

## **Effects of Participation in School Sports on Academic and Social Outcome Variables**

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## **Effects of Participation in School Sports on Academic and Social Outcome Variables**

### **Abstract**

For many students, school-led sports programs are an important part of their educational experience. Propensity score matching was used to investigate the impact of participation in school sports on academic and social variables. Data were obtained from the 2010 Minnesota Student Survey (MSS), resulting in a total sample of 29,535 12<sup>th</sup> grade students, of which 12,849 participated regularly (at least 1-2 times per week) in school-led sports. Participation in school sports was associated with higher GPAs, favorable perceptions of school safety, and increased perceptions of family and teacher/community support. Given that participation in school-organized sports provides many positive youth development outcomes, schools should consider promoting school-organized sports to students.

### **BACKGROUND**

A growing body of literature has investigated the importance of physical activity, noting the relationship between engagement in sports and increased academic outcomes, such as increased academic performance (Bradley, Kean & Crawford, 2013; Dweyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Eccles, Barber, Stone & Hunt, 2003; Fox, Barr-Anderson, Neumark-Sztainer & Wall, 2010) and elevated levels of academic resiliency (Peck, Roeser, Zarret & Eccles, 2008). The positive impact of after-school sports participation can also be extended to the social realm as well, where researchers have demonstrated a relationship with greater

psychological adjustment, lower levels of depression and externalizing behaviors, and positive relationships with peers (Fredricks & Eccles, 2005; Fredricks & Eccles, 2006). However these benefits may not be extended to leisure activities in general, but only to well-structured activities (Broh, 2002). Broh suggests that this may be because well-structured extracurricular sports facilitates the socialization of participants, helping them to develop a strong work ethic, persistence and respect for values essential for academic success and provides participants opportunities to build strong, supportive relationships with their peers and adults.

Despite empirical and theoretical support for the relationship between participation in school organized sports and favorable academic/social outcomes, there is still considerable debate about the true nature of this relationship (see Hattie & Clinton, 2012; Singh, Uijtdewilligen, Twisk, van Mechelen & Chinapaw, 2012; Taras, 2005). Finding high quality experimental/quasi-experimental studies in this domain is difficult (Feldman Farb & Matjasko, 2012; Singh, Uijtdewilligen, Twisk, van Mechelen & Chinapaw, 2012), and the absence of such articles may contribute to the divergent findings in this body of literature. Studies investigating the relationship between involvement in school sports and academics are mostly correlational in nature, limiting the inferences that can be drawn (Dweyer, Sallis, Blizzard, Lazarus & Dean, 2001). The lack of experimental research is not surprising because it would be difficult and likely unethical to randomly assign students to sports programs, while preventing others from participating. Therefore this study employs a statistical technique known as propensity score matching (PSM) in order to investigate the relationship between participation in school-organized sports and

academic and social outcomes in 12<sup>th</sup> grade students. This technique simulates a quasi-experimental design thereby addressing many of the issues outlined above.

Propensity score matching enables researchers to create a single numerical value from key covariates which can then be used to match participants enrolled in a program (or treatment) to similar students for whom the researchers have data but who did not participate in the program. By using statistical matching on key background and academic performance characteristics, analysis can be interpreted in a way that is equivalent to that of a quasi-experimental design, thus allowing for strong inferences to be drawn from the data (Rosenbaum & Rubin, 1983).

## **RESEARCH QUESTIONS**

This study builds on the current body of literature by addressing the following research questions: For those participating in school-organized sport activities at least 1 to 2 times per week, what is the impact of participating in those activities on GPA? What is the impact of participation in school sports on perceptions of family support, teacher and community support and school safety? This study extends the previous research by using PSM in order to move beyond a correlational approach by utilizing a statistical technique that allows for strong inferences to be drawn from the data (Rosenbaum & Rubin, 1983).

## **METHODS**

### **Procedure and Instrument**

Data used in this study come from the Minnesota Student Survey (MSS). The purpose of the MSS is to monitor important trends in students' habits, participation in in-school and after-school activities, and students' thoughts about positive and

risky behaviors. This study entails a secondary analysis of the 2010 administration of the survey.

### **Participants**

29,535 students were identified as being in the 12<sup>th</sup> grade and had answered all relevant items on the MSS survey. The mean age of the participant group was 17.66 (range 16-19 years, SD=0.52), with 52% female and 48% male. The ethnic backgrounds of the 12<sup>th</sup> grade student body were largely represented by students identified as white (81%), followed by Asian (5%), African American (4%), Latino (4%), American Indian (1%), and mixed/other (5%). Socio-economic status (SES) was calculated by students indicating their eligibility for receiving free and reduced price lunch. Twenty-one percent of the students reported receiving free or reduced price lunch. Students also indicated if they had an individualized education plan (IEP), which was used as an indication of special education status. In this 12<sup>th</sup> grade population 13% reported having an IEP. The sample of interest in this study includes 12,849 students in grade 12 who reported engaging in school-organized sports at least 1 to 2 times per week.

### **Measures**

Three social outcome scales were created using students' responses to the MSS items: perception of family support, perception of teacher and community support, and school safety. In this study, reliability coefficients obtained for the three subscales (see Table 1) indicated that all of the subscales showed an acceptable level of internal consistency although the reliability coefficient for family

support scales was slightly below .7 (George & Mallery, 2003). Also, CFA results indicated that all of the subscales had a good model-data fit.

INSERT TABLE 1

### **Data Analysis**

The first step of the data analysis was the creation of propensity scores used to match the students who reported engaging in school-organized sports at least 1-2 times per week to students who did not participate in school sports. Several variables were selected from the MSS database for the creation of propensity scores: age, special education status (SPED), eligibility for free or reduced lunch as an indicator of socioeconomic status (SES), gender, and ethnicity (American Indian, African American, Asian, Latino, Other/Multiple, White). These variables were selected because of their relation with both the outcome variables and the factors that may influence student participation in school sports (Arceneaux, Gerber & Green, 2010; Caliendo & Kopeinig, 2008).

Since type and frequency of school organized sports differ across schools, propensity scores were created for each school individually using multilevel linear modeling. This procedure allows investigating the impact of school-organized sports among the students who share the same school and community but differ with regard to engaging in sport activities organized by their schools. In order to estimate propensity scores in a multilevel modeling framework, participation in school-organized sports were predicted using the selected covariates as student-level predictors in a two-level (student and school) model. The multilevel model used in this study was as follows:

$$y_{ij} = \beta_{0j} + \beta_{1j}(Age)_{ij} + \beta_{2j}(SPED)_{ij} + \beta_{3j}(SES)_{ij} + \beta_{4j}(Ethnicity)_{ij} + r_{ij} \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \mu_{0j} \quad (2)$$

where  $y_{ij}$  represents participation in school organized sports (1=Yes, 0=No) for student  $i$  ( $i=1, \dots, N$ ) in school  $j$  ( $j=1, \dots, J$ ),  $\beta_{0j}$  is the intercept in Level 1 (i.e. student level),  $\beta_{1j}$  through  $\beta_{4j}$  are regression coefficients for the covariates mentioned above,  $r_{ij}$  is overall variation in Level 1, and  $\mu_{0j}$  is overall variation in Level 2 (i.e., school level). The predicted values for each student in the multilevel model were used as propensity scores in the propensity matching process.

The “nearest neighbor” method of PSM was employed in this analysis to match participants from the non-treated group to each member in the treatment group using propensity scores obtained from in the multilevel analysis. Participants from the non-treatment group (those not participating in school-organized sports) were matched on a one-to-one basis to a student who participates in school-organized sports and then discarded from the pool of possible matches for the next matched pair.

Table 2 contains the descriptive statistics for the covariates for both the students who participated in school-organized sports at least 1-2 times per week and those who did not. The  $t$ -tests and the standardized difference scores were used to compare the means of each group before matching. Standardized differences of less than absolute 10% can be considered a meaningful match (Austin, Grootendorst & Anderson, 2007).

## INSERT TABLE 2

Prior to matching, those who participated in school sports differed from the other students on a number of variables. The significant differences across the two samples indicated the need for PSM to create an equivalent comparison group. In Table 2, standardized differences between the groups' means after PSM are close to zero, informing us that all covariates were well balanced across the two groups through the use of PSM.

Once the two groups were matched the new sample ( $N= 12,849$  for each group) was used in an ordinary least squares regression to predict the students' GPA in 2010 and the three social measures derived from the MSS. Through the propensity score matching of 12<sup>th</sup> grade students in each school on the demographic variables, potential differences in GPA and the three social measures described earlier could be reasonably attributed to participation in school organized sport activities.

## RESULTS

Linear regression analyses were performed for each outcome variable in order to assess the impact of participation in school sports on students' academic achievement and their perception of family support, teacher and community support, and school safety. The results of these linear regression analyses are displayed in Table 3.

## INSERT TABLE 3

The results of regression analyses indicated that participation in school-based sport activities was a significant predictor for all of the outcome variables



after matching the students based on the propensity scores. Participation in school-based sport activities was positively related to GPA, family support, teacher and community support, and the perception of school safety. When examining the models presented in Table 3,  $R^2$ , the percent of explained variance in the model, contains the most valuable information about the impact of participation in school sports. This is because  $R^2$  indicates the unique contribution of participation in school-based sport activities for predicting the outcome variable.

## **DISCUSSION**

The present study used PSM to examine the role of participation in school-organized sports on GPA, family support, teacher and community support, and school safety. The findings in this study corroborate the findings of earlier studies, showing that participation in school-organized sports showed a positive effect on GPA, perceptions of family support, teacher and community support, and perceptions of school safety (Bradley, Kean & Crawford, 2013; Dweyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Eccles, Barber, Stone & Hunt, 2003; Fox, Barr-Anderson, Neumark-Sztainer & Wall, 2010; Fredricks & Eccles, 2005; Fredricks & Eccles, 2006). The positive and statistically significant regression coefficients for participation in school sports implies that students who participate in sport activities at their schools tend to feel their school is a safe environment, be more academically successful and feel more supported by the adults within their academic community and family than students who do not participate in such activities.

The very nature of survey data limits the types of analyses that can be

conducted and the corresponding conclusions that can be made. PSM allows observational data to be interpreted as though it was obtained through a quasi-experimental design (Barth, Guo & McCrae, 2008). Therefore, the present study goes beyond merely corroborating the findings of previous studies, by providing critical converging evidence supporting the importance of school-organized sports using a novel statistical technique that allows for stronger inferences to be drawn than typically afforded by traditional survey analyses (Rosenbaum & Rubin, 1983).

Although the effect sizes reported in this study seem small (ranging from 2% to 4%), they are comparable to effects observed in other studies (e.g., Hattie & Clinton, 2012). Small effect sizes in this situation are expected because participation in school sports does not directly influence classroom factors in a way that a classroom based intervention does. It is important to see that the positive factors students take from their engaging in school sports transfer to their academics and social sphere in a meaningful way.

This study used a novel statistical technique, PSM, to find evidence that suggests participation in school-organized sports can benefit students on both the academic and social level. Students who participate in school-organized sports are not only likely to have higher GPAs but are also more likely to perceive that they have teacher and community support, that their school is a safe environment, and that they have more family support than their non-sports playing peers.

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## Tables

Table 1.

*Reliability and CFA results for the seven subscales*

Subscale	$\alpha$	CFI	TLI	RMSEA
School safety	.81	.96	.91	.121
Family support	.72	.94	.82	.144
Teacher & community support	.79	.91	.84	.102

Note:  $\alpha$ : Coefficient alpha; CFI: Comparative fit index; TLI: Tucker-Lewis index; RMSEA: Root mean-squared error of approximation



Table 2.

*Group Comparisons: Grade 12 students in 2010 academic year*

Variables	<u>School Sports</u>		<u>No School Sports</u>		<u>Pre-Match Comparisons</u>		<u>Post-Match Comparison</u>
	Mean	SD	Mean	SD	Two tailed <i>t</i> -test ( <i>p</i> -value)	Standardized Difference (%)	Standardized Difference (%)
Age	17.66	0.51	17.66	0.53	.57	-0.54	0.53
Gender <sup>a</sup>	0.48	0.50	0.56	0.50	<.01	-12.03	-7.95
Free or Reduced Lunch <sup>b</sup>	0.15	0.36	0.26	0.44	<.01	-22.45	-0.44
Special Education Status <sup>b</sup>	0.09	0.28	0.16	0.36	<.01	-16.47	-1.86
American Indian	0.01	0.08	0.01	0.09	.01	-2.62	-0.10
African American	0.03	0.17	0.04	0.20	<.01	-4.69	-0.91
Asian	0.03	0.17	0.07	0.25	<.01	-13.69	-1.02
Caucasian	0.86	0.35	0.77	0.42	<.01	17.73	0.83
Latino	0.03	0.17	0.05	0.22	<.01	-8.70	1.22
Other/Multiple	0.04	0.21	0.06	0.23	<.01	-4.55	-0.75

**Note:** <sup>a</sup>1=Female, 0=Male; <sup>b</sup>1=Eligible, 0=Non-eligible. Ethnicity categories were dummy coded using white as the reference group.

Table 4.

*Group Comparisons: Grade 12 students in 2010 academic year*

	Outcomes											
	GPA			Family Support			Teacher & Community Support			School Safety		
	R <sup>2</sup>	β	S.E.	R <sup>2</sup>	β	S.E.	R <sup>2</sup>	β	S.E.	R <sup>2</sup>	β	S.E.
Intercept	.04			.03			.04			.02		
Participation in School Sports		2.98	.01		1.41	.01		0.51	.01		2.19	.02
		0.26	.01		0.51	.02		0.50	.02		0.71	.03