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High School Sports Involvement Diminishes the Association Between Childhood Conduct Disorder and Adult Antisocial Behavior

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Abstract

Purpose—Life course—persistent antisocial behavior manifests as a display of aggressive and antisocial behavior beginning in childhood (conduct disorder [CD]) and lasting through adulthood (adult antisocial personality disorder). This study aimed to build on prior research by evaluating whether involvement in high school sports helped attenuate the association between CD and subsequent adult antisocial behavior (AAB).

Methods—A prospective sample of 967 male and female adolescents (56% adopted) was used. Structured interviews were used to assess CD (symptoms before the age of 15 years), involvement in sports during high school, and past-year adult antisocial personality disorder symptoms in young adulthood (M age = 22.4 years).

Results—As expected, the association between CD and AAB was significantly less for those involved in sports ($\beta = .28$; $p < .001$) compared with those not involved in sports ($\beta = .49$; $p < .001$), $\chi^2(1) = 4.13$; $p = .04$. This difference remained after including known covariates of antisocial behavior in the model (age, gender, adoption status), and results were consistent across males and females. Involvement in other extracurricular activities (e.g., student government, plays, clubs) did not significantly moderate the relationship between CD and AAB.

Conclusions—Although selection effects were evident (those with more CD symptoms were less likely to be involved in sports), findings nevertheless suggest high school sports involvement may be a notable factor related to disrupting persistent antisocial behavior beginning in childhood and adolescence and lasting through young adulthood. Implications are discussed.

Keywords

Antisocial behavior; Conduct disorder; Extracurricular activities; Sports

Antisocial behavior, for example, failure to conform to norms or cruel, aggressive behavior, manifests as conduct disorder (CD) in childhood, which may or may not persist as antisocial personality disorder in adulthood. Adolescent-limited antisocial behavior may be normative, whereas life course–persistent antisocial behavior is particularly problematic [1,2]. Persistent antisocial behavior is substantially influenced by personality, neurocognitive [3,4], and genetic factors [5–7], which may be offset by beneficial environmental experiences [8,9]. Characteristics of neighborhood environment (e.g., presence of delinquent young people, availability of marijuana) are among the most consistent predictors of persistent antisocial behavior [10]. Other research has shown that CD and adult antisocial behavior (AAB) are more strongly related if there is an early onset of alcohol abuse [11,12]. Conversely, education and occupational achievement appear to offset the risk of persistent antisocial behavior [13], as does middle-to-high socioeconomic status [14].

The goal of the present study was to evaluate whether sports involvement in high school mitigates the association between childhood CD (before the age of 15 years) and young AAB (age ~22 years). High school sports involvement may offset risk for persistent antisocial behavior for several reasons. Typically, practice times often occur after school when adolescents are often unsupervised and when juvenile arrest rates peak [15]. Sports activity also provides exercise and guides other health behaviors, for example, adequate nutrition, that are correlated with childhood externalizing disorders [16]. Varsity sports may require a contract in which participating youth agree to maintain their grades and not use drugs to participate. For example, in Minnesota, students must make adequate progress toward school graduation requirements and not repeat a grade; engage in harassment or violence; or use tobacco, alcohol, or other drugs during the entire year [17]. Finally, although rare, sports involvement may provide an athletic scholarship for college and therefore may alter young adult trajectories for at-risk youth.

Cross-sectional research supports an association between reduced antisocial behavior and sports involvement and other extracurricular activities [18–21]. Mahoney and Stattin [19] found that for 14-year-old boys and girls, participation in highly structured leisure activities (e.g., sports) was negatively associated with antisocial behavior, whereas participation in low structure leisure activities (e.g., hanging out at a recreation center) was associated with higher levels of antisocial behavior. Other correlational research has found that involvement in sports or other extracurricular activities reduces the odds for smoking, illicit substance use, criminal activity in high school and young adulthood, being a high school dropout [18,22–24], and may be particularly important for children most at risk [19,25].

In their review of the literature, Morris et al. [26] concluded that, although some cross-sectional research supports an association between sports involvement and antisocial behavior, there has been little longitudinal research. Thus, we sought to investigate whether involvement in high school sports moderated the relationship between CD (before the age of 15 years) and past-year AAB in young adulthood (*M* age ~22), with the expectation that involvement in sports would help attenuate the CD–AAB association. We also aimed to evaluate whether involvement in extracurricular activities other than sports (e.g., clubs, debate, musicals) moderated the association between CD and AAB or whether this effect may be unique to sports specifically. Through this analysis, we were able to extend previous

work that evaluated the impact of extracurricular activities broadly [18–21] rather than the impact of each extracurricular activity specifically.

Methods

Participants

Data from all three waves of the Sibling Interaction and Behavior Study (SIBS) [27] were used in this investigation. An overall aim of SIBS was to understand genetic and environmental contributions to adolescent alcohol use and related psychopathology. Two types of families were recruited: families with a sibling pair who were related by adoption ($n = 409$) and families with full biological siblings ($n = 208$). Eligibility criteria for all families included having two children younger than 5 years of age. Families with adopted children were first recruited through three large adoption agencies (~600 to 700 placements per year). Adoptive family eligibility additionally included having an adopted child aged between 11 and 21 years who had been permanently placed into the adoptive home before 2 years of age (M age at placement = 4.7 months; standard deviation [SD] = 3.4 months; 96% were adopted before 1 year of age) and a second adolescent in the home who was not biologically related to the adopted adolescent. Families with biologically related children were recruited through publicly available birth certificates to match the adoptive sample in age and sex. SIBS was approved by the University Institutional Review Board.

Participation rates between nonadoptive (57%) and adoptive (63%) families were not significantly different. Comparisons of parents' education and marital status to 2000 census data show that parents were generally representative of the population although adoptive parents were more likely to have a college degree compared with nonadoptive parents [27]. After the baseline assessment, four sibling pairs were deemed ineligible (e.g., biologically related adopted siblings, developmental delay, death) and were excluded from further analysis.

Of the 1,226 eligible adolescents participating at Wave 1 (613 sibling pairs; M age = 14.9 years; $SD = 1.92$), more than half were adopted ($n = 691$, 56%) and female ($n = 671$, 55%). Adoptees included international (74%) and domestic placements (26%), with differences in ethnicity and gender across these two groups (international: 90% Asian ancestry; 60% female; domestic: 79% European ancestry; 41% female). Most nonadopted offspring were of European ancestry ($n = 96\%$, 46% female). Of those who participated in Wave 1, 94% ($n = 1,158$) returned for Wave 2 (~3.5 years later; M age = 18.3 years; $SD = 2.1$), and 92% ($n = 1,125$) participated at Wave 3 (~3.5 years later; M age = 22.4 years; $SD = 1.85$).

Procedure

After parents provided written informed consent for themselves and their children to participate (youth younger than 18 years provided written assent), families completed a variety of assessments, including diagnostic interviews and self-report surveys. Parents and children were interviewed separately by a different interviewer; each of whom had completed extensive training. Procedures at Wave 2 were similar to Wave 1, except only one parent (usually the mother) visited. Participants who were unable to visit the laboratory

at Wave 2 were interviewed by phone (15%). All Wave 3 interviews were conducted by phone.

Measures

Diagnostic assessment of antisocial behavior during childhood and early adulthood—Consistent with the DSM-IV definition of antisocial personality disorder, we assessed CD before the age of 15 years and AAB since the age of 15 years. DSM-IV symptoms of childhood CD (e.g., truancy, lying, and stealing) were assessed using the Diagnostic Interview for Children and Adolescents—Revised [28], modified for DSM-IV. A best estimate of both parent and child report was used so that if either endorsed the symptom, it was considered present. Symptoms were assigned based on a thorough review of the interviews and consensus by two individuals with advanced clinical training, supervised by a Ph.D.-level clinical psychologist. To maximize sensitivity, a weighted symptom count was utilized for CD so that if the symptom was subthreshold (i.e., disruptive behavior not severe or frequent enough to warrant a full symptom), it was counted as .5; if it was full-threshold, it was counted as 1.0 [29]. Because some adolescents were still 15 years old at Wave 2, the maximum of each individual symptom across Waves 1 and 2 was taken to obtain a lifetime CD symptom count through the age of 15 years.

AAB, characterized by more serious antisocial behavior since the age of 15 years (e.g., inconsistent work behavior and repeated arrests), was assessed with a Structured Clinical Interview for DSM-III-R Personality Disorders [30], modified for DSM-IV. Because we were interested in current antisocial behavior, we only counted antisocial behavior that was exhibited (1 = Yes; 0 = No) in the 12 months preceding the Time 3 assessment. Symptoms for every 25th case were coded for reliability by an independent consensus team ($\kappa = .78$ for CD and AAB diagnoses).

Sports involvement in high school—Involvement with sports during high school was measured using the Social Adjustment Interview, initially given when a participant was aged 19 years or older, usually after the completion of high school. Adolescents were asked “Did you belong to any clubs, organizations, athletic teams, or perform in any plays or musicals?” If they answered “yes,” they were asked to report which of the following organizations they belonged to: (1) varsity sports; (2) intramural sports; (3) student government; (4) debate/forensics; (5) clubs; (6) plays/musicals; (7) newspaper; and (8) other. If participants indicated extracurricular involvement in high school at any assessment, they were coded as involved in that activity in high school.

Attrition and missing values analyses

Chi-square difference tests showed that at Wave 2 participants did not differ from nonparticipants in gender (male, female), adoption status (adopted, not adopted), or ethnicity (European ancestry vs. other). There were no differences in adoption status or ethnicity associated with Wave 3 participation; however, females (94%) were significantly more likely to participate than males (90%); $\chi^2 = 6.56$ on 1 df; $p = .01$. There were no missing data on CD symptoms because we took the best estimate of each symptom across Wave 1 and Wave 2 assessments (all participants had Wave 1 data). Additionally, we had past-year

AAB data for everyone who participated at Wave 3 (92%). We did, however, have some missing data for sports involvement, either because of lack of participation at Wave 2 or Wave 3 assessments (6%–8%) or because the social adjustment interview given to those aged 18 years and younger did not include specific questions about involvement in sports (13%). The total sample size for our analysis based on these missing values was 967 (79% of eligible sample).

Analysis plan

Mplus 6.12 [31] was used to test study hypotheses. The cluster specification was used to account for nesting within families. The maximum likelihood with robust standard errors estimator was used to account for the non-normal distribution of the dependent variable (AAB). We included as covariates age, sex, and adoptive status as these variables have been shown to relate to externalizing disorders in prior research on this sample [32] and in others [33].

The magnitude of the CD-AAB path associations are described in terms of standardized coefficients (β , the mean difference in AAB in SDs for one symptom change in CD) and unstandardized coefficients (b , the mean difference in AAB for one symptom change in CD). To test for moderation of the CD-AAB association by sports involvement, we tested a “variant” model that allowed the regression of AAB on CD to vary across groups (sports involvement vs. no involvement), which was compared with an “invariant” model in which this association was constrained to be equal across groups. The chi-square difference test was used to determine significant differences between free and constrained models.

Results

Descriptive statistics

CD and AAB symptom counts by gender and adoption status are presented in Table 1. Males had significantly more CD and AAB symptoms than females. Although adoptees had slightly higher mean CD and AAB symptoms than biological offspring, these differences were not statistically significant (Table 1). CD and AAB were significantly correlated ($r = .39$; $p < .001$).

More than half the sample ($n = 646$, 66%) indicated they were involved in sports during high school ($n = 475$ varsity sports only, $n = 54$ intramural sports only, $n = 114$ both varsity and intramural sports)¹. We compared results using participants who played at either the varsity or intramural level with those who played varsity only; the results were the same. Therefore, we reported results for those involved with either varsity or intramural sports to retain maximal power. Notably, there was no significant difference in the percentages of those involved in sports by gender (males = 69%, females = 64%; $\chi^2(1) = 2.88$; $p = .09$) or adoption status (adopted = 66%, nonadopted = 66%; $\chi^2(1) = .01$; $p = .90$).

¹In the United States, varsity sports refer to involvement in sports activities that represent associated high schools in various city and state competitions. Intramural sports refer to recreational sports in which competition occurs within a school only (i.e., not competitively with other schools).

Compared to their involvement in sports, fewer adolescents were involved in student government (11%), debate/forensics (4%), or newspaper (7%), whereas considerable proportions were involved in clubs (40%) or plays/musicals (25%). There were some gender differences evident in extracurricular activity involvement. Females were more likely than males to be involved in student government (15% vs. 7%; $\chi^2(1) = 12.82$; $p < .001$), clubs (47% vs. 30%; $\chi^2(1) = 23.91$; $p < .001$), and plays/musicals (30% vs. 19%; $\chi^2(1) = 14.61$; $p < .001$). There were no significant gender differences in debate/forensics or newspaper involvement and no significant differences in extracurricular activity involvement by adoption status.

Table 2 describes CD and AAB symptoms for those involved in sports and all other extracurricular activities. Confirming prior cross-sectional research showing an association between sports involvement and antisocial behavior [18–20], those involved in high school sports had significantly fewer CD symptoms ($M = .91$; $SD = 1.31$) than those not involved ($M = 1.26$; $SD = 1.81$; $\chi^2(1) = 13.41$, $p < .001$); the effect size was small (Cohen's $d = -.22$). This difference remained significant after controlling for gender, $\chi^2(1) = 4.01$; $p < .05$. Notably, there was no significant difference in mean number of AAB symptoms for those involved or not involved in sports (Table 2).

There was some evidence of cross-sectional associations between CD and extracurricular involvement other than sports; those involved in student government, clubs, and plays/musicals had significantly fewer CD symptoms than those who were not involved. However, after controlling for gender, CD symptoms were no longer significantly different across involvement in student government [$\chi^2(1) = .15$; $p = .70$], clubs [$\chi^2(1) = .93$; $p = .34$], or plays/musicals [$\chi^2(1) = 1.23$; $p = .27$]. Also, those involved in clubs and plays/musicals had fewer AAB symptoms than those not involved. However, after controlling for gender, AAB symptoms were no longer significantly different across involvement in clubs [$\chi^2(1) = .30$; $p = .58$] but were significantly different for involvement in plays/musicals [$\chi^2(1) = 5.68$; $p = .02$]. Although the pattern of means in Table 2 generally shows more CD and AAB symptoms for those not involved in each of the extracurricular activities compared with those involved, there is little evidence that means were significantly different from one another, particularly after controlling for gender.

Does high school sports involvement moderate the relationship between conduct disorder and adult antisocial behavior?

The primary research question was whether the relationship between CD and AAB was significantly different across those who were involved versus not involved in high school sports. Confirming expectations, the relationship between CD and AAB was lower in magnitude for those involved in sports ($\beta = .28$; $b = .23$; $p < .001$) compared with those not involved ($\beta = .49$; $b = .33$; $p < .001$); $\chi^2(1) = 4.13$; $p = .04$. This effect remained after adding covariates of age, sex, and adoption status to the model, $\chi^2(1) = 4.79$; $p = .03$. Follow-up tests confirmed results were not significantly different across gender, $\chi^2(2) = 3.20$; $p = .20$.

What about other extracurricular activities?

We also evaluated whether involvement in extracurricular activities other than sports may have impacted the relationship between CD and AAB. For each of these group comparisons (involvement, no involvement), there was no significant difference in the association between CD and AAB (student government: $\chi^2(1) = .94$; $p = .33$; debate/forensics: $\chi^2(1) = .10$; $p = .76$; newspaper: $\chi^2(1) = .01$; $p = .94$; clubs: $\chi^2(1) = .11$; $p = .74$; plays/musicals: $\chi^2(1) = 1.46$; $p = .23$).

To further evaluate whether involvement in sports may be unique in its impact or whether being involved in extracurricular activities in general (i.e., combining various activities together) similarly reduces the association between CD-AAB, we evaluated significant differences in the CD-AAB association in four groups, including (1) those involved in sports but not any other extracurricular activity ($n = 268$); (2) those involved in any extracurricular activity other than sports ($n = 161$); (3) those involved in sports and at least one other extracurricular activity ($n = 366$); and (4) those not involved in any extracurricular activities ($n = 169$).

As expected, those involved in sports alone had a significantly smaller CD-AAB association ($\beta = .24$; $b = .19$; $p < .001$) than those not involved in any extracurricular activities ($\beta = .50$; $b = .35$; $p < .001$); $\chi^2(1) = 4.46$; $p = .04$. By contrast, there were no significant differences in the magnitude of the CD-AAB associations for those not involved in any extracurricular activities ($\beta = .50$; $b = .35$; $p < .001$) compared with (1) those involved in any extracurricular activity other than sports ($\beta = .42$; $b = .28$; $p < .001$); $\chi^2(1) = .78$; $p = .38$ and (2) those involved in sports plus at least one other extracurricular activity ($\beta = .32$; $b = .24$; $p < .001$), $\chi^2(1) = 1.99$; $p = .15$. Finally, we found no significant difference between those involved in sports alone and those involved in sports plus at least one other extracurricular activity, $\chi^2(1) = .46$; $p = .50$.

Discussion

Previous research has shown that antisocial behavior is substantially heritable [5–7], yet certain characteristics of the environment may offset or potentiate risk of life course–persistent antisocial behavior [10,11,13,14]. This study provides evidence that sports involvement in high school may be one such factor.

Following earlier research demonstrating a link between antisocial behavior and other markers of psychosocial health in relation to sports involvement [18–22], we found that those involved in sports had fewer CD symptoms than those not involved in sports. Although mean differences were small in effect, these findings demonstrate an important selection effect in sports involvement, that is, involvement may be a marker rather than a cause of positive adjustment for youth [19,34]. There were no mean differences in AAB symptoms for those involved in sports relative to those not involved, suggesting that there is not an overall protective impact of sports involvement on AAB. Rather, results suggest that sports involvement may be beneficial in offsetting risk for AAB for those with CD in particular. This finding follows earlier studies demonstrating such activities may be particularly important for children most at risk [19,25].

Specifically, we found that the association between CD and AAB in young adulthood was smaller in magnitude for those involved in sports during high school compared with those not involved. Although this association was not completely eliminated for those involved in sports and the magnitude of this moderation effect was generally small, results suggest sports involvement may be one factor important to desistence in antisocial behavior. An alternative explanation for the weaker association between CD and AAB for those involved in sports may be that sports involvement has a temporary effect on CD alone (e.g., providing supervision between 3 and 5 P.M.) rather than an enduring effect on AAB. Other explanations for why sports involvement may offset risk for persistence include physical and behavioral factors. Sports activity provides exercise and may guide other health behaviors, which may mediate the association between sports involvement and persistent antisocial behavior. Participation in varsity sports often requires a contract in which participating youth agree to maintain their grades and not use drugs or engage in violence; youth may not be able to participate or remain on the team if violations are noted [17]. Such contracts are often not required for participation in other extracurricular activities. Also, sports involvement may involve a substantially larger time commitment compared to other extracurricular activities. Future studies might consider evaluating potential mediators to better understand this relationship or use experimental methods (e.g., target children especially at risk for CD and randomly assigning them to conditions where they are encouraged vs. not encouraged to participate in sports) to tease apart any causal explanations.

We did not find that involvement in other extracurricular activities (student government, debate/forensics, clubs, plays, or newspaper) mitigated the relationship between CD and AAB, suggesting that sports involvement may be unique in this effect. We suspect this may be due to relatively lower levels of participation in some extracurricular activities relative to sports participation. For example, 66% of youth reported participating in varsity or intramural sports, whereas only 4% reported involvement in debate/forensics. Alternatively, many youth were involved in “clubs” (40%) and plays/musicals (25%). It may be that youth at risk for externalizing problems are more likely to select into sports compared to other extracurricular activities, and we found some evidence for this (see Table 2) particularly when accounting for gender in selection effects. As this is the first report that we are aware of that evaluates the moderating effect of high school extracurricular involvement on persistent, clinically assessed, antisocial behavior through the use of prospective data, replication and extension is necessary to anchor study findings.

We were not able to evaluate differences in type of sports involvement. Some research suggests involvement in power sports (e.g., martial arts, wrestling) increases the risk for antisocial behaviors for boys [35,36]. Endresen and Olweus [35] evaluated antisocial behavior only through mid-adolescence (ages, 11–15 years); thus, it is unclear if these effects would replicate in adulthood (e.g., age, 22 years). Forbes et al. [36] used retrospective report of sports involvement in a sample of college men and found that those in aggressive sports (e.g., football, basketball, wrestling, soccer) engaged in more psychological and physical aggression, and more sexual coercion toward their dating partners than men involved in non-aggressive (e.g., baseball, golf, cross-country, swimming) or no sports in high school. A second limitation includes generalizability. Although this sample is diverse in ethnicity in part through the inclusion of international adoptees, children

in this sample were primarily from two-parent families with parents of European ancestry. Replication is necessary to confirm whether findings will replicate in other populations. Strengths of this study include the use of prospective data through age ~22, clinical assessment of CD and AAB symptoms, the inclusion of both genders, as well as the inclusion of adopted and nonadopted adolescents.

This is one of many studies that have demonstrated how environmental experiences may offset or amplify risk of life course–persistent antisocial behavior [10–14]. In addition to academic and employment achievement [13], abstaining from substance use [11,12] and having a good neighborhood environment [10], it appears that high school sports involvement may offset risk for persistent antisocial behavior. It is crucial for future research to continue to identify additional environmental factors that mitigate the relationship between CD and AAB.

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References

1. Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychol Rev.* 1993; 100:674–701. [PubMed: 8255953]
2. Pulkkinen L, Lyyra AL, Kokko K. Life success of males on nonoffender, adolescence-limited, persistent, and adult-onset antisocial pathways: Follow-up from age 8 to 42. *Aggress Behav.* 2009; 35:117–135. [PubMed: 19184986]
3. Moffitt, TE. A review of research on the taxonomy of life-course persistent versus adolescence-limited antisocial behavior. In: Cullen, FT.; Wright, JP.; Blevins, KR., editors. *The Status of Criminological Theory*. New Brunswick, New Jersey: Transaction Publishers; 2008. p. 277–310.
4. White HR, Bates ME, Buysse S. Adolescence-limited versus persistent delinquency: Extending Moffitt's hypothesis into adulthood. *J Abnorm Psychol.* 2001; 110:600–609. [PubMed: 11727949]
5. Dick DM, Viken RJ, Kaprio J, et al. Understanding the covariation among childhood externalizing symptoms: Genetic and environmental influences on conduct disorder, attention deficit hyperactivity disorder, and oppositional defiant disorder symptoms. *J Abnorm Child Psychol.* 2005; 33:219–229. [PubMed: 15839499]
6. Hicks BM, Krueger RF, Iacono WG, et al. Family transmission and heritability of externalizing disorders—A twin-family study. *Arch Gen Psychiatry.* 2004; 61:922–928. [PubMed: 15351771]
7. Krueger RF, Hicks BM, Patrick CJ, et al. Etiologic connections among substance dependence, antisocial behavior, and personality: Modeling the externalizing spectrum. *J Abnorm Psychol.* 2002; 111:411–424. [PubMed: 12150417]
8. Feinberg ME, Button TM, Neiderhiser JM, et al. Parenting and adolescent antisocial behavior and depression—Evidence of genotype × parenting environment interaction. *Arch Gen Psychiat.* 2007; 64:457–465. [PubMed: 17404122]
9. Hicks BM, South SC, DiRago AC, et al. Environmental adversity and increasing genetic risk for externalizing disorders. *Arch Gen Psychiat.* 2009; 66:640–648. [PubMed: 19487629]
10. Herrenkohl TI, Lee J, Hawkins JD. Risk versus direct protective factors and youth violence: Seattle social development project. *Am J Prev Med.* 2012; 43:S25–S40.
11. Howard R, Finn P, Jose P, et al. Adolescent-onset alcohol abuse exacerbates the influence of childhood conduct disorder on late adolescent and early adult antisocial behaviour. *J Forens Psychiatry Psychol.* 2012; 23:7–22. [PubMed: 23459369]

12. Khalifa N, Duggan C, Howard R, et al. The relationship between childhood conduct disorder and adult antisocial behavior is partially mediated by early-onset alcohol abuse. *Personal Disord.* 2012; 3:423–432. [PubMed: 22888992]
13. Elkins IJ, Iacono WG, Doyle AE, et al. Characteristics associated with the persistence of antisocial behavior: Results from recent longitudinal research. *Aggress Violent Beh.* 1997; 2:101–124.
14. Lahey BB, Loeber R, Burke JD, et al. Predicting future antisocial personality disorder in males from a clinical assessment in childhood. *J Consult Clin Psych.* 2005; 73:389–399.
15. Snyder, HN.; Sickmund, M. *Juvenile Offenders and Victims: 2006 National Report.* Washington, DC: U.S. Department of Justice, Office of Justice Programs, Office of Juvenile Justice and Delinquency Prevention; 2006.
16. Liu JH, Raine A, Venables PH, et al. Malnutrition at age 3 years and externalizing behavior problems at ages 8, 11, and 17 years. *Am J Psychiatry.* 2004; 161:2005–2013. [PubMed: 15514400]
17. Minnesota State High School League. 2013–2014. Minnesota State High School League Handbook. Available at: <http://www.mshsl.org/mshsl/Publications/code/handbook/200%20Bylaws.pdf>.
18. Harrison PA, Narayan G. Differences in behavior, psychological factors, and environmental factors associated with participation in school sports and other activities in adolescence. *J Sch Health.* 2003; 73:113–120. [PubMed: 12677730]
19. Mahoney JL, Stattin H. Leisure activities and adolescent antisocial behavior: The role of structure and social context. *J Adolesc.* 2000; 23:113–127. [PubMed: 10831137]
20. Rutten EA, Stams GJ, Biesta GJ, et al. The contribution of organized youth sport to antisocial and prosocial behavior in adolescent athletes. *J Youth Adolesc.* 2007; 36:255–264.
21. Kretschmer T, Oliver BR, Maughan B. Pubertal development, spare time activities, and adolescent delinquency: Testing the contextual amplification hypothesis. *J Youth Adolesc.* 2014; 43:1346–1360. [PubMed: 24323040]
22. Bohnert AM, Garber J. Prospective relations between organized activity participation and psychopathology during adolescence. *J Abnorm Child Psychol.* 2007; 35:1021–1033. [PubMed: 17602293]
23. Kwan M, Bobko S, Faulkner G, et al. Sport participation and alcohol and illicit drug use in adolescents and young adults: A systematic review of longitudinal studies. *Addict Behav.* 2014; 39:497–506. [PubMed: 24290876]
24. Audrain-McGovern J, Rodriguez D, Wileyto EP, et al. Effect of team sport participation on genetic predisposition to adolescent smoking progression. *Arch Gen Psychiatry.* 2006; 63:433–441. [PubMed: 16585473]
25. Modecki KL, Barber BL, Eccles JS. Binge drinking trajectories across adolescence: For early maturing youth, extra-curricular activities are protective. *J Adolesc Health.* 2014; 54:61–66. [PubMed: 24060575]
26. Morris L, Sallybanks J, Willis K. Sport, physical activity and antisocial behavior in youth. *Aust Inst Criminology Res Public Policy Ser.* 2003; 49
27. McGue M, Keyes M, Sharma A, et al. The environments of adopted and non-adopted youth: Evidence on range restriction from the Sibling Interaction and Behavior Study (SIBS). *Behav Genet.* 2007; 37:449–462. [PubMed: 17279339]
28. Reich W. Diagnostic Interview for Children and Adolescents (DICA). *J Am Acad Child Psychiatry.* 2000; 39:59–66.
29. Elkins IJ, McGue M, Iacono WG. Prospective effects of attention-deficit/hyperactivity disorder, conduct disorder, and sex on adolescent substance use and abuse. *Arch Gen Psychiatr.* 2007; 64:1145–1152. [PubMed: 17909126]
30. Spitzer, RL.; Williams, JBW.; Gibbon, M., et al. *Structured Clinical Interview for DSM-III-R personality disorders (SCID-II).* New York, NY: New York State Psychiatric Institute, Biometrics Research; 1987.
31. Muthén, Muthén. Mplus [computer software]. Los Angeles, CA: Muthén & Muthén; 1998–.
32. Keyes MA, Sharma A, Elkins IJ, et al. The mental health of US adolescents adopted in infancy. *Arch Pediatr Adolesc Med.* 2008; 162:419–425. [PubMed: 18458187]

33. Juffer F, van IJzendoorn MH. Behavior problems and mental health referrals of international adoptees—A meta-analysis. *JAMA*. 2005; 293:2501–2515. [PubMed: 15914751]
34. Darling N, Caldwell LL, Smith R. Participation in school-based extracurricular activities and adolescent adjustment. *J Leis Res*. 2005; 37:51–76.
35. Endresen IM, Olweus D. Participation in power sports and antisocial involvement in preadolescent and adolescent boys. *J Child Psychol Psychiatry*. 2005; 46:468–478. [PubMed: 15845127]
36. Forbes GB, Adarns-Curtis LE, Pakalka AH, et al. Dating aggression, sexual coercion, and aggression-supporting attitudes among college men as a function of participation in aggressive high school sports. *Violence Against Women*. 2006; 12:441–455. [PubMed: 16617170]

IMPLICATIONS AND CONTRIBUTION

Although selection effects are evident, high school involvement in sports, but not other extracurricular activities, appears to offset risk for life course–persistent antisocial behavior. Findings suggest sports involvement is a unique protective factor for children exhibiting externalizing behaviors. Experimental research is needed to tease apart causal effects.

Table 1

Descriptive information for conduct disorder (CD) and adult antisocial behavior (AAB): symptoms by gender and adoption status (N = 1,226)

Gender	$\chi^2(1 \text{ df})$		Adoption status		$\chi^2(1 \text{ df})$	Range
	Males (n = 555)	Females (n = 671)	Adoptees (n = 691)	Biological offspring (n = 535)		
CD	1.48 (1.88)	.67 (1.12)	108.06***	1.10 (1.60)	.95 (1.51)	2.23 0–10.5
AAB	1.01 (1.18)	.58 (.98)	41.25***	.82 (1.12)	.70 (1.06)	2.77 0–7.0

Means (standard deviations) of CD and AAB are described across gender and adoption status. Differences across groups were tested by constraining means and using the chi-square difference test (χ^2) on 1° of freedom (df) to compare variant and invariant models.

Significance is denoted by *** $p < .001$.

Descriptive information for conduct disorder (CD) and adult antisocial behavior (AAB): symptoms by extracurricular involvement

Table 2

	CD		AAB		$\chi^2(1 \text{ df})$	$\chi^2(1 \text{ df})$
	Involved	Not involved	Involved	Not involved		
Sports	.91 (1.31)	1.26 (1.81)	.77 (1.06)	.82 (1.23)	13.41***	.45
Student government	.61 (1.02)	1.08 (1.55)	.67 (.87)	.80 (1.14)	6.62*	1.59
Debate/forensics	.70 (1.05)	1.04 (1.53)	.57 (.86)	.79 (1.13)	1.58	1.76
"Clubs"	.75 (1.22)	1.21 (1.65)	.61 (.95)	.90 (1.20)	16.75***	15.48***
Plays/musicals	.79 (1.24)	1.11 (1.58)	.57 (.93)	.85 (1.16)	7.05**	9.26**
Newspaper	.81 (1.24)	1.04 (1.53)	.58 (.88)	.79 (1.13)	1.19	1.47

Means (standard deviations) of CD and AAB are described across extracurricular activity involvement. Differences across groups were tested by constraining means and using the chi-square difference test (χ^2) on 1° of freedom (df) to compare variant and invariant models.

Significance is denoted by *** $p < .001$; ** $p < .01$; * $p < .05$.