



Published in final edited form as:

J Adolesc Health. 2014 March ; 54(3): 333–340. doi:10.1016/j.jadohealth.2013.09.002.

Painfully Obvious: A longitudinal examination of medical use and misuse of opioid medication among adolescent sports participants

Philip Veliz, Ph.D.^a, Quyen M. Epstein-Ngo, Ph.D.^a, Elizabeth Meier, Ph.D.^a, Paula Lynn Ross-Durow, Ph.D.^a, Carol J. Boyd, Ph.D.^b, and Sean Esteban McCabe, Ph.D.^a

^aInstitute for Research on Women and Gender, University of Michigan, 204 S. State St., Ann Arbor, MI 48109

^bSchool of Nursing, University of Michigan, 400 North Ingalls, Ann Arbor, MI 48109

Abstract

Purpose—The objective of this longitudinal study was to assess the prevalence of medical use, medical misuse, and nonmedical use of opioid medication among adolescents who participate in organized sports.

Methods—Data for this study were taken from the Secondary Student Life Survey (SSLS). A total of 1,540 adolescents participated in three waves of data collection occurring between the 2009–10 and 2011–12 school years, with 82% of the baseline sample completing all three waves.

Results—Using Generalized Estimating Equation (GEE) models to analyze the longitudinal data, it was found that male adolescents who participated in organized sports during each wave of the SSLS had higher odds of being prescribed an opioid medication (i.e., medical use) during the past year (AOR = 1.86, 95% CI = 1.23, 2.82), higher odds of past-year medical misuse of opioid medication due to taking too much (AOR = 10.5, 95% CI = 2.42, 45.5), and higher odds of past-year medical misuse of opioid medication in order to get high (AOR = 4.01, 95% CI = 1.13, 14.2) when compared to males who did not participate in organized sports during the study period. Among females, no association was found between participation in organized sports and medical use, medical misuse, and nonmedical use of opioid medication.

Conclusions—The results of this study indicate that adolescent males who participate in sports may have greater access to opioid medication, putting them at greater risk to misuse these controlled substances.

Key Words or Short Phrases

Adolescents; Prescription Medications; Opioid Use; Opioid Misuse; Sports Participation

© 2013 Society for Adolescent Medicine. Published by Elsevier Inc. All rights reserved.

Corresponding Author: Philip Veliz, Ph.D., Institute for Research on Women and Gender, University of Michigan, 204 S. State St., Ann Arbor, MI 48109, Phone: 716-867-2583, Fax: 734-764-9533, pveliz@umich.edu.

Implications and Contribution

This investigation revealed that male adolescents who continually participate in organized sports have higher odds of medical use and misuse of opioid medications. This finding suggests that male athletes may be at a greater risk to misuse opioid medications due to greater access to these medications.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Introduction

Controlled medications prescribed to adolescents during visits to emergency departments and hospital-based outpatient clinics almost doubled between 1994 and 2007, with opioids being the most frequently prescribed (i.e., roughly 3.5% in 1994 versus roughly 6% in 2007) [1]. Despite the therapeutic benefit of opioid medications to alleviate pain, these medications are misused in a variety of ways among youth [2–8]. For instance, the 2011 *Monitoring the Future* (MTF) study indicated that 8.7% of 12th graders indicated using prescription opioids (e.g., Vicodin®) without a doctor's orders (i.e., nonmedical use) during the past year [9].

These numbers from national surveys should be alarming given the high abuse potential of opioid medication and the current trend among some states to tighten restrictions on opioid medications to help curb a potential epidemic in the U.S. [10]. Even though there is increased public awareness of opioid misuse, adolescents involved in organized sports may be more likely to misuse opioid medications due to their increased risk for injury. Currently, there are nearly seven and a half million adolescents participating in sports at the high-school level [11]. However, it is reported that two million high-school athletic injuries occur each year, and roughly a quarter of emergency department visits among children and adolescents are the result of sports-related injuries [12–14].

Given the elevated risk of injury for sports participants, it would be likely that adolescents who participate in organized sports would be more likely to have been prescribed opioid medication when compared to their nonparticipating peers. Unfortunately, no research has examined if adolescent sports participants are more likely to use opioid medication than non-participants. Despite this gap in the literature, a recent study using data from the MTF survey examined whether participation in different types of competitive sports was associated with the nonmedical use of opioid medications [15]. The study found that secondary students who participated in football and wrestling had higher odds of using opioids nonmedically during the past year. The results of this study make sense given that football and wrestling have the highest severe injury rates among high school sports [16]. However, due to limitations in the MTF data, the study noted above only examined one measure of opioid misuse (i.e., nonmedical use) and could not assess whether sports participants were more likely to medically use or medically misuse opioid medications.

Even though sports participants may have a greater propensity to medically use opioid medications, it does not suggest that they would also be at a greater risk to misuse these prescription medications. In fact, many studies have found that involvement in organized sports is positively associated with a host of prosocial behaviors and has also been found to be a protective factor against adolescent substance use [17–19]. While most studies find sports participation is negatively associated with cigarette use and illicit drug use, there is consistent support that athletes are more likely to drink alcohol and engage in problem drinking [20]. Despite the positive benefits that adolescents gain from participation in sports, sports participation may actually put some adolescents at risk for substance use due to either increased access to different types of substances [15], the stress associated with athletic participation and maintaining a competent athletic identity [21–24], or exposure to a set of normative behaviors that can facilitate the use of different types of substances (e.g., using performance enhancing drugs to be the best) [25]. In other words, a critical examination of adolescent sports participation is necessary in order to examine if certain subpopulations of youth are at risk of various types of substance use, particularly substances with high abuse potential like opioid analgesics.

The purpose of this longitudinal study was to explore the association between participation in organized sports and the odds of past-year medical use (i.e., being prescribed a

medication), medical misuse (i.e., take too much of your own prescribed medication, or used your own prescription medication to get high), and nonmedical use (i.e., took medications not prescribed to you) of opioid medications. It is expected that sports participants will have a higher odds of past-year medical use, medical misuse, and nonmedical use of opioid medications when compared to nonparticipants. In particular, adolescents who continually participate (i.e. participate in each wave of the study) in sports should have the highest odds of medical use and misuse due to their increased exposure to opioid medications either directly through injury, or indirectly from leftover medications from old prescriptions or handouts from injured teammates.

Methods

The longitudinal subsample (n = 1,540) for this study comes from a larger, NIDA funded study of 4,511 middle school and high school students who participated in the Secondary Student Life Survey (SSLS) during the 2009–10, 2010–11, and 2011–12 school years. The longitudinal subsample consisted of 7th through 10th graders from the 2009–10 school year who completed the SSLS for all three waves of data collection. The average age of the longitudinal subsample at wave 1 was roughly 14 (ages ranged between 11 and 17), the average age at wave 2 was roughly 15 (ages ranged between 12 and 18), and the average age at wave 3 was roughly 16 (ages ranged between 13 and 19). The SSLS is a web-based survey that is given to the population of students at three high schools and two middle schools located in southeast Michigan. The average response rate for the SSLS across the three waves was roughly 68%, with a final retention rate of 83%. The response and retention rates for this study are comparable with other large-scale surveys on substance use [9].

Measures

The dependent variables measure past-year medical use, medical misuse and nonmedical use of opioid medications. Four dependent variables were created from the following questions: **(1) medical use** - “On how many occasions in the past 12 months has a doctor, dentist, or nurse prescribed the following types of medicine for you? *Pain Medication* (e.g., opioids such as Vicodin®, OxyContin®, Tylenol 3® with codeine, Percocet®, Darvocet®, morphine, hydrocodone, oxycodone)”; **(2) medical misuse/used too much** - “On how many occasions (if any) in the past 12 months have you used too much (e.g., higher doses, more frequent doses) of your prescribed medication? *Prescribed pain medication* (e.g., opioids [...])”; **(3) medical misuse/used to get high** - “On how many occasions (if any) in the past 12 months have you intentionally gotten high with your prescribed medication or used it to increase other drug or alcohol effects? *Prescribed pain medication* (e.g., opioids [...])”; **(4) Nonmedical use** - “On how many occasions in the past 12 months have you used the following types of medicines not prescribed to you? *Pain Medication* (e.g., opioids [...]).” The response scale for these four items included (1) Never, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, and (7) 40 or more occasions. For the analysis, all four questions were recoded as dichotomous variables, with 0 indicating no use/misuse of opioid medications during the past year and 1 indicating use/misuse of opioid medications during the past year. Further, two additional pairs of dichotomous variables were created for each of the four dependent variables in order to measure whether respondents medically used/misused opioids on only 1 or 2 occasions during the past year, or whether they used/misused opioid medications on multiple occasions during the past year (i.e. 3 or more occasions). Including these two additional sets of dichotomous variables helped assess whether opioid use or misuse was either sporadic (i.e. 1 or 2 occasions) or chronic (i.e. 3 or more occasions) among the adolescents in the study.

The main independent variable for this analysis is participation in organized sports and was measured by asking respondents to list three "...organization, clubs, teams, or groups you belong to." Respondents were given three spaces to type in the different organization, clubs, teams, or groups that they were involved with during that school year. Any sport team or club sport that was listed was considered an indicator of participation in organized sports. Roughly 63% of respondents indicated being involved in an organized sport at some point during the three waves of the SSLS. This estimate is comparable to another nationally representative survey that asked adolescents whether they had ever participated in organized or team sports [26].

Based on findings of previous studies, several control variables were included in the analyses to account for other factors that might influence medical use and misuse of opioid medications [7–8, 27]. The control variables included grade-level when the respondent participated in the SSLS at wave 1, parents' highest level of education, race, and a variable that captures the effect of time. Moreover, the Drug Abuse Screening Test, Short Form (DAST-10) was used as an additional control variable to account for respondents who may have a drug abuse problem on a variety of substances other than alcohol [28]. Respondents who used drugs other than alcohol during the past year were asked whether they had experienced any of 10 drug-related problems in the past 12 months. Based on past research, if a respondent positively endorsed three or more DAST items, this was considered a positive screen that signified a possible risk for drug abuse or dependence [28–29]. The percentages for these control variables are presented in table 1.

Data Analysis

The data analysis included 1,494 students who completed each wave of the SSLS between the 2009–10 and 2011–12 school years (46 respondents were excluded due to missing data). First, descriptive statistics for the dependent measures were described using frequency tables for males and females separately. Second, generalized estimating equation (GEE) models were used to assess the impact of sports participation (i.e., sports participation in general and continuous participation across each wave) on the odds of medical use, medical misuse, and nonmedical use of opioid medications for males and females separately [30]. Finally, the Z-test for the equality of coefficients was used in order to test differences between the strength of the coefficients between male sport participants and female sports participants for each group of models estimated in the GEE analyses [31].

Results

Table 2 provides descriptive statistics for the dependent variables for males and females. Findings indicated that females had significantly higher rates of medical use, medical misuse (only for using too much), and nonmedical use of opioid medications when compared to males. Examining the combined frequencies across the three waves of the SSLS, 28.4% of respondents indicated medical use of opioid medications on at least 1 occasion, with 6.9% of respondents indicating medical use on 3 or more occasions during the three year study period. With regard to medical misuse of prescribed opioid medications, 5.0% of respondents indicated using too much of their opioid medications on at least 1 occasion and 2.7% of respondents indicated using their opioid medications to get high on at least one occasion during the three year study period. Moreover, 1.8% of respondents indicated using too much of their prescribed opioid medication on 3 or more occasions and 0.7% of respondents indicated using their prescribed opioid medication to get high on 3 or more occasions during the three year study period. For nonmedical use of opioid medications, 10.7% of respondents indicated nonmedical use of opioid medication on at least 1 occasion,

with 4.5% indicating nonmedical use of opioid medications on 3 or more occasions during the three year study period.

Table 3 provides the results of the GEE models that examine the influence of sports participation (in general) on past-year medical use, medical misuse, and nonmedical use of opioid medications. When compared to male nonparticipants, male participants in organized sports had higher odds of past-year medical use of opioid medication on at least 1 occasion (Model 1a: AOR = 1.40, 95% CI = 1.03, 1.92) as well as past-year medical use of opioid medication on 3 or more occasions (Model 3a: AOR = 1.95, 95% CI = 1.03, 3.69). Further, the association between sports participation and past-year medical use of opioid medication on at least 1 occasion ($Z = 1.98, p < .05$), and medical use of opioid medications on 3 or more occasions ($Z = 2.01, p < .05$) was significantly different between males and females. This indicates that male adolescents who participate in sports are at greater risk than non-participants for past year medical use on at least 1 occasion and past year medical use on 3 or more occasions, while female adolescents who participate in sports are at no greater or less risk than non-participants for past year medical use on at least 1 occasion and past year medical use on 3 or more occasions.

Table 3 also shows that when compared to male nonparticipants, male participants in organized sports have higher odds of using too much of their prescribed opioid medication on at least 1 occasion during the past year (Model 4a: AOR = 2.99, 95% CI = 1.22, 7.41) and had higher odds of indicating using too much of their prescribed opioid medication on only 1 or 2 occasions during the past year (Model 5a: AOR = 3.73, 95% CI = 1.10, 12.7). Moreover, only the association between sports participation and past-year medical misuse (used too much) on at least 1 occasion was found to be significantly different between males and females ($Z = 2.45, p < .05$).

Table 4 provides results from the GEE models that assessed the impact of sports participation (continuous sports participation across each wave of the SSLS) on past-year medical use, medical misuse, and nonmedical use of opioid medications (analyses for 'used on 1 or 2 occasions' and '3 or more occasions' were not displayed in table 4). The analyses revealed that males who were continual sports participants (participated during each wave of the SSLS) had higher odds of past-year medical use on at least 1 occasion (Model 13a: AOR = 1.86, 95% CI = 1.23, 2.82), higher odds of past-year medical misuse due to taking too much on at least 1 occasion (Model 14a: AOR = 10.5, 95% CI = 2.42, 45.5), and had higher odds of past-year medical misuse in order to get high on at least 1 occasion (Model 15a: AOR = 4.01, 95% CI = 1.13, 14.2) when compared to males who did not participate in sports across the three waves of the SSLS. Moreover, the association between continual sports participants and past-year medical use of prescription opioids ($Z = 2.13, p < .05$), using too much of your prescription opioid medications ($Z = 3.58, p < .001$), and getting high with your prescription opioid medications ($Z = 2.02, p < .05$) were significantly different between males and females. Finally, it should also be highlighted that when compared to male nonparticipants, male continual sports participants had higher odds of past-year medical use of opioid medications on 3 or more occasions (model not presented in tables: AOR = 3.26, 95% CI = 1.27, 8.34), and the association was also found to be significantly different from female continual sports participants ($Z = 2.04, p < .05$).

Discussion

This study found that male adolescents who participated in organized sports had higher odds of past-year medical use and medical misuse (i.e., used too much) of opioid medications on at least 1 occasion when compared to male nonparticipants. Moreover, male sports participants had higher odds of past-year medical use of opioid medications on multiple

occasions when compared to male nonparticipants. Among male adolescents who participated in organized sports across each wave of the SSLS, these sports participants were found to have the highest odds of past-year medical use and medical misuse ('used too much' and 'used to get high') of opioid medications on at least 1 occasion when compared to their male peers who did not participate in sports at any point during the study. In regards to nonmedical use of opioid medications, no associations were detected among male sports participants.

The GEE analysis found no associations between sports participation and the odds of medical use, medical misuse, and nonmedical use of opioid medications among females. In fact, all of the statistically significant positive associations found between sports participation and medical use and misuse of opioid medications among males were significantly different from the null associations found between sports participation and medical use and misuse of opioid medications among females (except for model 5a/5b). This set of findings implies that adolescent males who participate in organized sports, particularly males who are continually involved in sports year after year, are at a greater risk of medical use and medical misuse of opioid medications when compared to their female peers who participate in organized sports.

In view of the empirical reality that adolescent males are more susceptible to severe injuries from participating in sports [16], it appears evident that male sports participants are more likely to be prescribed opioid medications. Moreover, the risk for male athletes to misuse these medications is amplified given that many adolescents have unsupervised access to these medications, and are more likely to obtain opioid medications for nonmedical use from their peers (particularly males) [8, 32]. Although the ostensible relationship between sports participation and medical use and misuse are driven by opportunity and access, it should be recognized how sports is a pivotal force in male adolescent development and how it can influence opioid use. Adolescent males depend on sports for social status, the maintenance of relationships with male peers and family members, and for a competent male identity [22, 33]. In other words, sports are a powerful site to be recognized as a man, and male adolescents will sacrifice their bodies through athletic performances to prove their masculinity. Consequently, opioid use and misuse among males could be the byproduct of a culture that teaches adolescents to play through pain.

This study partially confirmed the expected association between sports participation and the odds of medical use and misuse of opioid medications among adolescent males. However, the lack of any association between female sports participants and the odds of past-year opioid use and misuse needs some clarification given that a substantial percent of female high school athletes are estimated to be injured (21% of male athletes versus 14% of female athletes) due to their participation in sports [11, 34]. The data across the three waves of the SSLS indicated that females (in general) were more likely than males to indicate past-year medical use, medical misuse/used too much, and nonmedical use of opioid medications. This gender difference in opioid use and misuse makes sense given that females indicate greater pain sensitivity, more severe levels of pain and report pain of longer lengths when compared to men [35–36]. As a result of the higher proportion of females who medically use and misuse opioid medications, the influence of sports participation on opioid use may be mediated given females' increased access to these medications. Moreover, some studies have found a protective effect of sports participation on substance use among female athletes [18, 37–39], which may lower the risk of misusing opioid medications when compared to their nonparticipating female peers.

The results of this longitudinal study on interscholastic sports participation and prescription opioid use provide some evidence of an association between interscholastic sports

participation and prescription opioid use and misuse. Although medical prescription opioid use is not necessarily problematic, the risk of having unsupervised access to these medications can put adolescents at risk of illegally distributing or illegally using these controlled substances. Given that adolescents who participate in interscholastic sports may have greater access to opioid medications, greater awareness should be instilled in parents and coaches to monitor, store, and dispose of these medications properly.

Finally, there are several strengths and limitations that need to be discussed. A major strength of this study is that it is longitudinal and one of the first to examine the association between sports participation and opioid use and misuse among adolescents. Further, this study distinguished between several types of opioid misuse, such as medical misuse and nonmedical use, that other national surveys fail to distinguish in their measures [27]. Unfortunately, the conclusions from this study cannot be generalized to the population of adolescents in the U.S. given that the study drew on a population of five schools located in southeast Michigan. Despite the regional sample used, the measures used in the SSLS and delivery of the survey enhanced the quality and breadth of information collected from the adolescents who participated in the survey. Another limitation of this study was the lack of any measures that captured the normative environment regarding substance use among the adolescents' peers. Adolescents orient their substance use behaviors based on their peers' actual substance use and their perceptions of their peers substance use [40]. Future studies need to assess the normative orientations towards prescription opioid use and misuse within various sporting contexts. A final limitation that must be acknowledged was that the SSLS did not include measures to assess whether sports participants used, or misused opioids due to a sports-related injury. Although this is a weakness in the study, the data used to answer the questions proposed in this study is the best suited given the paucity of surveys that ask questions on both organized sports participation and the variety of measures that assess past-year opioid use.

Acknowledgments

This study was supported by National Institute for Drug Abuse research grants R01 DA024678, R01 DA031160, and T32 DA07267. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Drug Abuse or the National Institutes of Health.

Abbreviations used in Text

MTF	Monitoring the Future
SSLS	Secondary Student Life Survey
GEE	Generalized Estimating Equation
DAST-10	Drug Abuse Screening Test, Short Form

References

1. Fortuna RJ, Robbins BW, Caiola E, et al. Prescribing of controlled medications to adolescents and young adults in the United States. *Pediatr.* 2010; 126:1108–16.10.1001/archpediatrics.2012.85
2. Boyd CJ, McCabe SE, Cranford JA, et al. Adolescents' motivations to abuse prescription medications. *Pediatrics.* 2006; 118:2472–2480.10.1542/peds.2006-1644 [PubMed: 17142533]
3. McCabe SE, West BT, Boyd CJ. Leftover Prescription opioids and nonmedical use among high school seniors: a multi-cohort national study. *J Adolesc Health.* 2012 in press. 10.1016/j.jadohealth.2012.08.007

4. McCabe SE, West BT, Teter CJ, et al. Medical and nonmedical use of prescription opioids among high school seniors in the united states. *Arch Pediatr Adolesc Med.* 2012; 166:797–802.10.1001/archpediatrics.2012.85 [PubMed: 22566521]
5. McCabe SE, West BT, Teter CJ, et al. Co-ingestion of prescription opioid and other drugs among high school seniors: results from a national study. *Drug Alcohol Depend.* 2012; 126:65–70.10.1016/j.drugalcdep.2012.04.017 [PubMed: 22609061]
6. McCabe SE, West BT, Teter CJ, et al. Adolescent nonmedical users of prescription opioids: brief screening and substance use disorders. *Addict Behav.* 2012; 37:651–656.10.1016/j.addbeh.2012.01.021 [PubMed: 22366397]
7. McCabe SE, Boyd CJ, Cranford JA, et al. Motives for nonmedical use of prescription opioids among high school seniors in the united states: self-treatment and beyond. *Arch Pediatr Adolesc Med.* 2009; 163:739–744.10.1001/archpediatrics.2009.120 [PubMed: 19652106]
8. McCabe SE, Cranford JA, Boyd CJ, et al. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. *Addict Behav.* 2007; 32:562–575. [PubMed: 16843611]
9. Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. *Monitoring the future: a continuing study of american youth (12th-grade survey), 2011 – form 1 data codebook.* Ann Arbor: Institute for Social Research, The University of Michigan; 2012.
10. Department of Health, New York State. Narcotic Enforcement. Albany, NY: Available at: <http://www.health.ny.gov/professionals/narcotic/> [Accessed January 25, 2013.]
11. The National Federation of State High School Associations. *High School Athletics Participation Survey 2011–2012.* Indianapolis, IN: National Federation of State High School Associations; 2012. Available at: <http://www.nfhs.org/content.aspx?id=3282> [Accessed January 20, 2013.]
12. Burt CW, Overpeck MD. Emergency visits for sports-related injuries. *Ann Emerg Med.* 2001; 37:301–8. [PubMed: 11223767]
13. National Youth Sports Foundation. *Fact sheet: youth sports injuries.* Needham (MA): National Youth Sports Foundation; 1993.
14. Gotsch K, Annett JL, Holmgren P, et al. Non-fatal sports and recreation-related injuries treated in emergency departments - United States, July 2000–June 2001. *MMWR Morb Mortal Wkly Rep.* 2002; 51:736–740. [PubMed: 12201606]
15. Veliz PT, Boyd CJ, McCabe SE. Playing through pain? Sports participation and nonmedical use of opioid medications among adolescents. *Am J Public Health.* 2013; 103:e28–30.10.2105/AJPH.2013.301242 [PubMed: 23488520]
16. Darrow CJ, Collins CL, Yard EE, et al. Epidemiology of severe injuries among United States high school athletes:2005–2007. *Am J Sports Med.* 2009; 37:1798–1805.10.1177/0363546509333015 [PubMed: 19531659]
17. Feldman A, Matjasko J. The role of school-based extracurricular activities in adolescent development: a comprehensive review and future directions. *Rev Educ Res.* 2005; 75:159–210.
18. Pate RR, Heath GW, Dowda M, Trost SG. Association between physical activity and other health behaviors in a representative sample of US adolescents. *Am J Public Health.* 1996; 86:1577–1581. [PubMed: 8916523]
19. Pate RR, Trost SG, Levin, Dowda M. Sports participation and health-related behaviors among US youth. *Arch Pediatr Adolesc Med.* 2000; 154:904–911. [PubMed: 10980794]
20. Lisha N, Sussman S. Relationship of high school and college sports participation with alcohol, tobacco, and illicit drug use: a review. *Addict Behav.* 2010; 35:399–407.10.1016/j.addbeh.2009.12.032 [PubMed: 20100638]
21. Damm, J.; Murray, P. Alcohol and other drug use among college student-athletes. In: Etzel, EF.; Ferrante, AP.; Pinkney, W., editors. *Counseling college student-athletes: Issues and interventions.* Vol. 2. Morgantown, WV: Fitness Information Tecnology; 1996. p. 185-220.
22. Messner, MA. *Power at play: Sports and the problem of masculinity.* Boston, MA: Beacon Press; 1990.
23. Marcello RJ, Danish SJ, Stolberg AL. An evaluation of strategies developed to prevent substance abuse among student-athletes. *Sport Psychol.* 1989; 3:196–211.

24. Tricker R, Cook DL, McGuire R. Issues related to drug abuse in college athletes: athletes at risk. *Sport Psychol.* 1989; 3:155–165.
25. Hughes R, Coakley J. Positive deviance among athletes: the implications of overconformity to the Sport Ethic. *Sociol Sport J.* 1991; 8:307–325.
26. Sabo, D.; Veliz, P. *Go out and play: youth sports in America.* East Meadow, NY: Women’s Sports Foundation; 2008.
27. McCabe SE, West BT, Cranford JA, et al. Medical misuse of controlled medications among adolescents. *Arch Pediatr Adolesc Med.* 2011; 165:729–735.10.1001/archpediatrics.2011.114 [PubMed: 21810634]
28. Skinner HA. The Drug Abuse Screening Test. *Addict Behav.* 1982; 7:363–371. [PubMed: 7183189]
29. French MT, Roebuck MC, McGeary KA, Chitwood DD, McCoy CB. Using the Drug Abuse Screening Test (DAST-10) to analyze health services utilization and cost for substance users in a community-based setting. *Subst Use Misuse.* 2001; 36:927–946. [PubMed: 11697616]
30. Zeger SL, Liang KY, Albert PS. Models for longitudinal data: a generalized estimating equation approach. *Biometrics.* 1988; 44:1049–1060.
31. Paternoster R, Brame R, Mazerolle P, Piquero A. Using the correct statistical test for the equality of regression coefficients. *Criminology.* 1998; 36:859–866.
32. Ross-Durow PL, McCabe SE, Boyd CJ. Adolescents’ access to their own prescription medications in the home. *J Adolesc Health.* 2013 pii:S1054–139X. 10.1016/j.jadohealth.2013.02.012
33. Shakib S, Veliz P, Dunbar MD, Sabo D. Athletics as a source for social status among youth: examining variation by gender, race/ethnicity, and socioeconomic status. *Sociol Sport J.* 2011; 28:303–328.
34. Comstock, DR.; Collins, CL.; Corlette, JD.; Fletcher, EN. National high school sports-related injury surveillance study: 2011–2012 school year. Columbus, OH: Center for Injury Research and Policy; Available at: <http://www.nationwidechildrens.org/cirp-rio-study-reports> [Accessed February 15, 2013.]
35. Fillingim RB, King C, Ribeiro-Dasilva MC, Rahim-Williams B, Riley JL. Sex, gender, and pain: a review of recent clinical and experimental findings. *J Pain.* 2009; 10:447–485.10.1016/j.jpain.2008.12.001 [PubMed: 19411059]
36. Unruh AM. Gender variations in clinical pain experience. *Pain.* 1996; 65:123–167. [PubMed: 8826503]
37. Crosnoe R. Academic and health-related trajectories in adolescence: the intersection of gender and athletics. *J Health Soc Behav.* 2002; 3:317–335. [PubMed: 12467256]
38. Ford JA. Nonmedical prescription drug use among college students: a comparison between athletes and nonathletes. *J Am Coll Health.* 2008; 57:211–219. [PubMed: 18809538]
39. Peretti-Watel P, Francois B, Legleyel S. Beyond the U-curve: the relationship between sport and alcohol, cigarette and cannabis use in adolescents. *Addiction.* 2001; 97:707–716. [PubMed: 12084140]
40. Windle M. Parental, Sibling, and Peer Influences on Adolescent Substance Use and Alcohol Problems. *Appl Dev Sci.* 2000; 4:98–110.

Table 2

Descriptive Characteristics of Dependent Variables, by Gender (a)

	Wave 1		Wave 2		Wave 3		Waves 1 through 3 combined	
	Males (n = 743) % (n)	Females (n = 751) % (n)	Males (n = 743) % (n)	Females (n = 751) % (n)	Males (n = 743) % (n)	Females (n = 751) % (n)	Males (n = 743) % (n)	Females (n = 751) % (n)
Past Year Medical Use of Opioid Medication								
Used on at least 1 occasion	7.8% (58)	15.5% (116)	8.9% (66)	15.2% (114)	9.3% (69)	15.8% (119)	21.6%*** (161)	35.0%*** (263)
Used on only 1 or 2 occasions	5.4% (40)	11.7% (88)	7.6% (56)	11.9% (89)	7.4% (55)	12.7% (95)	17.8%*** (132)	30.0%*** (225)
Used on 3 or more occasions	2.4% (18)	3.8% (28)	1.3% (10)	3.3% (25)	1.9% (14)	3.1% (24)	4.6%*** (34)	9.2%*** (69)
Past Year Medical Misuse of Opioid Medication (Used Too Much)								
Used on at least 1 occasion	1.7% (13)	2.1% (16)	1.2% (9)	2.6% (20)	0.8% (6)	2.6% (20)	3.6%* (27)	6.3%* (47)
Used on only 1 or 2 occasions	0.8% (6)	1.6% (12)	0.7% (5)	1.6% (12)	0.5% (4)	1.7% (13)	2.0%** (15)	4.7%*** (35)
Used on 3 or more occasions	0.9% (7)	0.5% (4)	0.5% (4)	1.0% (8)	0.3% (2)	0.9% (7)	1.6% (12)	2.0% (15)
Past Year Medical Misuse of Opioid Medication (Used To Get High)								
Used on at least 1 occasion	1.2% (9)	0.8% (6)	0.5% (4)	1.6% (12)	0.4% (3)	1.0% (8)	2.0% (15)	3.3% (25)
Used on only 1 or 2 occasions	1.2% (9)	0.6% (5)	0.1% (1)	1.3% (10)	0.1% (1)	0.5% (4)	1.4% (11)	2.5% (19)
Used on 3 or more occasions	0.0% (0)	0.2% (1)	0.4% (3)	0.3% (2)	0.3% (2)	0.5% (4)	0.5% (4)	0.8% (6)
Past Year Nonmedical Use of Opioid Medication								
Used on at least 1 occasion	2.6% (19)	5.7% (43)	3% (22)	5.3% (40)	3.1% (23)	5.5% (41)	7.7%*** (57)	13.7%*** (103)
Used on only 1 or 2 occasions	1.8% (13)	3.0% (23)	1.8% (13)	3.2% (24)	1.8% (13)	3.5% (26)	5.2%** (39)	8.7%*** (65)
Used on 3 or more occasions	0.8% (6)	2.7% (20)	1.2% (9)	2.1% (16)	1.3% (10)	1.9% (15)	3.1%** (23)	6.0%** (45)

(a) 2 x 2 Chi-square analysis were run to examine gender differences in opioid use among the 3 combined waves. Adding the frequencies of respondents who used on only 1 or 2 occasions with those who used on 3 or more occasions will not equal the frequencies for all the respondents who used on at least 1 occasion for the combined waves only (e.g. a respondent could use on only 1 or 2 occasions at wave 1 and then used on 3 or more occasions at wave 2).

* p<.05,

** p<.01,

*** p<.001

	Medical Misuse of Prescribed Opioids (Used To Get High)			Nonmedical Use of Prescribed Opioids		
	Used on at least 1 occasion during the past year Model 7a	Used on only 1 or 2 occasions during the past year Model 8a	Used on 3 or more occasions during the past year Model 9a	Used on at least 1 occasion during the past year Model 10a	Used on only 1 or 2 occasions during the past year Model 11a	Used on 3 or more occasions during the past year Model 12a
Participated in Organized Sports (n = 462)	3.2% (15) .835 (.347–2.01)	2.6% (12) .645 (.226–1.84)	.6% (3) 1.68 (.311–9.10)	13.8% (64) 1.07 (.732–1.58)	9.3% (43) 1.23 (.738–2.05)	5.8% (27) .910 (.505–1.64)

Abbreviation: AOR, adjusted odds ratio.

(a) All GEE analyses control for grade-level when the respondent participated in the SLS at wave 1, parents highest level of education, race, a positive screening test result for the DAST-10, and time.

† indicates a significant difference (p<.05 or lower) between males and females regarding the association between sports participation and opioid use based on the Z-test of equality.

* p<.05,

** p<.01,

*** p<.001

Table 4
 GEE Analysis Examining the Relationship Between Continuous Involvement in Sports Participation and Past Year Opioid Use (a)

	Medical Use of Opioid Medication Used on at least 1 occasion during the past year Model 13a		Medical Misuse of Prescribed Opioids (Used Too Much) Used on at least 1 occasion during the past year Model 14a		Medical Misuse of Prescribed Opioids (Used To Get High) Used on at least 1 occasion during the past year Model 15a		Nonmedical Use of Prescribed Opioids Used on at least 1 occasion during the past year Model 16a	
	% (n)	AOR (95% CI)	% (n)	AOR (95% CI)	% (n)	AOR (95% CI)	% (n)	AOR (95% CI)
Males								
Did not Participate in Organized Sports (n = 266)	17.3% (46)	1 [Reference]	.8% (2)	1 [Reference]	1.1% (3)	1 [Reference]	7.9% (21)	1 [Reference]
Participated in Organized Sports at 1 wave (n = 129)	20.2% (26)	1.31 (.789–2.18)	4.7% (6)	†5.67* (1.18–27.2)	2.3% (3)	1.68 (.303–9.30)	6.2% (8)	.693 (.296–1.62)
Participated in Organized Sports at 2 waves (n = 157)	20.3% (32)	1.15 (.710–1.87)	4.5% (7)	†5.58* (1.13–27.6)	1.9% (3)	1.35 (.254–7.15)	10.2% (16)	1.40 (.678–2.90)
Participated in Organized Sports at 3 waves (n = 191)	29.8% (57)	†1.86** (1.23–2.82)	6.3% (12)	†10.5*** (2.42–45.5)	3.1% (6)	†4.01* (1.13–14.2)	6.3% (12)	.928 (.444–1.94)
Females								
Did not Participate in Organized Sports (n = 289)	34.6% (100)	1 [Reference]	8.3% (24)	1 [Reference]	3.5% (10)	1 [Reference]	13.5% (39)	1 [Reference]
Participated in Organized Sports at 1 wave (n = 169)	33.1% (56)	1.08 (.751–1.56)	7.7% (13)	†.901 (.440–1.84)	5.3% (9)	.173 (.685–4.37)	14.8% (25)	1.21 (.704–2.07)
Participated in Organized Sports at 2 waves (n = 158)	37.9% (60)	1.18 (.824–1.69)	4.4% (7)	†.613 (.240–1.56)	3.2% (5)	.944 (.321–2.78)	13.3% (21)	1.13 (.631–2.01)
Participated in Organized Sports at 3 waves (n = 135)	34.8% (47)	†1.00 (.679–1.48)	2.2% (3)	†.307 (.087–1.09)	0.7% (1)	†.316 (.038–2.62)	13.3% (18)	1.19 (.648–2.20)

Abbreviation: AOR, adjusted odds ratio.

(a) All GEE analyses control for grade-level when the respondent participated in the SSLS at wave 1, parents highest level of education, race, a positive screening test result for the DAST-10, and time.

† indicates a significant difference (p<.05 or lower) between males and females regarding the association between sports participation and opioid use based on the Z-test of equality.

* p<.05,

** p<.01,

*** p<.001