academic outcomes for both females and males is vital. Additionally, it is important to examine if sports participation has a unique impact for females. As more females are entering the traditionally masculine domain of sport, it is important to assess if females are benefiting from their opportunity to participate in what has long been a male preserve and whether these opportunities to participate in interscholastic sport are associated with females entering male-dominated academic domains such as math and science.

Moreover, examining the association between sports participation and academic outcomes at the macro-level, will help researchers assess how sports participation impacts the entire school environment, not simply how it influences participants directly (i.e., individual-level analyses) (Veliz and Shakib 2012). Interscholastic sports are an important feature in American public schools that both participants and non-participants experience day-to-day

within this institution of learning. Sports can be viewed as having a far-reaching impact for all students, fostering values that can have either positive or negative consequences for the student body (Coleman 1961a, 1961b). In other words, examining the impact of sports participation at the school level allows researchers to assess whether sporting opportunities and participation lend themselves to creating a more positive or negative academic environment for all students, participants or not.

By using school-level data from the 2009-2010 Civil Rights Data Collection (CRDC), this article examines if schools with higher female and male sports participation rates are associated with these schools having higher female and male AP enrollment rates (CRDC 2012). Moreover, in order to assess if females are uniquely benefiting from their opportunities to participate in sport, we examine whether schools with higher female representation in interscholastic sports (i.e., the female/male sport participation ratio) are also associated with these schools having higher female representation in AP courses in math and science (i.e., the female/male AP enrollment ratio).

BACKGROUND AND HYPOTHESES

The relationship between interscholastic sport and academic outcomes has been theorized about and empirically investigated for more than fifty years. The first researcher to question the effect of interscholastic sport participation on education was James Coleman in his seminal work *The Adolescent Society* (1961a). Although he never actually studied the relationship between academic outcomes and sport, he did question the culture created by interscholastic sport on how youth conceptualized academics. Finding that youth valued athletics more than scholarly activities due to enhanced social status, Coleman (1961a) theorized that sport led to the devaluing of education.

The theoretical model that became attributed to Coleman's research on adolescents was labeled the "Zero-Sum Model," which became shorthand for the hypothesis that participation in sports and other extra-curricular activities depleted student energy and resources that could have been otherwise devoted to academic endeavors (Marsh 1992; Otto and Alwin 1977). Despite its popularity and cultural sway, the Zero-Sum Model never generated much empirical evidence that supported the notion that athletic participation negatively impacted academic, social, or psychological outcomes among children and adolescents (Holland and Andre 1987; Marsh 1993). In fact, some of the initial forays that empirically assessed the validity of the Zero-Sum Model found that success in sports and success in academics were not mutually exclusive outcomes (Buhrmann 1972; Picou and Curry 1974; Rehberg and Schafer 1968; Schafer and Armer 1972; Schafer and Rehberg 1970; Snyder and Spreitzer 1989; Spreitzer and Pugh 1973). This research found that adolescents who pursue sports did not limit their social development at the expense of academic pursuits, but rather actually *broadened* their networks with pro-social peers and adults through sport. Holland and Andre (1987) explained the positive benefits of sport as an additional developmental experience. They asserted that sport provided experiences that build character and social skills that could indirectly translate to enhanced academic outcomes (e.g., punctuality). Moreover, Marsh (1992) developed a more narrowly defined explanation in relation to the positive academic outcomes that students indirectly accrue

from athletic participation. Because interscholastic sport facilitates involvement in other forms of participation in school-relevant activities, athletes develop a sense of identification with the school. Marsh argued that students who have a stronger connection, or identification with school, will benefit academically because of their psychological connection with the school mission.

For the most part, studies find that the association between interscholastic sport participation and academics are generally positive across numerous outcomes (Feldman and Matjasko 2005). However, findings across gender have been mixed. There is some evidence that both male and female athletes benefit similarly when it comes to academics. Studies have shown that both male and females report higher educational aspirations, an increased likelihood of being on an academic track, and higher chances of attending a four-year college (Marsh 1993; Marsh and Kleitman 2002; Marsh and Kleitman 2003; Sabo et al. 1993; Spreitzer 1994; Spreitzer and Pugh 1973). There is other evidence that males might benefit more than females academically from sports participation (Hanks 1979; Hanks and Eckland 1976; Videon 2002). Studies have shown that while positive associations between interscholastic sports participation and educational outcomes exist across gender, the effects may be stronger for males or females depending on the study (Spreitzer 1994; Spreitzer and Pugh 1973; Stephens and Schaben 2002).

While the findings regarding academic outcomes and sports participation are mixed when it comes to gender, there is some solid evidence that sports participation might have unique and specific effects for females in academics. Using a nationally representative longitudinal sample of 1,015 high school students, Hanson and Kraus (1998) found that involvement in interscholastic sports was more likely to demonstrate a positive influence on the science experiences of female athletes when compared to male athletes. More specifically, participating in varsity sports during students' senior year has a positive influence on females' access to and attitudes toward science. However, these positive relationships were not present for male athletes. Interestingly, these researchers also found that cheerleading and pep club participation, activities in line with gender stereotyped behaviors, were shown to have a negative impact on success in science. In a second similar longitudinal study comparing female athletes and non-athletes, Hanson and Kraus (1999) extended their analysis to include not only science but math. Similar to their prior study, this one demonstrated that participation in sports provided evidence for its positive influence on science and math achievement scores and attitudes toward the subjects.

Expanding upon this prior work, Pearson et al. (2009) compared male and female athletes and non-athletes on their participation in science and foreign language courses. Using a critical feminist theoretical perspective, these authors compared whether there were differences between the strengths of association between athletic participation and taking coursework outside of traditional gender role expectations. The researchers hypothesized that because female athletes are breaking down gender stereotypes by participating in a traditionally masculine domain, their sport participation might show a stronger association with taking non-traditionally feminine coursework. Conversely, male athletes would show no special propensity to take traditionally female coursework, such as advanced foreign language courses, because male participation in sport does not breakdown traditional gender

stereotypes. While these researchers found that athletes, regardless of sex, were more likely to take both advanced foreign language and advanced physics coursework than non-athletes, the association between athletic participation and advanced physics coursework was strongest for females. Interestingly, the relationship between athletic participation and advanced foreign language coursework did not demonstrate a parallel association for males. Because of the gendered legacy associated with physics, the researchers argued that this strong association, only for female athletes, might support the idea that participation in sports, a "traditionally masculine domain," might translate to greater feelings of female competence in other "traditionally masculine domains," such as science.

Overall, the literature that has assessed the relationship between sports participation and academic outcomes have revealed two common themes. First, sports participation is positively associated with most academic outcomes, suggesting that interscholastic sports and the academic mission within secondary schools are not mutually exclusive domains at odds with each other. Second, although the research is mixed on which gender benefits the most from participating in sports, female sports participants appear to reap some additional academic advantages in regard to enrolling and successfully taking courses in the math and sciences. While these studies suggest the important role that sports can play in promoting academic success and helping females break down gender stereotypes about appropriate behaviors in academic domains, these works have focused only on the individual as the unit of analysis. No work to date has examined whether schools with higher female or male sports participation rates are associated with higher female and male AP enrollment rates (AP enrollment rates as a measure of academic achievement). Further, no studies have examined whether schools with higher female representation in sports also have higher female representation in AP math and science courses.

Accordingly, the purpose of this study is twofold. First, do schools with higher female and male interscholastic sports participation rates also have higher female and male AP enrollment rates? Second, do schools with higher female representation in interscholastic sports (i.e., female sports participation rates and gender equity ratios for sports participation) also have higher female representation in AP courses – particularly in traditionally male academic programs like AP math and AP science (i.e., female AP enrollment rates and gender equity ratios for sports participation)? The specific hypotheses to be tested are:

> Hypothesis 1: Schools with higher female and male sports participation rates will have higher female and male AP enrollment rates.
>
> Hypothesis 2: The relationship between schools' female sports participation rates and female AP enrollment rates will be stronger than the relationship between schools' male sports participation rates and male AP enrollment rates – particularly in AP math and AP science.
>
> Hypothesis 3: Schools with higher female representation in interscholastic sports (i.e., number of female athletes divided by the number of male athletes) will have higher female representation in AP courses (i.e. number of females enrolled in AP courses divided by the number of males enrolled in AP courses) – particularly in AP math and AP science courses.

METHODS

Sample

Data for the analyses come from two major sources. The first source of data is from the suppressed 2010 Civil Rights Data Collection (CRDC).[1] The purpose of the CRDC is to collect information on public schools in order to assess whether educational opportunities are being provided in an equitable manner across elementary and secondary schools in the United States. The CRDC is a mandatory survey given to a random sample of school districts, with every school within that district required to participate in the survey. For the purposes of this study, information collected on the provision and participation in interscholastic sports (the number of students participating in sports) and the provision and participation in Advanced Placement courses (the number of students enrolled in AP courses) were used to construct the major independent and dependent variables for the analyses.[2] Due to the survey instrument asking only administrators at high schools to respond to questions that deal with the provision of sports and AP courses at their schools, the analyses include only high schools that offer grades 9-12 to both girls and boys during the 2009-2010 school year (*Full CRDC Sample*: n = 9,769). Moreover, the final sample further restricted the data to include only schools that offered sports and AP courses (e.g., AP math) during the 2009-2010 school year, yielding a final sample size of 4,644 high schools (*Restricted CRDC Sample*) with complete data from the 2010 CRDC data collection.

The second source of data comes from the Common Core of Data (CCD), which is collected annually by the National Center for Education Statistics (CCD 2012). The CCD gathers basic school-level information on all public elementary and secondary schools in the United States. To supplement the CRDC data, CCD data from the 2009-2010 school year is merged with the CRDC data to determine each school's geographic location (i.e., whether the school is located in an urban, suburban, town, or rural area and region of the United States), the percentage of students who are eligible for free or reduced price lunch, racial composition (the percentage of students who are White, Black, Hispanic, Asian), gender composition (the percentage of students who are female), number of students enrolled during the school year, the student to full-time teacher ratio, and whether the school is a regular public high school or a charter/magnet school. This analysis will draw on the CCD collection for the 2009-2010 school year among the population of public high schools offering grades 9 -12 (*Population of U.S. Public High Schools*: N = 16,289).

The restricted CRDC sample of 4,644 schools is used for the analyses in this study (refer to table 1). To compare how representative the restricted CRDC sample is to the population of public high schools, table 1 shows the descriptive statistics for the population of four-year public high schools obtained from the CCD, the full CRDC sample of public high schools, and the restricted CRDC sample of public high schools (the sample used for this study).[3]

[1]The Office for Civil Rights releases only suppressed data for the 2010 CRDC data collection. Specifically, any questions that asked about the exact number of participants (e.g. number of students suspended, enrolled in AP courses, who participate in interscholastic sports…) rounded these responses to the nearest increment of 5.

[2]The CRDC data collection asked only school administrators to report on the unduplicated count of students enrolled in at least one AP course and the duplicated count of students who are "taking AP mathematics," "taking AP science," "AP foreign language," and "who are taking other AP subjects." Given the lack of specificity of "other AP subjects," this enrollment count was excluded from the analysis.

The majority of schools in the restricted CRDC sample are located in suburban areas (32 percent) and within the southern region of the U.S. (41 percent). Ninety-five percent of public high schools in the restricted CRDC sample are considered regular high schools, while 5 percent are classified as either charter or magnet schools. The average number of students enrolled in the restricted CRDC sample of high schools is roughly 1,310 students, with the student body being typically half male (51 percent) and half female (49 percent). The restricted CRDC sample of high schools also recorded an average of 60 percent of the student body being white and an average of 40 percent of the student body being eligible for free or reduced price lunch. The average student-teacher ratio among the restricted CRDC sample of schools is roughly 1 teacher for every 17 students, and the average number of AP courses that schools provide students is roughly 11 different courses.

Dependent Variables

Several dependent variables are constructed to assess schools' level of academic achievement among the student body using an assortment of enrollment rates in advanced placement (AP) courses. The CRDC individual school report asks school administrators to report a duplicated count[4] of students enrolled in AP mathematics, AP science, and AP foreign language during the 2009-2010 school year. Moreover, school administrators are also asked to report an unduplicated count of all the students who were enrolled in at least one AP course during the 2009-2010 school year. All of these counts provided by school administrators are disaggregated by gender (Male and Female), so it is possible to construct and analyze schools' AP enrollment rates for both females and males separately.

High school AP enrollment rates are constructed using female and male enrollment numbers provided by the CCD. The CCD provides detailed information on the number of students who attend schools by gender and grade level (grades 9, 10, 11, or 12). This information on the characteristics of the school population made it possible to create AP enrollment rates that have a distinctive focus on gender. AP enrollment rates are constructed by dividing the number of students enrolled in AP courses for each school (numerator) by the total number of students who attend each school (denominator). For instance, the *female AP math enrollment rate* is constructed by dividing the total number of females enrolled in AP math courses for each school by the total number of females that attend each school. Accordingly, eight measures of AP enrollment rates are constructed for the analysis: (1) female AP math

[3]Comparing the restricted sample of public high schools with the population of four-year public high schools reveals several differences. First, it appears that schools located in town and rural areas are underrepresented in the restricted sample, while schools located in the Southern states are overrepresented in the restricted sample. Second, the restricted sample of public high schools has proportionally more regular public high schools when compared to the population. Finally, the average total enrollment for schools in the restricted sample is much larger than the average total enrollment among high schools in the population. The major reason for these discrepancies between the restricted sample and the population of four-year public high schools was the result of confining the sample to include only public high schools that offer both interscholastic sports and AP courses that include math, science, foreign language, and some other type of advanced placement course. Although the full sample of public four-year public high schools from the CRDC (9,669) came closer to being representative of the population of four-year public high schools, twenty-five percent of these schools did not offer any AP courses and 22% did not offer interscholastic sports. Given the parameters of this study, including schools that did not offer either AP courses or interscholastic sports would be unreasonable in relation to testing the hypotheses outlined above. Although the more restrictive sample used in this study (n = 4,644) reflects larger schools located in urban and suburban areas (and schools with more resources), this sample allowed for a realistic test of the hypotheses stated within this study.

[4]Duplicated counts mean that a student could be counted more than once. For instance, a student enrolled in AP calculus and AP statistics would be counted twice in regard to the overall AP math enrollment count. Furthermore, an unduplicated count means that a student is counted only once, regardless of taking multiple AP courses.

enrollment rates, (2) male AP math enrollment rates, (3) female AP science enrollment rates, (4) male AP science enrollment rates, (5) female AP foreign language enrollment rates, (6) male AP foreign language enrollment rates, (7) the rate of females enrolled in at least one AP course, and (8) the rate of males enrolled in at least one AP course.

In order to measure the gap in enrollment between females and males in AP courses, four measures are created to assess the gender equity ratio in AP enrollment: (1) gender equity ratios for AP math enrollment, (2) gender equity ratios for AP science enrollment, (3) gender equity ratios for AP foreign language enrollment, and (4) gender equity ratios for enrollment in at least one AP course. These measures are constructed by taking the number of females enrolled in AP courses divided by the number of males enrolled in AP courses for each school. For instance, the *gender equity ratio for AP math enrollment* is constructed by taking the number of females enrolled in AP math divided by the number of males enrolled in AP math across each school. Scores that are below 1 indicate that more males are enrolled in AP courses, while scores that are above 1 indicate that more females are enrolled in AP courses (scores that are equal to 1 represent gender equity; 50 females/50 males = 1).

Independent Measures

The major independent variables of interest in this study measure schools' interscholastic sport participation rates (male and female) and the schools' gender equity ratio for sports participation. The CRDC individual school report asks school administrators to report a duplicated count of students who participated on sports teams during the 2009-2010 school year. The counts provided for sport participants are disaggregated by gender, making it possible to construct sport participation rates for males and females across the sample of schools. Similar to AP enrollment rates, schools' sport participation rates are calculated by dividing the number of participants in each school by the number of students enrolled within each school. Moreover, gender equity ratios for sport participation are created by taking the number of female sports participants divided by the number of male sports participants across each school. Similar to the gender equity ratios for AP enrollment, values for gender equity ratios for sport participation that are below 1 indicate that more males participate in sports, while values above 1 indicate that more females participate in sports.

In order to balance the data for the multivariate analyses, several control variables are included to assess accurately the relationships that are hypothesized for this study. The CRDC and CCD provide measures of several institutional characteristics of high schools that are included in all of the multivariate analyses: *school enrollment* (the number of students per high school*), racial composition* (percentage of the student body who are white), *federal lunch enrollment* (percentage of students eligible for free or reduced price lunches), *gender composition* (percentage of the student body who are female), *the student-teacher ratio* (number of students divided by the number of fulltime teachers within the same school), *type of school* (i.e. regular versus charter/magnet), *type of community where the school is located* (urban, town, and rural areas were dummy coded and high schools located in suburban areas serve as the reference category.), *geographic region* of the school (Midwest, South and West were dummy coded and high schools located in the Northeast serve as the reference category), and the *total number of AP courses* provided by schools. It

should also be noted that a variable for schools' *total sport participation rates* is also created and used as a covariate for some of the multivariate analyses (the number of female and male sports participants in each school divided by the total number of students enrolled in each school).

Analytic Strategy

The analysis is divided into three parts. First, descriptive statistics are presented on AP enrollment rates, sport participation rates, and gender equity ratios for AP enrollment and sports participation Moreover, schools' male and female AP enrollment rates, and schools' male and female sport participation rates are compared to assess differences among males and females who self-select to participate in these school-sponsored courses or activities.

Second, multivariate analyses are conducted using negative binomial regression models to test hypothesis 1 and hypothesis 2 (models 1-8). Negative binomial regression models are used to analyze the relationship between gender-specific sport participation rates (e.g., female sport participation rates) and gender-specific AP enrollment rates (e.g., female AP math enrollment rates). Negative binomial regression models are the optimal choice due to AP enrollment rates being both highly skewed (skewed to the right) and over-dispersed (the variance is larger than the mean) (Osgood 2000). It should also be noted that negative binomial regression models are used to analyze count data, but can include an exposure term to convert the dependent variable into a rate. Accordingly, the negative binomial regression models for this study use exposure term(s) to convert the dependent variables into gender-specific AP enrollment rates: the total number of female students enrolled within schools are used to estimate female AP enrollment rates (e.g., number of females enrolled in AP math courses at school A divided by the number of females who attend school A), while the total number of male students enrolled within schools are used to estimate male AP enrollment rates (e.g., number of males enrolled in AP math courses at school A divided by the number of males that attend school A). Moreover, in order to test differences between the strength of regression coefficients between females sport participation rates (b1) and male sport participation rates (b2), the following statistical test for the equality of regression coefficients outlined by Paternoster et al. (1998) is used:

$$Z = \frac{b_1 - b_2}{\sqrt{SEb_1{}^2 + SEb_2{}^2}}$$

Third, ordinary least squares regression is used to test the validity of Hypothesis 3 (models 9-12), which focuses on the relationship between the gender equity ratio for sports participation and the gender equity ratios for AP enrollment. In other words, these models will be used to assess whether an increase in schools' gender equity ratio for sports participation (i.e., higher levels of female representation among student athletes) is associated with an increase in schools' gender equity ratio for AP enrollment (higher levels of female representation among students enrolled in AP courses).

RESULTS

Descriptive Findings

The descriptive results for schools' gender-specific sport participation rates, gender-specific AP enrollment rates, and gender-equity ratios for schools' sports participation rates and AP enrollment rates are provided in table 2. The results for the independent variable of interest, schools' sport participation rates, indicate that schools' male sport participation rates (52.5 percent) were higher when compared to schools' female sport participation rates (39.6 percent). Moreover, the average gender equity ratio for sports participation rates among the schools in the sample is .72, indicating a lower representation of females among student athletes (e.g., 72 female athletes/100 male athletes). Although there are no other national databases that track interscholastic sports participation rates in public high schools in the United States (Sabo and Veliz, 2011; Sabo and Veliz, 2012), the gender-equity ratio for sports participation rates from this sample is comparable to the gender-equity ratio among female and male sports participants (2009-2010: female participants = 3,172,637; male participants = 4,455,740; gender-equity ratio = .71) that is provided by the National Federation of State High School Associations (NFSHA 2011).

The results for the dependent variables suggest that schools' female AP math enrollment rates (4.32 percent), female AP science enrollment rates (4.91 percent), female AP foreign language enrollment rates (3.29 percent), and the percent of females enrolled in at least one AP course (18.97 percent) are higher when compared to schools' male AP math enrollment rates (4.22 percent), male AP science enrollment rates (4.09 percent), male AP foreign language enrollment rates (1.93 percent), and the percentage of males enrolled in at least one AP course (13.53 percent). Additionally, the average gender-equity ratio for AP math enrollment (1.25), AP science enrollment (1.43), AP foreign language enrollment (2.47), and enrollment in at least one AP course (1.54) among the schools in the sample indicate that there is a higher representation of females enrolled in these courses when compared to males (e.g., 247 female students enrolled in AP foreign language/100 male students enrolled in AP foreign language). Despite the lack of any comparable estimates from other data sources to gauge the accuracy of AP enrollment rates for this sample, data from The College Board (2012) found that in 2010 roughly 28 percent of high school graduates took an AP exam during high school. Although this estimate is much higher than the percent of females and males enrolled in at least one AP course (18.97 percent and 13.53 percent respectively) that is found within this sample, the enrollment rates being used in this study include the entire student body in the denominator and not simply the number of graduates. In other words, the denominator used in this study to calculate rates is much larger, given that students who may not graduate or will eventually drop out are included.

Multivariate Findings: Testing Hypothesis 1

Table 3 provides the results for the negative binomial regression analyses that test whether schools with higher female and male sports participation rates have higher female and male AP enrollment rates. Interestingly, these models indicate a positive association between schools' female sports participation rates and schools' female AP math enrollment rates ($b = .305$, $p<.001$), female AP science enrollment rates ($b = .385$, $p<.001$), female AP foreign

language enrollment rates (b = .625, p<.001), and enrollment rates in at least one AP course (b = .473, p<.001). Further, these models also show a positive association between schools' male sports participation rates and schools' male AP math enrollment rates (b = .269, p<. 001, male AP science enrollment rates (b = .390, p<.001, male AP foreign language enrollment rates (b = .345, p<.01, and male enrollment rates in at least on AP course (b = . 332, p<.001. These positive associations support the assumptions in hypothesis 1, suggesting that schools with higher female and male sports participation rates also have higher female and male AP enrollment rates when controlling for important school-level characteristics.

Multivariate Findings: Testing Hypothesis 2

Table 3 also provides the negative binomial regression coefficients and standard errors in order to compute the statistical test for the equality of regression coefficients (Z-test). Unfortunately, the negative binomial regression coefficients for schools' female and male sports participation rates have comparable positive associations with schools' AP math enrollment rates (Z = .40, non-sig.), AP science enrollment rates (Z = −.053, non-sig.), and AP foreign language enrollment rates (Z = 1.92, non-sig.). Only the negative binomial regression coefficients for schools' female and male sports participation rates have significantly different positive associations with schools' female and male enrollment rates in at least one AP course (Z = 2.32, p<.05). This difference indicates that schools' female sports participation rates have a stronger positive association with female enrollment rates in at least one AP course when compared with the positive association between schools' male sports participation rates and male enrollment rates in at least one AP course. These findings offer only partial support for hypothesis 2, given that it was expected that the associations between schools' female sports participation rates and female AP enrollment rates in math, science, and foreign language would be stronger than the associations found between schools' male sports participation rates and male AP enrollment rates in math, science, and foreign language.

Multivariate Findings: Testing Hypothesis 3

Table 4 presents the results of the linear regression models that test whether schools with a higher representation of females among student athletes are associated with a higher representation of females enrolled in AP courses. Two positive associations are found between schools' gender equity ratio for sports participation and schools' gender equity ratios for AP science (b = .116, p<.05) and enrollment in at least one AP course (b = .097, p<.001). These findings indicate that schools with a higher representation of females among student athletes (i.e., schools with higher gender equity ratios for sports participation) also have a higher representation of girls enrolled in AP science courses and a higher representation of girls enrolled in at least one AP course (schools with higher gender equity ratios for AP science and enrollment in at least one AP course). However, contrary to hypothesis 3, schools' gender equity ratio for sports participation is negatively associated with gender equity ratio for AP math (b = −.113), while no association is found between schools' gender equity ratio for sports participation and schools' gender equity ratio for AP foreign language (b = .100, non sig.). The findings from the linear regression models offer mixed support for hypothesis 3. In particular, the association between schools' gender equity

ratio for sports participation and schools' gender equity ratio for AP math enrollment is in the opposite direction, suggesting that schools with a greater representation of females among student athletes also have less representation of females in AP math courses.

DISCUSSION

A central question within the sports sociology literature is whether sports foster or detract from academic achievement among youth (Coakley 2010). Similar to most prior findings in the literature (Barron et al. 2000; Braddock 1981; Braddock et al. 1991; Broh 2002; Eccles and Barber 1999; Fejgin 1994; Hanks and Eckland 1976; Hauser and Lueptow 1978; Holland and Andre 1987; Howell et al. 1984; Mahoney and Cairns 1997; Marsh 1993; Marsh and Kleitman 2002; McNeal 1995; Otto 1976; Picou 1978; Rehberg and Schafer 1968; Spady 1971; Stegman and Stephens 2000), the findings from this study overwhelmingly support the positive association typically found between interscholastic sports participation and academic outcomes. Schools with higher male and female participation rates in interscholastic sports also have higher male and female AP enrollment rates in math, science, foreign language, and in being enrolled in at least one AP course. This study adds to prior research because it moves beyond examining the influence of sport participation using a micro-level approach. Instead of focusing on how the individual directly benefits academically through his or her own sports participation (learning skills and values in sport that translate to academic success), this study focuses on the macro-level influence of sport by examining the impact of schools' interscholastic sports participation rates on school-level academic outcomes.

A main concern with examining sport at the school or macro-level has been to determine how the culture of sport might diffuse or spill over into the academic culture (Veliz and Shakib 2012). Based on a small but growing literature in the field which uses both functionalist and critical feminist perspectives, researchers argue that increased female representation in sport (a traditionally male dominated domain) would also be associated with increased female representation in AP courses like math and science (traditionally male dominated academic domains). Prior research examining the relationship between interscholastic sports participation and academics has found a greater number of female athletes participating in male-dominated coursework like math and science (Hanson and Kraus 1998; Hanson and Kraus 1999; Pearson et al. 2009). While our study demonstrates that schools with higher female sports participation rates also have higher female AP enrollment rates in math and science, the association is similar to what is found between schools' male sports participation rates and male AP enrollment rates in math and science.

Despite this finding outlined above, the analyses discovered that schools' gender equity ratio for sports participation is positively associated with schools' gender equity ratios for AP science and overall AP enrollment (i.e. enrolled in at least one AP course). This suggests that schools with higher female representation in interscholastic sports also have higher female representation in AP science courses and higher female representation in AP courses in general. Given that these associations are between gender equity ratios which measure the gender gap in athletic participation and AP enrollment, it can be cautiously inferred that increased female representation in sports might be challenging a culture of gender

stereotypes for all girls and may positively influence enrollment in traditionally male-dominated academic domains like science. However, it should be mentioned that AP science in high school includes various courses such as biology, chemistry, computer science, environmental science, and physics; with high school females being more likely to be enrolled in AP biology and AP environmental science, and high school males being more likely to be enrolled in AP chemistry, AP computer science, and AP physics (Hill, Corbett, and Rose 2011). As a result of this gender segregation within AP science, this finding must be interpreted with caution, because it cannot be determined from the data[5] if schools with higher female representation in interscholastic sports also have higher female representation in AP science courses like physics or computer science – males out number girls by a 2 to 1 ratio in these AP courses (Hill et al. 2011).

Interestingly, and conversely to our hypothesis, there is a negative association between schools' gender equity ratio for sport participation and schools' gender equity ratio for AP math enrollment. This finding indicates that as schools' female representation in interscholastic sports increases, schools' female representation in AP math decreases (or male representation in AP math increases). This may suggest that greater female representation in interscholastic sports is not challenging traditional divisions between females and males, but can actually draw attention to these differences and strengthen gender biases between the sexes. In other words, schools with greater female representation in sports could be indicative of these schools' funneling females into gender segregated sports (e.g., girls' ice hockey versus coed ice hockey), which can ultimately reinforce gender differences instead of challenging them.

One of the major purposes of this paper has been to examine the mechanisms through which female sports participation might impact female participation in traditionally masculine academic domains. Prior research which has examined the relationships among sports, gender, and academics has found that female athletes are more likely than female non-athletes to engage in coursework traditionally stereotyped as masculine (Hanson and Kraus 1998; Hanson and Kraus 1999; Pearson et al. 2009). By examining this question using a micro-level of analysis, these prior studies suggest support for a critical feminist theoretical perspective that explains sports as operating to challenge gender bias by providing females athletes with direct experiences that might teach female athletes skills and values necessary for their success in more traditionally masculine domains such as math and science. By examining this question at the school-level, our goal was to provide insight into how other theoretical mechanisms might also operate to influence the relationship between gender, sports, and academics. More specifically, we wanted to examine if greater female representation in sports might influence all females, regardless of their personal participation levels, by constructing a culture within a school system where it is considered normative for girls to participate in other traditionally masculine domains.

Although the analyses provided mixed support for this hypothesis, it should be noted that one of the most consistent findings in the multivariate analyses is that the relationship

[5]It should be reiterated here that the CRDC survey instrument asks only school administrators to include a duplicated count of students enrolled in AP courses in four general areas: math, science, foreign language, and "other AP subjects."

between schools' female sports participation rates and female enrollment rates in at least one AP course is stronger when compared to the relationship between schools' male sports participation rates and male enrollment rates in at least one AP course (i.e. this was also validated in the gender equity ratio models – model 12). In other words, this set of findings may suggest that females in high schools are benefiting more from the relationship between interscholastic sports and enrolling in AP courses when compared to their male peers.

Finally, we need to highlight several contributions and limitations. This research is the first to examine the association between AP enrollment rates and sports participation rates. Prior studies have focused on many measures of academic success, but none has looked directly at AP enrollment levels (Barron et al. 2000; Braddock 1981; Braddock et al. 1991; Broh 2002; Eccles and Barber 1999; Fejgin 1994; Hanks and Eckland 1976; Hauser and Lueptow 1978; Holland and Andre 1987; Howell et al. 1984; Mahoney and Cairns 1997; Marsh 1993; Marsh and Kleitman 2002; McNeal 1995; Otto 1976; Picou 1978; Rehberg and Schafer 1968; Spady 1971; Stegman and Stephens 2000). AP enrollment is more reflective of high academic standards than grades, which are often very subjective, depending on the school. For example, high grades in one school might not translate to high grades at another school. Moreover, AP enrollment reflects a high academic orientation and captures a level of academic excellence that distinguishes high-achieving schools. One of the unique features of analyzing AP enrollment rates is that most schools allow students to self-select to enroll in these courses[6]. AP enrollment rates measure a certain level of academic rigor that the student body chooses to participate in voluntarily either to challenge themselves academically or to gain an advantage in the college admissions process.

A second contribution of this study is the use of gender-equity ratios to examine the gender-specific relationship between sports participation and AP enrollment. One of the major problems of simply examining the relationship between schools' sports participation rates and AP enrollment rates is that sports participation rates may be measuring school resources (Stearns and Glennie 2010). Schools with more resources typically have more extra-curricular activities and tend to have a student body that will be more likely to self-select to participate in various school-sponsored activities and advanced placement courses. By measuring the gap between female and male participation in sports and AP enrollment, a better analysis was achieved in order to tap into whether greater female representation in sports is associated with greater female representation in AP courses. To date, no other studies have examined the associations between interscholastic sport, gender and academics in this way.

Despite these important contributions, there are several limitations associated with this research. First, we cannot say definitively that increases in female sports participation actually translate to changes in individual perceptions that traditional gender roles are being

[6]It can easily be said that students do not have to participate in interscholastic sports in public high schools. However, it should be noted that not all schools allow student to self-select into AP courses. According to the 2010 CRDC data collection that was used for this study, 27.9% of public high schools that offered AP courses indicated that students were not able to self-select into these types of classes. Despite some schools not allowing students to self-select into AP courses, more than 70% of schools in the sample for this study indicated that a student was allowed to enroll in any AP course that the school offers without a recommendation or any other required criterion (except for a necessary course pre-requisite), even if some students are recommended or encouraged to take AP courses.

challenged. Just because a school might have a large number of females involved in sports does not automatically mean that traditional gender norms are weakened. We simply do not know what an active female student body in interscholastic sports means to the students in these schools and whether high levels of female engagement in sports alters perceptions that breakdown gender stereotypes. Future research should investigate how these school-level participation rates influence individual-level perceptions of gender stereotypes to obtain a clearer understanding of how the school culture influences individual attitudes and behavior. A second limitation of this study is related to the measures of sport participation used. This study uses a very rudimentary measure of sports participation, which did not account for the gender legacy associated with particular sports. For example, some sports are traditionally more masculine (such as football) and others are traditionally more feminine (such as volleyball). It is possible that schools with stronger female participation in more traditionally masculine sports would challenge gender stereotypes, more so than schools with stronger female participation in traditionally feminine sports like volleyball. Future research should differentiate between the types of sports in which youth participate and the degree to which a sport challenges or supports gender stereotypes. Finally, although this study is devoted to capturing a nationally representative sample of public high schools, many of the schools were funneled out of the analyses due to not having either AP courses or interscholastic sport. The conclusions drawn from this study represent only schools that have enough resources to provide students with several fringe benefits that less economically endowed schools cannot provide for their students.

Biographies

Philip Veliz is a postdoctoral fellow at the University of Michigan at the Institute for Research on Women and Gender (IRWG). His primary research interests include the sociology of sport, substance abuse, juvenile delinquency, and quantitative social research methods. He has published in the *American Journal of Public Health* and the *Journal of Studies on Alcohol and Drugs* regarding the association between different types of sports participation and prescription drug abuse.

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Table 1

Demographics of 4-year public high schools

	Population of U.S. Public 4-year High Schools (n = 16,289)	**Full CRDC Sample of 4-year Public High Schools (n = 9,769)**	***Restricted Sample* CRDC Sample of 4-year Public High (n = 4,644)**
School Location	**mean/percent**	**mean/percent**	**mean/percent**
Urban	24%	27%	24%
Suburban	24%	29%	32%
Town	17%	15%	15%
Rural	36%	29%	29%
Northeast	15%	13%	18%
Midwest	28%	23%	21%
South	33%	38%	41%
West	25%	26%	20%
School Type			
Charter/Magnet	9%	7%	5%
Student Body Characteristics			
Enrollment (number of students)	786	1082	1310
Percent Female	48%	47%	49%
Percent White	59%	56%	60%
Percent FLE	43%	43%	40%
Provision of School-Based Opportunities			
Student/Teach Ratio	16	17	17
Number of AP courses[(a)]	NA	NA	11

Note:

[(a)]The CCD does not provide information of the number of AP courses schools offer students

Table 2

Key Independent and Dependent Variables (n = 4,644)

Key Independent Variables	Mean	SD	t-score	
Female Sport Participation Rate	39.60%	.239	−71.14***	n = 4,644
Male Sport Participation Rate	52.50%	.266		
Total Sport Participation Rate	45.70%	.244	--	
Gender Equity Ratio (Sports Participation)	.72	.261	--	
Dependent Variables				
AP Math Rate (Male)	4.22%	.047	3.23***	n = 3,921[(b)]
AP Math Rate (Female)	4.32%	.046		
Gender Equity Ratio (AP math enrollment)	1.25	1.29	--	
AP Science Rate (Male)	4.09%	.047	10.62***	n = 3,573[(b)]
AP Science Rate (Female)	4.91%	.044		
Gender Equity Ratio (AP science enrollment)	1.43	1.66	--	
AP Foreign Language Rate (Male)	1.93%	.031	34.10***	n = 2,002[(b)]
AP Foreign Language Rate (Female)	3.29%	.040		
Gender Equity Ratio (AP For. Lang. enrollment)	2.47	2.53	--	
Enrolled in at least one AP course (Male)	13.53%	.106	48.29***	n = 4,549[(b)]
Enrolled in at least one AP course (Female)	18.97%	.146		
Gender Equity Ratio (Enrolled in at least one AP course)	1.54	1.15	--	

Notes:

[(a)] t-scores were estimated using paired sample t-tests

[(b)] Sample sizes varied due to the exclusion of schools in the analyses that indicated no enrollment for females or males in either AP math, AP science, AP foreign language, or being enrolled in at least one AP course.

Table 3

Negative Binomial Regression - Examining the Influence of Female and Male Sport Participation Rates on Female and Male AP Enrollment Rates

	AP Math Enrollment Rate						AP Science Enrollment Rate						AP Foreign Language Enrollment Rate						Enrolled in at least one AP course					
	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7			Model 8		
	Female Rate			Male Rate			Female Rate			Male Rate			Female Rate			Male Rate			Female Rate			Male Rate		
	b		SE	b		SE	b		SE	b		SE	b		SE	b		SE	b		SE	b		SE
constant	−3.18	***	.220	−3.18	***	.206	−3.17	***	.238	−3.50	***	.240	−2.70	***	.313	−3.15	***	.384	−1.79	***	.150	−2.126	***	.151
Urban	.193	***	.035	.201	***	.033	.045		.035	.131	***	.035	.024		.046	.074		.057	−.013		.024	.071	**	.025
Town	−.112	**	.043	−.087	*	.042	−.113	**	.044	−.114	**	.044	−.060		.073	−.140		.090	−.125	***	.029	−.111	***	.030
Rural	−.021		.036	−.048		.034	−.092	*	.037	−.089	*	.037	−.029		.054	−.032		.068	−.069	**	.025	−.108	***	.025
Midwest	.027		.042	.033		.041	.035		.043	−.044		.043	.118		.068	.112		.084	.100	***	.029	.089	**	.030
South	−.244	***	.039	−.276	***	.037	−.034		.041	−.186	***	.039	−.277	***	.060	−.278	***	.072	.114	***	.028	.007		.028
West	.060		.049	.077		.047	.085		.053	−.033		.053	.077		.078	.083		.096	.182	***	.034	.171	***	.036
Enrollment	−2.5E-04	***	2.3E-05	−2.1E-04	***	2.2E-05	−2.3E-04	***	2.3E-05	−2.3E-04	***	2.3E-05	−2.5E-04	***	3.0E-05	−3.2E-04	***	3.7E-05	−1.4E-04	***	1.7E-05	−1.5E-04	***	1.7E-05
Percent Female	.599		.370	.385		.355	.317		.414	.554		.419	−.718		.515	−.388		.612	−1.17	***	.254	−.545	*	.256
Percent White	−.341	***	.069	−.205	**	.067	−.121		.069	−.174	*	.071	−1.056	***	.104	−1.182	***	.129	−.241	***	.045	−.228	***	.047
Percent FLE	−.893	***	.082	−1.146	***	.080	−.826	***	.083	−1.10	***	.084	−.454	***	.120	−.595	***	.148	−.425	***	.056	−.843	***	.059
Student/Teacher Ratio	.006		.004	.004		.004	.010	*	.004	.017	***	.004	.014	*	.006	.013		.007	.015	***	.003	.010	***	.003
Charter/Magnet	.001		.059	.132	*	.057	.164	**	.057	.200	***	.059	.068		.081	.057		.103	.173	***	.039	.112	**	.041
Number of AP courses	.033	***	.002	.035	***	.002	.026	***	.002	.034	***	.002	.019	***	.003	.024	***	.003	.052	***	.001	.051	***	.002
Female Sport Participation Rate	.305	***	.069	--		--	.385	***	.072	--		--	.652	***	.110	--		--	†.473	***	.046	--		--
Male Sport Participation Rate	--		--	.269	***	.055	--		--	.390	***	.062	--		--	.345	**	.116	--		--	†.332	***	.041
negative binomial	.541		.013	.493		.012	.500		.013	.502		.013	.586		.019	.907		.032	.300		.006	.319		.007
	Pseudo R2 = .025			Pseudo R2 = .035			Pseudo R2 = .022			Pseudo R2 = .034			Pseudo R2 = .021			Pseudo R2 = .0186			Pseudo R2 =.046			Pseudo R2 =.048		
	n = 3,921			n = 3,921			n = 3,537			n = 3,537			n = 2,002			n = 2,002			n = 4,549			n = 4,549		

Notes:

* p<.05

Sociol Focus. Author manuscript; available in PMC 2015 January 01.

** p<.01

*** p<.001

(a) Z-test comparing the difference between regression coefficients for female sport participation rates (b1) and male sport participation rates (b2):

† Indicates a significant difference between regression coefficients at a .05 alpha level (two-tailed)

(b) Sample sizes varied due to the exclusion of schools in the analyses that indicated no enrollment for females or males in either AP math, AP science, AP foreign language, or being enrolled in at least one AP course.

Table 4

Linear Regression - Examining the Influence of Gender Equity Ratios for Sports Participation on Gender Equity Ratios for AP Enrollment

	AP Math Enrollment Gender Equity Ratio Model 9		AP Science Enrollment Gender Equity Ratio Model 10		AP For. Lang. Enrollment Gender Equity Ratio Model 11		Enrolled in at least one AP course Gender Equity Ratio Model 12	
	b	SE	b	SE	b	SE	b	SE
constant	−1 70 ***	.196	−1 11 ***	.215	−.630	.328	−1.13 ***	.110
Urban	−.016	.028	−.065 *	.030	−.091 *	.044	−.089 ***	.017
Town	−.034	.035	.007	.038	.111 **	.067	−.048 *	.020
Rural	.031	.030	.034	.032	.012	.050	.021	.017
Midwest	.044	.034	.027	.037	.040	.064	.037	.020
South	.038	.034	.103 **	.036	−.059 ***	.058	.095 ***	.019
West	.043	.039	.060	.046	−.063	.071	.068 **	.022
Enrollment	−7.0E-05 ***	2.0E-05	−2.6E-05	2.2E-05	2.9E-05	3.2E-05	−9.2E-06	1.2E-05
Percent Female	3 70 ***	.361	2.48 ***	.392	1.99 ***	.591	2.37 ***	.200
Percent White	−.212 ***	.054	−.036	.059	.018	.097	−.011	.031
Percent FLE	244 ***	.070	.239 ***	.075	.121	.116	.427 ***	.040
Student/Teach Ratio	.003	.002	−.002	.004	.004	.006	.001	.001
Charter/Magnet	−.084	.048	.079	.050	.032	.074	.053	.027
Number of AP courses	.001	.002	−.006 ***	.002	−.001	.002	.001	.001
Total Sports Participation Rate Gender Equity Ratio (Sports Participation)	.021	.058	−.086	.064	.179	.101	.029	.032
	−.113 *	.045	.116 *	.046	.100	.071	.097 ***	.024
	R-Square = .058 n = 3,921		R-Square = .046 n = 3,537		R-Square = .019 n = 2,002		R-Square = .068 n = 4,549	

note:

* p<.05

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** p<.01

*** p<.001

(a) In order for the dependent variables to be normally distributed, the natural log (ln) of gender equity ratios for the different types of AP enrollment were used.

(b) Sample sizes varied due to the exclusion of schools in the analyses that indicated no enrollment for females or males in either AP math, AP science, AP foreign language, or being enrolled in at least one AP course.