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Risk for excessive alcohol use and drinking-related problems in college student athletes

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Abstract

There is compelling evidence that college student athletes engage in frequent episodes of heavy drinking and are prone to negative consequences resulting from such use. This study sought to identify risk and protective factors associated with student-athlete drinking and determine if student-athlete risk factors differed from those of non-athletes. Athletes compared to non-athletes reported more exaggerated perceptions of peer heavy drinking and lower sensation seeking and coping and enhancement motives for drinking, suggesting a risk profile distinct from non-athletes. In the overall sample, higher sensation seeking, overestimation of peer heavy drinking, non-use of protective behaviors while drinking, and higher enhancement and coping drinking motives were associated with greater frequency of heavy episodic drinking and more negative drinking consequences. In athletes compared to non-athletes, sensation seeking was more strongly associated with heavy episodic drinking and drinking to cope was more strongly associated with negative alcohol-related consequences. Overall, the results suggest that already proven brief intervention strategies, with minor adaptations related to the roles of sensation seeking and drinking to cope, may be helpful for student athletes.

Keywords

Drinking; alcohol use; college students; athletes; risk factors

1. Introduction

College student athletes consistently report riskier patterns of alcohol use compared to their non-athlete peers (Brenner & Swanik, 2007; Leichliter, Meilman, Presley, & Cashin, 1998; Wechsler, Davenport, Dowdall, Grossman, & Zanakos, 1997; Yusko, Buckman, White, & Pandina, *in press*). The risk for alcohol use-related problems may be exacerbated by the unique social environments, heightened physical and psychological stress, and greater time constraints experienced by student athletes as a result of their dual status as an athlete and a student (Brenner & Swanik, 2007; Martens, Dams-O'Connor, & Beck, 2006; Watson, 2002). Among college students, in general, numerous individual, familial and social risk and protective factors have been identified for excessive or problematic alcohol consumption (Baer, 2002). There is a vast body of literature citing demographic factors, involvement in Greek organizations,

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motivations for drinking, normative beliefs about drinking, mood, and sensation seeking personality traits as being predictive of college student drinking behavior (for review see Baer, 2002; Brennan, Walfish, & AuBuchon, 1986). However, much less research has focused on risk and protective factors specifically associated with heavy drinking among college student athletes. In this study, proximal risk and protective factors related to alcohol use were assessed in undergraduate student athletes and non-athletes. The primary purpose of this paper was to identify significant risk factors associated with student-athlete heavy alcohol use and drinking-related negative consequences and determine if these risk factors differ between student athletes and non-athletes.

In college athlete samples, excessive alcohol use has been related to being male (Leichliter et al., 1998; Wechsler et al., 1997; Yusko et al., *in press*), Caucasian (Anderson, Albrecht, McKeag, Hough, & McGrew, 1991; Leichliter et al., 1998; Overman & Terry, 1991; Wechsler et al., 1997), and involved in a fraternity/sorority (Cashin, Presley, & Meilman, 1998; Wechsler et al., 1997). These same variables have been found to predict higher levels of drinking among college students in general (Baer, 2002). Thus, student athletes appear to parallel non-athlete students in demographic risks, but the similarities between these populations in terms of other well known risk factors is less clear.

In general college populations, stress (Park, Armeli, & Tennen, 2004), anxiety (Kushner & Sher, 1993; Stewart, Zvolensky, & Eifert, 2002), depressed mood (Camatta & Nagoshi, 1995; Weitzman, 2004) and sensation seeking tendencies (Yanovitzky, 2006) have been demonstrated to elevate risk for excessive or problematic alcohol use behaviors. Moreover, elevated levels of negative affect and stress increase college students' coping motivations for drinking (Colder, 2001; Hussong, Galloway, & Feagans, 2005), and using alcohol to cope is related to heavier and more problematic drinking patterns (Cooper, Russell, Skinner, Frone, & Mudar, 1992; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Pritchard, Wilson, & Yamnitz, 2007).

While it can be speculated that student athletes may experience a unique pattern of stress related to the added demands of elevated competition levels and increased athletic expectations (Selby, Weinstein, & Bird, 1990; Watson, 2002; Wilson & Pritchard, 2005), whether and how stress specifically influences student-athlete drinking behaviors has not been well established. Further, limited research has characterized the influence of negative mood states on drinking in student athletes, with only one study identifying a positive relationship between severity of depressive symptoms and student-athlete alcohol use and alcohol-related consequences (Miller, Miller, Verhegge, Linville, & Pumariega, 2002). Student athletes drinking to cope and drinking for enhancement reasons, however, have been strongly related to alcohol use (Martens, Cox, Beck, & Heppner, 2003). For example, Martens et al. (2005) found that drinking to cope with sport-related stress was related to greater negative personal consequences from drinking. In addition, a national study of student athletes reported that social drugs, including alcohol, were primarily used by athletes for recreational purposes or for its pleasurable effects (National Collegiate Athletic Association, 2001). Martens et al. (2005) found that drinking for its positive reinforcing effects was related to both greater alcohol consumption and greater negative personal consequences. Thus, as with non-athlete students (Cooper, 1994; Neighbors et al., 2007), enhancement and coping motivations may act as powerful influences on drinking behaviors in student athletes (Martens, Cox, Beck, & Heppner, 2003).

In some studies, sensation seeking tendencies have been shown to be more pronounced in college athletes compared to non-athletes (Hartman & Rawson, 1992; Schroth, 1995); however, the manner in which sensation seeking impacts alcohol use among student athletes has not been specifically explored. Student athletes have been reported to engage in more risky behaviors, including unprotected sex (Nattiv & Puffer, 1991) and heavy episodic drinking (e.g.,

Brenner & Swanik, 2007; Yusko et al., *in press*) compared to their non-athlete counterparts. Moreover, they may perceive risk for harm to be lower (Wetherill & Fromme, 2007).

Normative beliefs about peer drinking have consistently been found to be related to alcohol use among college students. College students tend to overestimate the amount (Perkins, Haines, & Rice, 2005; Yanovitzky, Stewart, & Lederman, 2006) and frequency (Perkins, Meilman, Leichliter, Cashin, & Presley, 1999) of alcohol typically consumed by their peers. College student athletes similarly tend to view their fellow student athletes, as well as non-athlete peers, as drinking more than themselves (Martens, Dams-O'Connor, Duffy-Paiement, & Gibson, 2006; Thombs, 2000). In fact, student athletes report higher levels of peer drinking and approval for drinking compared to non-athletes and these normative misperceptions mediate the relationship between athletic status and heavy drinking (Turrissi, Mastroleo, Mallett, Larimer, & Kilmer, 2007). Martens, Dams-O'Connor, Duffy-Paiement et al. (2006) found that student athletes estimated average drinking as higher for their non-athlete peers than their fellow athletes (see also Thombs, 2000). However, male student athletes appeared to be more influenced by athlete-specific norms, whereas female student athletes were more heavily influenced by the non-athlete specific norms. Thus, perceptions of peer drinking represent an additional source of risk for excessive or problematic drinking that could differentially impact student athletes compared to non-athletes.

Although substantial evidence suggests that student athletes engage in heavy and frequent problematic alcohol use (Brenner & Swanik, 2007; Hildebrand, Johnson, & Bogle, 2001; Leichliter et al., 1998; Nattiv et al., 1991; Nelson & Wechsler, 2001; Wechsler et al., 1997; Yusko et al., *in press*), many questions related to the risk factors specifically associated with student athlete alcohol use remain unanswered. This study was designed to assess differences in a broad range of potential risk factors in samples of college student athletes and non-athletes and to determine their differential effects on heavy and problem drinking. In line with prior research, being male, white and affiliated with a Greek organization were expected to predict alcohol use in college student athletes and non-athletes. Likewise, higher levels of stress, sensation seeking traits, coping motivations and negative affect, as well as overestimations of peer normative behaviors, were expected to predict excessive and problematic drinking in student athletes and non-athletes.

Few studies to date have directly compared athletes to non-athletes on how these risk factors relate to drinking; nevertheless we tentatively hypothesize that psychosocial risk factors in student athletes will be more predictive of heavy episodic drinking frequency and drinking-related problems compared to non-athletes. Specifically, we expect that coping motivations for drinking will be more strongly related to drinking for athletes than non-athletes. The rationale for this hypothesis is based on the fact that athletes have elevated levels of stress, which may increase their coping expectancies and, thus, their actual drinking to cope with their stress. In addition, based on the positive relationship between sensation seeking, alcohol use, and risky behaviors observed in general college student samples (Johnson & Cropsey, 2000) and given student athletes' tendency to engage in more risky behaviors, we hypothesize that sensation seeking will be more strongly associated with drinking in the student-athlete sample compared to the non-athlete sample. Finally, we hypothesize that student athletes will demonstrate a stronger relationship between their own drinking and their perceived alcohol use by peers compared to non-athletes. This hypothesis is based on the findings of Martens et al. (2006) cited above, as well as recent research by Turrissi et al. (2007) indicating that athletes experience greater connectedness with their peer groups and, thus, their drinking may be more receptive to perceived peer norms. This study adds to the growing body of literature on the substance use behaviors of college student athletes by examining a more comprehensive set of risk factors and comparing athletes to non-athletes. The results of this study should have

implications for the development of preventive interventions that focus on the specific needs of student athletes.

2. Method

2.1. Participants and Procedures

All participants were students recruited from a single large northeastern university during 2005 and 2006. The survey, which took approximately one half hour to complete, was anonymous. The study was approved by the university human subjects committee. Participants were categorized as student athletes or non-athlete students. Only students between 18 and 26 years of age were included in this study.

The student athlete sample was comprised of 392 varsity student athletes from 17 athletic teams. They were recruited during alcohol education seminars run by the university athletic department. University policy dictates that all student athletes must attend this type of seminar, however, participation in the research study was completely voluntary and team coaches were not present. Nevertheless, the participation rate of student athletes was 100%. Those who participated were entered into a lottery to win one of three possible prizes (2 MP3 players and a video game system). The average age of the student-athlete sample was 19.9 (SD = 1.3) years; 82% identified themselves as white (non-Hispanic), 40% were female, and 27% were in their first year of college.

The non-athlete sample included 504 students (who were not student athletes) recruited from introductory psychology (n = 70) or communication classes (n = 452). Participating students either received course credit or were entered into a lottery to win \$50 American Express gift cards or an MP3 player. Eighteen student participants were eliminated from the analyses for being older than 26 years of age or for being student-athletes. The average age of the student sample was 20.0 (SD = 1.4) years; 58% identified themselves as white (non-Hispanic), 63% were female, and 10% were first year students. A more complete description of the demographic characteristics of both samples and greater detail on participant recruitment are reported in Yusko et al. (*in press*).

2.2. Measures

2.2.1. Dependent variables—In the present study, the frequency of heavy episodic drinking occasions during the past year and total number of negative consequences related to alcohol use in the past year were used as the dependent variables. *Frequency of past year heavy episodic drinking* was calculated from a survey item that asked how many times in the past year the participant drank five or more drinks in one sitting for men or four or more drinks in one sitting for women (Wechsler et al., 2002; mean = 25.7, SD = 38.5, range = 0–250). *Alcohol-related problems* were measured using the 18-item version of the Rutgers Alcohol Problem Index, which has demonstrated reliability and validity in studies of adolescents and young adults (White & Labouvie, 1989, 2000). For this study we counted the total number of problems experienced in the last year (mean = 3.2, SD = 3.4, range = 0–17; alpha = 0.77), which has been shown to be a valid and reliable measurement strategy for college students (Martens, Neighbors, Dams-O'Connor, Lee, & Larimer, 2008). Both variables were log transformed due to non-normal distribution patterns.

2.2.2. Demographics—Participants provided information about their *sex* (coded 0 for female, 1 for male) and *ethnicity* (coded 0 for Asian/Pacific Islander, Black, Hispanic/Latino, or Other/Multi-Ethnic and 1 for White/Caucasian). They were also queried about their *school year* (coded 0 for first year student status and 1 for upper class status for confidentiality

purposes) and *membership in a fraternity or sorority* (coded 0 for non-membership and 1 for membership).

2.2.3. Risk and protective factors—We included seven empirically and theoretically supported risk factors in the analyses. *Stress* was measured as in Selby et al. (1990). Eleven items gauged how stressful participants found meeting academic demands, controlling their eating, their social life, having or getting an injury, controlling their weight, general health concerns, maintaining a scholarship (athletic or academic), academic competition, sports competition, and sport participation time demands. For each item, the level of stress was measured on a 5-point Likert scale (“not stressful at all” to “highly stressful”) with an additional category labeled “does not apply”. The two items that asked about “maintaining an academic or athletic scholarship” were combined into a single variable taking the maximum value since only a small percentage of the sample reported scholarships of either type. In addition, the “sports competition” and “time demands” items were excluded because these items did not apply to over 70% of non-athlete students. An average stress score was calculated from the remaining stressors ($\alpha = 0.80$).

Alcohol motivation was measured using the Drinking Motives Measure developed by Cooper (1994). The 20-item measure uses a 5-point Likert scale (from “almost never/never” to “almost always/always”) to assess how often alcohol is used for specific motives. It consists of four subscales (social, coping, enhancement, and conformity), each containing five items. Subscale scores were calculated by averaging the responses to the five items relevant to that scale. Due to time constraints, items associated with the social subscale were not included in the student-athlete survey. The average scores for the coping ($\alpha = 0.89$), enhancement ($\alpha = 0.93$), and conformity ($\alpha = 0.90$) subscales were used in the present analyses.

Peer normative perceptions were measured using two questions concerning an individual’s perception of heavy drinking by other university students and athletes, which were adapted from the Monitoring the Future survey (Johnston, O’Malley, Bachman, & Schulenberg, 2004) and asked using a format adapted from the Drinking Norms Rating Form (Baer, Stacy, & Larimer, 1991). Participants were asked to indicate the percentages of students and student athletes that they believed had at least one occasion of drinking five or more drinks in a row within the last two weeks.

The use of *protective behaviors* when drinking was measured with the Personal Protective Behaviors survey developed by Haines, Barker, and Rice (2006). Students were asked how often they engaged in 10 protective behaviors (e.g., “use a designated driver”, “avoid drinking games”) while drinking and responded on a 5-point Likert scale (ranging from “never” and “always”). An overall score was calculated by averaging each participant’s responses over the ten items ($\alpha = 0.88$).

Sensation seeking personality was assessed using a 9-item scale developed by Schafer, Blanchard, and Fals-Stewart (1994). Students responded to how often they acted or felt like the item (e.g., “act on the spur of the moment without stopping to think,” “get a kick out of doing things that are a little dangerous”) using a 5-point Likert scale (ranging from “never” to “always”). An overall sensation seeking score, calculated by averaging the values of all items, was used in the analyses ($\alpha = 0.90$).

The Profile of Mood States (POMS) Brief Form was used to measure overall *mood* and six subscales each containing five items: *tension-anxiety* ($\alpha = 0.80$), *depression-dejection* ($\alpha = 0.80$), *anger-hostility* ($\alpha = 0.80$), *vigor-activity* ($\alpha = 0.81$), *fatigue-inertia* ($\alpha = 0.81$), and *confusion-bewilderment* ($\alpha = 0.73$) (McNair, Lorr, & Droppleman, 1992). Students were provided with a list of 30 feelings and asked to respond how they feel

right now. Each item was asked on a 5-point Likert scale ranging from “not at all” to “extremely”. Subscales were calculated by averaging the responses to the five items relevant to that scale. The Total Mood Disturbance ($\alpha = 0.59$) score was calculated by summing the values for tension, depression, anger, fatigue, and confusion subscales and then subtracting the value for the vigor subscale as suggested by McNair et al. (1992).

3. Results

3.1. Differences between athlete and non-athlete students on demographics and risk and protective factors

Significantly more student athletes were white, non-Hispanic than non-athletes ($\chi^2 = 54.9$, $df = 1$, $p < .01$). However, these percentages are in line with those expected from NCAA college student athletes (National Collegiate Athletic Association, 2001) and the large minority population enrolled in the university. In addition, the athlete sample was more likely to be male ($\chi^2 = 45.6$, $df = 1$, $p < .01$) and less likely to be affiliated with a Greek organization ($\chi^2 = 29.2$, $df = 1$, $p < .01$) compared to the non-athlete student sample. Student athletes were more likely to be first-year students than non-athletes probably because the classes used for recruiting non-athletes included more upper level students ($\chi^2 = 42.9$, $df = 1$, $p < .01$). To control for the potential confounding effects of these variables, race/ethnicity, sex, and school year were included as covariates in the analyses.

Table 1 presents results of analyses of covariance comparing the student athletes and non-athletes on the risk and protective factors.² Because of the relatively large number of comparisons, a conservative significance level of $p < .01$ was selected. In addition, between-group effect sizes are shown. Student athletes reported significantly lower coping and enhancement motives for drinking, as well as lower sensation seeking tendencies compared to non-athletes. In addition, student athletes compared to non-athletes perceived that a greater percentage of non-athletes had engaged in at least one episode of heavy drinking (> 5 drinks) in the past 2 weeks (Table 1). Paired t-tests indicated that both athletes ($t(386) = 11.89$, $p < .001$) and non-athletes ($t(484) = 9.44$, $p < .001$) perceived non-athletes as being more likely to engage in heavy drinking than athletes. All of these significant differences produced relatively small effect sizes. Small effect sizes were also noted in relation to normative perceptions of athlete drinking as well as anger and depression scores on the mood profile scale. These differences did not achieve statistical significance, but may represent additional subtle differences between student athletes and non-athletes.

Bivariate associations—Table 2 presents a simplified correlation table showing the associations between each of the predictors and the two alcohol use variables for athletes and

²These analyses represent mean scores from all participants, regardless of sex. Because studies in student and athlete samples have found that the risk profiles of men and women may differ (e.g., Wilson et al., 2004; Selby et al., 1990), we also compared the means of each risk factor separately for male non-athletes, male athletes, female non-athletes, and female athletes: stress mean = 2.1, 2.1, 2.5, and 2.4, respectively; coping motives = 1.9, 1.5, 1.7, 1.5; conformity motives = 1.5, 1.4, 1.3, 1.2; enhancement motives = 2.7, 2.6, 2.6, 2.3; normative perceptions (students) = 55.5, 65.6, 56.8, 62.8; normative perceptions (athletes) = 48.5, 55.9, 48.6, 51.2; protective factors = 2.7, 2.5, 2.9, 2.9; sensation seeking = 3.2, 2.9, 3.0, 2.8; anger = 2.8, 2.1, 3.0, 2.2; confusion = 16.8, 17.3, 17.1, 17.8; depression = 2.2, 1.8, 2.6, 1.6; fatigue = 5.3, 6.1, 6.7, 6.9; vigor = 6.2, 6.3, 4.7, 5.6; anxiety = 2.3, 2.8, 2.4, 1.6; total mood disturbance = 23.3, 23.7, 27.1, 24.6.

Analysis of covariance (controlling for race/ethnicity and school year) was used to compare male and female students and male and female athletes, as well as male students to male athletes and female students to female athletes. Male compared to female students reported significantly lower stress, fatigue, and total mood disturbance, used fewer protective behaviors, and had higher sensation seeking and vigor scores (p 's < .01). Male compared to female athletes reported lower stress levels and used fewer protective behaviors, but reported more conformity and enhancement motivations and higher anxiety (p 's < .01). Due to these differences, sex was included as a covariate in all regression analyses. Male athletes compared to male non-athletes reported greater normative perceptions of student heavy drinking and higher anxiety, but lower coping motivations and sensation seeking (p 's < .01). Finally, female athletes compared to female non-athletes reported greater normative perceptions of student heavy drinking and higher anxiety, but lower coping and enhancement motivations for drinking (p 's < .01).

non-athletes. (The full matrix is available from the corresponding author upon request.) These data were used to inform the development of the hierarchical regression analyses described below. Sex and race were highly correlated with the number of heavy drinking episodes in athlete and non-athlete students and negative drinking consequences in student athletes. Greek affiliation was related to the alcohol variables in non-athlete students only, likely due to the low percent of student athletes (3%) who reported membership in a Greek organization. Stress was related to negative drinking consequences, whereas drinking motives, normative perceptions, and sensation seeking were all strongly correlated with heavy episodic drinking and negative consequences in both athletes and non-athletes. The use of protective factors was negatively related to heavy episodic drinking in student athletes only. Negative mood states were more consistently related to negative drinking consequences than heavy drinking in both athletes and non-athletes.

Normative beliefs of athlete and non-athlete heavy drinking episodes were highly correlated ($r = 0.73$, $p < .001$), thus, only perceived norms of non-athlete heavy drinking episodes were included in the regression analyses. Similarly, due to collinearity among the subscales of motivations for drinking, only a single subscale was included in a given model. First, the enhancement motives subscale was included because of its strong correlation to the drinking variables. Then, the coping motives subscale was added to the models in place of the enhancement subscale because the coping subscale also demonstrated strong correlations with the drinking variables. Because the mood subscales were all highly correlated, only the total mood disturbance score from the POMS was used in the regression analyses.

3.2 Risk factors for heavy episodic drinking and alcohol-related problems

Hierarchical regression analyses were used to determine the associations between the risk and protective factors and the drinking variables with demographic variables, including athlete status, added in the first step, risk factors added in the second step, and the interaction of athlete status with the risk factors added in the third step. Separate hierarchical multiple regression analyses were performed for past year heavy episodic drinking frequency and negative consequences from drinking. Athletes reported a significantly greater frequency of heavy episodic drinking in the past year ($M = 30.37$, $SD = 42.57$ versus $M = 22.09$, $SD = 34.63$, $t(848) = -3.13$, $p < .01$) and a similar number of alcohol-related problems ($M = 3.07$, $SD = 3.40$ versus $M = 3.29$, $SD = 3.41$, $t(887) = 0.96$, $n.s.$) compared to their non-athlete peers.³

The five demographic variables were significantly associated with heavy episodic drinking ($R^2 = 0.11$) and sex, race/ethnicity and Greek affiliation were associated with drinking consequences ($R^2 = 0.04$) (Step 1, Table 3 – Table 4, respectively). A greater frequency of heavy drinking episodes was associated with being an athlete, male, white, an upper class person and affiliated with a Greek organization. A greater number of negative consequences from drinking was associated with being male, white, and affiliated with a Greek organization.

When the risk factors (stress, sensation seeking, normative perceptions, enhancement motivations for use, protective behaviors, and total mood disturbance) were included in the second step of the regression analyses, there were statistically significant increases in R^2 for the heavy episodic drinking ($\Delta R = 0.18$, $p < .01$) and the drinking consequences ($\Delta R = 0.29$, $p < .01$) models (Step 2, Table 3 – Table 4, respectively). Higher sensation seeking personality,

³Comparison of means on frequency of heavy episodic drinking in the past year and number of alcohol-related problems separately for male non-athletes (26.8, 3.8, respectively), male athletes (39.5, 3.5, respectively), female non-athletes (19.4, 3.0, respectively), and female athletes (17.4, 2.4, respectively) revealed that male compared to female athletes reported greater frequency of heavy drinking episodes and more drinking-related problems (p 's $< .01$). Male compared to female non-athletes reported greater frequency of heavy drinking episodes and greater drinking-related problems (p 's $< .05$). Male athletes compared to male non-athletes reported significantly more episodes of frequent heavy drinking ($p < .01$), whereas female athletes did not differ in their drinking behaviors compared to female non-athletes.

overestimating normative heavy drinking behaviors, endorsing a greater number of enhancement reasons for drinking and employing fewer protective behaviors during drinking were significantly associated with a greater frequency of heavy drinking episodes in the overall sample. Higher sensation seeking personality, overestimating normative heavy drinking behaviors, endorsing a greater number of enhancement reasons for drinking, and greater mood disturbance scores were associated with a greater number of reported negative drinking consequences.

When the coping subscale of the drinking motives questionnaire was included in step 2 of the models instead of the enhancement subscale, there were statistically significant increases in R^2 in the heavy episodic drinking ($\Delta R = 0.13$, $p < .01$) and the drinking consequences ($\Delta R = 0.28$, $p < .01$) models. Higher sensation seeking ($\beta = .16$, $p < .001$), normative perceptions ($\beta = .14$, $p < .001$), coping reasons for drinking ($\beta = .25$, $p < .001$), and the use of fewer protective behaviors while drinking ($\beta = -.12$, $p < .001$) were associated with a greater frequency of heavy drinking episodes in the overall sample. Higher sensation seeking ($\beta = .22$, $p < .001$), normative perceptions ($\beta = .07$, $p < .05$), coping reasons for drinking ($\beta = .42$, $p < .001$), and the use of fewer protective behaviors while drinking ($\beta = -.06$, $p < .05$) were also associated with a greater number of reported negative drinking consequences.

When the mean-centered interaction terms between athlete status and risk variables were added to the regression models (that included the enhancement motives subscale), a statistically significant increment in R^2 was observed in the heavy episodic drinking variable model ($\Delta R = 0.017$, $p < .01$), but not the drinking consequences model ($\Delta R = 0.007$, *n.s.*). Athlete status moderated the relationship of sensation seeking to the frequency of heavy drinking episodes (Step 3, Table 3). As indicated by Figure 1, low levels of sensation seeking were not differentially associated with heavy episodic drinking for the two groups, but high levels of sensation seeking were associated with a significantly greater number of heavy drinking episodes among student athletes versus non-athletes.

When the coping subscale of the drinking motives questionnaire was included in step 2 and the athlete by coping interaction was included in step 3 (in place of the enhancement subscale), the increases in R^2 in the heavy episodic drinking ($\Delta R = 0.021$, $p < .01$) and the drinking consequences ($\Delta R = 0.014$, $p < .05$) models were both significant. As above, athlete status moderated the relationship of sensation seeking to the frequency of heavy drinking episodes ($\beta = .14$, $p < .01$). In this model, athlete status also moderated the relationship of coping motivations for drinking to drinking related negative consequences ($\beta = .11$, $p < .01$). Higher levels of coping motives were more strongly related to negative consequences in student athletes compared to non-athletes, whereas low levels were not differentially related for student athletes and non-athletes (Figure 2).

4. Discussion

A major goal of this study was to explore differences between student athletes and non-athletes on a variety of risk and protective factors that are known to be associated with alcohol use in an effort to inform the development and design of alcohol prevention strategies targeting student athletes. Despite a growing body of literature that supports the recognition of college student athletes as an at-risk population for heavy episodic alcohol use and negative consequences from that use, only limited research has explored the personal and psychosocial factors that influence these behaviors in student athletes. The added time demands and physical requirements necessary to play sports and be in school, along with the unique social environments and increased level of responsibility associated with being a collegiate athlete, may strongly influence a student athlete's risk profile for problematic alcohol use. In fact, acute alcohol ingestion has been shown to negatively impact athletic performance with consumption

of any alcohol 24 hours prior to athletic activity significantly reducing aerobic performance and weekly alcohol consumption doubling the rate of injury (O'Brien & Lyons, 2000). Nonetheless, student athletes report considerable alcohol use during their competitive season (Thombs, 2000; Yusko et al., *in press*) and do not appear to view alcohol as a legitimate threat to social, academic, or athletic performance.

In comparison to non-athletes, student athletes overestimated peer heavy alcohol use more, but also reported lower coping and enhancement motives for drinking, and lower sensation seeking traits; however, none of these differences showed large or medium effect sizes. Thus, the risk profile for student athletes appears distinct, albeit subtly, from non-athlete students. Of the risk factors examined in this study, the relationship of sensation seeking to alcohol use most clearly distinguished student athletes from non-athletes. Although the athlete sample reported a significantly lower average sensation seeking score, greater sensation seeking was more highly associated with frequency of heavy drinking episodes in the student athlete sample compared to the non-athlete sample. The lower average sensation seeking score found for athletes in this study may reflect the variety of athletic teams from which the present sample was drawn; higher contact sports are typically higher in sensation seeking (Schroth, 1995) and one large "contact" sports team was not included in the present sample. Nonetheless, the present study extends the commonly observed relationship of sensation seeking to alcohol use outcomes in college students (e.g., Camatta et al., 1995; e.g., Magid, Maclean, & Colder, 2007) to a sample of varsity college athletes. Moreover, it highlights sensation seeking as an area of perhaps greater risk for student athletes.

Coping motivations for drinking also appeared to distinguish student athletes from their non-athlete peers. The association of drinking to cope with drinking consequences appeared somewhat stronger in student athletes versus non-athletes; student athletes who reported coping as a greater motivation for drinking experienced more negative consequences as a result of that drinking. These results are similar to previous findings that indicated that sport-related coping is significantly correlated with alcohol-related personal problems (Martens et al., 2005). In our sample, student athletes were less likely to report drinking to cope or enhance the pleasurable effects of alcohol. While this may suggest weaker drinking motivations to be a protective factor already in place for student athletes in general, those who do drink for coping reasons are at heightened risk for experiencing negative consequences from their drinking. The fact that athletes reported lower scores on all the motivation scales may reflect our use of a general drinking motivation scale rather than one specifically designed to capture student-athlete motivations. Inclusion of items that gauge team activities, celebrations and losses, and teammate-specific pressures among the other motivations may be needed to provide a clearer and more complete view of what drives heavy episodic drinking behaviors as seen in student athletes (Martens et al., 2005).

In general, this study contributes to the literature on student athlete alcohol use by identifying distinct patterns of risk for problematic drinking by student athletes. However, the results should be viewed in relation to potential limitations from the use of retrospective, self-report data that included collection of highly sensitive information with potentially significant negative consequences, particularly for student athletes. As this sample represents one of convenience (due to the recruitment strategies that relied directly on coaches making their players available), and was drawn exclusively from a single northeastern NCAA Division I school, the present findings may not generalize to student athletes in other divisions (Brenner & Swanik, 2007) or at universities in other geographical regions. Men and women were combined in the athlete and non-athlete samples. Although we included sex as a covariate in the analyses, future studies should also consider sex by athlete interactions. Many of the risk factor measures that were included in this study were designed for the general college student body and, thus, may not have fully accounted for athlete-specific risk factors (e.g., specific

types of motivations [Martens et al., 2005]). Also, due to the short length of the survey, several potentially relevant risk factors were not included, thereby limiting our ability to develop a comprehensive risk profile. For example, the social motivations for drinking scale was not examined in the athlete sample; social motivations could represent an additional and important area of risk that should be examined in future studies (Wilson et al., 2004). In addition, the design of this study was cross-sectional. Therefore, temporal relations between risk factors and drinking variables could not be established. Moreover, a measure of current mood, rather than persistent mood, was used in these analyses, which may limit the generalizability and interpretability of the relationship observed between mood disturbance scores and negative consequences of drinking.

Despite these limitations, this is the only identified study to have directly compared student athletes and non-athlete students within the sampling frame of the same university environment on a number of alcohol use outcomes and risk factors. Overall, this research has helped to highlight significant differences and important similarities in several key risk factors associated with alcohol use in a sample of college student athletes and their non-athlete peers. Even though our findings are limited by small effect sizes, they provide preliminary support for using interventions that have proven efficacy with general samples of college students for student athletes, with minor content adjustments being necessary to make the intervention more athlete-specific. In particular, peer normative perceptions and the utilization of drinking-related protective behaviors may be critical targets for intervention with student athletes and non-athletes, while sensation seeking and drinking to cope may be especially relevant targets for intervention with student athletes.

Correction of normative misperceptions has already been identified as an effective component of proven prevention strategies that can affect behavior change in both the general college student body (Neighbors, Lewis, Bergstrom, & Larimer, 2006), as well as in college student athletes (Perkins & Craig, 2006). Therefore, the already supported brief intervention strategies that involve personalized feedback regarding peer norms might be promising interventions with student athletes (Larimer, Cronce, Lee, & Kilmer, 2004; Walters & Neighbors, 2005; White, 2006). The content of this feedback could be adapted for the unique perceptions of a student athlete population by including information on normative drinking behaviors and the frequency of heavy episodic drinking reported by student athletes as well as by non-athletes. In addition, helping student athletes develop protective strategies when drinking, which is often a component of personal feedback interventions, might also reduce problematic drinking (Martens et al., 2004).

Athlete-specific prevention strategies also need to incorporate understanding athlete-specific motivations for drinking and provide student athletes with healthier techniques for coping with academic and sport-specific stress, as well as alternative strategies for meeting sensation seeking needs. Such harm reduction prevention strategies have proven effective in reducing alcohol use and the negative drinking consequences associated with use among college students (Dimeff, Baer, Kivlahan, & Marlatt, 1999). Athlete-specific drinking consequences, such as alcohol-induced injuries, long-term consequences of off-season alcohol use, and other alcohol-related factors that can impair performance and competitiveness, may likewise be addressed using targeted harm reduction techniques. The use of relaxation training, biofeedback or social support as more proactive means of coping may also benefit student athletes who report high coping motivations for drinking (Bowen et al., 2006; Holahan, Moos, Holahan, Cronkite, & Randall, 2004; Wills, 1986).

Based on research showing that alcohol expectancies partially mediate the relationship between sensation seeking and alcohol consumption (Henderson, Goldman, Coover, & Carnevalla, 1994), an expectancy challenge intervention, such as that described by Darkes and Goldman

(1993), may be of potential value for student athletes with high sensation seeking tendencies. The development of more positive expectations about alcohol use has been linked to escalating patterns of heavy drinking in college students (Baer, 2002) and appears to predict patterns of risky alcohol consumption in female college athletes (Zamboanga, Horton, Leitkowski, & Wang, 2006). Thus, it may be possible to partially offset the influence of positive drinking motives on alcohol use outcomes by challenging student-athletes' inaccuracies about what they expect to happen when they use alcohol (i.e. "I will have more fun when I drink"). Taken together, the present findings offer preliminary evidence that a strategy of tailoring and merging existing brief intervention strategies to the specific needs of college athletes may help reduce the high-risk drinking patterns commonly found among student athletes. Future research aimed at exploring a broader array of risk factors, as well as risk factors associated with the use of drugs other than alcohol, is warranted.

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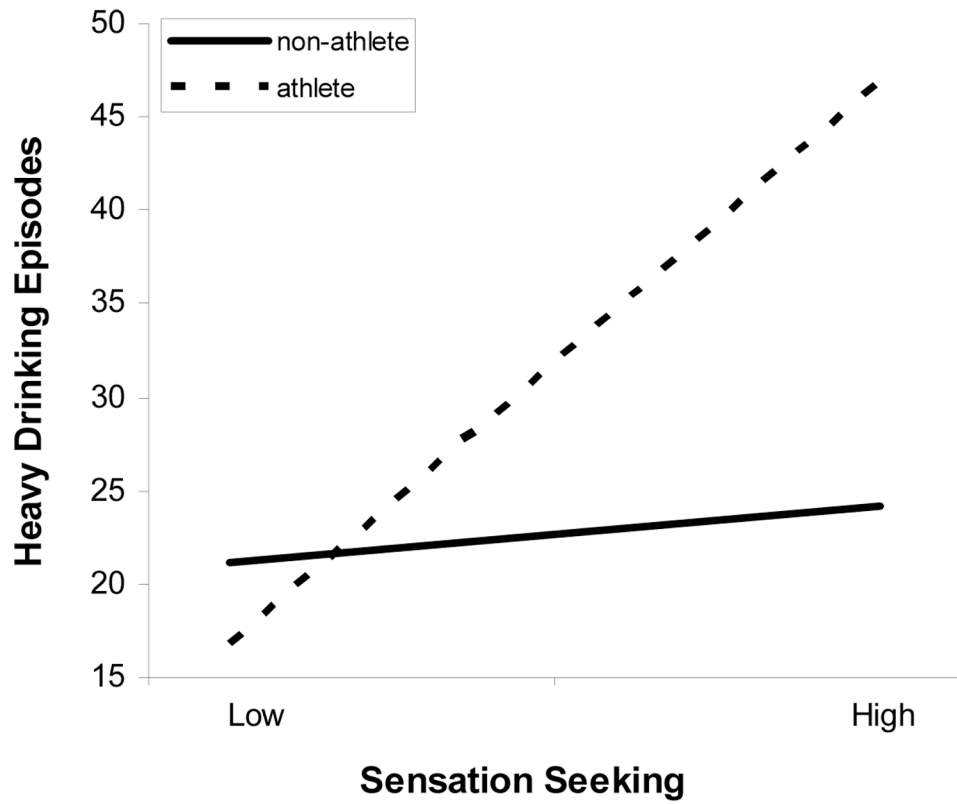


Figure 1. The influence of sensation seeking on frequency of heavy episodic drinking is moderated by student-athlete status.

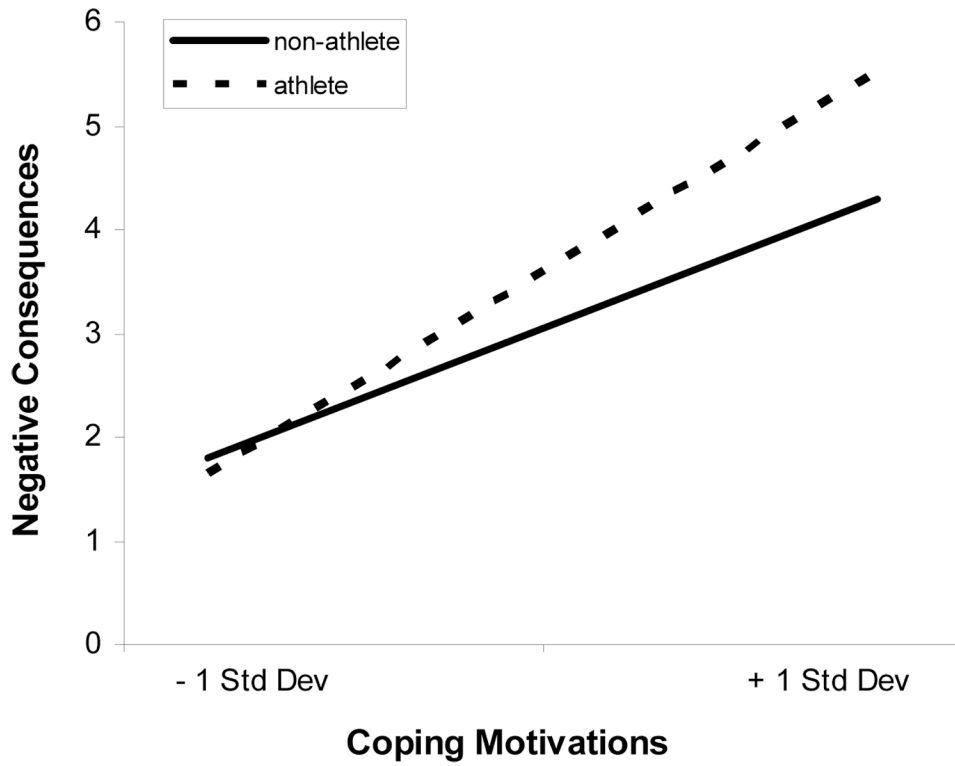


Figure 2. The influence of coping motivations for drinking on negative consequences from drinking is moderated by student-athlete status.

Table 1

Risk factor differences between student athletes and non-athletes, controlling for year in school, sex, and race/ethnicity

Risk Factor (M/SD)	Athletes (N = 392)	Non-athletes (N = 504)	Effect Size ^a
Stress	2.27 ± 0.72	2.35 ± 0.68	0.12
Drinking Motives			
Coping	1.53 ± 0.63 ^{**}	1.84 ± 0.79	0.39
Conformity	1.34 ± 0.53	1.43 ± 0.64	0.14
Enhancement	2.58 ± 1.02 ^{**}	2.72 ± 1.07	0.29
Normative Perceptions			
% Student heavy drinking in past 2 weeks	64.58 ± 22.92 ^{**}	56.41 ± 24.09	0.34
% Athlete heavy drinking in past 2 weeks	54.03 ± 25.55	48.61 ± 25.25	0.21
Protective Factors	2.61 ± 0.95	2.70 ± 0.94	0.10
Sensation Seeking	2.86 ± 0.55 ^{**}	3.05 ± 0.59	0.32
Mood States			
Anger	2.13 ± 3.00	2.89 ± 3.50	0.30
Confusion	17.50 ± 2.66	16.99 ± 3.24	0.17
Depression	1.74 ± 2.96	2.49 ± 3.54	0.23
Fatigue	6.39 ± 4.83	6.18 ± 4.65	0.04
Vigor	6.01 ± 4.33	5.28 ± 4.22	0.17
Anxiety	2.30 ± 3.21	2.38 ± 3.30	0.02
Total Mood Disturbance	24.05 ± 11.09	25.65 ± 11.33	0.14

^a As per Cohen (1988), effect sizes were calculated as the difference between the group means divided by the standard deviation. An effect size of 0.2 was considered small, 0.5 was considered medium, and 0.8 was considered large.

^{**} Note: $p < .01$

Table 2

Correlations of the demographic and risk factors with heavy episodic drinking and negative drinking consequences for athletes and non-athletes

	Athletes (N = 392)		Non-athletes (N = 504)	
	Heavy episodic drinking frequency	Negative drinking consequences	Heavy episodic drinking frequency	Negative drinking consequences
Sex ^a	.29**	.16**	.12**	.11*
Race ^{a, b}	.29**	.20**	.29**	.05
School Year ^{a, c}	.13*	.08	.09	.01
Greek affiliation ^a	-.08	-.05	-.15**	-.15**
Stress	.05	.20**	-.04	.10*
Drinking Motives				
Coping	.36**	.57**	.30**	.45**
Conformity	.22**	.36**	.12**	.27**
Enhancement	.50**	.52**	.40**	.52**
Normative Perceptions				
% Student heavy drinking	.20**	.17**	.21**	.15**
% Athlete heavy drinking	.33**	.25**	.13**	.07
Sensation Seeking	.35**	.42**	.14**	.27**
Protective Factors	-.23**	-.14**	-.11*	-.06
Mood States				
Anger	.09	.16**	-.06	.13**
Confusion	-.09	-.14**	.00	-.14**
Depression	.03	.15**	-.09*	.10*
Fatigue	.16**	.26**	-.00	.12**
Vigor	.10	.07	.02	.01
Anxiety	.13*	.22**	.03	.18**
Total Mood Disturbance	.09	.20**	-.05	.13**

^a Spearman's correlations were performed for all dichotomous variables

^b Coded as white, non-Hispanic versus non-white

^c Coded as first-year students versus upper classperson

* Note: $p < .05$;

** $p < .01$

Table 3
Hierarchical regression for frequency of heavy episodic drinking (N =893)

Variable	<i>B</i>	<i>SE B</i>	β
STEP 1			
Athlete Status	9.29	2.82	0.12**
Sex	-5.90	2.51	-0.08*
Race/Ethnicity ^a	11.30	2.66	0.14**
School year ^b	4.91	1.68	0.10**
Greek affiliation	-11.78	4.25	-0.09**
STEP 2			
Stress	-1.65	2.56	-0.03
Sensation seeking	1.40	2.81	0.02
Perceived norms – heavy drinking	0.16	0.07	0.10*
Enhancement motives	9.89	1.44	0.28**
Protective behaviors	-4.87	2.08	-0.10*
Mood disturbance score	-0.15	0.14	-0.05
STEP 3			
Athlete × Stress	-1.30	3.62	-0.02
Athlete × Sensation seeking	12.24	4.44	0.12**
Athlete × Perceived norms	0.07	0.10	0.03
Athlete × Enhancement motives	4.49	2.33	0.08
Athlete × Protective behaviors	-1.32	3.02	-0.02
Athlete × Mood disturbance	0.05	0.22	0.01

^aCoded as white, non-Hispanic versus non-white

^bCoded as first-year students versus upper class person

* Note: p<.05,

** p<.01

Table 4
Hierarchical regression for frequency of negative consequences (N =893)

Variable	<i>B</i>	<i>SE B</i>	β
STEP 1			
Athlete Status	0.13	0.25	0.02
Sex	-0.47	0.22	-0.07*
Race/Ethnicity ^a	0.26	0.23	0.04
School year ^b	-0.03	0.15	-0.01
Greek affiliation	-0.96	0.37	-0.08**
STEP 2			
Stress	0.15	0.22	0.03
Sensation seeking	0.71	0.24	0.12**
Perceived norms – heavy drinking	0.00	0.01	0.03
Enhancement motives	1.35	0.13	0.43**
Protective behaviors	-0.31	0.18	-0.07
Mood disturbance score	0.03	0.01	0.09*
STEP 3			
Athlete × Stress	0.26	0.32	0.04
Athlete × Sensation seeking	0.73	0.39	0.08
Athlete × Perceived norms	0.01	0.01	0.05
Athlete × Enhancement motives	-0.08	0.20	-0.02
Athlete × Protective behaviors	0.18	0.26	0.03
Athlete × Mood disturbance	-0.01	0.02	-0.01

^aCoded as white, non-Hispanic versus non-white

^bCoded as first-year students versus upper class person

* Note: $p < .05$

** $p < .01$