The Effect of Participation in School Sports on Academic Achievement Among Middle School Children

Xiaohui Guo

Chad D. Meyerhoefer[1]

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Abstract

Little is known about the relationship between human capital accumulation and school sports participation in middle school. We seek to fill this gap in the literature using data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999. Using the method of instrumental variables, we identify the causal impact of participation in school-sponsored sports on the academic performance of children in eighth grade. Our results indicate that participation in school sports increases test scores in reading, math, and science by approximately 24–36 percent, and that this effect is mediated through reduced absenteeism from class and improved academic self-concept. In addition, we find that boys benefit more from school sports than girls, as do children with poorer baseline academic background performance.

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[1] Guo, Meyerhoefer: Lehigh University. Corresponding Author: Guo, xig310@lehigh.edu.
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1. Introduction

Communities in Manhattan, New York City (NYC) scrambled to finance school sponsored sports programs in 2011 after CHAMPS, a pilot program funded by the NYC Department of Education to promote physical activity, had its funding reduced.[2] The cuts forced CHAMPS to supply only one coach per middle school, threatening the sustainability of sports programs at many participating schools. Likewise, in 2014, the state of Pennsylvania announced plans to cut more than $1 billion from the public education system, which led many Pennsylvania middle schools to suspend sports programs due to insufficient budget.[3] Despite their popularity, schools sports programs are often viewed as expendable when there are shortfalls in educational funding.

The economics literature contains numerous studies on the effect of participation in school sports, either in high school or in college, on educational attainment and labor market outcomes (Long and Caudill, 1991; Maloney and McCormick, 1993; Marsh, 1993; Anderson, 1998; Barron et al., 2000; Robust and Keil, 2000; Eide and Ronan, 2001; Libscomb, 2007; Lozano, 2008; Pfeifer and Cornelißen, 2010; Stevenson, 2010). These papers reach a consensus that students who participate in school sports are less likely to drop out of high school, more likely to attend college, and more likely to earn higher wages than their peers who have not participated in sports. However, there are few studies that have investigated the academic return to participating in middle school sports, and none that we are aware of that use nationally representative data.

Human capital accumulation in high school and adulthood builds upon the middle school experience, and there is reason to believe that participation in middle school sports may have a positive impact on intellectual growth and development. Studies indicate that when children enter into the period of adolescence, investments in non-cognitive skills, self-concept[4] and discipline, have a greater impact on long-run human capital accumulation than investments in cognitive skills (Cunha et al., 2006;

[2] A DNAINFO New York (10/19/2011) article reports that CHAMPS Middle School Sports and Fitness League cuts funds to middle school sports.
[3] A FactCheck.Org article (06/27/2014) covers the quotes of Tom Wolf.
[4] Baumeister (1999) provides a formal definition of self-concept in social psychology: "the individual's belief about himself or herself, including the personal attributes and who and what the self is."

Heckman et al., 2006; Pfeifer and Reuß, 2008). This is because children with better self-concept and discipline are more efficient at transforming investments in cognitive skills into learning skills. To the extent that socialization and training in sports improve self-concept and discipline, participation in school-sponsored sports may improve learning.

Our paper contributes to the literature on human capital accumulation by providing causal estimates of the effect of participation in school-sponsored sports on academic achievement for middle school children. We analyze data from the nationally representative Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K, 1998). To address endogeneity of participation in school sports, we use the method of instrumental variables (IV). Results from our IV estimation indicate that the effect of participation in school sports on academic achievement is statistically significant and positive among children in middle school. We find evidence that sports participation is associated with lower levels of absenteeism from class and better ratings on an academic self-concept survey instrument. In addition, we find that boys benefit more from school sports than girls, as do children with poorer baseline academic performance.

The rest of the paper is organized as follows: We review the benefits of school sports in Section 2. Section 3 contains a description of empirical approach. We describe the data in Section 4. Section 5 contains our empirical results. In Section 6, we conduct robustness checks of the validity of our instruments. Evidence of heterogeneous treatment effects is provided in Section 7 and Section 8 concludes the paper.

2. Benefits of School Sports

Many papers consistently document positive correlations between school sports and educational attainment. For instance, Marsh (1993) finds a positive correlation between participation in high school sports and college attendance. Long and Caudill (1991) present evidence of a positive correlation between participation in sports at the college level and a higher rate of graduation. These positive correlations are likely mediated through three mechanisms: better academic self-concept, academic discipline, and health.

2.1. Academic Self-Concept

A number of research studies establish the way that self-concept, which predicts success in the classroom and labor market, is improved through school sports. Spady (1970, 1971) proposes that participation in sports increases students' perception of social status, which not only enhances academic ambition and identification within the school, but also facilitates the formation of the skills and attitudes that contribute to a student's future success. Snyder and Spreitzer (1990) propose a Role theory in which success in sports provides student athletes incentives to do better in the classroom. In particular, athletes need to achieve sufficient academic outcomes in order to maintain their eligibility for school sports, and they may be required to improve their GPA in order to be recruited to participate in college sports. Thus, participation in sports enhances student athletes' perception of their academic role.

While a general measure of self-concept is used in most research studies, Marsh et al. (1988) and Marsh (1990) demonstrate the importance of content-specific self-concept in the evaluation of interventions related to children's academic performance. They find that academic achievement is significantly correlated with academic self-concept, but not with the general self-concept which encompasses non-academic attributes.

2.2. Academic Discipline

Beyond improvements in academic self-concept, Marks (1977) notes that school sports shape discipline in the classroom within the context of the Spend-and-Drain theory. He argues that participation in sports channels students' abundant energy, making them feel more energetic when doing homework after training for athletic competition. In addition, expanding excess energy in sports stimulates students' interest in school, leading to increased commitment to academic values. As a result, student athletes have lower rates of absenteeism from class than non-athletes.

Kuhn and Weinberger (2005) and Eren and Ozbeklik (2015) add that teamwork and leadership experience in school sports serves can also contribute to better academic self-concept and discipline.

Both of the two pathways, improved academic self-concept and reduced absenteeism, can lead to an improvement in educational outcomes (Marsh, 1993; Spreitzer, 1994). Booth and Gerard (2011) provide the most recent evidence of these pathways by collecting data on students aged 11-12 at four schools in Cleveland. They find positive correlations between academic self-concept and absenteeism in the fall semester and test scores in reading, math, and science in the concomitant spring semester.

2.3. Health

Another possible channel through which participation in school sports can influence educational attainment is through its effect on health. Strong et al. (2005) use quasi-experimental data to evaluate the effects of physical activity. They find that more physical activity lowers the probabilities of obesity, cardiovascular disorder, and asthma among school-aged youth. Likewise, Cawley et al. (2013) report that an increasing the amount of time spent in physical education (PE) classes reduces the probability of youth obesity, which is a contributor to many health problems among adolescents, such as prediabetes and bone and joint problems (US Department of Health and Human Services, 2010).

However, current research produces mixed evidence on whether the health benefits due to physical activity spill over to academic performance. Strong et al. (2005) identify a moderate association between greater PE class time and gains in academic test scores. In contrast, Cawley et al. (2013) find that higher number of mandated minutes of PE class does not affect academic test scores.

3. Empirical Approach

If participation in school sports was randomly assigned, one could identify the causal effect of participation in sports on academic achievement using the following Ordinary Least Square (OLS) regression:

$$Score = \alpha_0+\alpha_1*Sports +\sigma*X + \xi$$

where X is a vector of demographic variables; the dependent variable, Score, is the student's test score on any one of a number of standardized tests and the independent variable; Sports, is a binary indicator for whether the student participated in school sports. The coefficient, α_1, would capture the causal effect of interest under random assignment.

However, the decision to participate in school sports programs is not random. A selection bias may arise due to the fact that participation in school-sponsored sports programs is optional. For example, if students of lower academic ability disproportionately participate in school sports, α_1 will have a downward bias.[5] Alternatively, if children of higher socioeconomic status live in districts that provide higher quality education (leading to higher test scores) and greater opportunities to participate in sports, α_1 will have an upward bias.

Only a few studies have attempted to account for this selection. Lipscomb (2006) uses fixed-effect estimation to remove the influence of time-invariant confounding factors that affect both students' propensity to participate in school sports and standardized test scores. Formation of self-concept begins during early adolescence, according to Erikson's Stage of Development theory which describes individual's psychosocial development from infancy to adulthood (Erikson, 1968). Considering the dramatic changes of self-concept and other attributes of a child's personality that occur during middle school, fixed-effect estimation may not adequately reduce the effect of unobserved factors on the parameter of interest.

Several studies use the instrumental variable (IV) approach to correct for selection, which is consistent with both time varying and time invariant omitted factors. Stevenson (2010) uses the enactment of Title IX in 1972 as an instrument for variation

[5] Maloney and McCormick (1993) compare the academic achievement of students participating in interscholastic sports with non-participating students by collecting data on all undergraduate students at Clemons University in the period of 1985 through 1988. They find a positive correlation between the lower Grade Point Average (GPA) at college and poor academic background, the lower SAT scores and lower rankings of high schools, among college athletes. Despite of the lack of time for studying due to the conflicting demands of revenue-generating sports that may partially explain the lower GPA for student athletes, the selection into sports by lower ability students is more important: approximately 60% of the lower GPA for revenue-generating sports athletes is attributed to the poorer academic background.

in female athletic participation rates at the state level. She finds that a higher sports participation rate in the state generates higher rates of college attendance and employment among women. Barron et. al (2000) use the size of school, library books per capita, and the faculty-to-student ratio as instruments. They find that participation in high school sports results in student athletes' better educational attainment and higher wages. One limitation of this approach is that the use of school-level information to construct instruments may not account for unobservable attributes of schools that are correlated with higher levels of support for school sports.

Edie and Ronan (2001) find a positive effect of high school sports on educational attainment for the majority of students, except for white males, using IV estimation where height at the age of 16 is the instrument. Pfeifer and Cornebelißen (2010) also use height as instrument. They present evidence that high sports participation increases the probability of obtaining a secondary school degree or a professional degree from Germany. However, height in their study is measured in adulthood, which may be a weaker predictor of participation in school sports in high school than contemporaneous height. Similar to Edie and Ronan (2001), we use students' lagged height and the growth in height between 1st and 8th grade as instruments, assuming that the variation in body height is related to genetic factors that do not directly affect academic achievement. In addition, to accounting for selection into school sports, IV estimation has an additional benefit of correcting for classical measurement error (Bound et al., 2002).

There are two requirements for instruments. First, instruments must be powerful. Height is a powerful predictor of school sports participation because children who are relatively tall at a young age have a competitive advantage in many sports, and as a result, are more likely to participate (Cordovil et al., 2009). Likewise, children who grow quickly experience an increase in their competitiveness that may lead to a higher likelihood of contemporaneous participation in sports teams.

Second, the instruments must be conceptually valid, and as a result, meet the exclusion restriction. This restriction implies that the instruments affect the outcome variable (test scores), conditional on the set of observable characteristics, only through participation in school sports. In our case, this means that for our identification strategy to be valid, height cannot have a direct impact on academic ability. Previous studies have found a small positive correlation between body height and cognitive ability (Persico et al., 2004; Case and Paxson, 2008). However, they do not investigate whether the correlation reflects a causal effect through genetics or a spurious correlation due to the failure to control for attributes of the environment correlated with both height and ability.

Twin studies can help one disentangle the influence of environment and genetics on the correlation between height to cognitive skills. Using a large Finnish dataset of 8,798 twin pairs born between born before 1958 and both alive in 1974, Silventoinen et al. (2000) find that the relationship between height and ability is mostly mediated by environmental factors.[6] When the models are estimated by gender the small mediating effect of genetics disappears. However, the standard of living in Finland was lower than in western countries until 1970s. Silventoinen et al. (2004) use a dataset of 5,454 twin pairs living in Minnesota in the 1980s to reexamine the degree to which genetic and environmental factors determine the correlation between body height and education. This study confirms the earlier findings of no genetic association between height and education in the United States.[7]

4. Data

We use the restricted-use Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K, 1998) for our empirical analysis. These data, which are collected by the National Center for Educational Statistics of the U.S. Department of Education, track the school experience of a nationally representative sample of roughly 22,000 children entering kindergarten in the fall of 1998 (Institute of Education

[6] The standard error of height between twin pairs, either dizygotic (DZ) or monozygotic (MZ), is on the order of 6 center meters (cm). There is no difference of the standard errors by gender.

[7] Although physical activity is known to have an anabolic effect on bone issue, Courteix et al. (1998) present evidence that only long-run participation in gymnastics since childhood affects bone mineral acquisition in sports. The majority of school sports do not impact growth in height. Similarly, Damsgaard et al. (2000) conclude that playing school sports has no effect on growth in height during puberty.

Sciences, 2009).[8] The ECLS-K, 1998 contains detailed information on children, parents, and school administrators at entry to kindergarten, transition into primary school, and progression through 8th grade. Trained field agents surveyed children in schools and measured their weight and height. Parents were interviewed on the phone, and school administrators provided information on children's direct and indirect academic achievement. Identifiers for state of residence are contained in the restricted-use version of these data. For more information on the ECLS-K, 1998, see the User's Manual (Tourangeau et al., 2009).

We limit our sample to children who were surveyed in the spring of 8th grade because the question of whether a child participated in school sponsored sports was only asked in the 8th grade wave. We create an indicator variable that equals to one if the child participated in any school sports, either varsity or intramural, in 8th grade, or zero otherwise. Our instrumental variables are the child's height (in inches) in 1st grade and the growth in height between 1st grade and 8th grade.[9] We exclude 225 individuals with missing values on school sports participation, and height in first and 8th grade, which results in a final estimation sample of 9,200 students. Sample sizes across different models vary because some dependent variables are not available for all observations. We apply the child cross-sectional weight in 8th grade to ensure the estimates are nationally representative and cluster the standard errors at the Primary Sampling Unit (PSU) level.

The ECLS-K, 1998 contains a direct academic assessment instrument for the subjects of reading, mathematics, and science. In each subject area, children receive a 10-item routing test in two stages. Performance on certain question (routing items) in the first stage guided the selection and administration of one of two second-stage (high and low) forms in each subject. The second-stage forms contained items of appropriate difficulty for the level of ability indicated by the routing items.[10] We use the Item

[8] The ECLS-K contains respondents in 41 out of 50 states. That excluded states are: Arkansas, Idaho, Montana, Nevada, New Hampshire, North Dakota, South Carolina, Vermont, and West Virginia.

[9] We considered other measures of height as instruments, such as the height of the child in 8th grade, but this instrument set had the highest statistical power.

[10] See the Psychometric Report for the Eighth Grade, ECLS-K, 1998, (Najarian et al., 2009) for additional details.

Response Theory (IRT) test scores to measure academic achievement.[11] The IRT scores have two advantages over the raw scores: 1) Using IRT makes it possible to compare scores across children who received different second-stage forms; 2) IRT scores compensate for the possibility that a low-ability child could guess the answers to several difficult questions correctly.

In addition, information on the respondent's family, school, neighborhood, and state of residence is available in the 8th grade wave, allowing us to use an extensive set of control variables in our empirical model. The most important environmental variable in the control set is birth weight, which captures nutritional intake in utero, and affects both height and cognitive ability (e.g., Black et al., 2007; Xie et al., 2016). We also make use of questions measuring parental involvement in the child's schooling. Specifically, we create an indicator variable for whether there was a "family homework rule". Other control variables for household socio-demographic characteristics include child age (continuous in months), gender, race (White, Black, Hispanic, and Other), population density of residence (urban, suburban, or rural), family income[12], family size, and the highest education level of the parents (8th grade or less, some high school but did not graduate, high school graduate, some college or 2- year degree, 4-year college graduate, more than 4-year college degree). The control variables for school characteristics include school type (a binary indicator for public school) and the percentage of students at the school eligible for a free or reduced price lunch.

We also control for state-level measures of socio-economic status and educational resources, including real state per capita income, the percentage of adults in the state with a bachelor's degree or higher, the average public school pupil-to-teacher ratio, real total state tax revenue per student, and real state instructional expenditures per teacher. Per capita income and adult education were obtained from the U.S. Census Bureau and the other state-level characteristics were obtained from the U.S. Department of

[11] We use the corrected version of the scores that can be found at http://nces.ed.gov/pubs2012/2012014_Errata.pdf.

[12] Households were asked to report income to the nearest $1,000 income range. We create one measure of family income using the midpoint of the income ranges, a second measure using the upper limit of the income ranges, and a third measure using the lower limit of the income ranges. Empirical results are robust to the three measures. We report empirical results conditional on the midpoint measure for household income.

Education.

Table 1 contains summary statistics for the ECLS-K variables used in our empirical models. The participation rate in school sports among 8th grade students is 61.1%.

Figure 1 presents a conceptual model, constituting the likely channels through which involvement in school sports affects academic achievement.[13] The ECLS-K, 1998 contains measures of these likely channels.

In the 8th grade wave, two teachers (reading and math/science) were asked to rate the student's level of absenteeism from class (i.e., "How often is this student absent from your class?"). The options were: 1 - never, 2 - rarely, 3 - some of the time, 4 - most of the time, 5 - all of the time. We take the average of the response scores for the student's absenteeism from the two teachers to proxy for the student's academic discipline.[14]

The ECLS-K, 1998 measures each child's self-concept through a Self-Description Questionnaire (SDQ) administered in 8th grade. Questions in the SDQ were asked to measure the extent to which the child internalized his or her problems. Through these questions children were asked how they felt about their academic performance, including their competence in classroom learning, doing homework, and taking tests. A scale score was calculated as the mean of the scores of the individual items measuring the student's feelings towards his or her academic performance. This scale score was then rounded to the nearest integer to create the variable, SDQ problem internalization. The final measure of SDQ problem internalization is ordinal ranging from 1 to 4 in a descending order (1 – strongly agree with the presence of the internalizing problem, 2 – agree, 3 – disagree, 4 – strongly disagree). The Appendix contains detailed information about the SDQ administered to 8th graders.

The ECLS-K, 1998 also provides measures of children's health status. A parent was asked to rate their child's health on a scale from 1 to 5, indicating decreasing health status (1 - excellent, 2 - very good, 3 - good, 4 - fair, 5 – poor). Descriptive statistics

[13] The channels are not exhaustive, but we consider those in Figure 1 the most important.
[14] Both teachers gave similar ratings on absenteeism in most cases.

for these variables used to explore the mechanisms through which participation in school sports impacts academic achievement are contained in Table 2.

5. Empirical Results

5.1. Power of Instruments

The coefficients of the instruments from the first stage of our IV model are reported in Table 3. The OLS results indicate that both instruments are statistically significant predictors of individual's enrollment in school sports. The point estimate of the coefficients on the instruments indicate that being one inch taller in 1st grade increases the probability of participating in school sports in 8th grade by 0.9 percentage points; and growing one inch between 1st and 8th grade translates into an increase of the probability of enrolling in school sports in 8th grade of 1.3 percentage points. Moreover, the F statistic associated with the instrument set is 15.7, which is above conventional threshold of 10 for sufficiently powerful continuous instruments (Stock et al., 2002).

5.2. Validity of Instruments

Since our IV model is over-identified we can perform an over-identification test for the validity of the instruments. Hansen's J test examines whether the expected value of the cross product of unobservable errors and functions of observable variables are orthogonal (Hansen, 1982). The null hypothesis is that both instruments, height in 1st grade and height growth in 1st through 8th grade, are valid.[15] The chi-square statistics and p-values obtained from the test where the IRT test scores are the dependent variables are shown in Table 4. In all cases, we fail to reject the null hypothesis that the instruments are valid. However, the results of the over-identification test should be interpreted with caution. A failure to reject the null hypothesis, although consistent with our identifying assumption, does not prove that the instruments are valid. Rather, the theoretical validity of the instruments is based on research indicating that height does

[15] It is also possible that rejection of the null hypothesis is due to the incorrectly specified conditional moments.

not have a direct causal effect on cognitive ability (Silventoinen et al., 2000, 2004).

5.3. The Impact of School Sports on Academic Achievement

Table 5 presents estimation results of both the OLS the IV models of the impact of sports participation on academic achievement. The IV coefficients of the effect of participation in school sports on IRT scores in reading, math, and science are positive and statistically significant at the 1% level. The point estimates imply that participation in school sports in 8th grade increases the reading, math, and science IRT score by 62, 33, and 28 points respectively; or 36, 23, and 33 percent of the corresponding sample mean, respectively. The OLS estimates of the impact of school sports participation in reading and science test scores are small, but negative and precisely estimated. Contrasting these with the IV estimates suggests that there is selection into score sports by students with lower baseline academic performance or ability. The IV results are similar to those of Edie and Ronan (2001) who find, using a similar identification strategy, that participation in high school sports increases the likelihood of attending and graduating from college by 49.5 and 19 percent, respectively.

Our results suggest that participation in school sports has the largest impact on reading scores and the smallest impact on mathematics scores. This is consistent evidence from White and McTeer (1990) that the academic gain from sports participation is more pronounced in subjects where cultural context is more important, such as reading, than in objective subjects, such as math.

5.4. Mechanisms

We investigate the plausible mechanisms mediating the academic benefits of playing school sports, as described in Figure 1. We measure health status using parent evaluated health, we measure academic discipline using absenteeism from class, and we measure academic self-concept using SDQ problem internalization that gauges the extent to which children internalize their academic problems.

Table 6 displays OLS and IV estimates of the impact of school sports participation on these outcomes. We conduct over-identification tests for each model. The model with parent evaluated health as the outcome fails the test, while the models with absenteeism and problem internalization pass the test. This may be due to the direct relationship between height and health in the former model. As a result, we focus on the OLS estimate for parent's evaluated health, which is qualitatively similar to the IV estimates, but the IV estimates for absenteeism from class and SDQ problem internalization. The OLS estimates, presented in the Panel A of Table 6, suggest that participation in school sports is positively correlated with better parent evaluated health status. Consistent with earlier findings that participation in school sports shape discipline and improve academic self-concept (Marks, 1977; Snyder and Spreitzer, 1990), the IV estimates indicate that participation in school sports leads to lower rates of absenteeism from class and better ratings on SDQ problem internalization.

In order to investigate the next link in the pathways between sports participation and academic achievement, we estimated the impact of parent evaluated health, absenteeism from class, and SDQ problem internalization on IRT test scores in reading, math, and science. In this case we present only OLS results because we do not have instruments for these mechanism variables. As a result, the estimates represent associations rather than causal effects because academic outcomes, self-concept and discipline may be simultaneously determined.[16] Our OLS results indicate that better academic self-concept and discipline are positive and significantly correlated with the IRT scores across all subjects. In contrast, the effect of parent evaluated health status on test score is small and not statistically significant. These results suggest that participation in school sports improves test scores through higher rates of school attendance and better academic self-concept, but not necessarily through better health.

6. Robustness Checks

6.1. Parental Investment

Positive associations between children's educational attainment and parental

[16] In accordance with symbolic interactionism, Marsh et al. (1993) validate the bilaterally positive association between academic self-concept and academic performance. On one hand, higher academic self-concept enhances initiative and facilitates persistence after failure, improving academic achievement. On the other hand, better academic records alleviate depression and worries about school performance.

human capital investments have been identified in a large number of empirical studies. Keane and Wolpin (2001) find that parental subsidies (i.e., monetary transfers) are the most effective household intervention to encourage young adults at the age of 16 to pursue a postsecondary education. It is possible that children who participate in school sports may receive greater parental investments than those who do not. This could threaten our identification strategy if children who benefit from greater parental investments also have higher test score and are taller due to improved nutrition. To investigate this possibility, we consider two potential measures of parental investments: whether the child was covered by health insurance, and whether the child had access to routine medical care within the past year. Results of the Probit and IV-Probit regression of these binary variables on participation in school sports are shown in Table 9. Neither of the IV coefficients of participation in school sports is statistically significant, implying that student athletes do not receive more parental investments, as defined by these measures, than the non-athletes.

6.2. Discrimination at School

It is also possible that taller children are treated more favorably by teachers and classmates than shorter children in ways that build better self-concept (Persico et al., 2004). The hypothesis of the self-fulfilling prophecy predicts that biased teacher expectations against shorter students would ultimately lower their standardized test scores (Jussim, 1991). Likewise, Wentzel (1998) shows that peer support is a positive predictor of students' interest in learning and academic performance. Therefore, we examine whether favoritism by teachers and classmates at school is related to students' body height. A correlation between height and favoritism would pose a threat to the validity of our instruments because it would imply that height directly improves academic performance.

Children were asked about how close they felt toward their teachers and classmates (1 – never, 2 – sometimes, 3 – often, 4 - always). We use the degree of closeness to proxy for favoritism at school. We report the results of an OLS regression of these categorical variables on 1st grade height and the growth in height in Table 9.

None of the OLS coefficients of height in 1st grade and the growth in height between 1st and 8th grade is statistically significant in the two OLS models, and neither of the p-values corresponding to the F test for the significance of both instruments falls below 0.10. These results do not support the conjecture that taller students are favored by their teachers and peers.

6.3. Childhood Nutrition and General Self-Concept

One limitation of our data and modeling approach is that we cannot measure the nutritional intake of children throughout their lives, which may impact educational attainment (Strauss and Thomas, 1998). Although disparities in educational outcomes are more likely to be attributed to differences in childhood health and nutrition in developing countries (e.g., Haddad and Bouis 1991; Steckel 1995), we attempt to determine whether differences in nutritional intake impact our results. We do this by estimating a model with an additional control for the nutritional intake of children when they were of preschool age. In the spring kindergarten wave of the ECLS-K, a parent was asked to provide information on quality of household food. We create an indicator variable for whether the children had the kinds of food that the parent perceived as healthy.

Another concern is that taller children may have better self-concept independent of school sports, and that this improved self-concept due to height improves test scores (Libscomb, 2007). If this is the case it would violate the IV exclusion restriction. A set of general self-conception questions, adapted from the Rosenberg Self-Esteem Scale (Rosenberg 1965) are available in the SDQ.[17] These questions asked about the student's perceptions of usefulness, confidence, and pride, independent of academic performance. Responses to the three questions were standardized separately to a mean of zero and a standard deviation of one. The scale score of the general self-concept was then the average of the three standardized scores. A higher score indicates better general self-concept.

If the IV estimates are robust to the additional control of nutrition in childhood

[17] Note that this is a different measure than the one we use for academic self-concept.

and general self-concept, it suggests that that our IV strategy removes most of confounding influence of unobserved family and school environment.

Table 10 contains the estimates from models with childhood nutrition and general self-concept. In the IV equation with the additional control for childhood nutrition (Panel A), the estimated coefficients on participation in school sports are very similar to our original specification (Panel C) Likewise, including a control for general self-concept in the IV model does not attenuate the coefficient on school sports. This suggests that the academic premium enjoyed by taller students is mediated through participation in school sports.

Overall these robustness checks support of the validity of our instruments.

7. Heterogeneous Treatment Effect

7.1. Subgroup Analysis: Difference by Gender

In this section, we investigate whether the effect of participation in school sports on academic achievement differs by gender.[18] Both OLS and IV models are estimated separately for boys and girls, and the results are reported in Table 12. The first stage F statistic of the IV model for girls is twice as large as for boys (F = 20 for girls versus F = 10 for boys), suggesting that height and growth in height are a stronger set of predictors of participation in school sports for girls than for boys.

The results of the IV model in Table 11 indicate that the academic returns to school sports are greater for boys than for girls. In particular, participation in school sports increases the reading IRT score by 67 points, or 39 percent of the mean reading IRT score for boys, compared to a 24 point increase in the reading IRT score, or 14 percent of the mean reading IRT score for girls.[19]

Differences in competitive incentives in sports by gender may help explain the

[18] The Table of Summary Statistics by Gender will be available upon request. There are only small differences in test scores, participation rates in school sports, and body height and growth on average between boys and girls. For example, the participation rate in school sports is 63% for boys, and 59% for girls.

[19] The mean reading IRT score is 168.5 for boys, and is 173.5 for girls. To understand this gender-specific differences, we use the IV model to estimate the impacts of school sports on absenteeism and SDQ problem internalization by gender. A comparison of the gender specific results, available upon request, indicate that the extent to which school sports reduces absenteeism and improves academic self-concept is greater for boys than for girls.

gender gap in academic achievement resulting from school sports participation. Gneezy et al. (2003) and Gneezy and Rustichini (2004) find that although women perform as well as men in non-competitive environments, men outperform women in competitive environments.[20] A higher degree of risk aversion to competition in sports for girls makes them more likely to shy away from competition in school sports. The gender difference in attitudes toward risk is observed even at an early age, suggesting that this effect may be biological in nature.[21]

7.2. Nonlinear Treatment Effect: Diminishing Marginal Returns

Finally, we also investigate nonlinearity of the effect of participation in sports on IRT scores. Researchers have proposed that the academic benefits from participation in sports may vary with individual's baseline level of academic achievement (e.g., Rehberg and Schafer, 1968). We employ IV quantile regression to estimate the differential effects of participation in school sports on academic achievement across the IRT score distribution. We choose the conditional quantiles at the 25th, 50th, and 75th percentiles of the IV quantile regression.[22]

The IV quantile regression results (Table 12) indicate that the effect of participation in school sports is larger at the lower end of distribution of the IRT scores (e.g., for the IRT reading score: coef = 87.96, $p < 0.05$ at the 25th percentile; coef = 43.29, $p < 0.10$ at the 50th percentile; and coef = 17.51, $p > 0.10$ at the 75th percentile), implying decreasing marginal academic returns to participating in school sports. The nonlinearity of treatment effects suggests that students who are of lower academic ability gain more through participation.

Our results provide insight into two possible linkages that have been put forth in psychology literature to explain how socialization via sports generates academic self-

[20] The two studies conduct an experiment in which college students compete to solve mazes using a computer. The non-competitive environments are defined by payments for the pieces of mazes solved, while the competitive environments are defined by winner-takes-all. The tournaments are homogeneous-sex for both boys and girls.

[21] Jonathan Knight (2002) concludes the difference in competitiveness by gender across many species, including humans, in the reproductive process. The cost of mating with many partners is extremely low for males, making them to compete with each other to achieve that goal. However, the cost of parental investment is much higher for females, so females tend to be choosy rather than competitive.

[22] Our manual approach replicates two-step IV estimator in which the second stage is quantile regression. We bootstrap the standard errors of the IV quantile regression estimates by 400 times. Standard errors are stable with more than 300 times of bootstrap.

concept (Rehberg and Schafer, 1968). First, if higher test scores resulting from discipline taught in sports build up academic confidence, then one would expect an increasing marginal return of sports to academic achievement. However, the results from our IV quantile regression are not consistent with this hypothesis. The second linkage is involvement in elite groups. If a student who is less disposed toward college education consorts with college-oriented friends in sports teams, the student is more influenced by their educational aspirations through the adoption of the social norm. In this case, the academic return from school sports should be decreasing as one moves up the test score distribution, which is supported by our estimates.

8. Summary and Conclusions

The prior literature on school sports focuses primarily on the effect of participation in high school sports on educational attainment and labor market outcomes. Past research suggests that academic gains from high school sports are mediated through increases in the individual's discipline and academic self-concept. However, we are not aware of any nationally representative studies that investigate the academic returns from participation in middle school sports. In accordance with the multiplicative effect of investments in learning skills on human capital accumulation from infancy to adulthood (Cunha et al., 2006; Heckman et al., 2006), healthy development in each stage of human growth depends on successful completion of human capital accumulation in earlier stages. To fill this gap in the literature, this paper estimates the effect of participation in school sports on academic achievement for children in middle school, using the ECLS-K, 1998. Our analysis is unique among current research on the academic return to school sports for four reasons.

First, we provide the first causal estimates of the academic gain from playing school sports for children in middle school. We employ an IV model to correct for endogenous enrollment in school sports due to adverse selection, using lagged body height and the growth in height as instruments. The results of the IV model indicate that participation in school sports significantly improves the IRT scores from reading, math, and science in 8th grade.

Second, we explore plausible mechanisms through which sports participation affects academic performance. We find that the academic return to participation is mediated through academic self-concept and discipline.

Third, we find evidence that the beneficial effect of school sports is larger for boys than girls. The reason may be girls' aversion to competition in sports. If this is the case, then school sports programs emphasizing femininity (Connell, 1995) that de-emphasize overt physical competition in school sponsored sports should be encouraged. This may allow girls to benefit more from school sports, and help to create equal opportunities for women in the labor market.

Finally, we find that students with poorer academic backgrounds benefit more from participating in school sports. As a result, expanding access to school sports for low achieving students may help them to catch up with their peers.

A limitation of our analysis is that we lack of information on the length of a child's involvement in school sports in ECLS-K, 1998. Incorporating the dynamics of participation into the model would shed light upon the long-run academic return to the duration of involvement in school sports. Another limitation is that we cannot identify different types of school sports, such as intramural sports versus interscholastic sports.

Despite these limitations, the findings in this paper are useful to school administrators. Middle schools in the public education system are subjective to federal funding under the framework of No Child Left Behind Act (NCLB).[23] Schools that do not meet the NCLB requirements for adequate progress in reading and math face fines and sanctions. After the NCLB some schools were compelled to cut funding for physical education and sports to support extra instruction in reading and math (Center on Education Policy, 2006). However, our research shows that cutting funding for sports could be counter-productive.

This paper has other important policy implications. Students generally start participating in school-based sports programs in middle school because most elementary schools do not offer such programs. According to a Government

[23] 83% of middle schools nationwide are public, according to Table 1.

Accountability Office report (GAO, 2012), opportunities for middle school students to participate in school sports increased in the period of 2000 through 2006. Nonetheless, budget constraints remain the foremost barrier for middle schools to expanding school-based programs to allow broader participation.[24] Funding for school sponsored sports is primarily contingent upon financial support from local communities. When local governments face financial difficulties middle schools struggle to maintain accessibility to school-based sports. Some school districts have even instituted "pay-to-play" arrangements, which charge students a participation fee for school sports activities, disadvantaging students from low income households. In view of the local government's role in promoting children's outcomes in education and closing the gap in long-run human capital accumulation between children of low and high socioeconomic status, policymakers should encourage initiatives that expand access for children to participate in sports within the school context.[25]

[24] The GAO 2012 report cites that purchasing equipment, paying coaches, and subsidizing students' traveling for interscholastic sports are the top 3 financial concerns.

[25] For example, the Mayor's After-School Achievement Program (ASAP) is designed to expand opportunities to sports after school for Houston youth. Through ASAP, the city of Houston funds school agencies to provide after-school programs for middle school youth. ASAP is active during school year.

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Figure 1: Conceptual Model of Mechanisms

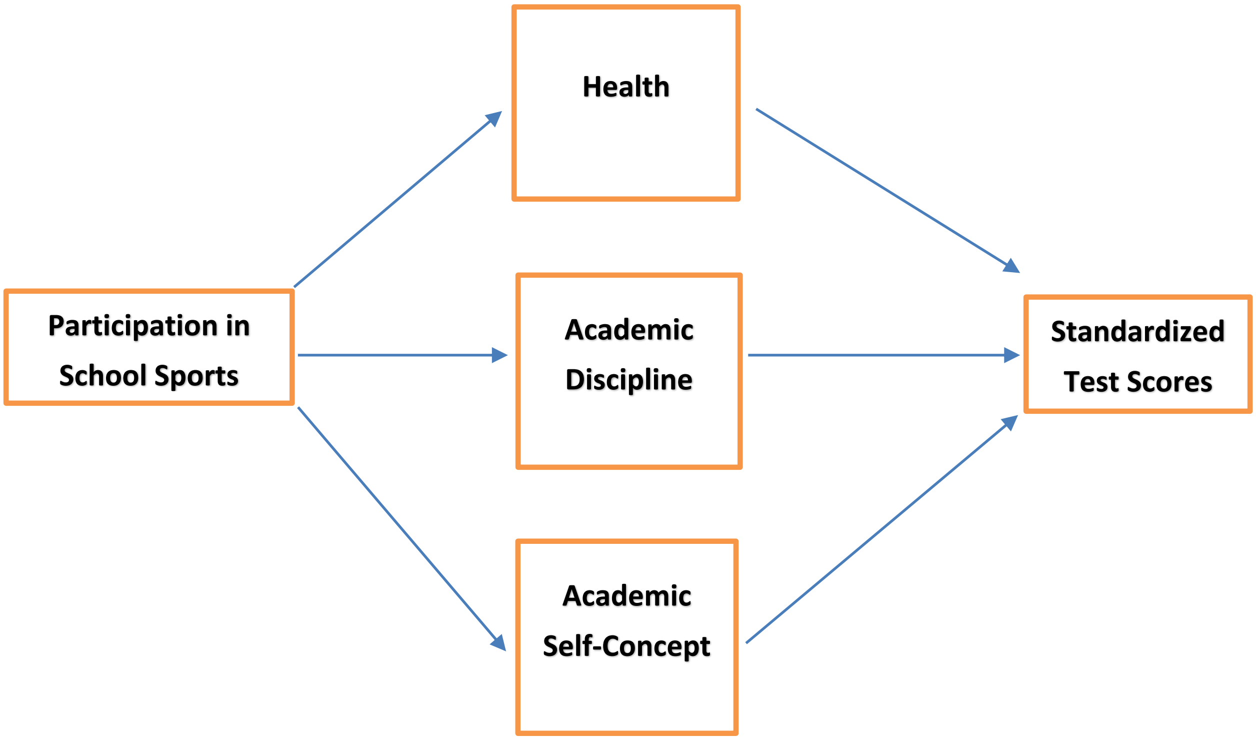


Table 1: Descriptive Statistics of Main Estimation in 8th Grade

VARIABLES	Mean	Std. Dev.
School Sports and Height		
Participation in School Sports	0.611	0.488
Height in 1st Grade (inches)	48.45	2.397
Growth in Height 1st Grade Through 8th Grade (inches)	15.98	2.246
Academic Performance		
Reading IRT Score	171.0	27.60
Math IRT Score	142.2	22.02
Science IRT Score	84.73	16.03
Student Characteristics		
Age in Months	171.4	4.519
Female	0.497	0.500
Grade Level of Child	7.895	0.349
White	0.615	0.487
Hispanic	0.173	0.379
Other Race/Ethnicity	0.108	0.311
Birth Weight (ounces)	91.27	53.53
School Characteristics		
Public School	0.830	0.376
% of Students in Free/Reduced-Price Meals in School	41.48	24.17
Household Characteristics		
Family Incomes ($1,000s)	76.03	59.86
Family Size	4.491	1.298
Parents' Highest Education	13.29	5.084
Urban	0.298	0.457
Suburban	0.361	0.480
Family Rule on Homework	0.938	0.241
State Characteristics		
Real Per Capita Income ($1,000s)	38.93	5.313
Public School Pupil-to-Teacher Ratio	15.65	2.571
Real Total Tax Revenues per Student	11,393	2,441
Real Instructional Expenditures per Teacher ($1,000s)	61.45	11.27
% of Adults with a Bachelor's Degree of Higher	26.99	4.246
Observations	9,200	9,200

Notes: Sample sizes are rounded to the nearest 50 and sample means are based upon unweighted data in order to comply with Department of Education non-disclosure requirements for ECLS-K, 1998.

Table 2: Descriptive Statistics of Mechanisms in 8th Grade

VARIABLES	Mean	Std. Dev.
Academic Discipline		
Absenteeism from Class (1-5)	2.093	0.516
Academic Self-Concept		
SDQ Problem Internalization (1-4)	2.037	0.545
Health		
Parent Evaluated Health (1-5)	1.614	0.774
Observations	9,200	9,200

Notes: Responses to Absenteeism from Class questions are averaged over the reading teacher's rating and the math/science teacher's rating (ECLS-K, 1998: User's Manual, Tourangeua et al., 2009). Scores of Absenteeism from Class are ordered from 1 (never absent) to 5 (absent all of the time). Scores of SDQ Problem Internalization are ordered from 1 (not true at all) to 4 (very true). Scores of Parent Evaluated Health are ordered from 1 (excellent) to 5 (poor). See notes to Table 1 for sample size and sample means.

Table 3: First Stage: Relationship between Height and School Sports Participation

VARIABLES	Participation in School Sports
Growth in Height 1st Grade Through 8th Grade	0.0130***
	(0.0044)
Height in 1st Grade	0.0091*
	(0.0047)
F-Statistic	15.67
Observations	7,450

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The ECLS-K, 1998 employed a 3-stage probability sample design to select a nationally representative sample of children attending kindergarten in 1998–99. In the first-stage the primary sampling units (PSUs) were geographic areas consisting of counties or groups of counties. The second-stage units were schools within sampled PSUs. The third- and final-stage units were children within schools (ECLS-K, 1998: User's Manual, Tourangeua et al., 2009). Heteroscedasticity-robust standard errors that allow for clustering within PSU are in parentheses. Cross-sectional weights in 8th grade are used to adjust for disproportionate sampling and survey nonresponse. The numbers of observations are rounded to the nearest 50 to comply with non-disclosure requirements for ECLS-K, 1998.

Additional variables included, but not shown, are: sex, age, grade, race/ethnicity (white, Hispanic, and other race, with black excluded), birth weight, population density (urban or suburban, with rural excluded), the type of school, the percentage of free and reduced-price meals eligible students; family income, family size, parents' highest education; real per capita income in the state, the percentage of adults with a bachelor's degree in the state, the average pupil/teacher ratio in public schools in the state, real total state tax revenue per student in the state, and real state instructional expenditures per student in the state.

Table 4: Over-Identification Tests: Hansen's J Test

VARIABLES	Reading IRT Score	Math IRT Score	Science IRT Score
Chi2 (1)	0.243	0.761	0.030
P-Value	0.622	0.782	0.860
Observations	7,400	7,400	7,450

*** p<0.01, ** p<0.05, * p<0.1

Notes: We perform Hansen's J Tests for Over-Identification. Hansen's J Tests follow IV-GMM estimation that allows for clustering standard errors on weighted regressions. Degree of Freedom of the Chi-Square Test is one. The null hypothesis of Hansen's J tests is that both instruments are valid. See notes to Table 3 for regression details.

Table 5: Impact of School Sports Participation on Academic Performance

VARIABLES	Reading IRT Score		Math IRT Score		Science IRT Score	
	OLS	IV	OLS	IV	OLS	IV
Participation in School Sports	-2.553***	61.88***	0.905	32.88**	-0.853*	27.54***
	(0.913)	(14.23)	(0.845)	(13.79)	(0.322)	(5.741)
IV Marg. Effect (%)		36.18%***		23.12%**		33.50%***
1st Stage F-Statistic		16.59		15.57		15.45
Observations	7,400	7,400	7,400	7,400	7,450	7,450

Standard errors in parentheses

*** p<0.01, ** p<0.05, *p<0.1

Notes: IV marginal effects (%) are obtained by using the Stata command eydx, which calculates semi elasticities. Standard errors for semi elasticities are derived from Delta method. See the notes to Table 3 for regression details.

Table 6: Investigating the Mechanisms:
Relationship between School Sports Participation and Health, Academic Discipline, and Academic Self-Concept

VARIABLES	OLS or Probit Marg. Effect	IV or IV-Probit Marg. Effect
Panel A: Health		
Parent Evaluated Health (lower is better)	-0.152***	-0.536**
	(0.030)	(0.264)
Panel B: Academic *Discipline*		
Absenteeism from Class (lower is better)	-0.058***	-0.479***
	(0.016)	(0.154)
Panel C: Academic Self-Concept		
SDQ Problem Internalization (lower is better)	-0.016	-1.299***
	(0.015)	(0.276)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: In each case, the sample size varies from 6,900 to 7,300. The F-statistics associated with the instruments in the first stage are greater than 10 for all dependent variables, ranging from 15.31 to 15.89. The instruments do not pass the Hansen J test for the outcomes in panel A. For the composite items of the SDQ Problem Internalization, which measures academic self-concept, see the SDQ questionnaire in Appendix. Parent Evaluated Health is a categorical variable scaling from 1 to 5 in a decreasing order. Negative marginal effects of Parent Evaluated Health, Absenteeism from Class, and SDQ Problem Internalization indicate improvement in these measures due to participation in school sports.

Table 7: Investigating the Mechanisms:
Relationship between IRT Scores and Health, Academic Discipline, and Academic Self-Concept

	OLS Estimation		
VARIABLES	Reading IRT Score	Math IRT Score	Science IRT Score
Parent Evaluated Health	-0.901	-0.840	-0.262
	(0.600)	(0.671)	(0.325)
Absenteeism from Class	-6.399***	-4.786***	-3.861***
	(1.454)	(1.003)	(0.626)
SDQ Problem Internalization	-4.631***	-4.082***	-2.400***
	(1.102)	(0.554)	(0.272)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Parent Evaluated Health, Absenteeism from Class, and SDQ Problem Internalization are categorical variables where higher values indicate worse outcomes. Negative signs of Parent Evaluated Health, Absenteeism from Class, and SDQ Problem Internalization indicate positive relationships with test scores. See the notes to Table 3 for regression details.

Table 8: Falsification Tests:
Relationship between School Sports Participation and Parental Investment

VARIABLES	Health Insurance Coverage		Routine Health Care	
	Probit Marg. Effect	IV-Probit Marg. Effect	Probit Marg. Effect	IV-Probit Marg. Effect
Participation in School Sports	0.0015	-0.1251	0.0492***	0.0635
	(0.0061)	(0.3526)	(0.0139)	(0.2142)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Both Health Insurance Coverage and Routine Health Care are binary variables. Health Insurance Coverage equals one if the student is covered by any health insurance; Routine Health Care equals one if the student has access to routine health care in the 8th grade. See the notes to Table 3 for regression details.

Table 9: Falsification Tests:
Relationship between Height and Favoritism at School

VARIABLES	Closeness to Teachers	Closeness to Classmates
Growth in Height 1st Grade Through 8th Grade	0.0043	-0.0039
	(0.0073)	(0.0041)
Height in 1st Grade	-0.0025	-0.0064
	(0.0087)	(0.0050)
F-Statistic	0.74	1.18
P-Value	0.481	0.3135

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Scores of closeness to teachers and classmates are ordered from 1 (never close) to 4 (always close). Higher values indicate better relationships with teachers and classmates. See the notes to Table 3 for regression details.

Table 10: Robustness Checks:
Control for Childhood Nutritional Intake and General Self-Concept

VARIABLES	Reading IRT Score		Math IRT Score		Science IRT Score	
	OLS	IV	OLS	IV	OLS	IV
Panel A: Control for Childhood Nutritional Intake						
Participation in School Sports	-2.329***	59.61***	0.218	31.15**	-1.201	28.33***
	(0.867)	(13.19)	(1.366)	(14.17)	(0.985)	(7.852)
Food Quality in Kindergarten	2.789**	-1.133	1.813	0.653	0.574	-1.008***
	(1.344)	(1.976)	(0.981)	(0.727)	(0.869)	(0.285)
F-Statistic		19.06		17.71		17.26
Panel B: Control for General Self-Concept						
Participation in School Sports	-3.757***	60.62***	0.126	31.03**	-1.451***	26.84***
	(0.832)	(14.63)	(0.838)	(14.21)	(0.340)	(5.626)
Self-Conception	7.934***	3.001*	5.452***	3.197**	3.938***	1.830**
	(0.870)	(1.808)	(0.478)	(1.273)	(0.442)	(0.868)
F-Statistic		14.75		13.61		13.62
Panel C: Primary Specification						
Participation in School Sports	-2.553***	61.88***	0.905	32.88**	-0.853*	27.54***
	(0.913)	(14.23)	(0.845)	(13.79)	(0.322)	(5.741)
F-Statistic		16.59		15.57		15.45

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Food Quality in Kindergarten is an indicator variable for whether the children had enough to eat and the kinds of food that the parents perceived as healthy. The Self-Concept is a continuous variable adapted from the Rosenberg general self-esteem. Its values are standardized to a mean of zero and a standard deviation of one. A higher score indicates better general self-concept. See the notes to Table 3 for regression details.

Table 11: Subgroup Analysis:
Impacts of School Sports Participation on Academic Performance by Gender

VARIABLES	Reading IRT Score		Math IRT Score		Science IRT Score	
	OLS	IV	OLS	IV	OLS	IV
Panel A: Male Students						
Participation in School Sports	-2.577**	66.77**	1.166	46.06	-0.868	37.50**
	(1.250)	(33.53)	(1.059)	(29.10)	(0.576)	(17.93)
IV Marg. Effect (%)		39.62%**		32.12%		43.57%**
F-Statistic		10.59		11.31		11.48
Observations	3,700	3,700	3,700	3,700	3,700	3,700
Panel B: Female Students						
Participation in School Sports	-2.370***	23.74*	0.551	2.327	-0.928**	16.55**
	(0.943)	(13.06)	(0.863)	(10.93)	(0.426)	(6.479)
IV Marg. Effect (%)		12.53%*		1.64%		25.14%**
F-Statistic		21.75		21.47		20.97
Observations	3,700	3,700	3,700	3,700	3,700	3,700

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: See the Notes to Table 3 for regression details.

Table 12: Quantile Regression
Nonlinear Impact of School Sports Participation on Academic Performance

VARIABLES	Reading IRT Scale Score		Math IRT Scale Score		Science IRT Scale Score	
	QR	IV-QR	QR	IV-QR	QR	IV-QR
Participation in School Sports – 25%	-4.132***	87.96**	1.406	44.11	-0.099	33.87**
	(1.526)	(39.02)	(0.963)	(27.96)	(0.785)	(16.49)
Participation in School Sports – 50%	-2.366**	43.29*	0.171	27.28	-1.058**	24.81*
	(0.995)	(25.46)	(0.992)	(46.21)	(0.504)	(13.71)
Participation in School Sports – 75%	-2.008***	17.51	0.198	11.84	-1.038**	12.23
	(0.615)	(17.12)	(0.568)	(16.49)	(0.491)	(10.93)
Observations	7,400	7,400	7,400	7,400	7,450	7,450

Standard errors in parentheses

*** p<0.01, ** p<0.05, *p<0.1

Notes: Standard errors in the IV-Quantile Regression contain simulation noise. See the notes to Table 3 for regression details.

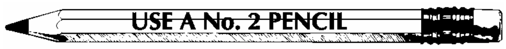
Spring 2007
Grade 8
Student Questionnaire

Prepared for the U.S. Department of Education
National Center for Education Statistics by:

Westat
1650 Research Boulevard
Rockville, Maryland 20850

LABEL

Use a #2 pencil to complete this questionnaire.



According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 1850-0750. Approval expires 01/31/2009. The time required to complete this information collection is estimated to average 20 minutes per response, including the time to review instruction, search existing data resources, gather the data needed, and complete and review the information collected. If you have any comments concerning the accuracy of the time estimate or suggestions for improving the survey instrument, please write to: U.S. Department of Education, Washington, D.C. 20202-4700. If you have comments or concerns regarding the status of your individual response to this survey, write directly to: National Center for Education Statistics, 1990 K Street, N.W., Washington, D.C. 20006-5650.

The collection of information in this survey is authorized by Public Law 107-279 Education Sciences Reform Act of 2002, Title I, Part C, Sec. 151(b) and Sec. 153(a). Participation is voluntary. You may skip questions you do not wish to answer; however, we hope that you will answer as many questions as you can. Your responses are protected from disclosure by federal statute (PL 107-279, Title I, Part C, Sec. 183). All responses that relate to or describe identifiable characteristics of individuals may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose, unless otherwise compelled by law. Data will be combined to produce statistical reports. No individual data that links your name, address, telephone number, or identification number with your responses will be included in the statistical reports.

MARKING DIRECTIONS

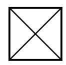
PLEASE READ CAREFULLY AND USE A SOFT LEAD (#2) PENCIL TO COMPLETE THIS QUESTIONNAIRE.

CHECKING BOXES

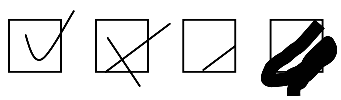
It is important that you check the box next to your answers and print clearly.

Shown below is the correct way to mark your answers, along with examples of incorrect ways.

Correct Mark:



Incorrect Marks:
Light and thin, outside the box, thick or scrawled.



PRINTING ANSWERS IN BOXES:

Print entire answer in box. Answers should be printed clearly and should not touch or cross any of the box lines. Do not cross zeroes or sevens. That is, do not write a zero with a line through it like this – θ, and do not write a seven with a line through it like this – ~~7~~.

Write digits like this:

1 2 3 4 5 6 7 8 9 0

Write words like this:

Harry Potter

THIS QUESTIONNAIRE IS NOT A TEST. WE HOPE YOU WILL ANSWER EVERY QUESTION (OTHER THAN THE ONES YOU ARE DIRECTED TO SKIP OVER), BUT YOU MAY SKIP ANY QUESTION YOU DO NOT WISH TO ANSWER. PLEASE GO TO THE NEXT PAGE TO BEGIN THE QUESTIONNAIRE.

ABOUT YOURSELF

20. How true is each of these about you?
MARK ONE RESPONSE ON EACH LINE.

		Not at all true	A little bit true	Mostly true	Very true
a.	Math is one of my best subjects.	☐	☐	☐	☐
b.	I feel angry when I have trouble learning.	☐	☐	☐	☐
c.	I like reading.	☐	☐	☐	☐
d.	I worry about taking tests.	☐	☐	☐	☐
e.	I get good grades in math.	☐	☐	☐	☐
f.	I often feel lonely.	☐	☐	☐	☐
g.	English is one of my best subjects.	☐	☐	☐	☐
h.	I feel sad a lot of the time.	☐	☐	☐	☐
i.	I like math.	☐	☐	☐	☐
j.	I worry about doing well in school.	☐	☐	☐	☐
k.	I enjoy doing work in reading.	☐	☐	☐	☐
l.	I worry about finishing my work.	☐	☐	☐	☐
m.	I enjoy doing work in math.	☐	☐	☐	☐
n.	I worry about having someone to hang out with at school.	☐	☐	☐	☐
o.	I get good grades in English.	☐	☐	☐	☐
p.	I feel ashamed when I make mistakes at school.	☐	☐	☐	☐

REFERENCES

1. Adapted with permission from Self-Description Questionnaire II (SDQII; Marsh, 1990).

21. How do you feel about the following statements?
MARK ONE RESPONSE ON EACH LINE.

		Strongly disagree	Disagree	Agree	Strongly agree
a.	I feel good about myself.	☐	☐	☐	☐
b.	I don't have enough control over the direction my life is taking.	☐	☐	☐	☐
c.	In my life, good luck is more important than hard work for success.	☐	☐	☐	☐
d.	I feel I am a person of worth, the equal of other people.	☐	☐	☐	☐
e.	I am able to do things as well as most other people.	☐	☐	☐	☐
f.	Every time I try to get ahead, something or somebody stops me.	☐	☐	☐	☐
g.	My plans hardly ever work out, so planning only makes me unhappy.	☐	☐	☐	☐
h.	On the whole, I am satisfied with myself.	☐	☐	☐	☐
i.	I certainly feel useless at times.	☐	☐	☐	☐
j.	At times I think I am no good at all.	☐	☐	☐	☐
k.	When I make plans, I am almost certain I can make them work.	☐	☐	☐	☐
l.	I feel I do not have much to be proud of.	☐	☐	☐	☐
m.	Chance and luck are very important for what happens in my life.	☐	☐	☐	☐

22. What adult do you to talk to when you need…
MARK ALL THAT APPLY IN EACH ROW.

		Parent	Adult relative	Adult at school	Other adult	No one
a.	Someone to cheer you up?	☐	☐	☐	☐	☐
b.	Help with school work?	☐	☐	☐	☐	☐
c.	Advice about making important decisions?	☐	☐	☐	☐	☐

23. What kid do you to talk to when you need...
MARK ALL THAT APPLY IN EACH ROW.

		Brother or sister	Friends at school	Other friends	No one
a.	Someone to cheer you up?	☐	☐	☐	☐
b.	Help with school work?	☐	☐	☐	☐
c.	Advice about making important decisions?	☐	☐	☐	☐

24. Is English your native language (the first language you learned to speak when you were a child)?

☐ Yes (**GO TO NEXT SECTION ON PAGE 13**)
☐ No (**GO TO QUESTION 25**)

25. How often do you speak your native language with...
MARK ONE RESPONSE ON EACH LINE.
IF AN EXAMPLE DOES NOT APPLY TO YOU, MARK "Does not apply."

		Never	Sometimes	About half of the time	Always or most of the time	Does not apply
a.	your parents?	☐	☐	☐	☐	☐
b.	your brothers and sisters?	☐	☐	☐	☐	☐
c.	friends in your school?	☐	☐	☐	☐	☐
d.	friends outside of your school?	☐	☐	☐	☐	☐