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Competitive sports participation in high school and subsequent substance use in young adulthood: Assessing differences based on level of contact

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Abstract

The objective of this analysis is to examine how participation in different types of competitive sports (based on level of contact) during high school is associated with substance use 1 to 4 years after the 12th grade. The analysis uses nationally representative samples of 12th graders from the Monitoring the Future Study who were followed 1 to 4 years after the 12th grade. The longitudinal sample consisted of 970 12th graders from six recent cohorts (2006–2011). The analyses found that respondents who participated in at least one competitive sport during the 12th grade had greater odds of binge drinking during the past two weeks (AOR = 2.04; 95% CI = 1.43, 2.90) 1 to 4 years after the 12th grade, when compared to their peers who did not participate in sports during their 12th grade year. Moreover, respondents who participated in high-contact sports (i.e., football, ice hockey, lacrosse, and wrestling) had greater odds of binge drinking (AOR = 1.80; 95% CI = 1.18, 2.72) and engaging in marijuana use during the past 30 days (AOR = 1.81; 95% CI = 1.12, 2.93) 1 to 4 years after the 12th grade when compared to their peers who did not participate in these types of sports during their 12th grade year. Accordingly, the findings indicate important distinctions in sport participation experiences on long-term substance use risk that can help inform potential interventions among young athletes.

Keywords

Sport; Contact; Monitoring the Future; Substance Use; Young Adulthood

INTRODUCTION

One of the key beliefs of The National Federation of State High School Associations is that interscholastic sport participation helps encourage the development of “healthy lifestyles” (The National Federation of State High School Associations, 2015). Of course, many principals, teachers, and parents also share this belief that involvement in sport will enrich adolescents’ developmental experience by providing a platform to learn and engage in

physical activity; a platform that will ultimately help sustain healthy lifestyles during adolescence and into adulthood. Problematically, much of this belief rests on a myth that involvement in any type of sport is essentially good (Coakley, 2014; Miracle and Ress, 1994).

In reality, some aspects of sport can hinder the positive development of adolescents and encourage lifestyles that can jeopardize both short- and long-term health. For instance, a common finding across both cross-sectional and longitudinal studies is that adolescents who participate in sport are at an increased risk to consume alcohol and engage in risky types of drinking practices (e.g., binge drinking) (Diehl et al., 2012; Kwan et al., 2014; Lisha and Sussman, 2010; Mays et al., 2011). Obviously, negative findings like this will not be touted by The National Federation of State High School Associations because it spoils the common narrative that sport promotes 'healthy lifestyles'. Unfortunately, the lack of reporting these negative findings within organizations that promote sport involvement keep both the public unaware of the risks involved with sport participation and diminish any efforts to help change problematic features associated with involvement in youth sport.

Given the commonly held myth that sport is essentially good for the development of adolescents to sustain healthy lifestyles, the current study examines how participation in competitive sports during high school is associated with substance use as adolescents transition into young adulthood (a phase in the lifecourse when substance use peaks). In particular, this study will examine the potential variation in substance use across certain type of sports participation based on level of contact. Accordingly, this theoretical conceptualization of sport-type based on level of contact will be useful in identifying and explaining why some athletes are at greater (or lower) risk of engaging in substance use as they transition into young adulthood.

LITERATURE REVIEW

The myth of sport being a positive aspect in the lives of adolescents has been an ongoing debate in the sociology of sport (Coakley, 2014; Miracle and Ress, 1994). One side of the debate views sport as a mechanism to help socialize adolescents to a set of values and behaviors that promotes positive physical, cognitive, and emotional development (Crosnoe, 2002; Marsh, 1992; McNeal, 1995). The other side of the debate views youth sport as either a distraction to fully engaging in academics (Coleman, 1961), or as a potentially harmful developmental experience that socializes participants to a set of norms that facilitates health compromising behaviors (e.g., using steroids to gain an advantage) (Hughes and Coakley, 1991; Messner, 1990; Messner and Sabo, 1990; Veliz et al., 2013a).

Although there is still continuous debate on how involvement in sport among adolescents influences their physical, cognitive, and emotional development, a number of studies over the past several decades has provided a robust amount of evidence indicating that participation in sport is positively associated with adolescents' academic achievement and health (Farb and Matjasko, 2012; Feldman and Matjasko, 2005; Holland and Andre, 1987; Pate et al., 1996; Pate et al., 2000; Sabo and Veliz, 2008). While these findings may suggest that involvement in sport has a positive influence on adolescent development, other studies

have highlighted an important paradox suggesting that involvement in youth sport may be associated with certain health compromising behaviors like substance use. For instance, research on the association between adolescent sport participation and substance use find that participation in sport is associated with adolescent athletes being at a greater risk of alcohol consumption, use of smokeless tobacco, and performance enhancing drugs (Diehl et al., 2012; Kwan et al., 2014; Lisha and Sussman, 2010; Mays et al., 2011).

These findings from studies that focus on adolescent sport participation and substance use reveal a type of health-paradox suggesting that adolescent athletes are engaging in harmful behaviors that would negatively influence both their overall health and athletic performance. Although this appears contradictory, previous research has noted that participation in sport may put some adolescents at risk for substance use because of increased access to different types of substances (e.g., pain killers) (Veliz et al., 2013a; 2013b; Veliz et al., 2014), the stress associated with athletic participation (e.g., self-medicating with drugs) (Damm and Murry, 1996; Marcello et al., 1989; Morse, 2013; Reardon and Creado, 2014; Tricker et al., 1989), and the exposure to normative behaviors (or group of peers) that can facilitate the use of different types of substances (e.g., drinking cultures) (Hughes and Coakley, 1991). Despite these empirical studies and explanations to understand this health-paradox regarding adolescent sport participation and substance use, the majority of these studies compartmentalize sport participation as a homogeneous concept, and mask the possibility that some types of sport provide vastly different social contexts than others (Veliz et al., 2015). In fact, most studies examining the association between participation in sport and substance use fail to capture how different types of sports (e.g., football) may be associated with these health compromising behaviors (Diehl et al., 2012; Kwan et al., 2014; Lisha and Sussman, 2010; Mays et al., 2011).

Although this is a clear gap in the literature, recent national cross-sectional studies in the U.S. have begun to analyze social and health-related outcomes among participants and the type of sport they play (Denham, 2011, 2014; Ford, 2007; Kreager, 2007; Sokol-Katz et al.; Veliz et al., 2013a, 2013b, 2015). For instance, Denham (2011) found that adolescents who participate in baseball, football, and weightlifting have higher levels of alcohol consumption when compared to their peers. Denham suggests that these types of athletes may believe that their athletic performance will not be hindered by alcohol consumption because the sports that they participate in require more anaerobic effort (rather than aerobic effort).

Interestingly, several of these recent studies have also considered categorizing the type of sport adolescents participate in by the amount of physical contact that is embedded within the sport (Veliz et al., 2015). Data collected from nationally representative samples of U.S. adolescents find that teen athletes who participate in different types of high-contact sports (i.e., football, lacrosse, ice hockey and wrestling) are more likely to engage in various types of substance use when compared to their peers who do not participate in these sports (Veliz et al., 2013a; 2013b; 2015). Moreover, teen athletes who participate in non-contact sports (i.e., cross-country, gymnastics, swimming, tennis, track, volleyball, and weightlifting) are less likely to engage in cigarette and marijuana use when compared to their peers who do not participate in these sports (Veliz et al., 2015).

Categorizing sport by the amount of contact endured by participants may help provide a better understanding regarding the paradoxical relationship between adolescent sport participation and substance use. Particularly, sports that involve high levels of contact (e.g., football) tend to socialize youth to view pain, violence, and risk as normative features within the sporting context that may influence risky behavior both on and off the playing field (Bloom and Smith, 1996; Frinter and Robinson, 1993; Huang et al., 1999; Jackson et al., 2002; Nixon, 1997; Segrave and Hastad, 1984). In other words, participants in contact sports learn to view their body as an instrument that can be easily gambled with, even if it would involve permeant damage (i.e., the body is a means to and end) (Bourdieu, 1978). Conversely, sports that involve minimal to no contact are valorized for their sustainability for participants across the life course. These types of sports emphasize an ascetic lifestyle that cultivates a normative orientation that values moderation and self-control in order to sustain long-term health (i.e., the body is an end in itself) (Bourdieu, 1978). Accordingly, certain types of sports may foster attitudes and behaviors favorable to drug use (or unfavorable to drug use) due to the social norms and practices embedded within these sporting contexts (e.g., physical contact as normative or non-normative) (Hughes and Coakley, 1991). In fact, high contact sports may be more capable of socializing participants to a set of normative behaviors that can facilitate substance use given the pervasive norms that surround risk taking, concealing pain, and the unending pursuit of being the best (Messner, 1990; Messner and Sabo, 1990).

AIMS AND HYPOTHESES

Although recent cross-sectional studies have begun to assess the association between involvement in different types of sports and substance use among adolescents, no *longitudinal* studies to date have examined whether involvement in certain types of sports during high school is associated with substance use during the transition into young adulthood (i.e., 18 to 25 years of age). Given that alcohol, tobacco, and illicit drug use tend to peak during this phase in the lifecourse (Substance Abuse and Mental Health Services Administration, 2013), this study seeks to fill a critical gap in the literature that surrounds the relationship between high school sports participation and the probability of subsequent substance use during the transition to young adulthood.

Accordingly, this study will address this gap in the literature by analyzing survey data collected from a nationally representative longitudinal panel of high school students who either participated in high-contact sports (i.e., football, ice hockey, lacrosse, and wrestling), semi-contact sports (baseball, basketball, field hockey, and soccer), non-contacts sports (cross-country, gymnastics, swimming, tennis, track, volleyball, and weightlifting), or who were not engaged in sports at all during their 12th grade year. Specifically, we analyze longitudinal survey data collected from several recent cohorts (2006 – 2011) of 12th graders studied as part of the Monitoring the Future (MTF) study (Johnston et al., 2014).

The present study seeks to address two specific aims. First, we examine whether involvement in any competitive sport during the 12th grade is associated with substance use 1 to 4 years post high school (i.e., 1 to 4 years after their 12th grade year), when accounting for past substance use behaviors and socio-demographic variables. Second, we examine

whether involvement in high-contact, semi-contact, or non-contact sports during the 12th grade is associated with substance use 1 to 4 years post-high school, when accounting for past substance use behaviors and socio-demographic variables. Given the existing cross-sectional research in this area and theoretical argument outlined above, we hypothesize that respondents who participate in high-contact sports are at the greatest risk for substance use 1 to 4 years post-high school when compared to their peers who did not participate in these types of sports during the 12th grade. Further, it is also hypothesized that respondents who participate in non-contact sports during the 12th grade are at the lowest risk for substance use 1 to 4 years post-high school when compared to their peers who did not participate in these types of sports during the 12th grade

METHODS

Data

The data for the current study come from the MTF study of U.S. secondary school students and young adults. The MTF study includes annual cross-sectional and longitudinal surveys conducted continuously since 1975 by the University of Michigan's Institute for Social Research (Johnston et al., 2014). For the current study, data from the longitudinal component of the MTF study were used. The longitudinal component of the MTF study involves 2,400 randomly selected 12th graders each survey year who participate in follow-up mail surveys on a biennial basis (a random half of the selected 12th graders receive the first follow-up one year after high school, and the other random half receives the first follow-up two years after high school; the two random halves are combined in this analysis such that follow-up 1 covers ages 19–20 and follow-up 2 covers ages 21–22). The attrition rate for the different cohorts in the MTF panel study from base year to first follow-up is approximately 50%, with roughly 3% attrition from first follow-up to second follow-up (Johnston et al., 2014). Questions regarding specific competitive sports participation were added to the 12th grade surveys in 2006, and were included on only one of the six randomly distributed questionnaire forms.

Sample

The current study draws on 1253 respondents from six recent longitudinal cohorts (2006 – 2011) who were eligible to complete at least one follow-up four years past their 12th grade year (i.e., 1 to 2 years past 12th grade [modal age 19–20] or 3 to 4 years past 12th grade [modal age 21–22]). Among the 1253 eligible respondents, 283 were removed due to missing data on key variables used in the analysis. Accordingly, the final unweighted sample included 970 respondents who had completed the MTF survey at baseline and completed at least one follow-up within 4 years after their 12th grade year: 430 respondents had complete data at baseline, first follow-up, and second follow-up; 426 respondents had complete data at baseline and the first follow-up, and 114 had complete data at baseline and the second follow-up. Refer to Table 1 for the unweighted demographic characteristics of respondents.

Comparisons of the longitudinal sample used for the analyses ($n = 970$) with the respondents who were excluded due to missing data on key measures ($n = 283$) indicated that the respondents included in this study were more likely to be female, White, have higher grades

during the 12th grade, did not cut class during the 12th grade, attend college after high school, and come from a family where at least one parent had a college degree or higher. The two samples were comparable with respect to the percent who participated in competitive sports during the 12th grade (including different types of sports), location of residence during the 12th grade (region of the U.S. and urbanicity), year they participated in the MTF during the 12th grade (cohort year), marital status during the study period and past 30 day/past two week drug use behavior across the study period.

Dependent Variables

Binge drinking during the past two weeks was measured at 12th grade and each follow-up by asking respondents to indicate, regarding the past two weeks, “How many times have you had five or more drinks in a row?...” Response options were “None”, “Once”, “Twice”, “Three to five times”, “Six to nine times,” and “Ten or more times”.

Cigarette use during the past 30 days was measured at 12th grade and each follow-up by having respondents indicate “How frequently have you smoked cigarettes during the past 30 days?” Response options were “Not at all”, “Less than one cigarette per day”, “One to five cigarettes per day”, “About one-half pack per day”, “About one pack per day”, “About one and one-half packs per day”, and “Two packs or more per day”.

Marijuana use over the past 30 days was measured at 12th grade and each follow-up by having respondents indicate “On how many occasions (if any) have you used marijuana (weed, pot) or hashish (hash, hash oil)...during the last 30 days?” Response options were “0 occasions”, “1–2 occasions”, “3–5 occasions”, “6–9 occasions”, “10–19 occasions”, “20–39 occasions”, and “40 or more occasions.”

Illicit drug use other than marijuana during the past 30 days was measured at 12th grade and each follow-up, and combined ten separate questions that asked respondents the number of occasions they used LSD, hallucinogens other than LSD, cocaine, crystal meth, heroin, inhalants, amphetamines (without a doctor’s orders), sedatives (without a doctor’s orders), tranquilizers (without a doctor’s orders), and narcotics other than heroin (without a doctor’s orders). The response categories for all ten of the illicit drugs included “0 occasions”, “1–2 occasions”, “3–5 occasions”, “6–9 occasions”, “10–19 occasions”, “20–39 occasions”, and “40 or more occasions”. Respondents who indicated using any one of the ten illicit drugs during the past 30 days were coded as using illicit drugs during the past 30 days.

Given that the past 30 day/two week prevalence rates were low at base year and at the first and second follow-ups (mean use was less than 1–2 occasions across all of the dependent measures), the four measures of substance use were recoded as binary variables with the following categories: (0) Did not use in the past 30 days/past two weeks, (1) Did use in the past 30 days/past two weeks. Table 3 provides the descriptive statistics (unweighted) for the different types of substance use during 12th grade, 1 to 2 years past the 12th grade, and 3 to 4 years past the 12th grade.

Key Independent Variables

The key independent variables used in the analyses focused on participation in competitive sports during the past year. The primary question provided to respondents was as follows: “In which competitive sports (if any) did you participate in during the LAST 12 MONTHS? Include school, community, and other organized sports. (Mark all that apply).” The competitive sports that respondents were able to select during the study timeframe included the following: baseball/softball, basketball, cross-country, field hockey, football, gymnastics, ice hockey, lacrosse, soccer, swimming, tennis, track and field, volleyball, weight lifting, wrestling, and ‘other sports’. First, a binary measure was constructed to capture participation in any competitive sports during the past year. Second, these questions were grouped into four unique categories that capture the amount of contact that participants experience within certain types of sports (Veliz et al., 2015). The first category includes sports that involve continual violent contact that officially sanction hitting, knocking, or wrestling (or tackling) opponents to the ground. Football, ice hockey, lacrosse, and wrestling were identified as *high-contact sports*. The second category includes sports that involve sporadic violent contact that may be officially sanctioned within the rules of the sport. Baseball, basketball, field hockey, and soccer were identified as *semi-contact sports*. The third category includes sports where no contact can occur between participants due to either official rules or the structure of the playing field. Cross-country, gymnastics, swimming, tennis, track, volleyball, and weightlifting were identified as *non-contact sports*. Finally, a fourth category is provided to account for participation in ‘other sports’. It should be noted that these four categories are not mutually exclusive (These variables can be assumed to produce independent effects that can be compared within the same model).

Control Variables

Several MTF variables known to be correlated with substance use were included as control variables in the analyses (McCabe et al., 2014). The control variables measured during the respondents’ 12th grade year included: binge drinking during the past two weeks, cigarette use during the past 30 days, marijuana use during the past 30 days, illicit drug use other than marijuana during the past 30 days, gender, race/ethnicity, self-reported grades, urbanicity of where the respondent lived during their 12th grade year, region of the U.S. where the respondent lived during their 12th grade year, number of nights respondent went out during a typical week during their 12th grade year, whether the respondent cut class during the 12th grade, highest level of education for at least one parent, and year respondent participated in the MTF during their 12th grade year.

Two additional control variables measured at the two follow-ups were also included: whether the respondent attended college at some point 1 to 2 or 3 to 4 years after their senior year and whether the respondent was married either 1 to 2 years or 3 to 4 years after their senior year. These two variables have proven to be key predictors of the course of substance use during the transition to adulthood (Bachman et al., 1997).

Data Analysis

Logistic regression models using generalized estimating equations (GEE) were used to assess the association between competitive sports participation during respondents’ 12th

grade year and substance use behaviors 1 to 4 years post-high school, while controlling for past 30 day/past two week substance use behaviors at baseline and socio-demographic variables (Hanley et al., 2003; Zeger et al., 1988). For the logistic analyses, adjusted odds ratios (AORs) and 95% confidence intervals (95% CIs) were computed and provided in the tables. All of the GEE analyses used corrective weighting to adjust for the sampling procedures that introduce unequal probabilities of selection into the MTF panel study.

RESULTS

Descriptive Statistics

Table 2 presents descriptive statistics for the sample of respondents who participated in competitive sports during their 12th grade year. The majority of respondents indicated participating in at least one competitive sport during the 12th grade (70.5%), with 19.6% of respondents participating in high-contact sports, 37.6% participating in semi-contact sports, 36.9% participating in non-contact sports, and 16% participating in ‘other sports’.

Table 3 shows the percent of respondents who indicated substance use across the study period. Examining the baseline data among respondents during their 12th grade year, 22.9% indicated using cigarettes during the past 30 days, 27.1% indicated binge drinking during the past two weeks, 21.0% indicated using marijuana during the past 30 days, and 17.8% indicated using some illicit drug other than marijuana during the past 30 days. Binge drinking during the past two weeks was the only substance that displayed an increase across the study period with 32.3% and 38.7% indicating binge drinking during the past two weeks 1 to 2 years and 3 to 4 years post-high school, respectively. Moreover, illicit drug use other than marijuana displayed a decrease across the study period with 11.3% and 9.7% indicating illicit drug use other than marijuana during the past 30 days 1 to 2 and 3 to 4 years post-high school, respectively.

Examining Participation in at Least One Competitive Sport

The results from the logistic regression analyses, which controlled for socio-demographic variables and substance use behaviors during the 12th grade, are provided in Table 4. The results indicate that when compared to their peers who did not participate in any sport during the 12th grade, respondents who participated in at least one competitive sport during the 12th grade were found to have greater odds of engaging in binge drinking during the past two weeks 1 to 4 years post-high school (AOR = 2.04; 95% CI = 1.43, 2.90). Competitive sport participation during 12th grade, in general, was not found to be associated with past 30 day cigarette use, marijuana use, or illicit drug use other than marijuana 1 to 4 years post-high school.

Examining Participation in Certain Types of Sports, Based on Level of Contact

Table 5 presents the AORs and 95% CIs for the different types of sports respondents participated in during the 12th grade. Examining differences by sport type indicated several positive associations with substance use 1 to 4 years post-high school. Individuals who participated in high-contact sports during the 12th grade had greater odds of binge drinking during the past two weeks (AOR = 1.80; 95% CI = 1.18, 2.72) and using marijuana during

the past 30 days (AOR = 1.81; 95% CI = 1.12, 2.93) 1 to 4 years post-high school, when compared to their peers who did not participate in high-contact sports. Moreover, respondents who participated in non-contact sports (AOR = 1.44; 95% CI = 1.07, 1.95) during the 12th grade had greater odds of binge drinking during the past two weeks 1 to 4 years post-high school, when compared to respondents who did not participate in these types of sports during the 12th grade. None of the different types of sports examined were associated with lower odds of substance use 1 to 4 years post-high school. Finally, it should be noted that interaction effects were tested to explore gender as a potential moderator of these association by sport type, however, these tests did not yield any statistically significant results.

DISCUSSION

The current study found that participation in at least one competitive sport during 12th grade was associated with greater odds of increased binge drinking 1 to 4 years post-high school; that is, after controlling for 12th grade substance use as well as several other socio-demographic covariates, binge drinking increased more so for those who played competitive sports their senior year of high school than for those who did not participate in sports. This finding is consistent with what has been found in other studies that have typically been cross-sectional or based on longitudinal studies based on more limited samples (Diehl et al., 2012; Kwan et al., 2014; Lisha and Sussman, 2010; Mays et al., 2011). Although the results were not presented in the current study, post-hoc analyses also revealed that participation in a greater number of sports during the 12th grade (i.e., three or more sports) was associated with greater odds of engaging in binge drinking (AOR = 2.31; 95% CI = 1.51, 3.54) and marijuana use (AOR = 1.80; 95% CI = 1.10, 2.93) 1 to 4 years post-high school when compared to their nonparticipating peers. This finding may suggest that some adolescents who participate in multiple sports could be over-committed to an athletic identity (e.g., a jock identity) (Miller, 2009; Miller et al., 2003), and may adopt or conform to behaviors that facilitate various types of substance use in order to successfully manage an overly-committed athletic identity (Hughes and Coakley, 1991).

The current study also extends previous research by assessing the association between participation in different types of sports (based on level of contact) and substance use using a longitudinal sample. The results show that participation in high-contact sports during high school is associated with a higher risk of substance use into young adulthood. In particular, respondents who participated in high-contact sports during the 12th grade had higher odds of engaging in binge drinking and marijuana use 1 to 4 years post-high school when compared to respondents who did not participate in these types of sports. This result extends what has been found in cross-sectional studies regarding the association between substance use and involvement in high-contact sports among adolescents (Denham, 2011; 2014; Veliz et al., 2013a; 2013b; 2015), and suggests that these risky drinking and drug use behaviors among this subgroup of athletes may persist into young adulthood (Veliz & McCabe, 2015).

One possible explanation that can help provide some insight to understanding why athletes in high-contact sports are at a greater risk for substance use (i.e., binge drinking and marijuana use) could be their greater susceptibility of experiencing severe injuries from

participating in these types of sports (Darrow et al., 2009). Given the greater pressure to hide pain (and injuries) in sports that involve high levels of contact, adolescent athletes may learn to self-medicate with various substances to help cope with pain suffered from injuries (Veliz et al., 2013; Veliz et al., 2014). Unfortunately, these coping strategies to hide pain (or even stress) that are learned in these sports during adolescence may carry over in to young adulthood.

Unexpectedly, the current study also found that participation in non-contact sports during the 12th grade was associated with greater odds of engaging in binge drinking 1 to 4 years post-high school when compared to respondents who did not participate in these types of sports (involvement in semi-contact sports yielding no association). Although these findings were unanticipated with respect to the hypothesized association, participants in these non-contact sports (which tend to require either low body fat, the need to be at a specific weight, or performance is based on actual body image) may be more susceptible to developing eating disorders (e.g. bulimia: bingeing and purging) (Baum, 2013). Indeed, binge drinking has been found to be associated with various types of eating disorders (Dawe and Loxton, 2004; Ferriter and Ray, 2011). Athletes in non-contact sports may be more susceptible to this type of drinking pattern given that it only occurs sporadically, followed by long stretches of abstinence in order to prepare their body for competition. Accordingly, these eating and drinking patterns may be learned during their participation in these sports during adolescence and carried into young adulthood.

While both high-contact sports and non-contact sports were found to be associated with binge drinking, it should be recognized that the results from the current study found that participation in at least one competitive sport during the 12th grade nearly doubled the odds of engaging in binge drinking. In fact, the association between involvement in sports and alcohol consumption among adolescents and young adults is a common finding across both cross-sectional and longitudinal studies (Diehl et al., 2012; Kwan et al., 2014; Lisha and Sussman, 2010; Mays et al., 2011). Although the larger institution of competitive sport may support norms that are supportive of risky drinking behaviors, future research needs to examine how different types of sports uniquely create normative contexts that are conducive to binge drinking during adolescence and young adulthood.

Problematically, the results of this study show that respondents who participated in high-contact sports during the 12th grade were at the greatest risk of engaging in binge drinking and using marijuana 1 to 4 years post-high school when compared to their peers who did not participate in these sports. Considering the results of the study, participation in competitive sports during high school may put some individuals at risk to engage in substance use during young adulthood. Accordingly, parents, coaches, counselors, and educators need to be aware that not all sports protect adolescents from engaging in unhealthy practices, and should consider the possible risks to adolescents during high school and as they transition into young adulthood. Moreover, school administrators should consider in-season counseling for athletes or require athletes to be screened for potential substance use disorders during yearly physicals. These types of efforts may have a positive impact on preventing problems with substance use among a young athletes who are either exiting or extending their athletic careers.

LIMITATIONS

While a primary strength of this study lies in the analysis of a nationally representative longitudinal sample of adolescents, this study relies exclusively on the sporting experiences of respondents during their 12th grade year. Unfortunately, this study cannot determine the impact of sports involvement at earlier or later ages. Another limitation of the current study involves the loss of a segment of respondents due to missing data on various items used for the analysis. In particular, the sample with no missing data was not directly comparable to the full sample. Given that the sample used for this study consisted of higher-achieving students, it may be relatively conservative and may not capture the full range of adolescents who are more likely to engage in various types of substance use. Finally, although the current study controlled and tested for potential interaction effects with respect to gender, the current study suffered from a relatively small sample size to detect small differences between males and females with respect to the association between different types of sports participation and substance use. Future studies using larger sample sizes should examine these differences between males and females who participate in either high-contact, semi-contact, and non-contact sports. Regardless of these limitations, this study provides the first foray to understand how participation in different types of sports influences substance use during the transition to young adulthood using a nationally representative sample of young adults.

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Table 1

Baseline control variables (n = 970; unweighted)

Time Invariant Baseline Control Variables (12th Grade)	
Male (ref.)	41.4%
Female	58.6%
White (ref.)	72.8%
Non-White	27.2%
Average grade during senior year; b– or higher (ref.)	90.0%
Average grade during senior year; c+ or lower	10.0%
Large MSA (urban area) (ref.)	28.6%
Other MSA (suburban area)	47.2%
Non-MSA (rural area)	24.2%
North East (ref.)	17.7%
North central	30.7%
South	32.5%
West	19.1%
Two or less nights out in a week (ref.)	55.1%
Three or more night out in a week	44.9%
Did not cut class during senior year (ref.)	68.5%
Cut class during senior year	31.5%
Both parents have less than a college degree (ref.)	43.8%
At least one parent has as college degree or higher	56.2%
Cohort Year - 2006 ^[a]	19.6%
Cohort Year - 2007	20.4%
Cohort Year - 2008	21.0%
Cohort Year - 2009	17.1%
Cohort Year - 2010	15.3%
Cohort Year - 2011	6.6%
Time Invariant Follow-Up Control Variables (Senior Year)	
Did not attend college during the study period (ref.)	19.8%
Attended college during the study period	80.2%
Was not married during the study period (ref.)	94.9%
Was married at some point during the study period	5.10%

^[a]These controls are treated as continuous measures.

ref. = Reference Group

Table 2

Major independent variables (n = 970; unweighted)

Sports Participation During the 12th Grade	
Did not participate in competitive sports (ref.)	29.5%
Participated in at least one competitive sport	70.5%
Different Types of Sports	
<u>High-Contact</u>	<u>19.6%</u>
Participated in Football During the 12th Grade	14.4%
Participated in Ice Hockey During the 12th Grade	1.8%
Participated in Lacrosse During the 12th Grade	3.5%
Participated in Wrestling During the 12th Grade	3.4%
<u>Semi-Contact Sports</u>	<u>37.6%</u>
Participated in Baseball/Softball During 12th Grade	15.4%
Participated in Basketball During 12th Grade	19.0%
Participated in Field Hockey During the 12th Grade	1.1%
Participated in Soccer During the 12th Grade	14.0%
<u>Non-Contact Sports</u>	<u>36.9%</u>
Participated in Cross-Country During the 12th Grade	5.5%
Participated in Gymnastics During the 12th Grade	1.8%
Participated in Swimming During the 12th Grade	9.5%
Participated in Tennis During the 12th Grade	7.4%
Participated in Track During the 12th Grade	14.0%
Participated in Volleyball During the 12th Grade	9.3%
Participated in Weight Lifting During the 12th Grade	11.3%
<u>Other Sports</u>	<u>16.0%</u>
Participated in Other Sports During the 12th Grade ^[a]	26.7%

^[a]The MTF provided introduced new categories for cheerleading, crew, equestrian, golf, and water polo starting in 2010. Given that these questions were only provided to only two of the cohorts of seniors, we collapse these participants into the 'Other Sport' category.

ref. = Reference Group

Table 3

Descriptive statistics for different types of substance use (time varying)

	12th Grade Year Baseline (n = 970; unweighted)	1 to 2 years past 12th grade year First Follow-Up (n = 874; unweighted)	3 to 4 years past 12th grade Second Follow-Up (n = 538; unweighted)
Cigarette Use (past 30 days)	22.9%	20.1%	23.0%
Binge Drinking (past two weeks) ^[a]	27.1%	32.3%	38.7%
Marijuana Use (past 30 days)	21.0%	20.4%	21.4%
Illicit Drug Use Other Than Marijuana (past 30 days) ^[a]	17.8%	11.3%	9.7%

^[a] Chi-Square analyses (df = 2) detected significant differences at the .001 alpha level (i.e., past 30 day substance use either increased or decreased during the study period).

Table 4

Examining the influence of different types of competitive sports participation (based on level of contact) during the 12th grade on past 30 day substance use 1 to 4 years post-high school

Participation in Competitive Sport During the 12th Grade (different types of sports) ^[a]	Cigarette Use (past 30 days)			Binge Drinking (past two weeks)			Marijuana Use (past 30 days)			Illicit Drug Use (past 30 days)		
	AOR	95% CI	Reference	AOR	95% CI	Reference	AOR	95% CI	Reference	AOR	95% CI	Reference
Did not participate in competitive sports (ref.)												
Participated in at least one competitive sport	1.34	.889, 2.02		2.04***	1.43, 2.89		1.29	.862, 1.93		1.17	.708, 1.93	
Time Invariant Baseline Control Variables (12th Grade)												
Female	.896	.599, 1.34		.818	.612, 1.09		.826	.578, 1.18		1.17	.728, 1.89	
Non-White	.546*	.333, .895		.626**	.439, .893		1.11	.735, 1.67		.701	.411, 1.19	
Average grade during senior year; c+ or lower	2.10*	1.15, 3.86		1.28	.758, 2.16		1.30	.710, 2.38		1.81	.905, 3.61	
Other MSA (suburban area)	1.21	.782, 1.87		.963	.683, 1.36		.957	.640, 1.43		1.15	.695, 1.90	
Non-MSA (rural area)	1.42	.852, 2.35		1.10	.739, 1.64		.754	.451, 1.26		1.07	.578, 1.98	
North central	1.53	.853, 2.76		1.27	.850, 1.90		.877	.534, 1.44		1.22	.596, 2.49	
South	1.87*	1.04, 3.37		.753	.494, 1.15		.921	.556, 1.53		1.93*	1.00, 3.71	
West	.778	.379, 1.59		.455**	.278, .745		.640	.367, 1.11		1.64	.762, 3.51	
Three or more night out in a week	1.40	.953, 2.07		1.72***	1.29, 2.30		1.58**	1.12, 2.24		1.30	.833, 2.04	
Cut class during senior year	1.41	.944, 2.11		1.39*	1.01, 1.91		1.16	.793, 1.68		1.67*	1.07, 2.63	
At least one parent has as college degree or higher	.805	.539, 1.20		1.23	.909, 1.67		.966	.670, 1.39		.935	.583, 1.50	
Cohort year	.918	.807, 1.04		1.00	.908, 1.11		.957	.848, 1.08		.969	.836, 1.12	
Time Invariant Control Variables: Substance Use at Baseline (12th Grade)												
Past 30 day/two week substance use during the 12th grade (substance corresponds with outcome measure) ^[a]	13.34***	9.01, 19.8		3.33***	2.38, 4.66		6.42***	4.28, 9.62		6.47***	4.14, 10.1	
Time Invariant Follow-Up Control Variables (1 to 4 years post high school)												
Attended college during the study period.	.693	.422, 1.14		1.75**	1.14, 2.68		.893	.564, 1.41		1.50	.811, 2.78	
Was married at some point during the study period	.456*	.233, .891		.348**	.164, .740		.337**	.151, .750		.298*	.098, .904	
Participated in the second follow-up ^[b]	1.21	.902, 1.61		1.53***	1.20, 1.95		1.07	.824, 1.40		.726	.489, 1.08	

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Participation in Competitive Sport During the 12th Grade (different types of sports) ^[a]	Cigarette Use (past 30 days)			Binge Drinking (past two weeks)			Marijuana Use (past 30 days)			Illicit Drug Use (past 30 days)		
	AOR	95% CI		AOR	95% CI		AOR	95% CI		AOR	95% CI	
	Wald $\chi^2 = 226.41$ ***			Wald $\chi^2 = 178.5$ ***			Wald $\chi^2 = 136.11$ ***			Wald $\chi^2 = 107.11$ ***		
	Mean VIF = 2.25			Mean VIF = 2.26			Mean VIF = 2.24			Mean VIF = 2.23		

* p<.05,
** p<.01,
*** p<.001

[a] The control variable for past 30 day/two week substance use during the 12th grade corresponds with the dependent variable (i.e., past 30 day substance use 1 to 4 years past the 12th grade). For instance, when estimating the odds of past 30 day cigarette use 1 to 4 years past the 12th grade, the model specifically controls for past 30 day cigarette use during the 12th grade (i.e., substance use at baseline).

[b] This is a time varying covariate to capture the influence of time (0 = first follow-up [1 to 2 years past the 12th grade], 1 = second follow-up [3 to 4 years past the 12th grade]).

VIF = variance inflation factor

Table 5

Examining the influence of different types of competitive sports participation (based on level of contact) during the 12th grade on past 30 day substance use 1 to 4 years post-high school (n = 970)

Participation in Competitive Sport During the 12th Grade (different types of sports) ^{a/}	Cigarette Use (past 30 days)		Binge Drinking (past two weeks)		Marijuana Use (past 30 days)		Illicit Drug Use (past 30 days)	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
High-Contact	1.12	.598, 2.10	1.79**	1.18, 2.72	1.81*	1.12, 2.93	1.01	.470 2.18
Semi- Contact	1.24	.824, 1.87	.919	.671, 1.26	1.03	.711, 1.49	.838	.511 1.37
Non-Contact	1.36	.911, 2.03	1.44*	1.07, 1.95	1.41	.967, 2.05	1.11	.676 1.84
Other Sports	.985	.631, 1.54	1.35	.981, 1.87	.707	.473, 1.06	1.54	.947 2.49
Time Invariant Baseline Control Variables (12th Grade)								
Female	.961	.614, 1.50	.923	.667, 1.28	1.06	.711, 1.59	1.11	.605 2.02
Non-White	.533*	.323, .879	.598**	.417, .857	1.07	.708, 1.61	.712	.422 1.20
Average grade during senior year; c+ or lower	2.17*	1.18, 3.99	1.31	.773, 2.23	1.32	.693, 2.51	1.90	.938 3.83
Other MSA (suburban area)	1.22	.792, 1.89	.923	.654, 1.30	.949	.633, 1.42	1.11	.674 1.84
Non-MSA (rural area)	1.39	.838, 2.31	1.04	.693, 1.56	.748	.446, 1.26	1.05	.569 1.92
North central	1.57	.866, 2.86	1.27	.848, 1.91	.861	.520, 1.43	1.22	.596 2.48
South	1.93*	1.05, 3.53	.740	.482, 1.14	.918	.555, 1.52	1.91	.988 3.69
West	.797	.387, 1.64	.436***	.268, .710	.626	.359, 1.09	1.60	.745 3.45
Three or more night out in a week	1.39	.941, 2.05	1.75***	1.31, 2.34	1.62**	1.14, 2.29	1.31	.836 2.04
Cut class during senior year	1.42	.944, 2.12	1.37	.997, 1.90	1.12	.765, 1.63	1.72*	1.09 2.72
At least one parent has as college degree or higher	.778	.523, 1.16	1.21	.888, 1.64	.924	.638, 1.34	.922	.574 1.48
Cohort year	.917	.806, 1.04	1.01	.912, 1.12	.951	.841, 1.08	.973	.839 1.13
Time Invariant Control Variables: Substance Use at Baseline (12th Grade)								
Past 30 day/two week substance use during the 12th grade (substance corresponds with outcome measure) ^{b/}	13.6***	9.11, 20.2	3.29***	2.34, 4.63	6.48***	4.30, 9.75	6.67***	4.28 10.4
Time Invariant Follow-Up Control Variables (1 to 4 years post high school)								
Attended college during the study period	.692	.421, 1.14	1.77**	1.15, 2.74	.876	.549, 1.40	1.54	.824 2.88

Participation in Competitive Sport During the 12th Grade(different types of sports) ^[a]	Cigarette Use (past 30 days)		Binge Drinking (past two weeks)		Marijuana Use (past 30 days)		Illicit Drug Use (past 30 days)	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Was married at some point during the study period	.469[*]	.239, .923	.343^{**}	.160, .738	.353[*]	.154, .807	.287[*]	.095, .862
Participated in the second follow-up ^[c]	1.21	.904, 1.62	1.54^{***}	1.20, 1.96	1.07	.817, 1.41	.720	.484, 1.07
Wald $\chi^2 = 224.2$ ^{***}		Wald $\chi^2 = 188.13$ ^{***}		Wald $\chi^2 = 137.04$ ^{***}		Wald $\chi^2 = 107.92$ ^{***}		
Mean VIF = 2.10		Mean VIF = 2.11		Mean VIF = 2.09		Mean VIF = 2.09		

* p<.05,

** p<.01,

*** p<.001

[a] Each of the 3 different types of sport by level of contact listed above were treated as separate binary variables (e.g., Contact-Sport: 0 = does not participate in a Contact-Sport, 1 = does participate in a Contact-Sport; Non-Contact Sport: 0 = does not participate in a Non-Contact Sport, 1 = does participate in a Non-Contact Sport; Semi-Contact Sport: 0 = does not participate in a Semi-Contact Sport, 1 = does participate in a Semi-Contact Sport)

[b] The control variable for past 30 day/two week substance use during the 12th grade corresponds with the dependent variable (i.e., past 30 day substance use 1 to 4 years past the 12th grade). For instance, when estimating the odds of past 30 day cigarette use 1 to 4 years past the 12th grade, the model specifically controls for past 30 day cigarette use during the 12th grade (i.e., substance use at baseline).

[c] This is a time varying covariate to capture the influence of time (0 = first follow-up [1 to 2 years past the 12th grade], 1 = second follow-up [3 to 4 years past the 12th grade]).

VIF = variance inflation factor