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Shannon R. Kenney

Loyola Marymount University, shannon.kenney@lmu.edu

Andrew P. Paves

University of Washington

Elizabeth M. Grimaldi

Loyola Marymount University

Joseph W. LaBrie

Loyola Marymount University, jlabbrie@lmu.edu

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Sleep Quality and Alcohol Risk in College Students: Examining the Moderating Effects of Drinking Motives

Shannon R. Kenney¹, Andrew P. Paves², Elizabeth M. Grimaldi¹, and Joseph W. LaBrie¹

¹Department of Psychology, Loyola Marymount University, Los Angeles, California

²Department of Psychology, University of Washington, Seattle, Washington

Abstract

Objective—Sleep problems and alcohol misuse are common issues experienced by college students that can have detrimental effects on overall health. Previous work indicates a strong relationship between poor sleep quality and alcohol risk in this population. This study explored the moderating effect of drinking motives in the relationship between global sleep quality and experience of alcohol-related negative consequences.

Participants—College students ($N = 1,878$) who reported past-month drinking.

Methods—Participants completed online surveys assessing sleep and alcohol-related behaviors.

Results—Poorer sleep quality and higher drinking motives (coping, conformity, and enhancement) predicted greater alcohol-related consequences, controlling for drinking. Further, coping motives moderated the relationship between sleep quality and consequences such that participants reporting poor sleep *and* high coping motives experienced heightened levels of consequences.

Conclusions—These findings advance the understanding of the relationship between sleep problems and alcohol-related risk and provide implications for targeted campus-based health promotion interventions.

Keywords

alcohol; health education

Alcohol misuse is common among U.S. college students. Results from several national studies estimate that approximately 80% of students have used alcohol, and of those students who drink, approximately 40% engage in heavy episodic drinking (4/5+ drinks per occasion for women/men).^{1,2} The risks associated with heavy drinking are well documented. Potentially harmful consequences include poor academic performance, physical or emotional conflicts, and development of future alcohol use disorders.^{1,3-5}

Sleep problems are another prevalent health-risk concern in this population. Overall, sleep duration and quality have gradually declined among college students.^{6,7} Up to 50% of

students report having irregular sleep schedules, later bedtimes, difficulty sleeping, and sleeping fewer hours than their ideal total sleep time, while approximately 60% report poor overall sleep quality.⁷⁻⁹ Like alcohol use, insufficient or poor quality sleep is linked to negative outcomes, including missing or falling asleep during class, failing out of school, falling asleep while driving, and impaired cognitive, motor, and emotional functioning.^{7,10-12} Furthermore, chronic or severe sleep problems may increase risks for later alcohol use disorder.^{13,14}

Sleep and Alcohol Risk

In clinical populations, alcohol dependent individuals exhibit lower quality sleep compared to non-dependent individuals, and sleep problems are found to precede diagnosis of alcohol dependence.^{15,16} Moreover, in longitudinal studies, sleep difficulties in adolescence have predicted earlier onset of alcohol use and experiencing drug related problems in young adulthood.¹⁷⁻²¹ Among college students, individuals reporting poor sleep quality tend to drink more frequently and excessively,²²⁻²⁴ experience more alcohol-related negative consequences,^{7,22, 23} and may be at risk for alcohol dependence.¹⁴

Cognitive impairments resulting from poor sleep (e.g., fatigue, impaired attention and concentration, lowered response inhibition) may result in poor drinking related decisions or failure to utilize protective behaviors.^{20,25} Several studies support that sleep deprivation impairs executive functioning, including problem solving, inhibitory functioning, and divergent thinking capacity.²⁶⁻²⁸ Further, in laboratory studies, alcohol intake is associated with decreased motor response and increased risk-taking behaviors among sleep deficient participants, relative to those participants not deprived of sleep.²⁹ Taken together, evidence suggests that poor sleep may deprive individuals of physical and cognitive resources that offer protection against alcohol consequences, particularly in high-risk drinking contexts.

Drinking Motives

In order to better understand the relationship between poor sleep and alcohol risk, it is important to examine the potential influence of drinking motives, a well-established predictor of alcohol risk. Drinking motives, which refer to reasons for drinking based on one's internal affective states and environmental influences, are consistently linked to alcohol-related problems.³⁰⁻³² Drinking motives are conceptualized along two dimensions: positive reinforcement (i.e., creating or enhancing positive outcomes) or negative reinforcement (i.e., avoiding negative outcomes), and internal rewards (i.e., obtaining a desired affective state) or external rewards (i.e., gaining social approval).^{31,33,34} This framework has been used to differentiate four distinct motives: (1) enhancement (positive reinforcement/internal reward, i.e., drinking to enhance positive affect); (2) social (positive/external, i.e., drinking to be social); (3) coping (negative/internal, i.e., drinking to reduce negative affect; and (4) conformity (negative/external, i.e., drinking to avoid social rejection).

College students most frequently endorse positive reinforcing social and enhancement motives,^{31,35} both of which are associated with increased drinking quantity.^{31,32,35-39} More specifically, social motives are associated with more normative drinking behaviors and not

to problematic use,^{32,40-42} whereas enhancement motives are associated with alcohol consequences, both directly and indirectly through heavier drinking.^{38,43,44} Negative reinforcing motives (coping and conformity) are strong predictors of alcohol-related consequences.^{40,45-47} Yet, of all the drinking motivations, drinking to cope is most consistently predictive of alcohol-related problems, over and above drinking.^{30-32,38,48-51} Drinking to cope is particularly risky because it reflects a deficit in problem-focused coping behaviors in which students use alcohol as a mechanism to temporarily manage or escape negative internal states. Therefore, even though using alcohol as a negative reinforcer fails to effectively resolve problems and heightens risks for experiencing drinking-related consequences, coping motivated drinkers may become dependent on alcohol's short-term excitatory or tension reduction effects. In fact, heavy drinking college students who rely on coping motivated drinking are less likely to transition out of excessive drinking patterns than students who do not drink to cope.⁵²⁻⁵⁴

Drinking Motives as a Moderator of the Sleep-Alcohol Consequences Relationship

Few studies have examined the relationship between sleep quality and drinking motives. In a general sample of college students⁵⁵ and a sample of individuals meeting criteria for Post-Traumatic Stress Disorder,⁵⁶ poor sleep quality predicted greater coping drinking motives. To date however, no known studies have examined the role of drinking motives in the relationship between poor sleep quality and alcohol-related outcomes. This is surprising given that both sleep quality and drinking motives appear to increase risks for alcohol-related consequences. Furthermore, motivations for drinking may be particularly influential for sleep deprived students who may experience impaired physical and executive functioning in high-risk drinking contexts. It has been proposed that these students may lack alternative means for managing affect, as a result.^{8,55} In the current study, we sought to gain a better understanding of potential mechanisms by which sleep problems increase risk for alcohol use. Specifically, we examined the role of drinking motives on this relationship, a well-established predictor of alcohol consequences and correlate of poor sleep quality.

Study Aims and Hypotheses

Given both the prevalence and risk associated with alcohol misuse and poor sleep in university populations, it is important for college health professionals to better understand their co-occurring relationship and factors that may increase risk. The current study examined the potential moderating influence of drinking motives in the relationship between global sleep quality and alcohol-related consequences, over and above drinking, in a sample of college student drinkers. We hypothesized that poor sleep quality, and enhancement, coping, and conformity motives would each be predictive of alcohol-related negative consequences, over and above alcohol consumption. Further, based on existing research, we expected coping motives to moderate the relationship between sleep quality and alcohol risk such that participants reporting poor sleep *and* high coping motivations for drinking would experience greater levels of alcohol-related consequences. Findings aim to provide important implications for college-based health promotion initiatives.

Method

Participants

Data were collected from undergraduate students at two West Coast universities as part of a larger longitudinal intervention study. One university was a large, public university with approximately 30,000 undergraduate students; the other was a mid-sized, private university with total undergraduate enrollment of approximately 5,600. Initially, 6,000 students were randomly selected to participate and received invitations to complete a screening survey via email and standard mail. To ensure completion, potential participants received several reminders from the research team: 5 via email, one postcard via standard mail, and one telephone call. Of those invited, 2,689 (44.8%) completed the screening survey and were compensated with \$15 as well as entry into a prize raffle including two iPods and two \$100 VISA gift cards. Of these participants, 2,044 (76.0%) reported drinking at least one day in the past month. The current sample was comprised of 1,878 participants who reported past month drinking *and* completed all measures used in the current study. All data used in the current study were collected prior to any intervention. The present sample was 62.8% female and reported a mean age of 20.09 years ($SD = 1.37$). The majority of participants were White (62.0%) and the remaining were Asian (15.5%), Black (2.4%), Hawaiian/Pacific Islander (1.6%), Multiracial (10.5%), and other (8.0%). Also, 12.9% reported their ethnicity as Hispanic.

Procedures

The Institutional Review Boards at the participating universities approved the study design and protocol. Recruitment took place in the Fall of 2011. Students received invitations to participate in the study via postal mail and email. Invitations contained the web address to the online survey and also a unique participant identification number. After entering the assigned identification number, the first screen consisted of the study consent forms where students provided consent electronically. Participants were immediately administered the online screening survey.

Measures

Demographics—Participants were asked to provide personal data about their age, gender, race, and ethnicity.

Global sleep quality—Global sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI).⁵⁷ The measure consists of 19 items assessing past month sleep habits including the following components: sleep duration (hours slept per night), sleep disturbance (e.g., waking up in the middle of the night), sleep latency (amount of time it takes to fall asleep), daytime dysfunction (e.g., drowsiness), sleep efficiency (hours spent in bed versus hours actually asleep), use of sleeping medications, and perceived overall sleep quality. The scores were summed to calculate the final global measure score ranging from 0 to 21 ($\alpha = .65$), with higher cumulative scores indicating poorer global sleep quality.^{57,58} The PSQI has demonstrated good criterion validity.⁵⁸⁻⁶⁰

Drinking motives—Motivations for drinking were assessed using the 20-item Drinking Motives Questionnaire (DMQ),³² a well-validated measure of drinking motives.^{32,61} Respondents were asked, “Thinking of the times you drank in the past 30 days, how often would you say that you drank for the following reasons?” Responses were measured on a 5 point Likert scale from 1 (*never*) to 5 (*always*) and four subscales were assessed, each using summed composites: Coping ($\alpha = .87$; e.g., “To forget your worries”), Conformity ($\alpha = .91$; e.g., “To be liked”), Social ($\alpha = .90$; e.g., “Because it helps you enjoy a party”), and Enhancement ($\alpha = .89$; e.g., “Because it’s exciting”).

Alcohol-related consequences—Negative alcohol-related problems experienced in the past three months were measured with a modified Rutgers Alcohol Problems Index (RAPI)⁶². Participants were asked if they had experienced each of 23 specific consequences while drinking or due to alcohol use (e.g., “Had a fight, argument, or bad feelings with a friend,” “went to work or school high or drunk”). Participants rated the frequency in which a consequence occurred in the past 3 months using a 4-point scale ranging from 1 (*never*) to 4 (*more than 10 times*). Summing the number of these specific types of problems encountered yielded an index of consequences, with a range of 0 to 23. The RAPI demonstrated strong inter-item reliability ($\alpha = .90$).

Drinks per week—The Daily Drinking Questionnaire (DDQ)⁶³ was used to assess typical weekly drinking in the previous month. Participants were first provided with the definition of a standard drink (i.e., one half ounce of pure ethyl alcohol, which is contained in one 1.5 ounce shot of 80-proof liquor, one 12-oz beer, or one 4-oz glass of wine), and then instructed to “consider a typical week within the past month” before answering, “How many drinks did you typically consume on a Monday? Tuesday?” and so on. Participants’ open-ended responses across the seven weekdays summed to indicate the total drinks per week variable. The DDQ has demonstrated good test-retest validity⁶⁴ and criterion validity.⁶⁵

Results

Overall, 53.8% of the sample reported poor sleep quality (indicated, per guidelines, by a global sleep quality score greater than 5⁵⁷). On average, males consumed 8.77 ($SD = 10.07$) drinks per week and females consumed 5.09 ($SD = 6.21$) drinks per week. Prior to analyses, we explored the distributional properties of all variables. The alcohol-related consequences and weekly drinks variables were non-normally distributed. Therefore, for these variables, outliers greater than three standard deviations from the mean were set at one unit larger than the next most extreme value.⁶⁶ As shown in the bivariate correlation matrix (Table 1), alcohol-related consequences positively correlated with being male, weekly drinks, poorer sleep quality, and endorsement of each drinking motive subscale. Weekly drinks was positively correlated with being male, White racial status, poorer sleep quality, and coping, social, and enhancement motives. In addition, poorer global sleep quality was positively correlated with being female and higher drinking motives.

Table 2 shows a hierarchical multiple regression model predicting alcohol-related negative consequences by global sleep quality and drinking motives, controlling for drinking. Prior to computing any interaction items, all predictors were standardized to avoid statistical artifacts

associated with multicollinearity, and no issues with tolerance were encountered. Each step added a significant amount of variance (all $ps < .001$). In Step 1, sex, age, and race were included as covariates; in Step 2, weekly drinks was added; global sleep quality was entered in Step 3; drinking motives (social, enhancement, coping, and conformity) were added in Step 4; and in Step 5 the interaction terms Sleep \times Social Motives, Sleep \times Enhancement Motives, Sleep \times Coping Motives, and Sleep \times Conformity Motives were entered. The full model accounted for 40.2% of the variance in alcohol-related consequences. Overall, sex, weekly drinks, global sleep quality, coping motives, conformity motives, enhancement motives, and Sleep \times Coping motives were significant predictors of alcohol-related consequences ($ps < .001$).

Figure 1 demonstrates the interaction between global sleep quality and coping motives. Interactions were graphed according to established guidelines in which the predictor and moderator variables were plotted at one standard deviation below (low) and above (high) the respective mean⁶⁷. Although reporting poorer (as compared to better) sleep quality was associated with greater levels of alcohol-related consequences overall, poor sleep emerged as particularly risky for those reporting high levels of coping motives. Among participants reporting high levels of coping motives, reporting poorer (as compared to better) sleep quality was associated with significantly greater levels of alcohol-related consequences. Simple slope analyses were determined to be significant among participants with high ($t = 9.07, p < .001$) and low ($t = 3.23, p = .001$) levels of coping motives.

Comment

The results from this study support and advance the literature linking sleep and alcohol-related problems in college student populations. Replicating previous studies, poor sleep quality was associated with increased levels of alcohol consequences.^{7,22,25} Moreover, sleep quality was strongly predictive of consequences even when controlling for weekly drinking quantity, a well-established predictor of alcohol risk,^{1,30} thus highlighting its important role in alcohol risk. These findings also shed light on psychosocial factors that may moderate the relationship between sleep quality and alcohol-related problems by examining the intervening role of drinking motives. Not only was poor sleep quality correlated with greater endorsement of drinking motives, but, consistent with hypotheses, greater coping motives exhibited a risk enhancing effect on the relationship between sleep quality and negative consequences. Poorer (as compared to better) sleep quality was associated with a 61.9% increase in experience of alcohol-related negative consequences among participants endorsing high coping motives for drinking, compared to a 29.9% increase in consequences among individuals reporting low coping motives.

The interaction between sleep quality and coping motives highlights potential risks among college student drinkers. Endorsement of inadequate coping strategies appears especially risky for students deprived of sleep who are already susceptible to alcohol-related consequences. In drinking contexts, poor sleep may exacerbate risks associated with coping-motivated drinking by impairing cognitive abilities, motor coordination, and inhibitions toward high-risk behavior.^{29,68} Moreover, over time, the inability of coping-based drinking to effectively resolve problems may, in effect, worsen negative affect.^{38,45} This is a

concerning cycle in which unresolved emotional problems adversely affect one's sleep quality, further increasing dependency on coping-motivated drinking and exposure to high-risk drinking contexts.

Implications

Given the prevalence of sleep problems in college student populations, these findings are potentially valuable for college personnel interested in reducing harms associated with student drinking. In the current study, not only were sleep problems common (53.8% reported poor quality sleep), but poor sleep predicted greater experience of alcohol-related consequences, over and above established predictors of alcohol risk. These findings thus provide strong support for the need for alcohol prevention interventions that include a sleep component in order to address these co-occurring risk behaviors simultaneously. From a treatment perspective, there is evidence that improvement in sleep problems is associated with abstaining or reducing drinking among individuals diagnosed with co-occurring sleep and alcohol use disorders.⁶⁹ Several interventions aimed at college students with sleep disorders have effectively used cognitive behavioral techniques such as sleep restriction therapy, stimulus control, and relaxation techniques to reduce sleep problems.⁷⁰ In addition, simple education in sleep hygiene may result in overall better sleep practices.⁷¹ It may also be advantageous for college personnel to implement general educational interventions about sleep, especially since poor sleep is related to a host of other adverse outcomes (e.g., poor cognitive and motor functionality^{10,11}). Incorporating sleep education into college orientation programming, for instance, may provide incoming students with helpful tools for establishing healthy sleep habits in new residential contexts.

For student drinkers exhibiting sleep problems, problem focused skills training may be particularly valuable. Teaching at-risk students skills that can be used to better manage multiple interpersonal stressors (e.g., relaxation techniques, seeking positive outlets of emotional support) may provide healthy alternatives to high risk coping-motivated drinking. Students presenting at student health centers due to anxiety or stress should be screened for potential sleep and drinking problems as they may be using alcohol as a mechanism to deal with negative affect. Moreover, given their proximity to students, residence hall advisors may be valuable conduits in recognizing students who might be in need of help. Providing residence hall advisors with pamphlets or contact information, or training them to provide students with helpful tips for better sleep and alternative coping behaviors may be beneficial.

In addition to building adaptive lifestyle coping and alternatives to drinking, sleep deprived students may benefit from learning adaptive coping skills that can be utilized in college drinking contexts. Current alcohol harm reduction interventions primarily focus on normative restructuring and social motivations for drinking that may not be suited to this at-risk subpopulation. Rather, tailored interventions that incorporate cognitive behavioral coping skills training to help students avoid risky drinking behaviors and situations appear warranted for sleep deprived students. Alcohol interventions that incorporate coping skills training have been effective in reducing drinking and problems in both adult alcohol⁷²⁻⁷⁴ and adolescent⁷⁵⁻⁷⁷ samples, and thus hold much promise for use on college campuses.

Limitations

This study has several limitations that should be considered when evaluating the findings. For example, this study used a cross-sectional design and thus prevents us from drawing conclusions regarding causal relationships. We cannot state whether poor quality sleep preceded heavy drinking, or if problematic drinking impacted sleep patterns. Although our results may also be subject to errors from self-report data, previous studies have indicated good reliability and validity in assessing alcohol use and sleep.^{24,58} However, it is important to note the borderline internal consistency reliability ($\alpha = .65$) of the PSQI measure. Even though similar alpha levels (e.g., $\alpha = .65$ -.69) have recently been reported for the PSQI in other published studies^{78,79} and an alpha of .65 is considered “minimally acceptable”,⁸⁰ it is nonetheless important to interpret findings with this in mind. Finally, even though high levels of stress are the strongest predictor of poor sleep quality among college students,⁷ no measures of negative affect or stress were included in this study. Future studies should explicate how coping motives and sleep are related to stress or other forms of emotional distress.

Conclusions

There is increased justification to assess sleep as it relates to alcohol use among college students. Recently, studies have demonstrated a growing prevalence of sleep problems among college students, as well as an association between sleep problems and alcohol-related risk.²⁵ The current study expands the understanding of these college student risk behaviors by highlighting the moderating effect of coping motives in the relationship between sleep quality and alcohol-related negative consequences. These findings may be used to design effective interventions targeting college students who exhibit problematic sleep and/or alcohol-related behaviors. College health professionals might consider assessing students' sleep quality, alcohol use, and their reasons for drinking in order to identify at-risk students who may benefit from tailored interventions.

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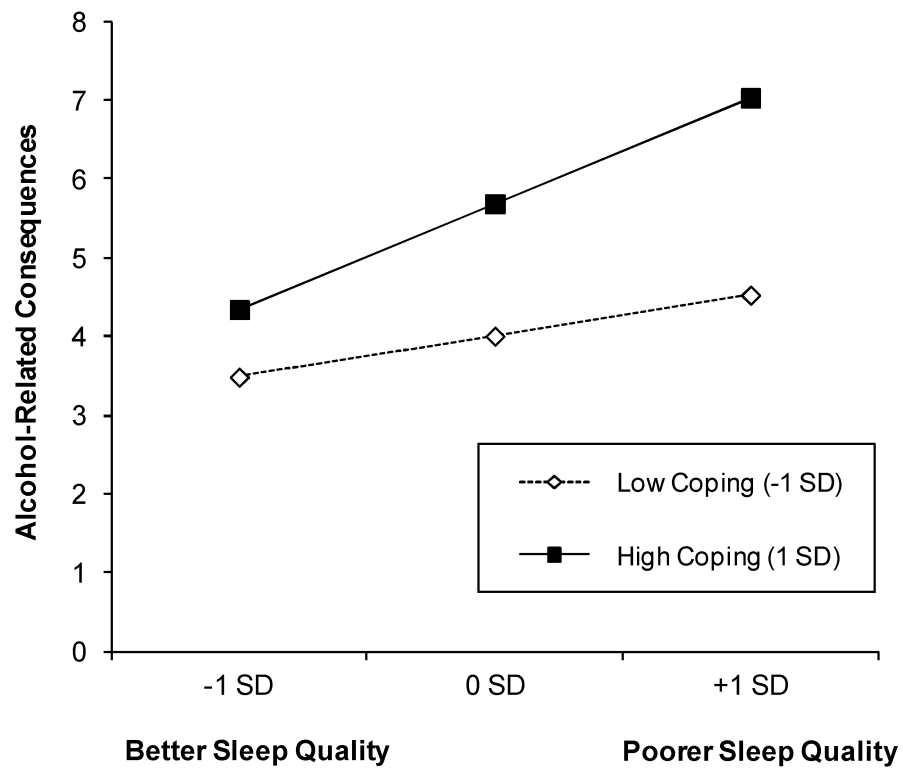


Figure 1. Coping drinking motives x level of sleep quality on experience of alcohol-related negative consequences.

Table 1

Correlation matrix using full sample

Measure	1	2	3	4	5	6	7	8	9
1 Sex (female) ^a	--								
2 Age	-.04	--							
3 Race (White) ^b	-.01	.02	--						
4 Weekly drinks	-.27***	-.03	.12***	--					
5 Alcohol-related consequences	-.10***	-.03	.03	.54***	--				
6 Global sleep quality ^c	.10***	.04	-.01	.07**	.25***	--			
7 Coping drinking motives	.01	-.05*	-.05*	.18***	.33***	.18***	--		
8 Conformity drinking motives	.00	-.01	.10***	.04	.21***	.10***	.39***	--	
9 Social drinking motives	-.05*	-.04	.03	.32***	.27***	.08***	.40***	.24***	--
10 Enhancement drinking motives	-.06**	-.10***	.09***	.41***	.35***	.09***	.37***	.16***	.64***

Note. Typical weekly drinks assessed for past month; alcohol consequences assessed for past three months.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

^aFor Sex, reference level is male.

^bFor Race, reference level is non-White.

^cHigher values denote poorer sleep quality.

Table 2
Hierarchical Multiple Regression Model Predicting Alcohol-Related Consequences by
Sleep Quality and Drinking Motives

Model 1: Predictor	R ²	B	SE	Final β
Step 1:	.01***			
Sex (female=1, male=0)		-.61	.14	-.10***
Age		-.20	.14	-.03
Race (White=1, Non-White=0)		.21	.14	.04
Step 2:	.29***			
Weekly drinks		3.35	.12	.56***
Step 3:	.04***			
Global sleep quality		1.23	.11	.21***
Step 4:	.05***			
Social drinking motives		-.24	.15	-.04
Coping drinking motives		.92	.13	.16***
Conformity drinking motives		.61	.12	.10***
Enhancement drinking motives		.57	.15	.10***
Step 5:	.01***			
Sleep \times Social motives		-.20	.14	-.03
Sleep \times Enhancement motives		.19	.14	.03
Sleep \times Conformity motives		.10	.10	.02
Sleep \times Coping motives		.41	.11	.08***
Total R ²	.40			

Note. R²= R-square change including level of significance at step of change; B, SE, and P from the final step with all predictors entered.

* $p < .05$.

** $p < .01$.

*** $p < .001$.