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Protective Behavioral Strategies, Social Norms, and Alcohol-Related Outcomes

Brooke J. Arterberry, M.S.,

University of Missouri

Ashley E. Smith, M.A.,

University of Missouri

Matthew P. Martens, Ph.D.,

University of Missouri

Jennifer M. Cadigan, B.A., and

University of Missouri

James G. Murphy, Ph.D.

University of Memphis

Abstract

The present study examined the unique contributions of protective behavioral strategies and social norms in predicting alcohol-related outcomes. Participants were 363 students from a large public university in the Midwest who reported at least one binge-drinking episode (5+/4+ drinks for men/women in one sitting) in the past 30 days. Data were collected 1/2010–3/2011. We used SEM to test models where protective behavioral strategies (PBS) and social norms were predictors of both alcohol use and alcohol-related problems, after controlling for the effects of gender. Both PBS and descriptive norms had relationships with alcohol use. PBS also had a relationship with alcohol-related problems. Overall, the findings suggest that PBS and social norms have unique associations with distinct alcohol-related outcomes.

Keywords

Alcohol; Protective Behavioral Strategies; Social Norms

Correspondence concerning this article should be addressed to Matthew P. Martens; Department of Educational, School, and Counseling Psychology, 16 Hill Hall, University of Missouri, Columbia, MO 65211; martensmp@missouri.edu; (573) 882-3382 (t), (573) 884-5989 (f).

Department of Educational, School, and Counseling Psychology, University of Missouri, 16 Hill Hall, University of Missouri, Columbia, MO 65211; bjaww8@mail.missouri.edu; askv2@mail.missouri.edu; martensmp@missouri.edu; jmc6y2@mail.missouri.edu; jgmurphy@memphis.edu.

DECLARATION OF INTEREST

The authors report no conflicts of interest.

INTRODUCTION

The high rate of alcohol use and binge drinking among college students continues to be a public health concern. Research has found that excessive drinking among college students is widespread and contributes to negative consequences (Johnston, O'Malley, Bachman, & Schulenberg, 2009). For instance, college-bound students who drink less in high school tend to increase frequency and quantity of drinking after the first year of college (White, Fleming, Kim, Catalano, & McMorris, 2008). In addition, approximately 85% of college students have tried alcohol (Johnston et al., 2009) and approximately 40–45% of college students reported engaging in binge drinking in the preceding two weeks (i.e., 5+ drinks for men and 4+ drinks for females: Wechsler et al., 2002). Furthermore, college students experience a wide variety of consequences related to excessive drinking (Abbey, Saenz, & Buck, 2005; Hingson, Zha, & Weitzman, 2009; Park, 2004). Research suggests approximately 1,800 deaths, 600,000 injuries, 646,000 assaults, and 97,000 sexual assaults occur each year in the college student population as a result of alcohol use (Hingson et al., 2009).

Many variables are associated with the likelihood of engaging in excessive alcohol use including demographic characteristics, personality factors, environmental contexts, familial factors, and cognitive factors (Cox & Klinger, 2002; Hawkins, Catalano, & Arthur, 2002; Hawkins, Catalano, & Miller, 1992; Wechsler, Dowdall, Davenport, & Castillo, 1995). Of these variables, clinical researchers are most interested in those associated with alcohol use that can also be addressed in various intervention efforts such as specific cognitions and/or behaviors. Two factors that have been examined in several studies related to cognitions and behaviors are social norms and protective behavioral strategies, both of which have been frequently included in intervention efforts among college students (e.g., Larimer et al., 2007; Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007).

Considering both social norms and protective behavioral strategies are common components of targeted interventions, it is important to understand their unique contributions to alcohol-related outcomes. Research has shown that an association exists between social norms and both alcohol use and alcohol-related problems (Larimer, Turner, Mallett, & Geisner, 2004; Mattern & Neighbors, 2004; Neighbors, Larimer, & Lewis, 2004; Neighbors et al., 2006; Neighbors et al., 2007; Neighbors et al., 2010). In one study, perceived norms were associated with alcohol use and alcohol-related problems even after controlling for the effects of other variables known to be associated with alcohol use, such as fraternity/sorority membership, drinking motives, and alcohol expectancies (Neighbors et al., 2007). Similarly, research findings have shown PBS to be associated with alcohol use and alcohol-related negative consequences, such that higher levels of PBS use are associated with less alcohol use and fewer alcohol-related problems (Benton et al., 2004; Delva et al., 2004; Martens et al., 2004; Martens, Ferrier, & Cimini, 2007; Sugarman & Carey, 2007). Other studies have shown PBS use mediates the relationship between risk factors like drinking motives (Martens, Pedersen, LaBrie, Ferrier, & Cimini, 2007) and depressive symptoms (Martens et al., 2008) and alcohol-related outcomes.

Although previous studies have demonstrated the relationship among social norms, PBS, and alcohol related outcomes, it is important to understand both the similarities and differences between the constructs. One important parallel between social norms and PBS is they both address alcohol use in terms of specific cognitions associated with increased alcohol risk, where, PBS also includes a salient behavioral component. In terms of social norms theory, the effect of perceived norms on individual behavior is related to a cognitive discrepancy between actual and perceived normative behavior (e.g., Cialdini, Reno, & Kallgren, 1990; Perkins, 2002). For example, most college students, including those who drink heavily, believe their peers drink more alcohol than they do (i.e. descriptive norms). These biases can then lead students to believe they drink less than other students and conclude their own alcohol use is less problematic than it may in fact be (Baer, 1994; Borsari & Carey, 2003; Perkins, 2002; Perkins & Wechsler, 1996). In contrast, protective behavioral strategies (PBS) are defined as both cognitive and behavioral strategies individuals can use while drinking alcohol to reduce negative consequences related to their alcohol use (Martens et al., 2004). Students who know and employ the use of PBS such as avoiding drinking games, using a designated driver, and planning to leave a party at a predetermined time can mitigate the negative consequences associated with alcohol use (Martens et al., 2005).

Considering both PBS and social norms are commonly used components in interventions, the examination of how each component uniquely contributes to alcohol-related outcomes can influence how clinicians and researchers develop and perform interventions. The relationship of social norms and PBS to alcohol-related outcomes is of particular interest to clinical researchers and those in the areas of prevention and health promotion, as brief motivational interventions used among heavy drinking college students often include modules on these constructs (Barnett, Murphy, Colby, & Monti, 2007; Larimer et al., 2007; Martens, Kilmer, Beck, & Zamboanga, 2010). Although research has generally shown brief motivational interventions are efficacious at reducing alcohol use among college students (Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Larimer & Crounce, 2007), relatively little is known regarding the unique contribution individual components of these interventions have in association with alcohol-related outcomes. This is an important limitation of alcohol intervention research. However, the importance of social norms is an exception, as several studies have shown interventions that only include personalized descriptive normative feedback are effective at reducing alcohol use (Lewis & Neighbors, 2007; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Neighbors, Larimer, & Lewis, 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006; Neighbors et al., 2010). The effect of these interventions on alcohol-related problems, though, is inconsistent, as one study found no effect on alcohol-related problems (Neighbors et al., 2006), while another found effects only for women (Neighbors et al., 2010).

One important piece of evidence that would support the rationale for developing PBS-specific interventions, or for including PBS-related content in multi-component interventions, would be to show PBS use was uniquely associated with alcohol use and alcohol-related problems even after controlling for the effects of variables known to have strong associations with alcohol-related outcomes. Our purpose in the present study was to examine the unique effects of PBS and descriptive social norms on both alcohol use and

alcohol-related problems. We hypothesized PBS use would be associated with both alcohol use and alcohol-related problems, and descriptive norms would be associated with alcohol use, after controlling for the effects of the other. If supported, such findings would indicate both PBS and descriptive norms are uniquely associated with alcohol-related outcomes after controlling for the effects of the other, thereby providing additional evidence supporting their inclusion in single- or multi-component alcohol intervention programs.

METHOD

Participants and Procedures

Participants were 363 students from a large public university in the Midwest who reported at least one binge-drinking episode (5+/4+ drinks for men/women in one sitting) in the past 30 days. Only participants who reported binge drinking were included as this was inclusion criteria for the larger parent study (see below). The majority of the sample were female (65.3%) and White (89.4%), with other ethnicities as follows: Asian/Pacific Islander 3.4%, African American 2.8%, Hispanic 2.5%, Native American .3%. Those reporting 'other' for ethnicity were 1.7% of the sample. The mean age was 20.1 years.

Data were collected as part of a larger clinical trial examining the efficacy of brief interventions at reducing alcohol use among college students, with baseline data used in the present study (Martens et al., in press). Participants were recruited via an email announcement over the university's mass communication system. Interested students were invited to participate in a study on "health behaviors and alcohol use." Those who were interested in participating were directed to follow a link that took them to an online screening questionnaire. There they provided basic demographic information, contact information in the event that they were eligible for the study, and their response to the binge drinking screening questionnaire. Eligible individuals were contacted by telephone and invited to participate. If interested, they came to our on-campus laboratory for an enrollment meeting. After completing the informed consent questionnaire, participants completed the baseline battery of questionnaires. Participants then received their assigned intervention and completed 1-month and 6-month follow-ups (not reported in this paper). One thousand, six hundred twenty five students responded to the screening questionnaire, 1,061 of which met eligibility criteria. Four hundred seventy five students were contacted and enrolled in the study, but 110 were ineligible because they either met diagnostic criteria for alcohol dependence or reported heavy drug use. Two additional participants did not provide complete baseline data, leaving a sample of 363 for this study. The university Institutional Review Board approved these procedures.

Measures

Protective Behavioral Strategies Scale (PBSS: Martens et al., 2005)—The PBSS consists of 15 items assessing strategies to limit alcohol use and negative consequences on three subscales: Stopping/Limiting Drinking (SLD), Manner of Drinking (MOD), and Serious Harm Reduction (SHR). Participants were asked to indicate how frequently they use each strategy on a 6-point scale ranging from 1 (*never*) to 6 (*always*). In previous studies, the PBSS has shown acceptable validity and reliability (Martens et al., 2005; Martens et al.,

2007). In the present study, Cronbach's alpha was .81 (PBSS total score), .80 (SLD), .68 (MOD), and .49 (SHR).

Daily Drinking Questionnaire (DDQ: Collins, Parks, & Marlatt, 1985)—The DDQ is a frequently used assessment in college drinking studies that measures alcohol consumption by using a calendar-based method (Carey, Carey, Maisto, & Henson, 2006; Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990; Martens, Ferrier, & Cimini, 2007). Participants were asked to indicate the number of drinks they typically consume on each day of the week over the past 30 days. Standard definitions of an alcoholic drink were provided: a 12oz beer (i.e., most bottled or canned beer), a 5oz glass of wine (i.e., a regular-sized glass of wine), or a 1.25oz (one shot) drink of hard alcohol. From the DDQ, we calculated average number of drinks per week and average number of drinking days per week. Drinks per week values greater than 50 were Winsorized to 50 and were used to limit the influence of outliers. Participants were also asked to indicate the peak number of drinks consumed on a single occasion in the past 30 days.

Drinking Norms Rating Form (DNRF: Baer, Stacy, & Larimer, 1991)—The DNRF was used to assess perceived drinking among other college students (i.e., descriptive norms). The format of the DNRF mirrored the DDQ, except participants were asked to estimate typical drinking on each day of the week for specific reference groups. In the present study, we calculated perceived drinks per week for four groups: the typical male/typical female college student nationwide and the typical male/typical female student at the university where the study was conducted. As with drinks per week, estimates of 50+ drinks per week were Winsorized to 50 in order to limit the influence of outliers. The DNRF is frequently used in the college drinking literature to assess descriptive drinking norms (Larimer et al., 2007; Neighbors, Larimer, & Lewis, 2004; Neighbors et al., 2007).

Rutgers Alcohol Problems Index (RAPI: White & Labouvie, 1989)—The RAPI consists of 23 items that assess the frequency individuals experience various alcohol-related problems. In the present study, participants indicated how frequently they experienced each problem in the past year. Participants were asked to indicate the number of times they have experienced the problem, ranging from 0 (*never*) to 4 (*more than 10 times*). The RAPI has been shown to be a valid measure of assessing alcohol-related problems (Carey & Correia, 1997; Devos-Comby & Lange, 2008; White & Labouvie, 1989). The internal consistency estimate for this sample was .83.

Demographics—Participants completed a measure that obtained information such as gender, ethnicity, age, and year in school.

DATA ANALYSIS

Analyses were conducted using SPSS v. 20 and AMOS v. 20. We used SEM to examine the relationship among PBS, descriptive norms, alcohol use, and alcohol-related problems in two separate models. In the first model, PBS were modeled as a latent exogenous variable with the three PBSS subscales as indicator variables; descriptive norms were modeled as a latent exogenous variable with the four estimates of social norms as indicator variables; and

alcohol use was modeled as a latent exogenous variable with drinks per week, drinking days per week, and peak number of drinks as indicator variables. In the second model, alcohol use was included as a covariate and RAPI scores were modeled as a manifest exogenous variable representing alcohol-related problems. Gender was included in both models as a covariate (see Figures 1 & 2). For identification purposes, the path between each latent variable and one of the indicators was fixed to one, as were the parameters between the error and disturbance terms and their corresponding variables. Maximum likelihood estimation procedures were used for all analyses.

RESULTS

Descriptives and Correlations

The means, standard deviations, and correlations for all measured variables are presented in Table 1. Participants averaged 15.77 ($SD = 10.81$) drinks per week, drank 2.86 ($SD = 1.25$) days per week over the past 30 days, and reported a mean of 8.82 ($SD = 4.72$) drinks during peak drinking occasions. Participants reported an average score of 10.74 ($SD = 8.31$) on the RAPI. Bivariate correlations among alcohol use, alcohol related problems, descriptive norms, and PBSS subscales were in the expected directions.

Structural Equation Modeling (SEM) Analysis

Model One—Figure 1 illustrates the relationships among PBS, descriptive norms, and alcohol use. Loadings for all indicator variables were satisfactory ranging from $\beta = .48$ to $\beta = .99$, $p < .001$. These loadings provided support for the measurement portion of the model. Both PBS and descriptive norms were related to alcohol use. PBS was negatively associated with alcohol use ($\beta = -.21$, $p < .001$), while descriptive norms were positively associated with alcohol use ($\beta = .57$, $p < .001$). Overall model fit was adequate (e.g., CFI = .88, SRMR = .06).

Model Two—Due to the significant relationships between PBS, norms, and alcohol use, we modeled alcohol use as a covariate to control for its effects when examining the unique relationships among PBS, norms, and alcohol-related problems. In the second analysis (see Figure 2), loadings for PBS, descriptive norms, and alcohol use were adequate ($\beta = .46-.97$, $p < .001$). PBS had a significant, negative association with alcohol-related problems ($\beta = -.23$, $p < .001$). However, descriptive norms were not associated with alcohol-related problems ($\beta = .08$, $p = .27$). Overall model fit was adequate (e.g., CFI = .88, SRMR = .06).

Invariance Testing

We conducted invariance testing to determine if the regression parameters in the structural models differed between men and women. If so, this would suggest differential effects of PBS and/or descriptive norms on the alcohol-related outcome variables. Findings suggested that there were no gender differences in the alcohol use model, as there were no significant differences in the chi-square value when comparing a model where parameters were freely estimated to a model where parameters were constrained to be equal between gender ($\chi^2_{\text{diff}} = 3.30$, 2 df, $p = .19$). When examining the alcohol-related problems model, results indicated that there were no significant differences between a model where these parameters were

allowed to be freely estimated and one where they were constrained to be equal between gender, $\chi^2_{\text{diff}} = 5.55$, 3 df, $p = .14$. We therefore concluded the effects of PBS and descriptive norms on alcohol-related outcomes were similar between men and women.

DISCUSSION

The purpose of this study was to determine whether PBS and descriptive social norms had unique associations with alcohol use and alcohol-related problems. Considering excessive drinking among college students is risky and can lead to negative consequences, it is important to identify factors that can help clinicians and researchers in developing efficacious interventions. Results supported our hypotheses. PBS had a unique relationship with alcohol use and alcohol-related problems even after controlling for the effects of gender, alcohol use and descriptive norms. In contrast, descriptive social norms had a unique association with alcohol use but were not associated with alcohol-related problems after controlling for the effects of gender, alcohol use, and PBS.

Results from this study provide additional evidence regarding the relationship between PBS use and alcohol-related outcomes. Prior research has shown PBS use was associated with alcohol use and alcohol-related negative consequences, a finding replicated in the current study (Benton et al., 2004; Delva et al., 2004; Martens, Ferrier, & Cimini, 2007; Martens et al., 2004; Martens et al., 2005; Sugarman & Carey, 2007). However, these prior efforts generally examined the effects of PBS without including other theoretically relevant variables into the predictive model, thereby limiting the degree to which one could make conclusions about unique effects associated with using such strategies. In contrast, the present study found PBS use exhibited a unique relationship with alcohol outcomes above and beyond the effects of social norms, a variable that has been shown to be strongly associated with alcohol use. In addition, PBS had a unique association with alcohol related problems, whereas social norms did not. Thus, these findings highlight the potential importance of assessing for PBS use when attempting to account for alcohol use and related problems among college drinkers.

We also found descriptive social norms were uniquely associated with alcohol related outcomes, although they only had a unique relationship with alcohol use. The relationship between social norms and alcohol-related problems has been inconsistent in the college drinking literature. It may be social norms primarily impact rates of alcohol-related problems mostly or exclusively via its effects on alcohol use, whereas a construct like PBS may have a more direct association with alcohol-related problems.

These findings have implications for intervention and prevention efforts. Interventions utilizing PBS and descriptive norms are thought to impact alcohol use in distinct manners. PBS use is consistent with a relatively straightforward behavioral perspective, whereby an individual could hypothetically be taught to engage in specific actions that resulted in less alcohol use and fewer alcohol-related problems. In contrast, interventions using descriptive norms are thought to impact subsequent alcohol use by creating dissonance in the individual between his/her current behavior and the behavior of the typical college student. Many interventions such as the popular BASICS (Dimeff, Baer, Kivlahan, & Marlatt, 1999)

program (and interventions modeled from it) include feedback/education on multiple distinct components. The results of the current study provide support for including information on both descriptive social norms and PBS use in these interventions, as in the present study each had a unique association with alcohol related outcomes.

There were several limitations to this study. Due to the cross-sectional design of the study, causal relationships between alcohol use and alcohol-related problems and descriptive social norms and PBS could not be determined. Further research may benefit from examining the direct/indirect effects of PBS and descriptive norms utilizing a longitudinal design. Although anonymity was guaranteed to participants, the data was gathered from self-report. The generalizability of the findings is also limited in part by participants being from only one Midwestern University, with little ethnic diversity. Future research may benefit from longitudinal designs with variables measured over identical timeframes to determine causal relationships between alcohol outcomes and PBS and social norms as well as including a more diverse sample of participants to expand generalizability.

Despite these limitations, the current study provides important information regarding the possible unique associations PBS and descriptive social norms may have when including them in both multi-component interventions and single component brief interventions. Alcohol use and alcohol-related negative consequences among college students continues to be widespread (Johnston et al., 2009). We encourage clinicians and researchers to continue to understand the unique and combined contributions of PBS and social norms in regards to prevention and intervention efforts.

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References

- Abbey A, Saenz C, Buck PO. The cumulative effects of acute alcohol consumption, individual differences and situational perceptions on sexual decision making. *Journal of Studies on Alcohol*. 2005; 66:82–90. [PubMed: 15830907]
- Baer JS. Effects of college residence on perceived norms for alcohol consumption: An examination of the first year in college. *Psychology of Addictive Behaviors*. 1994; 8:43–50.10.1037/0893-164X.8.1.43
- Baer JS, Stacy A, Larimer M. Biases in the perception of drinking norms among college students. *Journal of Studies on Alcohol*. 1991; 52:580–586. [PubMed: 1758185]
- Barnett NP, Murphy JG, Colby SM, Monti PM. Efficacy of counselor vs. computer-delivered intervention with mandated college students. *Addictive Behaviors*. 2007; 32:2529–2548.10.1016/j.addbeh.2007.06.017 [PubMed: 17707594]
- Benton SL, Schmidt JL, Newton FB, Shin K, Benton SA, Newton DW. College student protective strategies and drinking consequences. *Journal of Studies on Alcohol*. 2004; 65:115–121. [PubMed: 15000510]
- Borsari B, Carey KB. Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol*. 2003; 64:331–341. [PubMed: 12817821]
- Carey KB, Carey MP, Maisto SA, Henson JM. Brief motivational interventions for heavy college drinkers: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*. 2006; 74:943–954.10.1037/0022-006X.74.5.943 [PubMed: 17032098]

- Carey KB, Correia CJ. Drinking motives predict alcohol-related problems in college students. *Journal of Studies on Alcohol*. 1997; 58:100–105. [PubMed: 8979218]
- Carey KB, Scott-Sheldon LAJ, Carey MP, DeMartini KS. Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addictive Behaviors*. 2007; 32:2469–2494.10.1016/j.addbeh.2007.05.004 [PubMed: 17590277]
- Cialdini RB, Reno RR, Kallgren CA. A focus theory of normative conduct: the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*. 1990; 58:1015–1026.10.1037/0022-3514.58.6.1015
- Collins RL, Parks GA, Marlatt GA. Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology*. 1985; 53:189–200.10.1037/0022-006X.53.2.189 [PubMed: 3998247]
- Cox WM, Klinger E. Motivational structure: Relationships with substance use and processes of change. *Addictive Behaviors*. 2002; 27:925–940.10.1016/S0306-4603(02)00290-3 [PubMed: 12369476]
- Delva J, Smith MP, Howell RL, Harrison DF, Wilke D, Jackson DL. A study of the relationship between protective behaviors and drinking consequences among undergraduate college students. *Journal of American College Health*. 2004; 53:19–26.10.3200/JACH.53.1.19-27 [PubMed: 15266726]
- Devos-Comby L, Lange JE. Standardized measures of alcohol-related problems: A review of their use among college students. *Psychology of Addictive Behaviors*. 2008; 22:349–361.10.1037/0893-164X.22.3.349 [PubMed: 18778128]
- Dimeff, LA.; Baer, JS.; Kivlahan, DR.; Marlatt, GA. Brief alcohol screening and intervention for college students (BASICS): A harm reduction approach. New York, NY, US: Guilford Press, New York, NY; 1999.
- Hawkins JD, Catalano RF, Arthur MW. Promoting science-based prevention in communities. *Addictive Behaviors*. 2002; 27:951–976.10.1016/S0306-4603(02)00298-8 [PubMed: 12369478]
- Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance use prevention. *Psychological Bulletin*. 1992; 112:64–105.10.1037/0033-2909.112.1.64 [PubMed: 1529040]
- Hingson RW, Zha W, Weitzman ER. Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students ages 18–24, 1998–2005. *Journal of Studies on Alcohol and Drugs*. 2009; (Supplement)(16):12–20. [PubMed: 19538908]
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future national survey results on drug use, 1975–2008. Vol. II: College students and adults ages 19–50. Bethesda, MD: National Institute on Drug Abuse; 2009.
- Kivlahan DR, Marlatt GA, Fromme K, Coppel DB, Williams E. Secondary prevention with college drinkers: Evaluation of an alcohol skills training program. *Journal of Consulting and Clinical Psychology*. 1990; 58:805–810.10.1037/0022-006X.58.6.805 [PubMed: 2292630]
- Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999–2006. *Addictive Behaviors*. 2007; 32:2439–2468.10.1016/j.addbeh.2007.05.006 [PubMed: 17604915]
- Larimer ME, Lee CM, Kilmer JR, Fabiano PM, Stark CB, Geisner IM, Neighbors C. Personalized mailed feedback for college drinking prevention: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*. 2007; 75(2):285–293.10.1037/0022-006X.75.2.285 [PubMed: 17469886]
- Larimer ME, Turner AP, Mallett KA, Geisner IM. Predicting drinking behavior and alcohol-related problems among fraternity and sorority members: Examining the role of descriptive and injunctive norms. *Psychology of Addictive Behaviors*. 2004; 18:203–212.10.1037/0893-164X.18.3.203 [PubMed: 15482075]
- Lewis MA, Neighbors C. Optimizing personalized normative feedback: The use of gender-specific referents. *Journal of Studies on Alcohol and Drugs*. 2007; 68:228–237. [PubMed: 17286341]
- Lewis MA, Neighbors C, Oster-Aaland L, Kirkeby BS, Larimer ME. Indicated prevention for incoming freshmen: Personalized normative feedback and high-risk drinking. *Addictive Behaviors*. 2007; 32:2495–2508.10.1016/j.addbeh.2007.06.019 [PubMed: 17658695]

- Martens MP, Ferrier AG, Cimini MD. Do protective behavioral strategies mediate the relationship between drinking motives and alcohol use in college students? *Journal of Studies on Alcohol and Drugs*. 2007; 68:106–114. [PubMed: 17149524]
- Martens MP, Ferrier AG, Sheehy MJ, Corbett K, Anderson DA, Simmons A. Development of the Protective Behavioral Strategies Survey. *Journal of Studies on Alcohol*. 2005; 66:698–705. [PubMed: 16329461]
- Martens MP, Kilmer JR, Beck NC, Zamboanga BL. The efficacy of a targeted personalized feedback intervention among intercollegiate athletes: A randomized controlled trial. *Psychology of Addictive Behaviors*. 2010; 24:660–669.10.1037/a0020299 [PubMed: 20822189]
- Martens MP, Martin JL, Hatchett ES, Fowler RM, Fleming KM, Karakashian MA, Cimini MD. Protective behavioral strategies and the relationship between depressive symptoms and alcohol-related negative consequences among college students. *Journal of Counseling Psychology*. 2008; 55:535–541.10.1037/a0013588 [PubMed: 22017560]
- Martens MP, Pedersen ER, LaBrie JW, Ferrier AG, Cimini MD. Measuring alcohol-related protective behavioral strategies among college students: Further examination of the Protective Behavioral Strategies Scale. *Psychology of Addictive Behaviors*. 2007; 21:307–315.10.1037/0893-164X.21.3.307 [PubMed: 17874881]
- Martens MP, Smith AE, Murphy JG. The efficacy of single-component brief motivational interventions among at-risk college drinkers. *Journal of Consulting and Clinical Psychology*. (in press).
- Martens MP, Taylor KK, Damann KM, Page JC, Mowry ES, Cimini MD. Protective behavioral strategies when drinking alcohol and their relationship to negative alcohol-related consequences in college students. *Psychology of Addictive Behaviors*. 2004; 18:390–393.10.1037/0893-164X.18.4.390 [PubMed: 15631613]
- Mattern JL, Neighbors C. Social norms campaigns: Examining the relationship between changes in perceived norms and changes in drinking levels. *Journal of Studies on Alcohol*. 2004; 65(4):489–493. [PubMed: 15376823]
- Neighbors C, Dillard AJ, Lewis MA, Bergstrom RL, Neil TA. Normative misperceptions and temporal precedence of perceived norms and drinking. *Journal of Studies on Alcohol*. 2006; 67:290–299. [PubMed: 16562412]
- Neighbors C, Larimer ME, Lewis MA. Targeting misperceptions of descriptive drinking norms: Efficacy of a computer-delivered personalized normative feedback intervention. *Journal of Consulting and Clinical Psychology*. 2004; 72:434–447.10.1037/0022-006X.72.3.434 [PubMed: 15279527]
- Neighbors C, Lee CM, Lewis MA, Fossos N, Larimer ME. Are social norms the best predictor of outcomes among heavy-drinking college students? *Journal of Studies on Alcohol and Drugs*. 2007; 68:556–565. [PubMed: 17568961]
- Neighbors C, Lewis MA, Atkins DC, Jensen MM, Walter T, Fossos N, Larimer ME. Efficacy of web-based personalized normative feedback: A two-year randomized controlled trial. *Journal of Consulting and Clinical Psychology*. 2010; 78:898–911.10.1037/a0020766 [PubMed: 20873892]
- Neighbors C, Lewis MA, Bergstrom RL, Larimer ME. Being controlled by normative influences: Self-determination as a moderator of a normative feedback alcohol intervention. *Health Psychology*. 2006; 25:571–579.10.1037/0278-6133.25.5.571 [PubMed: 17014274]
- Park CL. Positive and negative consequences of alcohol consumption in college students. *Addictive Behaviors*. 2004; 29:311–321.10.1016/j.addbeh.2003.08.006 [PubMed: 14732419]
- Perkins HW. Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol*. 2002; (Suppl 14):91–100. [PubMed: 11925064]
- Perkins HW, Wechsler H. Variation in perceived college drinking norms and its impact on alcohol abuse: A nationwide study. *Journal of Drug Issues*. 1996; 26:961–974.
- Sugarman DE, Carey KB. The relationship between drinking control strategies and college student alcohol use. *Psychology of Addictive Behaviors*. 2007; 21:338–345.10.1037/0893-164X.21.3.338 [PubMed: 17874884]

- Wechsler H, Dowdall GW, Davenport A, Castillo S. Correlates of college student binge drinking. *American Journal of Public Health*. 1995; 85:921–926.10.2105/AJPH.85.7.921 [PubMed: 7604914]
- Wechsler H, Lee JE, Kuo M, Seibring M, Nelson TF, Lee H. Trends in college binge drinking during a period of increased prevention efforts. *Journal of American College Health*. 2002; 50:203–217. [PubMed: 11990979]
- White HR, Fleming CB, Kim MJ, Catalano RF, McMorris BJ. Identifying two potential mechanisms for changes in alcohol use among college-attending and non-college-attending emerging adults. *Developmental Psychology*. 2008; 44:1625–1639. [PubMed: 18999326]
- White HR, Labouvie EW. Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol*. 1989; 50:30–37. [PubMed: 2927120]
- Wood MD, Nagoshi CT, Dennis DA. Alcohol norms and expectations as predictors of alcohol use and problems in a college student sample. *The American Journal of Drug and Alcohol Abuse*. 1992; 18:461–476.10.3109/00952999209051042 [PubMed: 1449125]

Figure 1. Relationships of PBS and Norms to Alcohol Use

Note. Indicator variables and values were not included. PBS = Protective Behavioral Strategies; Norms = Nationwide and University Descriptive Social Norms; Alcohol Use = drinks per week, drinking days per week, and peak number of drinks.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 2. Relationships between PBS, Norms, Alcohol Use, Gender, and Alcohol Problems

Note. Indicator variables and values were not included. PBS = Protective Behavioral Strategies; Norms = Nationwide and University Descriptive Social Norms; Alcohol Use = drinks per week, drinking days per week, and peak number of drinks; RAPI = Rutgers Alcohol Problems Index. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 1

Mean, Standard Deviations, and Correlations among all measured variables

	1	2	3	4	5	6	7	8	9	10	11	M	SD
1. Peak Drinks	-											8.82	4.72
2. Drinking Days	.31**	-										2.86	1.25
3. DPW	.69**	.57**	-									15.77	10.81
4. SLD	-.25**	-.05	-.20**	-								3.05	.92
5. MOD	-.36**	-.18**	-.32**	.48**	-							3.48	.85
6. SHR	-.20**	-.14**	-.08	.34**	.34**	-						5.25	.78
7. NNM	.31**	.30**	.52**	-.07	-.18**	.04	-					25.47	11.26
8. NNF	.29**	.32**	.54**	-.09	-.17**	.04	.82**	-				17.12	8.22
9. UNM	.37**	.32**	.56**	-.08	-.20**	.03	.90**	.80**	-			25.90	11.28
10. UNF	.32**	.29**	.55**	-.04	-.16**	.07	.79**	.90**	.85**	-		18.29	8.75
11. RAPI	.37**	.31**	.37**	-.12*	-.31**	-.13*	.30**	.26**	.30**	.26**	-	10.74	8.31

Note. DPW = Drinks Per Week; SLD = Stop/Limiting Drinking; MOD = Manner of Drinking; SHR = Serious Harm Reduction; NNM = Nationwide Norms for Males; NNF = Nationwide Norms for Females; UNM = University Norms for Males; UNF = University Norms for Females; RAPI = Rutgers Alcohol Problems Index.

*
 $p < .05$.

**
 $p < .01$.