# Reducing Alcohol Use Among High School Athletes: A Randomized Controlled Trial of a Brief, Web-Based Personalized Normative Feedback Intervention

Diana M. Doumas
*Boise State University*

Nadine R. Mastroleo
*Binghamton University*

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**Diana M. Doumas\***
Boise State University
Department of Counselor Education
Institute for the Study of Behavioral Health and Addiction

**Nadine R. Mastroleo**
Binghamton University
Department of Psychology

## Author Note

*Correspondence concerning this article should be addressed to Diana Doumas at Department of Counselor Education, Boise State University, 1910 University Drive, Boise, ID 83725. E-mail: dianadoumas@boisestate.edu  Telephone: (208) 426-2646; Fax: (208) 426-4386.

## Abstract

High school athletes are at risk for heavy alcohol use, which is associated with consequences that may negatively impact performance and eligibility to participate in sports.  This study evaluated the efficacy of a web-based personalized normative feedback (PNF) intervention on reducing alcohol use among high school athletes in their senior year.  Class periods were randomized to the intervention or an assessment-only control group.  Athletes completed surveys at baseline and a 6-week follow-up.  Athletes were classified as high-risk or low-risk drinkers based on baseline reports of binge drinking.  Results indicated for athletes classified as high-risk drinkers, those in the intervention group reported significantly greater reductions in quantity of weekly drinking and peak drinking quantity compared to those in the assessment-only control group.  There were no significant intervention effects for frequency of alcohol use.  Findings provide support the efficacy of web-based PNF intervention for reducing alcohol use among high school senior athletes.

**Keywords:** alcohol, drinking, high school athletes, personalized normative feedback, web-based

Alcohol use represents a significant problem among high school students with nearly 60% of students reporting alcohol use by the end high school (Johnston, O'Malley, Miech, Bachman, Schulenberg, & Patrick, 2019).  National survey data indicate alcohol use escalates through high school, with the highest rates of drinking reported by high school seniors (Johnston et al., 2019).  Specifically, 30.2% of high school seniors surveyed reported using alcohol within the past 30 days and 42.9% of high school seniors reported being drunk at least once in their lifetime (Johnston et al., 2019).  Among high school students, alcohol use is associated with multiple negative consequences including impaired neurocognitive functioning (Nguyen-Louie et al., 2015), academic problems (Patte, Qian, & Leatherdale, 2017), engaging in regretted sexual activities (Borsari et al., 2013), dating violence, attempting suicide, using illicit

drugs, riding with a driver who had been drinking (Miller, Naimi, Brewer, & Jones, 2007), and drinking and driving (Borsari et al., 2013). Additionally, hazardous drinking among high school students is most frequently engaged in by older high school students (Borsari et al., 2013).

**Alcohol Use Among High School Student Athletes**

Although participation in athletics is generally viewed as a healthy behavior (Naylor, Gardner, & Zaichkowsky, 2001), relative to the general high school population, student athletes have been identified as a high-risk group for alcohol use (Diehl, Theil, Zipfel, Mayer, Litaker, & Schneider, 2012; Kwan, Bobko, Faulkner, Donnelly, & Cairney, 2014; Lisha & Sussman, 2010). Specifically, findings from literature reviews (Lisha & Sussman, 2010; Kwan et al., 2014) and a meta-analysis (Diehl et al., 2012) indicate high school student athletes report higher levels of alcohol use and heavy drinking than non-athletes. Further, Diehl et al. (2012) reported a pooled odds ratio of 1.13 [1.10-1.16], indicating that athletes were more likely to drink than non-athletes. Findings from this meta-analysis also included a calculated lifetime prevalence of alcohol consumption of 78% among student athletes (Diehl et al., 2012), a rate higher than the 60% national prevalence rate for high school students (Johnston et al., 2019). Alcohol-related consequences may be particularly harmful for student athletes as heavy alcohol use can result in physical and cognitive impairment, which may result in injury (Shirreffs & Maughan, 2006) or negatively impact performance (Grossbard, Hummer, LaBrie, Pederson, & Neighbors, 2009; Shiffeffs & Maughan, 2006) or eligibility to participate in sports (Grossbard et al., 2009). Additionally, similar to patterns found in the general high school population, alcohol use among high school athletes escalates through high school, with the heaviest use reported by seniors (Fredricks & Eccles, 2006; Hoffman, 2006; Lisha, Crano, & Delucchi, 2014; Mays, DePadilla, Thompson, Kushner, & Windle, 2010; Wichstrom & Wichstrom, 2009). Thus, it is imperative to identify effective alcohol intervention for student athletes, particularly for those in their senior year when alcohol use and heavy drinking are at the highest levels.

The athletic culture and peer-related factors have been proposed as explanations for the higher rates of drinking reported by student athletes (Martens, Dams-O'Connor, & Beck, 2006). The athletic culture has been associated with an encouragement to drink larger quantities of alcohol, with athletes reporting higher levels of binge drinking than non-athletes (Martens et al., 2006). According to the social norming theory (Perkins, 2002), students overestimate the drinking of their peers, believing that their peers drink more than normative data suggest. This overestimation is related to higher levels of alcohol use as students try to match their drinking to that of their peers. Additionally, perceived drinking norms for more proximal groups are more predictive of drinking behavior than perceived norms for more distal groups (Baer, Stacy, & Larimer, 2001). Consistent with the social norming theory, research indicates student athletes over-estimate peer alcohol use, believing both their athletes and non-athlete peers drink more than they do (Dams-O'Connor, Martin, & Martens, 2007; Doumas & Haustveit, 2008). Further, the best predictor of alcohol use among athletes is perceived peer alcohol use (Hummer, LaBrie, & Lac, 2009). Overall, these findings suggest student athletes may drink in order to match their perceptions of peer alcohol consumption. Thus, providing accurate feedback to student athletes regarding peer drinking may result in a downward adjustment in perceptions of peer drinking and a subsequent reduction in alcohol use.

A growing body of literature suggests that providing accurate drinking norms to student athletes is related to a reduction in drinking. Specifically, personalized normative feedback (PNF) interventions based on social norming theory are effective in reducing risk factors for alcohol use (Fearnow-Kenney et al., 2016) and alcohol use among intercollegiate student athletes (Doumas & Haustveit, 2008; Doumas, Haustveit, & Coll, 2010; LaBrie, Hummer, Huchting, & Neighbors, 2009; Martens, Kilmer, Beck, & Zamaboanga, 2010). Despite these findings, no research to date has specifically examined PNF with high school athletes, despite evidence suggesting efficacy with intercollegiate student athletes. Further, research demonstrates that drinking risk status is a moderator of intervention effects such that reductions in alcohol use are greater for student athletes who report high-risk drinking (Doumas & Haustveit, 2008; Doumas et al., 2010). One explanation for this finding is that adolescents select peers with similar drinking habits (Urberg, Luo, Pilgrim, & Degirmencioglu, 2003) and greater peer group substance use predicts greater overall alcohol use (Cruz, Emery, & Turkheimer 2012). Thus, high-risk drinkers are likely to associate with other student athletes who are drinking in similar ways. Further, high-risk drinkers are likely to over-estimate the alcohol use of typical students, as well as student athletes in general. The discrepancy between perceived norms and normative data is likely larger for high-risk athletes than low-risk athletes, leading to greater reductions in drinking among this group.

**The eCHECKUP TO GO**

The eCHECKUP TO GO (San Diego State University Research Foundation, n.d.) is a brief, web-based PNF intervention designed to reduce alcohol use and enhance protective behaviors aimed at reducing alcohol-related harm. The eCHECKUP TO GO has been identified as a highly effective, low cost alcohol intervention by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) *CollegeAIM* Alcohol Intervention Matrix (National Institute on Alcohol Abuse and Alcoholism, 2015). The program includes standardized alcohol screening instruments and provides personalized normative feedback aimed at reducing risk factors for alcohol use and increasing protective behavioral strategies. The eCHECKUP TO GO program is brief, can be disseminated to large groups of students within one class period, and is inexpensive ($1075 per year for unlimited use). Research supports the efficacy of the eCHECKUP TO GO intervention with first year intercollegiate athletes (Doumas et al., 2010). Specifically, findings indicate that among student athletes classified as high-risk drinkers (i.e., reporting binge drinking at baseline), those in the intervention group reported significantly greater reductions in weekly drinking quantity and peak drinking quantity compared to those in the control group from baseline to a 3-month follow-up.

Although originally developed for college students, researchers have identified the eCHECKUP TO GO as a promising school-based intervention for high school students (Doumas & Esp, 2019; Doumas, Esp, Flay, & Bond, 2017; Doumas, Esp, Turrisi, Hausheer, & Cuffee, 2014; Doumas, Esp, Johnson, Trull, & Shearer, 2017; Authors, in press). Findings from an initial randomized controlled trial examining the efficacy of the eCHECKUP TO GO with ninth grade students indicate students completing the program reported a reduction in risk factors for alcohol use, frequency of drinking alcohol, and alcohol-related negative consequences compared to students in a comparison group from baseline to a 3-month follow-up (Doumas et al., 2014). Research specific to high school seniors indicates that relative to an assessment-only control group, students participating in the eCHECKUP TO GO intervention reported a reduction in risk factors for alcohol use (Doumas, Esp, Johnson et al., 2017) and alcohol use (Authors, in press; Doumas, Esp, Flay, & Bond, 2017) from baseline to a 6-week follow-up, and alcohol-related consequences from baseline to a 6-month follow-up (Doumas & Esp, 2019). Similar to the literature on college athletes, intervention effects were moderated by drinker risk status, with high-risk student athletes reporting the greatest reductions in alcohol use (Authors, in press; Doumas, Esp, Flay, & Bond, 2017) and alcohol-related consequences (Doumas & Esp, 2019). To date, however, the efficacy of the eCHECKUP TO GO intervention has not been examined for high school athletes.

**The Current Study**

Although high school student athletes have been identified as a high-risk population for heavy drinking (Diehl et al., 2012; Kwan et al., 2014; Lisha & Sussman, 2010) and research indicates brief interventions using personalized normative feedback are effective in reducing drinking among intercollegiate athletes (Doumas & Haustveit, 2008; Doumas et al., 2010; LaBrie et al., 2009; Martens et al., 2010) and high school students (Authors, in press; Doumas, Esp, Flay, & Bond, 2017; Doumas et al., 2014), we could find no published studies evaluating PNF programs with high school athletes. Several reviews of the literature on high school athlete student drinking indicate that there is a need for research examining interventions aimed at reducing alcohol use among high school student athletes (Diehl et al., 2012; Kwan et al., 2014; Lisha & Sussman, 2010). Additionally, research indicates alcohol use among student athletes escalates through high school (Fredricks & Eccles, 2006; Hoffman, 2006; Lischa et al., 2014; Mays et al., 2010; Wichstrøm & Wichstrøm, 2009), pointing to the importance of examining the efficacy of alcohol interventions for student athletes in their senior year of high school.

The aim of the current study is to address this gap in the literature by examining the efficacy of a web-based PNF program in reducing heavy drinking in high school athletes in their senior year. Because there is some evidence that the eCHECKUP TO GO is more efficacious for high school students (Authors, in press; Doumas & Esp, 2019; Doumas, Esp, Flay, & Bond, 2017) and intercollegiate athletes (Doumas et al., 2010) who are high-risk drinkers, we also examined drinking status as a moderator of intervention effects. We hypothesized that student athletes in the intervention group would report greater reductions in alcohol use (i.e., frequency, quantity) relative to those in the assessment-only control group and that intervention effects would be moderated by drinking risk status such that high-risk athletes in the intervention group would report the largest reductions in alcohol use.

## Method

### Participants

Participants in this study were high school senior athletes recruited from two high schools in the Northwest. Parents of all seniors ($N = 832$) were mailed consent forms. A total of 389 (47%) parents provided written consent. Among students with parental consent, those who were present during the baseline assessment ($n = 360$) were given an opportunity to participate in the study. Among these, 174 (48.9% female, 51.1% male) provided assent and answered "yes" to the question: Do you play a high school sport?" Random assignment of class periods resulted in 54.0% ($n = 94$) of students assigned to the intervention group and 46.0% ($n = 80$) to the control group. All the students assigned to the intervention group who assented to participate in the study completed the intervention. Participant ages ranged from 15 to 18 ($M = 17.14$, $SD = 0.45$). Participants were primarily Caucasian (83.2%), with 5.2% Hispanic, 4.0% Asian, 2.3% African-American, 1.7% American Indian/Alaskan Native, 3.5% other. For sport played, 25.9% reported track ($n = 45$), 16.7% soccer ($n = 29$), 12.1% cross country ($n = 21$), 11.5% football ($n = 20$); 11.5% basketball ($n = 20$), 10.3% baseball/softball ($n = 18$), 8.6% lacrosse ($n = 15$), 6.9% swimming ($n = 12$), 6.3% tennis ($n = 11$), 5.2% volleyball ($n = 9$), 3.4% ultimate Frisbee ($n = 6$), 2.3% wrestling ($n = 4$), 2.3% golf ($n = 4$), 2.3% ski racing ($n = 4$), 2.3% cheerleading ($n = 4$), 1.7% hockey ($n = 3$), and 4.6% other ($n = 8$); 26.7% of students reported playing 2 different sports and 4.8% reported playing 3 different sports.

### Measures

*Alcohol Use.* Recommendations by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) include assessing alcohol use with at least three measures of consumption covering quantity, heavy use, and frequency (NIAAA, 2003). We included three measures of alcohol use typically used in high school intervention studies: weekly drinking quantity, peak drinking quantity, and frequency of alcohol use. A drink was defined as "a 12-ounce can or bottle of beer, a 4-ounce glass of wine, or a shot of distilled spirits or a shot in a mixed drink".

Typical weekly drinking was assessed using the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) in which participants were asked, "Given that it is a typical week, please write the number of drinks you probably would have each day." A response scale is provided for each day of the week (e.g., Monday__, Tuesday__, etc.). Weekly drinking was calculated by combining the reports for the seven days of the week. Peak drinking and drinking frequency were assessed using the Quantity/Frequency/Peak Questionnaire (QFP; Dimeff, Baer, Kivlahan, & Marlatt, 1999; Marlatt et al., 1998). Peak drinking quantity was assessed with the question "What is the most number of drinks that you have consumed on any given night in the past month?" Frequency of alcohol use was assessed using the question "How often do you use alcohol" with responses provided on an 8-point Likert scale with options ranging from "0" to "7" ("Every day" to "Do not drink alcohol"). High scores represent lower frequency of alcohol use.

*Classification of High-Risk vs. Low-Risk Drinkers.* We also asked participants to report on binge drinking. Binge drinking was defined as having 5 or more drinks in a row for males and 3 or more for females in the past 2 weeks based on research establishing cut-points for children and adolescents (Donovan, 2009). Using this measure, 28.2% of the participants were classified as high-risk drinkers (27.5% in the intervention group; 28.7% of the assessment-only control group) and 71.8% were classified as low-risk drinkers.

### The eCHECKUP TO GO

The eCHECKUP TO GO is a 30-minute PNF intervention available through the San Diego State University Research Foundation (http://www.echeckuptogo.com/). The program is customized for the participating high school, including providing normative data for the specific high school, referrals to the school counselor and for the local community, and designing the website using school colors and logos. The program consists of an online assessment module followed by a personalized feedback module. The online assessment module includes questions regarding basic demographic information and information on alcohol consumption, drinking behavior, alcohol-related consequences, and beliefs about alcohol. Once all questions are completed, personalized feedback is given to participants via text, graphs, and video recordings embedded in the program. Individualized feedback is provided in the following domains: graphical depictions of quantity and frequency of drinking, estimated risk-status for negative consequences associated with drinking, genetic risk, tolerance, approximate financial cost of drinking in the past year, and normative feedback comparing one's own drinking to peer drinking. The feedback section also includes the student's responses and correct

answers to a "quiz" on physical performance and a list of goals generated from the assessment questions and ways to meet those goals. The program assesses student willingness to use several protective behavioral strategies followed by a list of strategies the student selected that can be used as steps to change drinking behavior.

## Procedure

A member of the research team contacted two high school principals to invite participation in the study. The two schools are located in a metropolitan region in the Northwest, graduation rates range from 96-99%, and approximately 30% of the student body qualifies for free or reduced lunch. Parents of all seniors were contacted as the study procedures were implemented during a common course for high school seniors. Additionally, the School District Research Board required parental consent for students regardless of age. The school contacted parents of all seniors via letter by mail at their addresses provided by the registrar's office. The letter contained a parental consent form and a project-addressed, stamped envolope. Parents were asked to return signed consent forms indicating permission for their adolescent to participate in the study. In addition, a phone number and email address for the research team were provided so parents could ask questions prior to signing the consent form. Reminder letters were sent to the student's home address and with the student. Participants who received parental consent were asked to assent prior to participating in the baseline survey.

A member of the research team recruited students during a common core class period. Class periods were randomly assigned to the intervention or an assessment-only control group using a computer-generated random numbers table. Students with parental consent met at the school's computer lab to participate in the study. A member of the research team and a school counselor described the research study and invited the students to participate. Students who agreed to participate were given a unique personal identification number (PIN) to maintain confidentiality and a URL to access the baseline survey. Students then logged onto the survey website where they read a welcome screen explaining the research and were asked for their assent to participate. Once students gave assent by clicking "Agree," they were taken to a screen that asked them to enter their PIN and were then directed to begin the baseline survey, which took approximately 20 minutes to complete. Students who did not have parental consent or who did not provide assent remained in their classroom with their teacher and completed an alternative exercise. Students in the intervention group completed the online intervention program immediately after completing the baseline survey. A member of the research team read a script to the participants to ensure standardized delivery of the study procedures. Research team members were present to assist participants and serve as monitors, ensuring participants complete the program, kept their eyes on their own screens, were engaged in the program, and that there was no discussion among participants. All participants who completed the baseline survey were invited to participate in a 6-week follow-up survey. All study procedures were approved by the University Institutional Review Board and the School District Research Board.

## Statistical Analyses

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). We examined differences on demographic and outcome variables between the two study conditions at baseline. We assessed the importance of incorporating random effects (i.e., participants nested within school and within period) using $AIC_C$ (Burnham & Anderson, 2002) under the restricted maximum likelihood algorithm (REML). We examined the intraclass correlations (ICCs) to evaluate the degree of non-independence among students within school and within period. The ICCs for both within school and within classroom ranged from .01 - .09 and .04 - .06, respectively, compared to a within student ICC of .56. Due to the small proportion of variance at the school and classroom level, we determined inclusion of these random effects unnecessary. We fit study outcomes with a repeated measures multivariate analysis of variance (MANOVA) with group (intervention; control) and risk-status (low; high) as grouping factors and time (baseline; follow-up) as the within factor. Correlations among the outcomes variables at baseline are reported in Table 1. We conducted post hoc univariate analyses of variance (ANOVAs) to examine the significant effects and post hoc Tukey's Honest Significant Difference (HSD) tests to examine mean differences in the change from baseline to follow-up for the significant outcome variables. Analyses were considered significant at $p < .05$. The authors used partial eta squared ($\eta^2_p$) as the measure of effect size with the magnitude as follows: small ($\eta^2_p \geq .01$), medium ($\eta^2_p \geq .06$), large ($\eta^2_p \geq .14$) (Cohen, 1969; Richardson, 2011). All analyses were conducted in SPSS version 24.0.

## Results

### Preliminary Analyses

Means and standard deviations for each of the outcome variables at baseline and the 6-week follow-up are shown in Table 2. Results of a MANOVA revealed no baseline differences in drinking variables (i.e., weekly drinking quantity, peak drinking quantity, and frequency of alcohol use) between the intervention and control groups, Wilks' Lambda = .99, $F(3, 169) = 0.65$, $p = .59$, $\eta^2_p = .01$. We also examined differences on demographic variables between the two study conditions at baseline. Analyses revealed no differences in age, $t(172) = 0.17$, $p = .87$, gender, $\chi^2(1) = 3.42$, $p = .06$, or ethnicity, $\chi^2(5) = 5.31$, $p = .38$, between the two groups.

Overall, 77.0% ($n = 134$) of the 174 participants participated in the 6-week follow-up. For the final sample, 55.2% ($n = 74$) were in the intervention group and 44.8% ($n = 60$) were in the assessment-only control group. There were no differences in attrition between the two groups, $\chi^2(1) = 0.34$, $p = .56$. Additionally, there were no differences in age, $t(172) = 1.10$, $p = .28$, ethnicity, $\chi^2(5) = 3.45$, $p = .63$, weekly drinking quantity, $t(172) = -0.09$, $p = .93$, peek drinking quantity, $t(172) = -0.70$, $p = .49$, or frequency of alcohol use, $t(172) = -0.90$, $p = .37$, between those who completed both assessments and those who completed the baseline assessment only. We did, however, find a significant difference in attrition for gender, $\chi^2(1) = 3.87$, $p = .05$, with a higher rate of attrition for females (29.4%) than males (16.9%).

### Changes in Alcohol Use by Intervention Group and Drinker Risk Status

Results of the repeated measures MANOVA revealed a significant main effect for the time x group interaction, Wilks' Lambda = .93, $F(3, 128) = 3.02$, $p = .03$, $\eta^2_p = .07$, and the time x group x risk-status interaction, Wilks' Lambda = .93, $F(3, 128) = 3.13$, $p = .03$, $\eta^2_p = .07$. Post-hoc analyses indicated a significant interaction effect for time x group x risk status interaction for weekly drinking quantity, $F(1, 130) = 6.32$, $p = .01$, $\eta^2_p = .05$, and peak drinking quantity, $F(1, 130) = 5.35$, $p = .02$, $\eta^2_p = .04$. As predicted, intervention effects were moderated by risk-status, such that the greatest reductions in weekly drinking quantity and peak drinking quantity were reported by high-risk students in the intervention group. Post-hoc analyses, however, indicated no significant effects for frequency of alcohol use. Examination of the slopes in Figure 1 indicates that among high-risk drinkers, those in the intervention group reported a significantly greater reduction in weekly drinking quantity compared to students in the control group ($p < .02$). Slopes for the low-risk drinkers, however, indicate no differences between the intervention and control groups ($p = 1.00$). Similarly, examination of the slopes in Figure 2 indicates that among high-risk drinkers, those in the intervention group reported a significantly greater reduction in peak drinking quantity compared to students in the control group ($p < .001$). Slopes for the low-risk drinkers, however, indicate no differences between the intervention and control groups ($p = .93$).

## Discussion

The aim of this study was to evaluate the efficacy of a web-based PNF intervention, eCHECKUP TO GO, in reducing alcohol use among high school athletes in their senior year. Research indicates high school athletes are a high-risk group for alcohol use (Diehl et al., 2012; Kwan et al., 2014; Lisha & Sussman, 2010). This is particularly true for seniors, as athlete alcohol use escalates throughout high school (Fredricks & Eccles, 2006; Hoffman, 2006; Lischa et al., 2014; Mays et al., 2010; Wichstrøm & Wichstrøm, 2009). Although research indicates the eCHECKUP TO GO is effective in reducing alcohol use among intercollegiate athletes (Doumas et al., 2010) and high school seniors (Authors, in press; Doumas, Esp, Flay, & Bond, 2017), this is the first study to examine the efficacy of the eCHECKUP TO GO for high school athletes. Findings from this study are consistent with the social norming theory (Perkins, 2002), providing support for efficacy of a PNF intervention with high school student athletes in their senior year. Thus, this study adds to the literature by providing support for the efficacy of the eCHECKUP TO GO for this high-risk population.

Results of this study indicate student athletes in the intervention group reported greater reductions in quantity of alcohol use than those in the control group and that intervention effects were moderated by drinker risk status. For weekly drinking quantity, high-risk drinkers in the intervention group reported a 13.8% reduction in weekly drinking quantity, whereas those in the control group reported a 25.9% increase. Similarly, for peak drinking quantity, high-risk drinkers in the intervention group reported a 17.2% reduction in peak drinking quantity compared to a 10.7%

increase in the control group. This pattern of findings is consistent with collegiate athlete research indicating a 46% and 32% reduction in weekly drinking and peak drinking among high-risk athletes in the intervention group, compared to increases of 21% and 11% in the control group (Doumas et al., 2010). Results also parallel findings from research with high school seniors indicating a 15% reduction in weekly drinking among high-risk seniors in the intervention group relative to a 37% increase in the control group (Doumas, Esp, Flay, & Bond, 2017). Thus, in the absence of an intervention, it appears that natural trajectory is for students to increase their quantity of alcohol use as the semester progresses. In contrast, we did not find any significant intervention effects for frequency of alcohol use. Thus, although results support the efficacy of the eCHECKUP TO GO in reducing the quantity of weekly alcohol use and peak alcohol use, there were no differences in how often students consumed alcohol between the intervention and control groups.

Findings from this study are consistent with research indicating that web-based PNF programs are effective in reducing alcohol use among intercollegiate athletes (Doumas & Haustveit, 2008; Doumas et al., 2010; LaBrie et al., 2009; Martens et al., 2010) and high school seniors (Authors, in press; Doumas, Esp, Flay, & Bond, 2017). In addition, the finding that the intervention was effective for student athletes classified as high-risk drinkers parallels research for both intercollegiate student athletes (Doumas & Haustveit, 2008; Doumas et al., 2010) and high school seniors (Doumas & Esp, 2019; Doumas, Esp, Flay, & Bond, 2017). Additionally, although we did not find significant effects for frequency of alcohol use, other research provides some evidence that the eCHECKUP TO GO is effective in reducing drinking frequency among intercollegiate athletes (Doumas et al., 2010) and high school students (Doumas, Esp, Flay, & Bond, 2017; Doumas et al., 2014). It is possible that follow-up timeframe may partially explain the discrepancy in findings between quantity and frequency of use. Although the quantity questions in this study ask students about typical weekly drinking quantity and peak alcohol use in the past month, the frequency question contains choices such as "less than once a year." Thus, this frequency measure may not be capturing short-term changes in frequency of alcohol use. In contrast, the frequency of use measure used in Doumas et al. (2010) and Doumas, Esp, Flay, & Bond (2017) assessed frequency of drinking to intoxication in the past month. Further, although Doumas et al. (2014) used the same frequency of alcohol use measure used in this study, the timeframe between baseline and follow-up was longer (i.e., 3-months).

## Limitations and Future Directions

Although this study adds to the literature by providing evidence for the efficacy of the eCHECKUP TO GO intervention for decreasing alcohol use in high-risk student athletes, several limitations deserve note. First, due to a primarily Caucasian sample from the Northwest region, generalizability is limited. Additionally, although participants were recruited from two high schools, the sample was relatively small. Future research with larger, more diverse samples is needed to increase the generalizability of the findings. Further, the duration of the follow-up was relatively short. Future research should examine intervention effects for longer periods of time to assess whether or not findings are sustained throughout the academic year. A longer term follow-up would also allow for the examination of alcohol-related consequences, including academic, socio-emotional, cognitive, and physical consequences associated with alcohol use. Research suggests that reductions in alcohol-related consequences may occur subsequently to reductions in alcohol use, thereby requiring a longer follow-up period to capture intervention effects for alcohol-related consequences (Doumas & Esp, 2019).

Next, although school-specific norms were used as the personalized normative feedback in this study, research suggests that athlete drinking is influenced more by athlete norms than typical student norms (Dams-O'Connor et al., 2007). According to social norming theory, perceived drinking norms for more proximal groups are more predictive of drinking behavior than perceived norms for more distal groups (Baer, Stacy, & Larimer, 2001). Thus, future research should examine whether or not changes in drinking are greater if the normative feedback presented provides information about athlete drinking norms rather than typical student drinking norms. It is possible that using athlete specific normative feedback might produce larger intervention effects than using typical student normative data. Further, it would be interesting to examine the changes in perceptions of peer alcohol, including both typical student alcohol use and athlete specific alcohol use, as mediators of intervention effects. Other potential mediators include alcohol-related cognitions (e.g., beliefs about alcohol and positive alcohol expectancies) and protective behavioral strategies used to minimize harm associated with drinking.

Finally, research indicates there are differences in drinking patterns during the in-season and off-season, (Mastroleo, Barnett, & Bowers, 2019; Martens, Dams-O'Connor, & Duffy-Paiement, 2006) and across sports (Martens, Watson, & Beck, 2006). Thus, in-season vs off-season might be an interesting moderator of intervention effects. 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 status at the time of assessment (e.g., Mastroleo et al., 2019). Further, 31.5% of student athletes in this study reported playing two or three sports, further complicating our ability to classify students as in-season vs off-season. Future studies with larger samples should examine whether or not there are differences in intervention efficacy in-season and off-season and for athletes participating in different sports.

### Implications for Sport Psychologists

Results of this study have important implications for intervention efforts aimed at reducing alcohol use among high school student athletes. First, 28.2% of this sample were classified as high-risk drinkers, indicating nearly one third of the student athletes in this sample reported binge drinking at least once in the month prior to the baseline survey. Additionally, student athletes in the control group actually increased their weekly drinking quantity drinking over the course of the fall term. Thus, athletic staff, school personnel, and school psychologists need to be careful not to minimize drinking as "typical athlete drinking," but to recognize that alcohol use may increase as the academic year progresses. This may be especially true for seniors as research suggests that alcohol increases during the final year of high school (Johnston et al., 2019). It may be the eCHECKUP TO GO acts as a protective intervention limiting increases in drinking behaviors when presented to student athletes early in their senior year of high school. Similar findings have been reported for first-year college students who played a sport in high school who received a normative feedback intervention in the first semester of college (Turrisi et al., 2009). The implications of an intervention that can both reduce drinking, as well as protect students from increases in alcohol use, may be an important tool for sport psychologists to reduce long-term harm associated with increased drinking behaviors.

The eCHECKUP TO GO may be used as a general intervention program for student athletes as described in this study. The eCHECKUP TO GO may also be used with athletes outside of the school setting. Sport psychologists may use web-based PNF programs such as the eCHECKUP TO GO with their individual clients. Although athletes may be hesitant to report alcohol-related issues to coaches, advisors, or their psychologist, they may be more willing to complete an online program in between counseling sessions (Doumas et al., 2010). Research suggests when being asked personal health related questions individuals are more likely to disclose more accurately via computerized surveys compared to an in-person assessment (Rischman, Kiesler, Weisband, & Drasgow, 1999). When being asked about sensitive topics (e.g., drinking), the potential of minimizing concerns can occur when reporting information directly to a person in order to avoid embarrassment or repercussions (Tourangeau & Yan, 2007). The anonymity of an online assessment may lead to more honest disclosure of sensitive information as anonymity reduces concerns about being judged (Joinson, 1999). After completing the eCHECKUP TO GO intervention online, athletes can bring their feedback or can log into the eCHECKUP TO GO during their therapy session to review the feedback with their psychologist. The psychologist can then use the feedback as a guide to discuss alcohol use, risk factors, protective behaviors, and other harm reduction approaches to assist athletes in making decisions around alcohol use that align with their academic and athletic goals.

### Conclusion

High school student athletes remain a high-risk population for alcohol use, with alcohol use escalating throughout the high school years. Although research has demonstrated that PNF programs are effective in decreasing alcohol use among intercollegiate athletes (Doumas & Haustveit, 2008; Doumas et al., 2010; LaBrie et al., 2009; Martens et al., 2010) and high school seniors (Authors, in press; Doumas, Esp, Flay, & Bond, 2017; Doumas et al., 2014), this is the first study to examine the efficacy of a web-based PNF program for high school athletes in their senior year. Results of this study suggest providing the eCHECKUP TO GO during the senior year is effective for reducing weekly drinking quantity and peak drinking quantity among high school athletes. Implications for sports psychologists include using web-based PNF such as eCHECKUP TO GO either as a school-based intervention or with their individual clients as part of therapy targeting the reduction of alcohol use.

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Table 1

*Bivariate Correlations for Drinking Variables at Baseline*

| Drinking Variable | 1 | 2 | 3 |
|---|---|---|---|
| 1. Weekly drinking quantity | — | | |
| 2. Peak drinking quantity | .73** | — | |
| 3.  Frequency of alcohol use | -.73** | -.72** | — |

*Note*. For frequency of or alcohol use, higher score represent lower frequency of alcohol use.
** *p* < .01.

Table 2

*Differences in Alcohol Use by Study Condition and Risk-Status*

|  |  | Risk-Status | | |
| --- | --- | --- | --- | --- |
|  |  | Low-Risk[a] | High-Risk[b] | Total Sample[c] |
| Outcomes |  | *M (SD)* | *M (SD)* | *M(SD)* |
| **Weekly Drinking Quantity** |  |  |  |  |
| Control | Baseline | 0.36 (0.81) | 6.67 (5.44) | 2.05 (3.99) |
|  | Follow-Up | 0.50 (1.23) | 8.31 (7.01) | 2.58 (5.40) |
| Intervention | Baseline | 0.42 (1.30) | 8.40 (4.50) | 2.58 (4.38) |
|  | Follow-Up | 0.50 (1.54) | 7.25 (4.76) | 2.32 (4.09) |
| **Peak Drinking Quantity** |  |  |  |  |
| Control | Baseline | 0.32 (0.98) | 8.13 (2.58) | 2.40 (3.81) |
|  | Follow-Up | 0.50 (1.15) | 7.25 (5.62) | 2.30 (4.25) |
| Intervention | Baseline | 0.59 (1.13) | 9.00 (3.78) | 2.87 (4.33) |
|  | Follow-Up | 1.09 (2.21) | 6.10 (3. 28) | 2.45 (3.52) |
| **Frequency of Alcohol Use** |  |  |  |  |
| Control | Baseline | 2.27 (1.35) | 5.06 (0.93) | 3.02 (1.76) |
|  | Follow-Up | 2.16 (1.43) | 4.94 (1.24) | 2.90 (1.85) |
| Intervention | Baseline | 2.11 (1.42) | 5.30 (0.80) | 2.97 (1.91) |
|  | Follow-Up | 2.06 (1.41) | 5.10 (0.79) | 2.88 (1.86) |

[a] Control Group *n* = 44; Intervention Group *n* = 54.
[b] Control Group *n* = 16; Intervention Group *n* = 20.
[c] Control Group *n* = 60; Intervention Group *n* = 74.