Economic Inquiry

CAN SCHOOL SPORTS REDUCE RACIAL GAPS IN TRUANCY AND ACHIEVEMENT?

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While existing research supports that participation in high-school athletics is associated with better education and labor-market outcomes, the mechanisms through which these benefits accrue are not well established. Using individual microdata collected daily, and team-specific schedules, we retrieve estimates of the causal effect of high-school athletic participation on absenteeism, suggesting that participation decreases absences, driven primarily by reductions in unexcused absences in boys. There are also strong game-day effects in truancy, in both boys and girls, with truancy declines on game days more than offset by subsequent absenteeism. Important heterogeneity by race, gender, and family structure may serve to substantially reduce racial gaps in truancy and achievement. (*JEL* I21, L83)

But here's the thing: most American principals I spoke with expressed no outrage over the primacy of sports in school. In fact, they fiercely defended it. "If I could wave a magic wand, I'd have more athletic opportunities for students, not less," Bigham, the former Tennessee principal, told me. His argument is a familiar one: sports can be bait for students who otherwise might not care about school. "I've seen truancy issues completely turned around once students begin playing sports," he says. "When students have a sense of belonging, when they feel tied to the school, they feel more part of the process."

(Amanda Ripley, "The Case Against High-School Sports," *The Atlantic*, October 2013)

I. INTRODUCTION

In the 2012–2013 academic year, more than 12% of boys in grades 9 through 12 participated in high-school football. Overall, it marks the 24th consecutive year of increase in high-school athletic participation, with track and field, basketball, soccer, and baseball/softball each attracting more than one million student athletes.[1] At the same time, however, there is growing concern among parents and policy makers, who question the efficacy of participation and the potential imbalance represented in the escalating pursuit of nonacademic activities within American educational institutions. Clearly, a better understanding of the implicit tradeoffs associated with athletic participation is fundamental to navigating any future provisions of athletic opportunities. Our contribution will be to move us in that direction.

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1. National Federation of State High School Associations (NFHS), www.nfhs.org, and the National Center for Education Statistics, http://nces.ed.gov.

ABBREVIATIONS

GPA: Grade-Point Average
NFHS: National Federation of State High School Associations
SPS: Seattle Public Schools
WIAA: Washington Interscholastic Activities Association

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The related academic literature suggests that high levels of participation are not without justification. In fact, the meta-narrative is quite clearly that participation in high-school athletics correlates with or contributes to improvements in outcomes. For example, existing research broadly implicates athletic participation in better labor-market outcomes (Barron, Ewing, and Waddell 2000; Eide and Ronan 2001; Stevenson 2010), higher high-school grade-point average (GPA), standardized-test performance, and class rank (Barron, Ewing, and Waddell 2000; Lipscomb 2007; Rees and Sabia 2010), and more favorable in high-school and college degree attainment (Barron, Ewing, and Waddell 2000; Eide and Ronan 2001; Lipscomb 2007; Pfeifer and Cornelißen 2010; Stevenson 2010). Persico, Postlewaight, and Silverman (2004) find that high school athletics participation mediates much of the positive adult labor market returns to height.

Even with such evidence, it remains that we arrive at better policy when the underlying mechanisms that contribute to related outcomes from athletic participation are understood. As athletic funding comes under increasing scrutiny, any draw down of athletic resources should be informed by the channels through which benefits might derive. Likewise, anticipating any gender or racial heterogeneity in the role of athletics in outcomes allows for more nuance and sophistication in how we navigate the future of athletics in education.

Among the potential mechanisms of interest in a broad analysis of the future role of athletics in education, one might suspect that athletic participation reduces leisure time, may reduce the amount of nonschool time devoted to studying, or lead students toward taking less-demanding classes, for example. To the extent such mechanisms are prominent, athletic participation should adversely affect human-capital acquisition. However, the rules under which sport is undertaken in school tend to bundle participation with human-capital investments: to participate, students must maintain a minimum GPA, for example, and show up for classes, particularly on days of games. Thus, it would not be surprising to find that athletic participation has positive effects on human-capital investments, with such effects potentially large for students who are otherwise marginal in their academic endeavors.

In this article, we consider the effect of athletic participation on student-athlete absenteeism. While the consequences of student absenteeism are not yet well understood in the literature—and seem to not have been considered at all among athletes—there is evidence supporting that instructional time may itself be an important factor in educational achievement and other outcomes. For example, in a country-level design, Lee and Barro (2001) find that more time in school improves math and science test scores although reading scores may suffer. Using international survey data, Lavy (2012) and Rivkin and Schiman (2013) leverage within-school across-subject variation in weekly instruction time and find positive effects on standardized-test scores. Evidence from charter schools also suggests that successful schools tend to have longer school days or years, and that instructional time correlates with school effectiveness (Angrist, Pathak, and Walters 2013; Dobbie and Fryer 2011; Hoxby and Murarka 2009).

Quasi-experimental evidence in Pischke (2007) suggests that student cohorts exposed to shorter school years exhibit lower academic achievement and higher rates of grade repetition, holding curriculum constant. Eren and Millimet (2007) report weak evidence that longer school years improve math and reading test scores, which they identify from variation across U.S. states. Using within-state variation in unscheduled school closures, Marcotte and Hemelt (2008) find that the percentage of students passing math assessments falls by about one-third to one-half a percentage point for each day school is closed, with the effect largest for students in lower grades. Exploiting weather closures as a source of exogenous variation, Marcotte (2007) suggests that the share of students testing proficient in winters with average levels of snowfall (about 17 inches) is about one to two percentage points lower than in winters with little to no snow. With a similar identification strategy, Marcotte and Hansen (2010) suggests that a 10-day increase in instructional days yields a 0.2 *SD* increase in state math assessments, or the equivalent of a 3- to 5-percentage-point increase in the number of students passing math assessments. Using state-mandated changes in test-date administration in Minnesota, which moved five times in 5 years, Hansen (2011) also shows that more instructional time prior to test administration increases student performance. Fitzpatrick, Grissmer, and Hastedt (2011), Carlsson, Dahl, and Rooth (2012), and Aucejo and Romano (2014) also identify off of variation in the timing of testing.[2] Perhaps as important, Card and Krueger (1992) and Betts and Johnson (1997) support that subsequent earnings can increase with school-year length.

Overall, we are inclined to interpret "instructional time" estimates as lower bounds on the true effect of absenteeism on educational achievement, since absenteeism arguably represents both a reduction in instructional days *plus*, for example, the misalignment of a student's progression in coursework and that of the class. While the literature's use of "number of instructional days" is a district- or school-specific variable, absenteeism is typically student specific. As such, falling behind the pace of instruction partially forecloses on their ability to absorb new material upon returning. It is in this way that we anticipate that the causal effect of absenteeism may well be larger than that of instructional days. In fact, Goodman (2014) reconsiders weather-induced absences alongside student-specific absences and finds that student absences force teachers to spend time getting students on the same page as their classmates. In the end, teachers appear to deal well with coordinated disruptions (e.g., snow days) but poorly with student-specific absences.[3]

Among the students contributing to our analysis, 97% report having an absence of some kind every year, while more than 85% report having an unexcused absence in the average academic year. If absenteeism differs systematically with athletic participation—we will end up arguing that it does—it clearly has the potential to contribute to explaining the observed heterogeneity in outcomes.[4]

Using daily administrative data from Seattle Public Schools (SPS), we examine the effect of active participation in athletics on school attendance. Previous literature (Barron, Ewing, and Waddell 2000) suggests that the main challenge to identifying the effect of athletic participation on attendance is positive selection into athletic participation—those who tend to select into athletics are likely the same as those who tend to select into higher attendance. As such, comparisons of absenteeism rates among athletes and those of the general student body are likely to misidentify the causal effect of athletic participation. In our baseline specifications, then, for years in which we observe a student participating in one or more high-school sports, we leverage only the time-series variation in sport-specific seasons to retrieve an estimate of the causal effect of active participation on attendance including student-by-year fixed effects and identifying off of the sport-specific variation in seasons and season length, where each athlete spends some of the school year in season and some not. We thereby avoid a fundamental confounder in identifying the effect of athletic participation on absenteeism. We also absorb unobserved shocks to absenteeism in school-weeks with school-by-year-by-week fixed effects.[5]

In this setting, we show that active participation reduces male athletes' overall absenteeism by 5.2%, while female attendance appears relatively unresponsive. Notably, the effect is primarily explained by a reduction in unexcused absences—arguably, the more malleable sort of absence—which we interpret as consistent with athletes optimizing around policy-induced incentives. Unexcused absences fall by 10.3% at the mean for boys. The relationship is strongest for Black male athletes (12.8% declines at the mean), among boys in homes with only one

2. Representing still others from this large literature, Baker (2013) exploits disruptions to instruction associated with labor action, and Cortes, Bricker, and Rohlfs (2012) exploit the quasi-random variation between students in the ordering of classes, where the higher rate of absenteeism in early class creates a wedge in instructional time that significantly reduces grades in those courses.

3. Aucejo and Romano (2014) also consider the relative effectiveness of reducing absences in extending instructional time, identifying the effect of absences on performance using within-student variation in the number of absences in grade three and grade five on associated standardized-test scores. Test-score gains are much larger than those deriving from instructional time, with 10-day reductions in absenteeism implying 5.8% and 3% of a standard deviation increases in math and reading, respectively.

4. Absenteeism has also been directly implicated in determining academic success among university students. For example, Dobkin, Gil, and Marion (2010) exploit a discrete change in mandatory attendance for students scoring below the median on midterm exams, and find that a 10% increase in attendance increased subsequent exam scores by 0.17 standard deviations. Using variation from randomly determined class times to instrument for attendance, Arulampalam, Naylor, and Smith (2012) also find that missing class leads to poorer performance, a relationship that is particularly strong among high-performing students. For additional considerations of absenteeism in post-secondary education see Romer (1993), Durden and Ellis (1995), Marburger (2001, 2006), Stanca (2006), and Chen and Lin (2008).

5. Given the within-student design, potential imbalance in unobservables across the "treatment" and "control" observations is not of great concern. By definition, no student-athlete contributes to treatment observations without also contributing to control observations. Thus, any difference is only driven by the possible unequal contributions particular student athletes may make to treatment and control groups. The traditional balance tests raise no concerning patterns, however.

parent (11.9%), and in lower grades (14.6% in grades 9 and 10). This heterogeneous response by race serves to reduce racial gaps in truancy and achievement by approximately 20%.

While we anticipate having been able to retrieve an estimate of the causal effect of active participation in athletics on attendance, doing so off of comparisons of in-season athletes to out-of-season athletes may underestimate important channels through which athletics leads to attendance gains. We have in mind relationships with coaches, connections with teammates, school connectedness, for example, or eligibility criteria that may continue the duration of the school year. Clearly, we are identifying the marginal contribution of *active* participation, over and above whatever else athletic affiliations may afford but are independent of season. To the extent coaches play a mentoring role with athletes out of season, for example, our control group may well attend at higher rates than they would in the absence of athletic affiliation. To the extent such mechanisms spill into out-of-season athletes, our identification will under-represent the extent to which active participation influences attendance.

With sport-specific schedules available, we also relax the constraint that absenteeism among active athletes is constant across game days and nongame days. Doing so, we see even stronger evidence that students are responding to incentives, as absences fall on game days and rise the day after. This flexibility also reveals a similar pattern among female athletes, with attendance gains on game days offset by declines thereafter of a magnitude that leaves the net effect of athletic participation approximately zero (and therefore insignificant in specifications that ignore the timing of absences around game days).

While the focus of our analysis is on the effect of athletic participation on truancy and absenteeism, before concluding we briefly consider participation's effects on grades. While grades appear unresponsive to the fraction of class days spent in active competition, there is an important heterogeneity in apparent responsiveness. That is, grades fall slightly with active competition in White and Asian boys while rising with active competition in Black and Hispanic boys. The response by White and Asian girls mirrors that of boys, while Black and Hispanic girls' academic performance appears unaffected. Consistent with the results on attendance, boys from households without two parents show the largest gains from time spent in active athletic participation.

In Section II we provide additional context for the empirical exercise to follow, discussing some of the institutional information and the relevant incentives faced by student athletes. In Section III we describe our data and in Section IV we set up the empirical problem more formally and present results. We offer concluding remarks in Section V.

II. BACKGROUND

Reductions in school funding put additional pressure on resources, and parents and others are seeming to be increasingly nervous about potential imbalances in athletic versus academic focus in education. For example, fundamental to the concern of many is that any increase in time allocated to athletics implies offsetting reductions elsewhere. If not a direct substitution, the hype and acclaim surrounding athletics may likewise encourage athletes to focus less on academic preparedness, so much so that we could anticipate student athletes sub-optimally investing in nonathletic human capital in favor of sport. Of course, injury and recovery times may well introduce mechanistic relationships between athletic participation and absenteeism.

Alone, these concerns make it tempting to anticipate that athletes will exhibit higher levels of truancy and that, if anything, that truancy increases in periods of active participation. Yet, to find such patterns in the data would run counter to a growing literature that documents positive outcomes associated with athletics, which are more consistent with lower rates of absenteeism. Moreover, anticipating tension between academic and athletic pursuits, school districts typically have safeguards in place to protect academic interests. For example, in order to be eligible for competition on a game day, athletes are required to have attended a full day of classes. Athletes can also jeopardize their eligibility by irregular school attendance, whether or not the absences occur on game days, or by failing to maintain at least a 2.0 cumulative-GPA, as well as a 2.0 GPA in the classes they are currently enrolled in (Seattle Public Schools 2011). While we remain agnostic, as yet, with respect to the effect of athletics on absenteeism, such incentives give reason to anticipate that absenteeism may in fact be lower among athletes. In short, the same "hype" that worries parents and administrators alike, when appropriately governed, introduces a currency of sorts in the policy maker's ability to steward student athletes into classes, as the price of absenteeism is arguably higher for athletes, and particularly higher in-season.

While we take the relationships between athletic participation and longer-run outcomes as given, many of the same challenges to identification in existing literature will exist as here we attempt to identify a role for absenteeism as a possible mechanism. For example, if physical activity itself improves academic performance, then we should anticipate better average outcomes from athletes than nonathletes, even without a direct role for organized sport. In this case, the ideal experiment—hold physical activity constant while varying athletic participation—is largely unachievable.

Given positive selection into athletics, the role of athletics in outcomes could also be confounded by third factors that explain both. For example, Barron, Ewing, and Waddell (2000) document that there is indeed a large signaling component to high-school athletic participation—many of the long-run benefits associated with athletics are also consistent with positive sorting of high-ability students into athletics (e.g., educational attainment, employment, wages, holding supervisory positions, receiving piece-rate compensation).[6] With these concerns in mind, we will identify the effects of athletic participation on absenteeism by exploiting only the differences in the timing and lengths of seasons over the school year for given athletes, and variation in the team-specific dates on which games occur.[7]

III. DATA

In order to speak to the relationship between athletics and attendance, we acquired restricted-use data from SPS, inclusive of students' demographics, sport-specific indicators of athletic participation, and daily attendance records. The data span all 10 traditional SPS high schools over academic years 2008–2009 through 2011–2012. In order to identify the effect of athletic participation separately from that due to the effects of other athlete attributes that themselves might directly contribute to attendance, we discard nonathletes and exploit only the exogenous variation in athletic seasons and game days to identify the causal effect of being an athlete on absenteeism.[8]

From among all SPS athletes, we discard all observations for an academic year in which a student participates in multiple sports within the same season (e.g., participation in two SPS-defined "winter sports") as such students perhaps face a different treatment intensity or are otherwise different in unobservables. As only 0.79% of all SPS athletes participate in two sports within the same season, the cleaner identification purchased here does not come at much of a cost. We also discard all cheerleaders from the analysis, as their participation spans the entirety of all other sport seasons and contribute nothing to our estimate of the effect of being in active competition on attendance.[9] We also drop any athlete appearing to transfer from one SPS high school to another midway through a school year.

In the remaining SPS data, daily records of attendance for all student athletes yields a sample of more than 2.5 million student-day observations, or more than 7,000 student athletes. Overall, approximately 35% of the boys in SPS and 31% of girls in SPS participate in at least one sport during the average academic year in our sample. In Table 1, we stratify demographic and attendance data by gender and, although they will not contribute to the econometric analysis, include statistics for nonathletes for additional context. Within SPS, Whites are over-represented in athletics—they account for approximately half of all athletes despite being about one-third of the nonathlete population. In terms of grade level, athletes generally reflect the distribution of the nonathlete population.

6. As not all of the variation in outcomes is explained by selection, there is room for additional human capital having been acquired through participation, which is also consistent with Kuhn and Weinberger (2005), who find that higher wages are partly attributable to the leadership skills developed through athletic participation.

7. There are examples in the existing literature that consider the effect of sports seasons on attendance by comparing average attendance during the season to average attendance out of season. For example, Laughlin (1978) finds that among 243 high-school wrestlers, attendance is higher during the season. Silliker and Quirk (1997) conclude that among 123 high-school soccer players, attendance at school seemed to be better in- season, but the difference was not significant. In no case that we know of is class-level or day-level variation in attendance exploited, or unobserved student heterogeneity considered.

8. Nonathletes can be retained in order to better identify other parameters in the model but, without variation in their status (i.e., they are never "active"), they contribute nothing to the estimate of interest. The inclusion of nonathletes would be justified if their patterns of attendance provided at least as good a counterfactual for active athletes' attendance as did inactive athletes. However, there are reasons to believe that this may not be the case (e.g., athletes tending to be better students in other dimensions)

9. As is the case for the inclusion of nonathletes, retaining cheerleaders (e.g., to better identify school effects) does not change the reported results.

TABLE 1
Summary Statistics for Athletes and Nonathletes

	Athletes	Boys Nonathletes	All	Athletes	Girls Nonathletes	All
Students	3,941	7,360	11,301	3,217	7,290	10,507
Student-years	7,907	13,344	21,251	6,453	13,395	19,848
Student-days	1,382,011	2,258,556	3,640,567	1,132,704	2,278,796	3,411,500
White	.49	.36	.41	.52	.31	.38
Asian	.20	.26	.24	.24	.26	.25
Black	.21	.22	.22	.14	.28	.23
Other	.11	.17	.15	.11	.16	.14
Grade 9	.28	.32	.31	.28	.29	.29
Grade 10	.26	.24	.25	.28	.24	.26
Grade 11	.24	.21	.22	.24	.22	.23
Grade 12	.22	.23	.23	.20	.24	.23
Both parents	.69	.54	.60	.70	.53	.58
Periods absent per day	.38	.65	.55	.38	.64	.56
Periods excused	.22	.28	.26	.27	.33	.31
Periods unexcused	.16	.38	.29	.11	.31	.25
Semester GPA	3.01	2.40	2.63	3.37	2.73	2.94

Notes: Statistics are calculated from administrative records spanning 10 SPS high schools over academic years 2008–2009 through 2011–2012. A student is considered an "athlete" in a given year if (s)he participates in at least one of the following sports on a school-organized varsity, junior varsity, or freshman team: baseball, basketball, cross country, football, golf, gymnastics, soccer, softball, swimming, tennis, track and field, volleyball, and wrestling. Six periods make up the standard school day. However, in the two most recent years, one school implemented a schedule with only five periods per day. Additionally, three schools added an additional study hall period twice a week in a number of the observed academic years, bringing the total possible periods absent to seven on these days. Observations from days with either one fewer or one additional period make up 2.4% and 5.3% of the data, respectively. Robustness checks demonstrate that our regression results are not sensitive to the particular class scheduling in these school years. (For example, our results will be robust to the inclusion of fixed effects for school-by-year-by-day-of-week, which cleans up much of the natural variation in absenteeism than may not be attributable to active sport.) GPA is measured on a standard 4.0 point scale. Students are "active" or "in-season" during district-defined periods when tournaments and regular training sessions may be held. Dropped from the analysis are students who transfer to another SPS school midway though an academic year (<1% of all athletes), and students who participate in multiple sports, contemporaneously (<1% of all athletes).

As indicated in Table 1, athletes and nonathletes differ significantly in their absenteeism rates. Both male and female athletes are recorded absent for 0.38 school periods per day, on average. With six class periods in the typical school day, this implies that athletes are missing an average of 1.9 class periods per week, or roughly the equivalent of one school day every 3.2 weeks. Nonathletes are absent roughly 0.64 periods per day, or the equivalent of 3.2 class periods per week, or 1 day every 1.9 weeks.

In addition to a record of the number of periods absent, our data include whether the absences were "excused" or "unexcused." According to SPS, absences may be excused for reasons pertaining to the health of the student or a family member, as well as for religious holidays, educational activities, a late bus, or a school-imposed suspension. District policy explicitly prohibits other reasons from justifying an absence as "excused," and parents are given 48 hours following an absence to contact the school and petition to excuse an absence. Table 1 also reveals two notable differences when absences are tabulated by type. First, despite boys and girls being absent at similar rates overall, the distribution of absence types is markedly different by gender, as girls record approximately 22% more excused absences than are recorded for boys. Second, the proportion of excused to unexcused absences is approximately 40% higher for athletes than for nonathletes. Also in Table 1, we see the known tendency for athletes' GPAs to be higher, on average.

SPS control when athletes are considered active, and the types of activities that can occur in and out of official seasons. This includes the maximum number of matches athletes may participate in (between 10 and 21 per year, depending upon the sport). As shown in Table 1, nearly half of all student-day observations are "in-season," which we refer to as "active" days.

In Table 2, we summarize attendance and participation, by sport, across race and gender. Firstly, panel A illustrates the large attendance gaps that exist across racial groups, particularly with respect to unexcused absences. Whites and Asian boys miss, on average, roughly 0.32

TABLE 2
Summary Statistics for Athletes by Race, Gender, and Sport

	Boys				Girls			
	White	**Asian**	**Black**	**Hispanic**	**White**	**Asian**	**Black**	**Hispanic**
Panel A: Absenteeism statistics across race and gender								
Periods absent	.32	.30	.52	.51	.35	.32	.53	.49
Periods excused	.23	.17	.24	.25	.28	.21	.30	.31
Periods unexcused	.09	.14	.29	.25	.07	.11	.23	.18
Panel B: Athlete-by-year counts by race, gender, and sport								
Baseball	693	150	156	98	.	.	.	.
Basketball	378	130	622	83	288	90	325	119
Cross country	658	163	71	76	488	136	63	48
Football	847	289	647	258	.	.	.	.
Golf	323	64	–	–	89	59	–	–
Gymnastics	–	-	–	–	287	110	36	42
Soccer	724	170	268	260	805	171	114	125
Softball	.	.	.	.	385	180	124	115
Swimming	495	221	30	49	615	263	19	87
Tennis	333	456	29	59	482	511	89	96
Track	634	258	389	121	510	137	268	100
Volleyball	.	.	.	.	505	297	170	142
Wrestling	326	203	107	100	34	36	–	–
Panel C: Percent of school year spent in-season								
In-season	.50	.48	.51	.48	.48	.46	.48	.48
Panel D: Percent participating in 1, 2, or 3 sports per year								
1 sport	.64	.71	.66	.70	.70	.73	.71	.72
2 sports	.31	.23	.27	.25	.25	.24	.23	.23
3 sports	.05	.06	.08	.05	.05	.04	.05	.06

Notes: Refer to the notes found in Table 1 for a description of the data. To protect the privacy of students, results calculated from data on 10 or fewer students are suppressed (indicated with a "–").

periods per day, while Blacks and Hispanics miss 0.52. In unexcused absences, though, a gap emerges between Whites and Asians, and widens between Whites and Blacks—White athletes miss only 0.09 unexcused periods per day, while Asian athletes miss about 1.6 times this amount, and Black athletes 3.3 times the rate of White athletes. In panel B we see racial compositions varying across sport. Student counts indicate very little participation by some groups within a few sports (e.g., female wrestlers). It is apparent that the distribution of athletes varies both within and across sports. For example, Black students make up the largest racial group in basketball, while swimming (another winter sport) largely attracts White and Asian students. Looking within, rather than across columns paints much the same picture—Black boys concentrate most heavily in football, basketball and, to a lesser extent, track and field, while the most popular sports for White boys appear to be football, soccer, and baseball. The final panels in Table 2 show that time spent in-season is approximately equal across race and gender, and that the proportion of athletes participating in one, two, or three sports per year is similar across columns.

In Table 3, we provide a simple comparison of average attendance rates across "active" and "inactive" athletes by sport. The results show no clear picture of the effect of being in active competition on attendance as average attendance rates among athletes in some sports appears to go up during the sport's season while declining for others. One possible explanation for this is the fact that these attendance statistics fail to account for general patterns of attendance over the school year, leaving spring sports appearing to have a negative affect on attendance, since attendance in the spring is relatively poor, generally, regardless of sports participation or in-season status.

To summarize the general patterns in attendance, we plot the average daily periods absent for active and inactive athletes, and nonathletes over the academic year in Figure 1. Note that different students are contributing to the athlete plots in different time periods, while the nonathlete plot is the same set of students throughout the school year. It is clear that for unexcused absences in particular, there is an upward trend through the academic year. What is interesting, however, is that while the unexcused absences of inactive athletes follow the general upward

TABLE 3
Athletes' In-Season and Out-of-Season Absences, by Sport

	Boys		Girls	
	Out-of-Season	**In-Season**	**Out-of-Season**	**In-season**
Panel A: Absent Periods—Unexcused				
Fall sports				
Cross country	0.09	0.04	0.10	0.04
Football	0.34	0.16		
Golf	0.10	0.05	0.09	0.11
Volleyball			0.17	0.08
Winter sports				
Basketball	0.25	0.19	0.24	0.18
Gymnastics			0.08	0.07
Swimming	0.08	0.06	0.08	0.05
Wrestling	0.21	0.17	0.21	0.20
Spring sports				
Baseball	0.11	0.15		
Soccer	0.14	0.18	0.12	0.06
Softball			0.14	0.17
Tennis	0.08	0.08	0.06	0.09
Track	0.11	0.16	0.12	0.16
Panel B: Absent Periods—Excused				
Fall sports				
Cross country	0.21	0.16	0.28	0.21
Football	0.28	0.24		
Golf	0.25	0.21	0.22	0.28
Volleyball			0.33	0.23
Winter sports				
Basketball	0.24	0.24	0.30	0.33
Gymnastics			0.28	0.29
Swimming	0.19	0.21	0.28	0.24
Wrestling	0.22	0.24	0.24	0.25
Fall sports				
Baseball	0.23	0.27		
Soccer	0.18	0.24	0.31	0.23
Softball			0.26	0.32
Tennis	0.16	0.18	0.19	0.28
Track	0.17	0.25	0.24	0.32

Notes: Refer to the notes found in Table 1 for a description of the data. To protect the privacy of students, results calculated from data on 10 or fewer students are suppressed.

trend in the general student population in the latter part of the year, the unexcused absences of active athletes fail to rise, until much later in the year when many athletes are still "active" yet are no longer competing as the state championship tournament concludes.

IV. EMPIRICS

A. *The Effect of In-Season Status on Absenteeism*

To begin, we simply consider how being in active competition changes daily average attendance of athletes. Using ordinary least squares on a panel of daily attendance records for all SPS students in the sample years (2008–2009 through 2011–2012) in which they participated in at least one high-school sport, we estimate the model,

$$(1) \quad PeriodsAbsent_{asd} = \alpha + \beta Active_{asd} + \epsilon_{asd}$$

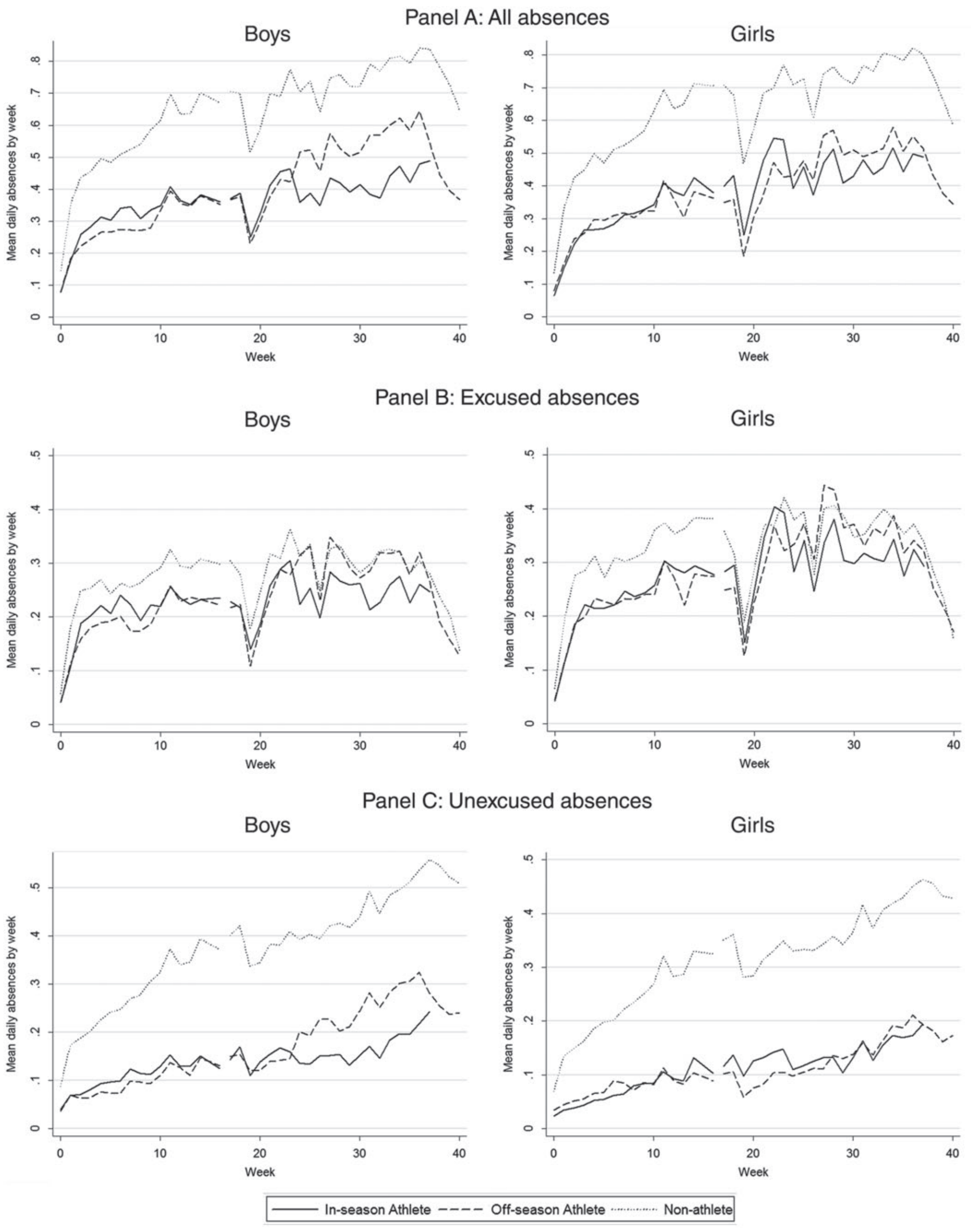
where $PeriodsAbsent_{asd}$ is the number of school periods student athlete a is absent from school s on day d, and is determined by a's participation status, $Active_{asd}$, which equals one if athlete a is in-season on day d. In all specifications, standard-error estimates correct for possible clustering at the school level.[10] Given differences in absenteeism and possible differences in the intensity of treatment across genders, we estimate Equation (1) separately for boys and girls. Of course, if active athletics participation decreases absenteeism, $\hat{\beta}$ will be negative.

The results in column 1 of Table 4 imply that active athletes exhibit lower rates of absenteeism on average. The number of periods boys are absent declines with active participation by approximately .027 per day, or 7% of the absence rate exhibited by inactive athletes (.39 classes daily). Active girls are absent .022 fewer classes per day, or 5.7% of the mean out-of-season absence rate (also .39 classes). The size and statistical significance of the estimates are modest, indicating with the confidence interval around the point estimate on the relationship between girls' sports participation and their school attendance spanning zero.

In several dimensions, even though the simple model of Equation (1) cannot be explained by athlete selection, it fails to account for athletes selecting systematically into seasons (i.e., sports), which may correlate with other unobservable student attributes that drive attendance. For

10. With few clusters (e.g., we have ten schools), the asymptotic approximation of the autocorrelation within clusters may not be valid. We have conducted sensitivity analysis with respect to estimated standard errors, correcting for possible clustering at the school-year, and at the school-week level. Of the options, correcting for clustering at the school-level yields the largest standard-error estimates, which we choose to present. This is consistent with Baum, Nichols, and Schaffer (2011) who note that "with nested levels of clustering, clusters should be chosen at the most aggregate level … to allow for correlations among individuals at that level," and with Cameron and Miller (2015), who argue that "the consensus is to be conservative and avoid bias and use bigger and more aggregate clusters when possible, up to and including the point at which there is concern about having too few clusters." T-tests are conducted using $G-1=9$ degrees of freedom when correcting for clustering at the school level. In Table A1 we demonstrate the sensitivity of standard-error estimates to various assumptions on the pattern of clustering. We also provide confidence intervals for the main results following the "few clusters" approach of Ibragimov and Müller (2010, 2013).

FIGURE 1
Mean Daily Absences by Week, by Gender: (A) All Absences, (B) Excused Absences, and (C) Unexcused Absences



example, if students who have more active days in a given year are more industrious or more competitive, and also have lower rates of absenteeism through the year, the point estimate in column 1 will be biased downward. If school attendance is lower in times when sports participation is higher (as is the case in the spring term), this variation would also be potentially problematic. Likewise,

TABLE 4
The Effect of Being in Active Competition on Class Absences

Panel A: Boys (n = 1,382,011)	(1)	(2)	(3)
Active athlete	−0.027**	−0.040***	−0.020**
	(0.011)	(0.010)	(0.008)
Mean out-of-season absences	.39	.39	.39
% Impact	−7	−10.3	−5.2
School-by-week FE	No	Yes	Yes
Student-by-year FE	No	No	Yes
Panel B: Girls (n = 1,132,704)	**(1)**	**(2)**	**(3)**
Active athlete	−0.022	−0.027**	−0.013
	(0.013)	(0.012)	(0.009)
Mean out-of-season absences	.39	.39	.39
% Impact	−5.7	−6.9	−3.3
School-by-week FE	No	Yes	Yes
Student-by-year FE	No	No	Yes

Notes: Estimated standard errors are reported in parentheses, adjusted for any clustering at the school level. Percent impacts are relative to the mean number of periods absent among out-of-season athletes.

***Significant at 1%; **significant at 5%; *significant at 10%.

school-level factors, more broadly, may correlate with attendance and average season lengths at the school.

To account for such potential confounders, we re-estimate Equation (1) as,

$$(2)\quad PeriodsAbsent_{asdwy} = \alpha + \beta Active_{asd} + \lambda_{ay} + \tau_{swy} + u_{asdwy}$$

with the addition of athlete-by-year fixed effects, λ_{ay}, and school-by-year-by-week fixed effects, τ_{swy}. Thus, in column 2 of Table 4, we identify the effect of being in active competition on absenteeism by leveraging the variation in student-by-year variation in in-season status within a given school-week. In column 3—our preferred specification—we also absorb student-specific heterogeneity into the error structure, exploiting the day-by-day variation in the timing of students' active seasons. While point estimates do move across columns, the overall story is insensitive to specification—attendance improves with active competition. From our fully-specified model, estimates imply that boys' absences fall with active athletic participation—being in-season reduces the number of periods absent by 5.2% relative to that seen out-of-season, on average. Although point estimates suggest that absences also decline among girls (3.3%), one should hesitate drawing such a conclusion as the confidence interval also includes zero. Of course, we should note again that in our setting we are identifying the marginal contribution of *active*, in-season participation over and above any general increase in attendance that athletic affiliation itself may induce.

B. Are Patterns of Unexcused and Excused Absences Different?

Before we consider the potential for heterogeneous effects, it will be instructive to consider the distinctions between absences designated "excused" versus those designated "unexcused." In particular, by separately identifying the effect of active competition on the type of absence has the potential to separate competing patterns of behavior. For example, a decline in unexcused absences would be consistent with athletes substituting away from oversleeping or leisure activities crowding out classes—examples of the sort of behavior that leads to unexcused absences—while excused absences should move differently, if not at all. We hesitate to think of this as a proper falsification exercise, as we can easily think of mechanisms that would move excused absences systematically with sport activity. For example, offsetting increases in excused absences would be consistent with students or parents investing additional resources in having given absences excused while the student is actively participating. As absences may be "excused" for reasons pertaining to the health of the student, we likewise might anticipate increases in excused absences among sports particularly susceptible to injury. Similarly, sanctioned tournaments that directly conflict with classes would, we imagine, increase excused absences. However, we see no evidence that scheduled tournaments conflict with classes.

In Table 5, we report the estimated effect of being active on excused and unexcused absences, adopting the fully-specific model in Equation (2). Doing so clearly points to the patterns of absenteeism among boy athletes being driven by their "unexcused" behavior—unexcused absences decline 10.3% when athletes are active, though excused absences decline only insignificantly (1.3%). The small negative effect of being active on excused absences should not be ignored, however, as it is by this that we learn that the decline in unexcused absences cannot be explained by parents investing in having given absences excused when their children are actively competing. Were this the case, which we could not rule out a priori, that the point estimate in column 2 would be positive. In supplemental analysis, we also find support for the conjecture that declines

TABLE 5
The Effect of Being in Active Competition on Unexcused and Excused Absences

Panel A: Boys (n = 1,382,011)	**Unexcused (1)**	**Excused (2)**
Active athlete	−0.018**	−0.003
	(0.005)	(0.006)
Mean out-of-season absences	**.17**	.22
% Impact	−10.3	−1.3
Panel B: Girls (n = 1,132,704)	**Unexcused (1)**	**Excused (2)**
Active athlete	−0.004	−0.009
	(0.003)	(0.008)
Mean out-of-season absences	.12	.27
% Impact	−3.3	−3.3

Notes: All specifications include student-by-year and school-by-week fixed effects. Estimated standard errors are reported in parentheses, adjusted for any clustering at the school level. Percent impacts are relative to the mean number of periods absent among out-of-season athletes.

***Significant at 1%; **significant at 5%; *significant at 10%.

in full-day absences are somewhat larger, suggesting that much of the change in behavior represents deliberate declines in truancy.

As is the case in the restricted model reported in Table 4, the patterns of absences around girls' active competitions again appear modest when separated by whether the absence was excused or not. However, we can still rule out that parents are investing additional resources in having given absences excused when their girls are actively competing. Although insignificant, interpreting point estimates directly implies that unexcused and excused absences decline among girls by 3.3%.

C. Heterogeneity

Race. Assuming that the effect of active participation on absenteeism is constant across race seems overly restrictive in light of significant race differences in both school attendance and sports participation. We therefore stratify the earlier estimates by race, which we present in Table 6. Among boys, doing so reveals that the effect of being in active competition on unexcused absences is strongest among Black and Hispanic boys, who exhibit a 12.8% decline in unexcused absences relative to their average out-of-season attendance rates (which are high relative to White and Asian boys). The decline in White and Asian absenteeism is less than half this size (relative to their mean) and statistically insignificant at conventional levels. Since out-of-season Black and Hispanic boys are truant approximately 0.2 periods more, per day, than Whites and Asians, the effect represents a 20% reduction in the racial truancy gap. As in earlier specifications, excused absences do not increase in-season among any race/gender group, which we continue to interpret as ruling out that parents are more inclined to have given absences excused when their children are active. Indeed, any declines in excused absences would be consistent with improved health of the student or family, fewer conflicting educational activities or late buses, or a decline in school-imposed suspensions during active seasons.

Family Structure. In Table 7 we stratify by a measure of family structure—whether the student is recorded as living with both parents, or "not with both parents," which includes those in foster care, living with grandparents, or, as is predominantly the case, with one parent. There is a large body of work highlighting the association between divorce and children's long-run outcomes. As such, we think that considering the role of family structure in how athletics explains outcomes is an important aspect for policy makers to consider.[11]

While power is somewhat limited, there is a noteworthy robustness to the Black and Hispanic result above; Table 7 suggests that this is capturing a single-parent effect, of a sort. Note, first, that the stratification by family structure reveals that average absenteeism is higher among single-parent families in all race/gender cells. Unexcused absences are highest among Black and Hispanic boys from single-parent homes (.39), while excused absences are highest among Black and Hispanic girls from single-parent homes (.32).

11. Using the National Longitudinal Survey of Youth, Antecol and Bedard (2007) "find that an additional five years with the biological father decreases the probability of smoking, drinking, engaging in sexual activity, marijuana use, and conviction." Exploiting variation in the divorce rate generated by changes in states' unilateral divorce laws, Gruber (2004) demonstrates that those adults exposed to unilateral divorce as children in the decade after the law change obtained less total education. This same identifying variation leads Cáceres-Delpiano and Giolito (2012) to conclude that individuals who were children at the time of the reforms exhibited higher rates of violent crime arrests as adults. Both Antecol and Bedard (2007) and Cáceres-Delpiano and Giolito (2012) cite reduced supervision and adult interaction as possible mechanisms. We believe this explanation to be particularly relevant for athletes as coaches have the potential to serve as de facto surrogates to active athletes, providing adult supervision and role modeling otherwise absent.

TABLE 6

Racial Heterogeneity in the Effect of Active Competition on Absences

Panel A: Boys	**Unexcused**		**Excused**	
	White/Asian (1)	**Black/Hispanic (2)**	**White/Asian (3)**	**Black/Hispanic (4)**
Active athlete	−0.005	−0.040***	−0.003	−0.003
	(0.005)	(0.007)	(0.005)	(0.009)
Mean out-of-season absences	.11	.31	.21	.24
% Impact	−4.9	−12.8	−1.4	−1.2
Observations	951,020	430,991	951,020	430,991
Students	5,416	2,491	5,416	2,491
Panel B: Girls	**Unexcused**		**Excused**	
	White/Asian (1)	**Black/Hispanic (2)**	**White/Asian (3)**	**Black/Hispanic (4)**
Active athlete	−0.001	−0.016	−0.006	−0.017
	(0.001)	(0.010)	(0.007)	(0.013)
Mean out-of-season absences	.09	.22	.26	.3
% Impact	−1.3	−7.4	−2.2	−5.6
Observations	851,045	281,659	851,045	281,659
Students	4,840	1,613	4,840	1,613

Note: See notes for Table 5.
***Significant at 1%; ** significant at 5%; * significant at 10%.

Among boys (Panel A), the effect of being in active competition on unexcused absences is seemingly strongest among Black and Hispanic boys from single-parent homes—declines in unexcused absences are 12.4% relative to their mean out-of-season attendance rates. Considering the racial difference between out-of-season truancy among single-parent athletes (0.21 periods per day), in-season sports participation serves to reduce this gap by 23%. The effect among Black and Hispanic boys of two-parent households is also large—9% relative to the mean—but fails to exclude zero from the confidence interval. In Panel B we see that girls' unexcused absences vary with family structure, similar to boys. Different, however, is that the precision and percentage-impact appear greater among girls in two-parent households, with sports participation again reducing the racial gap in truancy. In no case does stratifying by family structure reveal significant relationships between athletic participation and excused absences, although the impact for Black and Hispanic students generally exceeds that of Whites and Asians.

Grade Level. The incentives to please coaches or compete for playing time may change throughout athletes' high-school careers, making any grade-level heterogeneity an interesting distinction. In Table 8, we estimate the effect of being in active competition on excused and unexcused absences stratifying by upperclassman and underclassman status, and again by gender. Across both boys and girls, active engagement in athletics predicts larger declines in absenteeism in earlier grade levels (i.e., grades 9 and 10). This is particularly so among boys, where absenteeism rates are some 14.6% lower at the mean, a reduction of .7 class periods in a 5-day school week. Among upperclassmen, the estimated effect remains statistically significant, but drops in size to 6.1% of the mean absenteeism rate. Again, in boys, excused absences do not appear to be responsive to active sports participation, and the negative point estimates again suggest that there is no measurable substitution across unexcused and excused absences. Excused absences do fall among girls in lower grade levels, although there is also less heterogeneity across active and inactive athletes. In unreported analysis, a triple difference reveals somewhat larger negatives among underclassmen who eventually dropout, suggesting that the larger effect for upperclassmen may derive from (earlier) attrition by those students most responsive to active participation. Importantly, however, data limitations leave us unable to distinguish between dropouts and transfers (out of SPS). As such, one should be measured in making related inference.

TABLE 7
Heterogeneity across Family Structure in the Effect of Active Participation on Absences

	Living with Two Parents			Not Living with Two Parents		
	All (1)	White/Asian (2)	Black/Hispanic (3)	All (4)	White/Asian (5)	Black/Hispanic (6)
Panel A: Boys						
Unexcused absences						
Active athlete	−0.006	−0.004	−0.019	−0.034***	−0.009	−0.048***
	(0.005)	(0.004)	(0.010)	(0.007)	(0.011)	(0.007)
Mean out-of-season absences	.12	.09	.21	.29	.18	.39
% Impact	−5.3	−4.1	−9	−11.9	−4.8	−12.4
Excused absences						
Active athlete	−0.003	−0.003	−0.004	0.000	0.001	−0.001
	(0.006)	(0.006)	(0.012)	(0.008)	(0.007)	(0.011)
Mean out-of-season absences	.21	.2	.23	.25	.25	.25
% Impact	−1.6	−1.5	−1.7	0	.2	−.4
Observations	954,449	761,856	192,593	427,562	189,164	238,398
Students	5,434	4,327	1,107	2,473	1,089	1,384
Panel B: Girls						
Unexcused absences						
Active athlete	−0.003*	−0.001	−0.017***	−0.008	−0.002	−0.019
	(0.001)	(0.001)	(0.004)	(0.009)	(0.006)	(0.018)
Mean out-of-season absences	.09	.07	.15	.19	.13	.28
%-Impact	−3.2	−.9	−11.6	−4.3	−1.3	−6.9
Excused absences						
Active athlete	−0.010	−0.007	−0.021	−0.010	−0.004	−0.017
	(0.007)	(0.007)	(0.014)	(0.013)	(0.013)	(0.022)
Mean out-of-season absences	.26	.25	.28	.31	.3	.32
%-Impact	−3.7	−2.8	−7.5	−3.2	−1.2	−5.2
Observations	799,453	658,688	140,765	333,251	192,357	140,894
Students	4,538	3,737	801	1,915	1,103	812

Note: See notes for Table 5.
***Significant at 1%; **significant at 5%; *significant at 10%.

D. Are There Game-Day Effects on Absenteeism?

According to the Washington Interscholastic Activities Association (WIAA), athlete attendance is monitored and eligibility is jeopardized by poor attendance. However, it is notable that athletes are required to attend a full day of school on the day of any sport competition in order to be eligible for competition. As such, to the extent students are responding to incentives, we might expect more than simple level shifts in attendance for periods of active participation.

To our data, we add nearly 8,500 tournament events—school-by-sport-specific dates on which competition occurred within SPS. Schedule data for all sports were collected from daily online historical records in the Seattle Times, internet records databases, and from high-school coaches.[12] We believe we have nearly full coverage over the 4 years, though we suspect some missing dates for the wrestling tournaments and gymnastics meets occurring in the first 2 years.

In the models of Table 9, we allow athlete a's absenteeism to vary differently on game days, and on the calendar days immediately before and after a game. We adopt our preferred specification from above, but, as sports can tend to follow somewhat regular schedules (e.g., football tending to play games on Fridays), we report specifications with and without day-of-week fixed effects.

Allowing for this flexibility proves important to fitting the data, and reveals an interesting

12. See www.athletic.net, www.maxpreps.com, and www.nwcaonline.com. The records we collect are for all varsity tournaments. For many sports, there is either no distinction between varsity- and nonvarsity-level athletes, or tournaments include varsity and nonvarsity heats. Likewise, inspecting more recent event calendars for sports in which seniors and nonseniors do not compete against one another, there exists a high degree of symmetry in the tournament calendars, with both varsity and junior varsity teams competing on the same day at different times or locations. As we do not have information on the varsity-status of athletes, we treat all athletes as following the varsity schedule. We anticipate that any remaining measurement error would bias us towards finding no effect.

TABLE 8
Active Competition on Class Absences, by Grade Level

Panel A: Boys	**Grades 9–10**		**Grades 11–12**	
	Unexcused (1)	**Excused (2)**	**Unexcused (3)**	**Excused (4)**
Active athlete	−0.022***	−0.005	−0.012*	−0.002
	(0.006)	(0.008)	(0.006)	(0.007)
Mean out-of-season absences.	.15	.21	.2	.23
% Impact	−14.6	−2.4	−6.1	−.8
Observations	752,462	752,462	629,549	629,549
Students	4,298	4,298	3,609	3,609
Panel A: Girls	**Grades 9–10**		**Grades 11–12**	
	Unexcused (1)	**Excused (2)**	**Unexcused (3)**	**Excused (4)**
Active athlete	−0.005*	−0.017*	−0.003	−0.000
	(0.003)	(0.009)	(0.005)	(0.007)
Mean out-of-season absences	.09	.25	.15	.3
% Impact	−5.9	−6.9	−1.9	−.1
Observations	637,870	637,870	494,834	494,834
Students	3,625	3,625	2,828	2,828

Note: See notes for Table 5.
***Significant at 1%; **significant at 5%; *significant at 10%.

TABLE 9
Game-Day Effects of Active Sports Participation on Class Absences

Panel A: Boys ($n = 1{,}382{,}011$)	**Unexcused**		**Excused**	
	(1)	**(2)**	**(3)**	**(4)**
Active athlete	−0.016***	−0.013**	−0.001	−0.003
	(0.005)	(0.004)	(0.005)	(0.005)
Active × GameDay −1	−0.004*	−0.006**	−0.007	−0.006
	(0.002)	(0.002)	(0.004)	(0.004)
Active × GameDay	−0.019***	−0.026***	−0.020	−0.017
	(0.005)	(0.006)	(0.026)	(0.026)
Active × GameDay +1	0.021***	0.014***	0.030***	0.034***
	(0.005)	(0.003)	(0.005)	(0.004)
Mean out-of-season absences	.17	.17	.22	.22
Day-of-week FE	No	Yes	No	Yes
Panel B: Girls ($n = 1{,}132{,}704$)	**Unexcused**		**Excused**	
	(1)	**(2)**	**(3)**	**(4)**
Active athlete	−0.005	−0.005	−0.005	−0.007
	(0.003)	(0.003)	(0.005)	(0.005)
Active × GameDay −1	0.002	0.005	0.003	0.006
	(0.003)	(0.003)	(0.005)	(0.005)
Active × GameDay	−0.006***	−0.007**	−0.037*	−0.033*
	(0.003)	(0.003)	(0.017)	(0.017)
Active × GameDay +1	0.014***	0.008**	0.018**	0.020**
	(0.003)	(0.003)	(0.008)	(0.007)
Mean out-of-season absences	.12	.12	.27	.27
Day-of-week FE	No	Yes	No	Yes

Note: See notes for Table 5.
***Significant at 1%; **significant at 5%; *significant at 10%.

pattern that is consistent with students optimizing around the incentives they face. For boys, the pattern in unexcused absences is clearly systematic around tournament dates, with the overall decline in absences documented above seemingly driven by general declines in absenteeism, but particularly large declines in absenteeism on game days, with an offsetting increase on days following tournaments, where active athletes are apparently not different from inactive (i.e.,

TABLE 10
Game-Day Effects by Sport, Boys

Boys (n = 1,382,011)	**Unexcused (1)**	**Excused (2)**		**Unexcused (1)**	**Excused (2)**
Active × Baseball	−0.027***	−0.020*	Active × Soccer	−0.021*	−0.021
	(0.008)	(0.009)		(0.010)	(0.012)
Baseball × GameDay −1	−0.007	0.001	Soccer × GameDay −1	−0.008	0.017*
	(0.005)	(0.010)		(0.007)	(0.009)
Baseball × GameDay	−0.029**	−0.026	Soccer × GameDay	−0.017	−0.001
	(0.010)	(0.031)		(0.010)	(0.033)
Baseball × GameDay +1	0.001	0.012	Soccer × GameDay +1	0.012	0.017
	(0.003)	(0.008)		(0.012)	(0.012)
Active × Basketball	−0.012**	−0.019	Active × Swimming	0.010	−0.006
	(0.005)	(0.013)		(0.006)	(0.008)
Basketball × GameDay −1	−0.003	0.015	Swimming × GameDay −1	0.003	−0.052***
	(0.007)	(0.029)		(0.007)	(0.010)
Basketball × GameDay	−0.062***	−0.021	Swimming × GameDay	0.011	0.008
	(0.011)	(0.053)		(0.007)	(0.021)
Basketball × GameDay +1	0.025**	0.079**	Swimming × GameDay +1	0.006	0.025
	(0.011)	(0.029)		(0.005)	(0.047)
Active × Cross Country	0.027***	−0.011	Active × Tennis	−0.018	0.000
	(0.008)	(0.007)		(0.017)	(0.012)
Cross Country × GameDay −1	0.011*	0.002	Tennis × GameDay −1	0.007	−0.026
	(0.005)	(0.009)		(0.005)	(0.018)
Cross Country × GameDay	0.034***	0.036	Tennis × GameDay	0.018	0.012
	(0.006)	(0.032)		(0.011)	(0.028)
Cross Country × GameDay +1	0.019**	0.036	Tennis × GameDay +1	0.002	−0.006
	(0.006)	(0.020)		(0.006)	(0.016)
Active × Football	−0.037**	0.027**	Active × Track	−0.025*	0.011
	(0.012)	(0.009)		(0.011)	(0.015)
Football × GameDay −1	−0.029**	−0.040***	Track × GameDay −1	−0.021**	−0.025*
	(0.010)	(0.012)		(0.009)	(0.013)
Football × GameDay	−0.038***	−0.072***	Track × GameDay	0.004	−0.010
	(0.011)	(0.020)		(0.011)	(0.022)
Football × GameDay +1	0.129***	0.183***	Track × GameDay +1	0.037**	0.036**
	(0.038)	(0.047)		(0.013)	(0.013)
Active × Golf	0.023*	0.010	Active × Wrestling	0.008	−0.002
	(0.012)	(0.012)		(0.009)	(0.009)
Golf × GameDay −1	0.007	−0.016	Wrestling × GameDay −1	0.006	−0.009
	(0.005)	(0.027)		(0.015)	(0.011)
Golf × GameDay	0.014	−0.008	Wrestling × GameDay	−0.005	−0.016
	(0.009)	(0.030)		(0.016)	(0.016)
Golf × GameDay +1	−0.002	−0.021	Wrestling × GameDay +1	0.023	0.024**
	(0.006)	(0.015)		(0.018)	(0.010)

Note: See notes for Table 5.
***Significant at 1%; **significant at 5%; *significant at 10%.

out-of-season) athletes. This pattern is consistent with a strong behavioral response to the policy, but with an offsetting effect—athletes make up for their increased attendance leading up to game days with post-game-day retreats, of a sort. This pattern is even more evident in excused absences. While the earlier results (see Table 5) reveal no net difference in excused absences between in-season and out-of-season boys, allowing for game-day effects in Table 9 uncovers an underlying pattern of declining absences leading into game days (although point estimates are insignificant) and a large and significant increase in excused absences on days that follow game days. Using the point estimates from the models without day-of-week fixed effects, relative to the average active boy on days not surrounding a tournament, active boys experience only slightly lower absenteeism rates the day before a game. However, the effect is more than doubled on game days, reducing truancy by 21% relative to inactive athletes. This is followed by a *rise* in truancy on the day after a game, even accounting for the overall reduction while in-season. Excused absences also increase on the day after a game—the day after a game, excused absences are 13.6% higher than we see in active boys on days not surrounding a game. While this

TABLE 11
Game-Day Effects by Sport, Girls

Girls (*n* = 1,132,704)	Unexcused (1)	Excused (2)		Unexcused (1)	Excused (2)
Active × Basketball	−0.014	0.001	Active × Swimming	0.013***	−0.012
	(0.012)	(0.008)		(0.004)	(0.007)
Basketball × GameDay −1	−0.012	0.013	Swimming × GameDay −1	−0.006	0.019
	(0.013)	(0.023)		(0.005)	(0.015)
Basketball × GameDay	−0.043***	−0.057**	Swimming × GameDay	0.014*	0.004
	(0.010)	(0.023)		(0.007)	(0.020)
Basketball × GameDay +1	0.029**	0.087***	Swimming × GameDay +1	0.009	0.011
	(0.010)	(0.019)		(0.011)	(0.030)
Active × Cross Country	0.009	−0.007	Active × Tennis	−0.030***	−0.007
	(0.008)	(0.006)		(0.009)	(0.007)
Cross Country × GameDay −1	−0.001	−0.036*	Tennis × GameDay −1	0.011*	−0.000
	(0.007)	(0.017)		(0.006)	(0.017)
Cross Country × GameDay	0.019***	−0.019	Tennis × GameDay	0.006	0.009
	(0.005)	(0.032)		(0.006)	(0.026)
Cross Country × GameDay +1	0.002	0.029	Tennis × GameDay +1	0.007	−0.003
	(0.004)	(0.017)		(0.013)	(0.013)
Active × Golf	0.012	0.033	Active × Track	−0.006	−0.012
	(0.013)	(0.019)		(0.011)	(0.015)
Golf × GameDay −1	−0.022	−0.040	Track × GameDay −1	−0.017	−0.034*
	(0.013)	(0.031)		(0.010)	(0.018)
Golf × GameDay	−0.005	−0.044	Track × GameDay	−0.001	−0.017
	(0.020)	(0.032)		(0.009)	(0.016)
Golf × GameDay +1	0.039**	0.011	Track × GameDay +1	0.045***	0.059**
	(0.016)	(0.026)		(0.013)	(0.023)
Active × Gymnastics	0.011	0.015	Active × Volleyball	0.004	−0.017
	(0.007)	(0.013)		(0.004)	(0.010)
Gymnastics × GameDay −1	0.027	−0.028	Volleyball × GameDay −1	−0.004	−0.012
	(0.017)	(0.024)		(0.004)	(0.008)
Gymnastics × GameDay	0.005	−0.023	Volleyball × GameDay	−0.016***	−0.063***
	(0.012)	(0.036)		(0.005)	(0.015)
Gymnastics × GameDay +1	0.000	0.061**	Volleyball × GameDay +1	0.013	0.017
	(0.010)	(0.021)		(0.008)	(0.011)
Active × Soccer	0.017**	−0.003	Active × Wrestling	0.032*	−0.023
	(0.007)	(0.010)		(0.015)	(0.029)
Soccer × GameDay −1	0.002	0.012	Wrestling × GameDay −1	0.022	0.048
	(0.004)	(0.009)		(0.039)	(0.035)
Soccer × GameDay	0.009	−0.028	Wrestling × GameDay	−0.029	0.042
	(0.005)	(0.015)		(0.029)	(0.032)
Soccer × GameDay +1	0.006**	−0.004	Wrestling × GameDay +1	0.024	0.082**
	(0.002)	(0.010)		(0.033)	(0.029)
Active × Softball	−0.026**	−0.015			
	(0.009)	(0.015)			
Softball × GameDay −1	0.000	−0.015			
	(0.011)	(0.009)			
Softball × GameDay	−0.000	−0.048			
	(0.011)	(0.029)			
Softball × GameDay +1	0.005	−0.017			
	(0.007)	(0.013)			

Note: See notes for Table 5.
***Significant at 1%; **significant at 5%; *significant at 10%.

is consistent with parents investing additional resources in having absences excused, our prior would be for such practice to be demonstrated leading up to game days, or on game days, where marginal absences are more likely to trigger ineligibility. Thus, we anticipate that part of this pattern may be explained by injury and or recovery times, which we consider below.

Among girls, recall that we found no significant differences in either unexcused or excused absences overall. However, allowing for game-day effects in the patterns of absences likewise points to significant reductions in absences on game days followed by significant increases in absences on days that follow game days. Relative to the average inactive girl, active girls exhibit

TABLE 12
Does the Degree of Active Participation in a Semester Change Final Course Grades?

Panel A: Boys ($n = 89{,}807$)	**(1)**	**(2)**	**(3)**
Prop. semester active	0.095**	0.077**	0.007
	(0.037)	(0.028)	(0.010)
Mean out-of-season grade	2.98	2.98	2.98
Course-by-semester-by-school FE	No	Yes	Yes
Student FE	No	No	Yes
Panel B: Girls ($n = 73{,}841$)	**(1)**	**(2)**	**(3)**
Prop. semester active	0.055	0.078***	−0.006
	(0.042)	(0.024)	(0.010)
Mean out-of-season grade	3.38	3.38	3.38
Course-by-semester-by-school FE	No	Yes	Yes
Student FE	No	No	Yes

Notes: All regressions include grade fixed effects. Estimated standard errors are reported in parentheses, adjusted for any clustering at the school level. By "course," we mean to imply a particular subject and course code (e.g., Geometry 101) rather than a particular section of Geometry 101. Schools may teach concurrent sections of the same course within a semester.

***Significant at 1%; **significant at 5%; *significant at 10%.

TABLE 13
Racial Heterogeneity in the Effect of Active Participation on Grades

Panel A: Boys	**White/Asian (1)**	**Black/Hispanic (2)**
Prop. semester active	−0.012	0.058***
	(0.012)	(0.018)
Mean out-of-season grade	3.18	2.5
Observations	61,666	28,141
Panel B: Girls	**White/Asian (1)**	**Black/Hispanic (2)**
Prop. semester active	−0.017*	0.008
	(0.009)	(0.023)
Mean out-of-season grade	3.51	2.93
Observations	55,441	18,400

Notes: All regressions include student, school-year-semester-course, and grade fixed effects. Estimated standard errors are reported in parentheses, adjusted for any clustering at the school level.

***Significant at 1%; **significant at 5%; *significant at 10%.

similar absenteeism rates the day before a game, but 9.1% lower truancy rates on game days. On days following games, they exhibit 11.6% *higher* unexcused-absenteeism rates when compared to active girls on game days or the day prior. Excused absences decrease 13.7% on game days, but again rise the day after a game.

While somewhat cumbersome given that tournaments for some sports fall disproportionately on particular days of the week (e.g., a majority of football games occur on Fridays, and cross-country invitational meets on Saturdays), sport-specific estimates are provided in Tables 10 and 11. Across all sports, the model suggests that football players are potentially the most sensitive to game-day effects. On days prior to games they are 38.8% less likely to be absent than are inactive male athletes, 44.1% less likely on game days, but 54.1% *more likely* to be absent on days following a game.[13] Other sports in which absenteeism is seemingly quite responsive to game days include boys' basketball (8.8% decrease, 43.5% decrease, and 7.7% increase) and girls' basketball (21.7% decrease, 61.7% decrease, and 10.8% increase). Two sports—cross country and golf, which both attract mainly White and Asian students—seemingly having unexcused absences increase with active participation.[14]

E. Academic Performance

We next turn to an analysis of the effects of active participation on student achievement, leveraging student-by-class-level administrative transcript data. With the potential to consider within-class variation in performance, we generally have six observations per semester for each athlete—for each we have a course title, subject code, and final letter grades. For our purpose, we transform letter grades into a standard 4.0 scale, and create a semester-level measure of active participation for each athlete using the sport-specific schedules considered above. That is, we regress athlete a's performance in class c on the proportion of semester t that athlete spent in season,

$$(3) \quad Grade_{acstg} = \alpha + \gamma Prop.SemesterActive_{at} + \lambda_a + \eta_g + \sigma_{sct} + u_{acstg},$$

where σ_{sct} is a set of school-by-course-by-term-by-school-year fixed effects. While attendance

13. Relative to the off-season rates of absenteeism specifically among football players (.34), these numbers are also quite large, at −19.4, −22.1, and 27.1.

14. The racial heterogeneity apparent in Table 6 may instead be driven by a combination of sport-specific effects and differences in participation rates by race and sport. In an unreported table, we re-estimate the equation used to produce Table 10, but interact the variables associated with the two sports with the most significant participation by minority boys (i.e., football and basketball) with an indicator for Black/Hispanic status. In short, while the game-day dynamics we report do not appear to be race-specific, the magnitudes are significantly larger for Black and Hispanic boys.

TABLE 14

Heterogeneity across Family Structure in the Effect of Active Participation on Grades

	Living with Two Parents			Not Living with Two Parents		
Panel A: Boys	**All (1)**	**White/Asian (2)**	**Black/Hispanic (3)**	**All (4)**	**White/Asian (5)**	**Black/Hispanic (6)**
Prop. semester active	−0.009	−0.017*	0.035	0.046*	0.022	0.087***
	(0.010)	(0.009)	(0.052)	(0.022)	(0.037)	(0.024)
Mean out-of-season grade	3.15	3.27	2.68	2.59	2.86	2.35
Observations	61,984	49,405	12,579	27,823	12,261	15,562

	Living with Two Parents			Not Living with Two Parents		
Panel B: Girls	**All (1)**	**White/Asian (2)**	**Black/Hispanic (3)**	**All (4)**	**Black/Hispanic (5)**	**All (6)**
Prop. semester active	0.002	−0.003	−0.000	−0.023	−0.052**	0.003
	(0.009)	(0.011)	(0.040)	(0.023)	(0.023)	(0.074)
Mean out-of-season grade	3.38	3.56	3.1	3.12	3.34	2.75
Observations	52,153	42,949	9,204	21,688	12,492	9,196

Note: See notes for Table 13.
***Significant at 1%; **significant at 5%; *significant at 10%.

is observed daily, grades are relatively infrequent outcomes; observed only twice per year. We therefore abandon the individual-by-year fixed effects, and adopt athlete and grade-level fixed effects (λ_a and η_g, respectively). Estimated standard errors again allow clustering at the school level.

While initial specifications in Table 12 suggest some systematic variation in academic performances with differences in the intensity of active participation, accounting for unobserved heterogeneity specific to students and to semester-specific courses within schools (in Column 3) yields point estimates that are small and statistically insignificant.[15]

In Table 13, we stratify by both gender and race, which reveals an important difference in how grades move with active participation. In particular, in boys, point estimates suggest that performance among Black and Hispanic athletes improves with active participation and the effect is statistically significant. White and Asian athletes appear to suffer slight declines, though the estimate is not statistically significant. The same asymmetry is true among female athletes, with White and Asian athletes' grades declining and Black and Hispanics' rising, but both effects are small relative to the effect for Black and Hispanic boys, and statistically significant at the 10% level only for White and Asian girls.

In Table 14 we again stratify by a measure of family structure—whether the student is recorded as living with both parents, or "not with both parents," which includes those in foster care, living with grandparents, or, as is predominantly the case, with one parent. Doing so suggests that it is Black and Hispanic boys who do not live with both parents that drive the relationship between active participation and improvements in academic outcomes. Moreover, the magnitude of the point estimate is not inconsequential, suggesting that Black and Hispanic boys spending most of the semester active could improve by nearly 0.3 in two classes (e.g., the difference between a B and a B+). Interestingly, this effect represents an approximately 20% reduction in the racial gap in grades for boys from this family structure, which is on par with the gap reduction seen in truancy. Stratifying by family structure also reveals that there is declining performance with active participation among White boys living with two parents. The magnitude of this decline is small, however, relative to the gains by Black and Hispanic athletes, and marginally significant.

Among girls, the academic performance of those living with both parents appears unresponsive to the athletic calendar, whether pooled or stratified by race. The net effect of greater active sports participation for girls not living with both parents is negative, which appears to be driven by declines by White and Asian girls.

15. Given the discrete nature of letter grades, a point estimate of 0.095 cannot represent a 0.095 average increase across all courses in a semester which is spent entirely in-season. Rather, accounting for such an effect arising from across six classes, the effect is equivalent to a student experiencing roughly a 0.3 point increase in two classes (e.g., going from B to B+) or a 0.6 point increase in one class (e.g., one grade being changed from B to A−).

V. CONCLUSION

Whereas parents and administrators may be concerned that sports draw students' priorities away from academics, we find little evidence to support that active participation either decreases school attendance or student achievement. Indeed, with daily student-level records of attendance, we find that active athletic participation in high school reduces absenteeism, with truancy reductions as the primary mechanism. Moreover, we find particularly strong responses among Black and Hispanic students, and athletes living in single-parent households, suggesting that the incentives introduced with high-school athletics may be of particular benefit to demographic groups that are often in relative need. This disproportionate response serves to reduce the racial gap in truancy by more than 20%.

Despite the overall reductions, there are partially offsetting increases in absenteeism following game days—when we allow for sport-specific effects, we find as large as a 28% increase in the propensity for football players to record unexcused absences on days following a game (relative to inactive athletes). While such truancy patterns increase confidence in having retrieved estimates of the causal effect of participation on absenteeism, at the same time we see the partial undoing of the attendance gains leading up to game days as an area of immediate concern. Students' transcripts also suggest that the truancy response we document around active participation shows up in academic gains—the longer is an athlete's length of season, the higher is academic performance.

APPENDIX

TABLE A1
Standard-Error Sensitivity around the Effect of Being in Active Competition on Unexcused and Excused Absences

Panel A: Boys (n = 1,382,011)	Unexcused (1)	Excused (2)
Active athlete	−0.018	−0.003
Standard-error estimates: IID	0.001***	0.002
Individual	0.003***	0.004
School-by-week	0.002***	0.003
School-by-year	0.004***	0.005
School	0.005**	0.006
Ibragimov-Müller (95% CI)	[−0.035, −0.009]	[−0.022, 0.012]

TABLE A1
Continued

Panel B: Girls (n = 1,132,704)	Unexcused (1)	Excused (2)
Active athlete	−0.004	−0.009
Standard-error estimates: IID	0.001***	0.003***
Individual	0.002*	0.004**
School-by-week	0.002**	0.004**
School-by-year	0.002	0.006
School	0.003	0.008
Ibragimov-Müller (95% CI)	[−0.021, 0.005]	[−0.038, 0.012]

Notes: All specifications include student-by-year and school-by-week fixed effects. Ibragimov-Müller confidence intervals follow Ibragimov-Müller (2010, 2013).

***Significant at 1%; **significant at 5%; *significant at 10%.

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