Heavy Drinking Among High School Student Athletes and Non-Athletes: Do Differences Emerge as Early as the Ninth Grade?

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This is an Accepted Manuscript of an article published by Taylor & Francis in *Substance Use & Misuse* on 2022, available online: https://doi.org/10.1080/10826084.2022.2040032
Heavy Drinking Among High School Student Athletes and Non-Athletes: Do Differences Emerge as Early as the Ninth Grade?

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Declaration of Interest Statement: We have no conflicts of interest to declare.

Abstract

Background: High school athletes have been identified as a high-risk group for heavy drinking. Little is known, however, about the timing of when student athlete heavy drinking begins to diverge from that of non-athletes. Objectives: The aim of the current study is to examine differences in changes in heavy drinking among ninth grade student athletes and non-athletes across the academic year. We hypothesized that student athletes would report greater increases in heavy drinking compared to non-athletes from fall to spring semester. Methods: Ninth grade students (N= 217) aged 13 to 15 completed questionnaires on heavy drinking indices, quantity of peak drinking, frequency of binge drinking, and estimated blood alcohol concentration (eBAC) during the fall and spring semesters. Results: Consistent with our hypothesis, student athletes reported significantly greater increases in heavy drinking compared to non-athletes from fall to spring semester. Additionally, there was a significant increase in all three indices of heavy drinking for student athletes, whereas there were no significant changes for non-athletes. Conclusions: Results demonstrate divergence in the quantity and frequency of heavy drinking between student athletes and non-athletes during the ninth grade. These findings indicate the optimal timing of preventive intervention programs may be different for student athletes and non-athletes. Results also suggest that preventive intervention program targeting heavy drinking should be implemented for high school student athletes as early as the fall semester of the ninth grade when students are transitioning to high school.

Keywords: heavy drinking, high school, student athletes

Alcohol use in the U.S. escalates through adolescence, with national survey data indicating lifetime prevalence rates for alcohol use increase from 23.5% to 58.5% from eighth to twelfth grade (Johnston et al., 2019). Even more concerning is the escalation in heavy drinking rates from middle school to high school, with 10.1%, 25.5%, and 40.8% of eighth, tenth, and twelfth grade student reporting drinking to intoxication at least once in their lifetime. Further, among eighth, tenth, and twelfth grade students, 2.6%, 8.8%, and 17.5% report being drunk in the past 30 days and
3.8%, 8.5%, and 14.4% report binge drinking in the past two weeks, respectively (Johnston et al., 2019). Additionally, alcohol use and heavy drinking in high school are associated with multiple negative consequences including impaired neurocognitive functioning (Nguyen-Louie et al., 2015), academic problems (Patte et al., 2017), attempting suicide, and using illicit drugs (Miller et al., 2007). High-risk drinking behavior among high school students is also associated with having a hangover, passing out, engaging in regretted sexual activities, and drinking and driving (Borsari et al., 2013).

**High School Student Athletes**

Although sport participation in high school is related to several positive outcomes including academic achievement, psychological resiliency, and positive self-worth, this is not the case for alcohol use (Fredricks & Eccles, 2006). A growing body of research has identified high school student athletes as a high-risk group for heavy drinking, with student athletes reporting both higher levels of alcohol use and heavy drinking relative to the general high school population (Diehl et al., 2012; Kwan et al. 2014; Lisha & Sussman, 2010). Diehl et al. (2012) reported a pooled odds ratio of 1.13 [1.10-1.16], indicating that high school athletes were significantly more likely to drink than non-athletes over a range of alcohol consumption indices (e.g., lifetime prevalence, number of drinks per occasion, and heavy drinking episodes). Further, findings from this meta-analysis also included a calculated lifetime prevalence of alcohol consumption of 78% among student athletes (Diehl et al., 2012). Research also suggests that although student athletes report only slightly higher rates of alcohol use, they report significantly higher rates of binge drinking and peak drinking quantities than non-athletes (Martens et al., 2006). Thus, student athletes may not drink more frequently than non-athletes, but when they do drink, they drink more. This is significant as heavy alcohol use may be particularly problematic for student athletes, resulting in physical and cognitive performance deficits related to athletic performance demands (Grossbard et al., 2009) that may negatively impact performance and increase the risk of injury (Shiff effs & Maughan, 2006).

Several explanations have been proposed to account for the heavy use of alcohol among student athletes (Martens et al., 2006). For example, the athletic culture has been associated with an encouragement to drink larger quantities of alcohol (Martens et al., 2006). Athletes may also view alcohol use as a reward for successful athletic performance (Pitts et al., 2018). Additionally, consistent with the social norming theory (Perkins, 2002), research indicates student athletes over-estimate peer alcohol use (Dams-O’Connor et al., 2007; Doumas & Haustveit, 2008) and perceived peer alcohol use is the best predictor of alcohol use among student athletes (Hummer et al., 2009). Similarly, research indicates elevated rates of binge drinking among athletes are associated with the view that alcohol is normative in their peer group (Ford, 2009). Thus, heavy drinking among student athletes may serve to perpetuate risky alcohol use through both culturally sanctioned alcohol use and normative perceptions.

Similar to the general high school population, alcohol use escalates over time, with student athletes report the highest rates of alcohol use during the senior year (Fredricks & Eccles, 2006; Hoffman, 2006; Lisha et al., 2014; Mays et al., 2010; Wichstrom & Wichstrom, 2009). Results from these studies, however, indicate that alcohol use (Fredricks & Eccles, 2006; Hoffman, 2006; Lisha et al., 2014), problem alcohol use (Mays et al., 2010), and alcohol intoxication (Wichstrom & Wichstrom, 2009) increase more rapidly for student athletes than non-athletes. To our knowledge, however, there is no data to suggest when student athletes begin to drink more than non-athletes, leaving the timing of implementing preventive interventions for student athletes unclear. Thus, identifying when high school athletes become a high-risk group relative to other high school students may provide valuable information for the implementation of preventive intervention programming for this high-risk group of students.

**Current Study**

The aim of the current study is to extend the literature by examining differences in changes in heavy drinking among ninth grade student athletes and non-athletes across the academic year. To achieve this aim, we evaluated differences in the change in three indices of heavy drinking, peak drinking quantity, frequency of binge drinking, and eBAC between ninth grade student athletes and non-athletes from the fall semester to spring semester. We hypothesized that student athletes would report greater increases in heavy drinking indices compared to non-athletes from fall to spring semester.
Method

Participants and Procedures

Participants were ninth grade students recruited from one school in a metropolitan area in the Northwest. The junior high school enrolls approximately 800 students in seventh through ninth grade. Students are predominantly White (60.0%) and Hispanic (25.7%), with 15% English Language Learners (ELLs); 51.4% of students are eligible for free or reduced lunch. We used a parent opt-out procedure with active student assent. All parents of ninth grade students were contacted by the school via letter by mail at their permanent addresses. Enclosed in the letter was a project-addressed, stamped decline postcard. If a parent did not want their child to participate in the research project, they were asked to print their name and student’s name and return the postcard indicating their option to decline. In addition, a phone number and email address were provided so that parents could decline their children’s participation via phone or email. If the parent did not send in a decline postcard, call, or email to the schools, the student was invited to participate in the study.

All students with passive parental consent (N = 223) were recruited during class periods during the fall semester. At the start of the class, a member of the research team described the research and invited students to participate. Students who elected to participate were assigned a unique pin number and the URL for participation. Participants logged on to the survey website on individual laptops and were directed to a welcome screen describing the research and were asked to enter their PIN number. Once they entered the PIN, they were presented with the informed assent statement describing the study procedures and were asked to indicate their assent by clicking “Agree”. If participants indicated their willingness to continue, they were routed to a baseline survey, which was completed immediately. This survey took approximately 15 minutes to complete. Students whose parents declined their teen’s participation or who did not provide assent were given an alternative activity to complete during the class period. All students who provided assent and participated in the baseline survey (n = 217) were invited to complete a 3-month follow-up survey. Overall, 81.6% (n = 177) of the 217 participants participated in the spring follow-up assessment. Among the students who did not participate, 12 were no longer enrolled in the school and 28 were absent on the day the follow-up assessment was conducted. Procedures for administration of the follow-up survey were similar to those of the baseline survey. All study procedures were approved by the University Institutional Review Board and the School Distric Research Board.

Among the 177 students (45.9% male; 51.1% female) who completed both baseline and follow-up assessments, ages ranged from 13 to 15 (M = 14.19, SD = 0.45). Participants identified their race/ethnicity as White (66.7%), Hispanic (15.3%), Asian (6.2%), African-American (7.3%), American Indian/Alaskan Native (3.4%), and Hawaiian/Other Pacific Islander (1.1%). Overall, 57.2% of students were classified as student athletes and 42.8% were classified as non-athletes. Among student athletes, 41.4% reported playing basketball (n = 41), 38.4% volleyball (n = 38), 21.2% track (n = 21), 19.2% football (n = 19), 15.2% soccer (n = 15), 10.1% wrestling (n = 10), 10.1% tennis (n = 10), 7.1% baseball/softball (n = 7), 5.1% cheerleading (n = 5), 3.0% cross country (n = 3), 3.0% golf (n = 3), 2.0% hockey (n = 2), 2.0% rugby (n = 2), and 9.1% other (n = 9); 18.5% of students reported playing two sports and 33.3% reported playing three or more sports.

Measures

Demographics

Participants completed a brief demographic questionnaire providing their age, sex, and race/ethnicity. Students were also asked “Do you play a high school sport?” and what sports they played with both a list of sports and an open-ended “other” category.

Heavy Drinking

Heavy drinking was assessed using three indices: peak drinking quantity, frequency of binge drinking, and eBAC. Peak drinking quantity was assessed using the Quantity/Frequency/Peak Questionnaire (QFP; Dimeff et al., 1999; Marlatt et al., 1998). Participants were asked “What is the most number of drinks that you have consumed on any given night in the past month?” Frequency of binge drinking was assessed with the question: “Think back over the last two weeks. How many times have you had 3 (female)/4 (male) or more drinks in a two hour period?” The number of drinks was based on research establishing cut-points for male and female adolescents in different age categories.
(Donovan, 2009). To assess estimated eBAC, we used the Widmark (Widmark, 1932/1981) formula which takes into account alcohol volume, hours of alcohol consumption, participant sex, and participant weight. We used participants’ report of peak alcohol volume and number of hours over which those drinks were consumed to calculate eBAC.

Data Analysis

All outcome variables were examined for outliers at baseline and follow-up and were adjusted to 3.3 SD above the mean before conducting analyses (Tabachnik & Fidell, 2007). Using this procedure, we identified 15 data points (<1.5%) that were outliers. We fit study outcomes with a repeated measures multivariate analyses of variance (MANOVAs) with group (athlete; non-athletes) as the grouping factor and time (fall; spring) as the within factor and three dependent variables (peak drinking quantity; frequency of binge drinking; eBAC). We conducted post hoc univariate analyses of variance (ANOVAs) to examine the significant effects. Analyses were considered significant at p < .05. The authors used partial eta squared (η²) as the measure of effect size with the magnitude as follows: small (η² ≥ .01), medium (η² ≥ .06), large (η² ≥ .14) (Cohen, 1969; Richardson, 2011). All analyses were conducted in SPSS version 25.0.

Results

Preliminary Analyses

Means and standard deviations for each of the outcome variables at baseline and follow-up are shown in Table 1. There were no differences in age, t(215) = -.08, p = .95, ethnicity (dichotomized into White and Other), χ²(1) = 2.72, p = .10, gender, χ²(1) = 1.55, p = .21, or athletic status, χ²(1) = 0.16, p = .69, between those who completed both assessments and those who completed the baseline assessment only. We did, however, find significant differences in attrition for peak drinking quantity, t(215) = 2.40, p = .02, frequency of binge drinking, t(215) = 2.15, p = .03, and eBAC, t(215) = 2.21, p = .02, with attrition associated with higher rates of alcohol use. Further analyses, however, indicated no differential attrition between athletes and non-athletes for peak drinking quantity, F(3, 213) = 0.19, p = .66, frequency of binge drinking, F(3, 213) = 1.86, p = .42, or eBAC, F(3, 213) = 2.11, p = .15.

Heavy Drinking Across the Academic Year

A repeated measures MANOVA was conducted to examine changes in heavy drinking indices between student athletes and non-athletes across the academic year. Results revealed a significant interaction effect for time x athlete status, Wilks’ Lambda = .95, F(3, 173) = 2.82, p = .04, η² = .05. The test of between-group differences at baseline indicated there was no statistically significant difference in heavy drinking between student athletes and non-athletes in the fall semester, Wilks’ Lambda = .98, F(3, 173) = 1.25, p = .29, η² = .02. Statistical contrast for the post-hoc univariate ANOVAs are reported in Table 1. Post-hoc univariate ANOVA analyses indicated a significant interaction effect for time x athlete status for peak drinking quantity, (p < .01), frequency of binge drinking (p < .03), and eBAC (p < .01). As seen in Figures 1-3, student athletes reported significantly greater increases in peak drinking, binge drinking, and eBAC from the fall semester to the spring semester compared to non-athletes. Follow-up univariate ANOVAs revealed that change in heavy drinking were significant for student athletes for peak drinking, F(1,99) = 8.93, p < .01, η² = .08, binge drinking, F(1,99) = 7.26, p < .01, η² = .07, and eBAC, F(1,99) = 9.73, p < .01, η² = .09 whereas there was no significant change for non-athletes in reports of peak drinking, F(1,76) = 0.46, p = .50 η² = .01, binge drinking F(1,76) = 0.28, p = .60, η² = .00, or eBAC, F(1,76) = 1.09, p = .30, η² = .02.

Discussion

High school athletes have been identified as a high-risk group for heavy alcohol use (Diehl et al., 2012; Kwan et al., 2014; Lisha & Sussman, 2010). Heavy drinking in high school is associated with negative consequences (Borsari et al., 2013; Miller et al., 2007; Nguyen-Louie et al., 2015; Patte et al., 2017), which may be particularly problematic for student athletes due to the impact on performance and injury (Shiffef & Maughan, 2006). Although research indicates that heavy drinking in adolescence escalates more quickly among student athletes relative to non-athletes (Mays et al., 2010; Wichstrom & Wichstrom, 2009), it is not clear when student athlete heavy drinking diverges from that of non-athletes. The aim of this study was to address this gap in the literature by examining the difference in changes in heavy drinking among ninth grade athletes and non-athletes across the academic year. We hypothesized that athletes would increase heavy drinking quantity and frequency compared to non-athletes from the fall to spring.
semester. Results of this study indicated that ninth grade student athletes reported a significantly greater increase in peak drinking quantity, frequency of binge drinking, and eBAC from fall to spring semester compared to non-athletes. This study adds to the literature by demonstrating that heavy drinking among student athletes increases and diverges from that of non-athletes as early as the ninth grade.

Findings from this study are consistent with research suggesting that student athletes report higher levels of alcohol use than non-athletes (Diehl et al., 2012; Kwan et al. 2014; Lisha & Sussman, 2010) and that problem alcohol use (Mays et al., 2010) and alcohol intoxication (Wichstrom & Wichstrom, 2009) increase more rapidly among student athletes than non-athletes through high school. This study extends the current literature by demonstrating that student athletes begin to increase their heavy drinking relative to non-athletes as early as the ninth grade. Specifically, results indicate that although there were no differences in heavy drinking between student athletes and non-athletes during the fall semester, student athletes reported significantly higher levels of heavy drinking relative to non-athletes during the spring semester. Further, student athletes reported a significant increase in heavy drinking from fall to spring semester, whereas there was no increase in heavy drinking among non-athletes. Although effect sizes were small for the increases in heavy drinking between student athletes and non-athletes over time, the effect sizes for the increase in heavy drinking among student athletes from the fall to spring semester were in the medium range. Thus, findings from this study provide important information for the timing of implementing preventive intervention programming for student athletes relative to non-athletes.

Although this study adds to the literature on heavy alcohol use among high school student athletes, several limitations deserve note. First, because the sample was primarily White and Hispanic and was recruited from one school in the Northwest, generalizability is limited. Future research with larger, more diverse samples is needed to increase the generalizability of the findings. Second, we found differential rates of attrition in that there was a higher rate of attrition among students reporting higher levels of alcohol use during the fall semester. There was, however, no differential attrition between student athletes and non-athletes for heavy drinking indices, minimizing the impact of differential attrition on the study findings. Next, examination of mediators was beyond the scope of this study. Because perceptions of peer alcohol use are the most significant predictor of student athlete alcohol use (Hummer et al., 2009), perceptions of peer drinking may be important mediator to examine in future research. Finally, future studies should examine whether the changes in drinking reported in this study are moderated by in-season and off-season status as research indicates there are differences in drinking patterns during the in-season and off-season (Mastroleo et al., 2019). Although student athletes were asked to indicate what sport they played, we did not specifically ask if they were in-season. Research examining drinking differences by season status typically use self-report of in-season vs off-season status to accurately identify current season status at the time of assessment (e.g., Mastroleo et al., 2019). Further, 51.8% of student athletes in this study reported playing two or more sports, further complicating our ability to classify students as in-season vs off-season.

Despite the limitations, results of this study have important implications for preventive intervention efforts aimed at reducing heavy drinking among high school student athletes.

First, high school personnel (e.g., coaches, counselors, and teachers), need to be aware that student athletes are at a higher risk for heavy alcohol use than non-athletes and that heavy drinking among student athletes begins to surpass that of non-athletes as early as the ninth grade. Next, results of this study indicate that the quantity and frequency of heavy drinking diverges between student athletes and non-athletes during the ninth grade, suggesting both the timing of preventive intervention strategies and types of strategies should be considered when selecting programs targeting student athlete alcohol use. Similar to interventions designed for students as they transition to college as a means of reducing alcohol related harm (e.g., Turrisi et al., 2009), the window identified in this study presents an important opportunity to prevent increases in heavy drinking among student athletes, potentially reducing these students’ experiencing negative consequences associated with heavy drinking.

While risk factors for alcohol use among athletes within our sample were not included, past studies have identified drinking motives, negative alcohol expectancies, and normative beliefs as significant predictors of student athlete alcohol use (Ford, 2009; Olthuis et al., 2020; Pitts et al., 2018). Research supports the efficacy of personalized normative feedback (PNF) programs that target these risk factors in reducing heavy drinking among collegiate athletes (Doumas & Haustveit, 2008; Doumas et al., 2010; LaBrie et al., 2009; Martens et al., 2010) and student athletes in their senior year of high school (Doumas & Mastroleo, 2021). Because findings from this study suggest it may be
important to provide PNF preventive interventions to student athletes as early as in the fall semester of the ninth grade, future research examining the efficacy of PNF programs among student athletes in their first year of high school is warranted to reduce both acute and long term consequences for this high risk population.

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https://doi.org/10.1080/10826084.2018.1512624


https://doi.org/10.15288/jsad.2009.70.555


Table 1

Descriptive Statistics and Statistical Contrasts for Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Athletes</th>
<th>Non-Athletes</th>
<th>Time x Athlete Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 100)</td>
<td>(n = 77)</td>
<td></td>
</tr>
<tr>
<td>Peak Drinking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>0.36 (1.43)</td>
<td>0.78 (2.06)</td>
<td>.96 6.61** .01 .04</td>
</tr>
<tr>
<td>Spring</td>
<td>1.23 (2.80)</td>
<td>0.69 (2.00)</td>
<td></td>
</tr>
<tr>
<td>Binge Drinking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>0.05 (0.26)</td>
<td>0.10 (0.42)</td>
<td>.97 4.75* .03 .03</td>
</tr>
<tr>
<td>Spring</td>
<td>0.27 (0.76)</td>
<td>0.09 (0.40)</td>
<td></td>
</tr>
<tr>
<td>eBAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>0.01 (0.02)</td>
<td>0.02 (0.05)</td>
<td>.96 7.42** .01 .04</td>
</tr>
<tr>
<td>Spring</td>
<td>0.02 (0.06)</td>
<td>0.01 (0.03)</td>
<td></td>
</tr>
</tbody>
</table>

Note. WL = Wilks’ Lambda.

*p < .05. **p < .01.
Figure 1

Means for Fall and Spring for Peak Drinking Quantity by Athletic Status

Note. This figure demonstrates model-based means (± 1 model-based standard error) for peak drinking quantity by athlete status. The increase over time is significant for student athletes.
Figure 2

*Means for Fall and Spring for Frequency of Binge Drinking by Athletic Status*

*Note.* This figure demonstrates model-based means (± 1 model-based standard error) for frequency of binge drinking by athlete status. The increase over time is significant for student athletes.
Figure 3

Means for Fall and Spring for Frequency of eBAC by Athletic Status

Note. This figure demonstrates model-based means (± 1 model-based standard error) for eBAC by athlete status. The increase over time is significant for student athletes.