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Multi-informant investigation of college student drinking behaviors and social anxiety : the role of perceived descriptive and injunctive norms

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MULTI-INFORMANT INVESTIGATION OF COLLEGE STUDENT DRINKING BEHAVIORS AND SOCIAL ANXIETY: THE ROLE OF PERCEIVED DESCRIPTIVE AND INJUNCTIVE NORMS

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Abstract

Problematic alcohol use in college is a major public health concern. Identification of variables related to development of alcohol-related problems is an important research goal. Social anxiety and perceived social norms are two such variables. Social anxiety is associated with concurrent experience of alcohol-related problems and development of future problems with alcohol. Perceived norms, especially norms related to perceived approval of risky alcohol use (i.e., injunctive norms), are related to greater drinking problems among college students with higher social anxiety. College students typically overestimate the amount that other students in general use alcohol, and the discrepancy between perceived and actual norms is related to problems with alcohol. However, discrepancies between perceived and actual norms have not been evaluated for proximal peer group alcohol quantity, frequency, alcohol-related problems, and approval of risky drinking. The current study sought to identify if such discrepancies existed by asking 56 undergraduate online survey respondents to complete measures of alcohol use, alcohol-related problems, and perceived norms, and to refer one close friend who would complete a battery of self-report measures of their own alcohol use and actual norms. Results supported that students overestimated their friends' injunctive norms and alcohol problems, but not descriptive norms. Social anxiety was negatively correlated with drinking frequency and not significantly correlated with alcohol-related problems. Higher misperception of friends' problems was related to greater alcohol use quantity and alcohol-related problems. Higher injunctive norms discrepancy was related to fewer drinking occasions. Results highlight the importance of considering proximal peer groups when investigating the role of perceived norms and drinking behaviors.

Introduction

Alcohol use is very prevalent on college campuses, with over 63% of full-time college students reporting past month alcohol use compared to 51.1% in the general U.S. population (Substance Abuse and Mental Health Services Administration, 2010). Many college drinkers also report experiencing negative consequences related to drinking, such as engaging in risky behaviors (e.g., driving under the influence of alcohol; Wechsler, Davenport, Dowdall, & Moeykens, 1994) and academic problems (e.g., lower GPA; Singleton, 2007). College students are also more likely than their non-college age peers to be diagnosed with an alcohol use disorder (AUD; Slutske, 2005). Further, 63.6% of students reported binge drinking (i.e., five drinks within two hours for men, and four drinks within two hours for women) in the past year (Cranford, McCabe, & Boyd, 2006). This represents a much higher prevalence than that observed in the general population (15.5%; Chavez, Nelson, Naimi, & Brewer, 2011). Binge drinking in college is associated with a higher likelihood of experiencing negative consequences related to drinking such as getting in trouble with campus police and sustaining an injury (Wechsler et al., 1994). Risky drinking in college is not a time-limited phenomenon, but has been linked with AUD even after students leave college (O'Neill, Parra, & Sher, 2001). Given that many college students engage in risky drinking and experience alcohol-related impairment, it is important to understand variables related to college student drinking.

Social anxiety has been identified as one risk factor for alcohol-related problems (e.g., Buckner & Schmidt, 2009; Buckner, Schmidt et al., 2008; Buckner & Turner, 2009; Crum & Pratt, 2001). Social anxiety disorder (SAD; also known as social phobia) is characterized by distress and impairment related to fear of evaluation in social situations (American Psychiatric Association, 2000). Among individuals with a lifetime diagnosis of SAD, 27.3% also met criteria for alcohol dependence and 20.9% met criteria for alcohol abuse (Schneier et al., 2010). These rates are higher than those observed in the general population without SAD, in which 12.5% met criteria for alcohol dependence and 17.8% met criteria for alcohol abuse (Schneier et al.,

2010). Comorbidity of these disorders has also been observed among college students, such that those with SAD were almost twice as likely to also have an AUD (Kushner & Sher, 1993). Studies using a retrospective design have shown that for many participants with co-occurring SAD and AUD, SAD tends to occur before the onset of AUD (Buckner, Timpano, Zvolensky, Sachs-Ericsson, & Schmidt, 2008; Randall, Thomas, & Thevos, 2001; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). SAD has also been related to a later onset of alcohol dependence even after controlling for presence of other co-occurring disorders (Buckner, Schmidt et al., 2008; Buckner, Timpano et al., 2008).

Further, high levels of social anxiety in adolescence appear to be predictive of later alcohol use problems. Prospectively, German adolescents aged 14-16 years who were diagnosed with SAD were more likely than those without SAD to develop heavy alcohol use (at least 40g of ethanol per day for men, 20g for women) at 4-year follow-up (Zimmermann et al., 2003). SAD diagnosis in adolescence was a significant predictor of alcohol dependence onset at age 30, even after controlling for other diagnoses (Buckner, Schmidt et al., 2008). Among women aged 19-21, SAD predicted onset of AUD at three years follow-up (Buckner & Turner, 2009).

It appears that experiencing some symptoms of social anxiety without meeting full criteria for the disorder is a risk factor for later development of alcohol-related problems. Individuals with subclinical levels of social anxiety were more likely than those without significant levels to develop heavy drinking patterns (i.e., 5 or more drinks on one occasion) and AUD at a median 12.6 year follow-up (Crum & Pratt, 2001). Among older adolescents, higher self-reported social anxiety was related to subsequent onset of AUD (Buckner & Schmidt, 2009). Drinkers who reported alcohol-related impairment endorsed greater fear of negative evaluation than drinkers who did not report problems related to their alcohol use (B. A. Lewis & O'Neill, 2000). Further, higher scores of self-reported social anxiety were positively related to both more alcohol dependence symptoms and more alcohol-related problems (Gilles, Turk, & Fresco,

2006). Social anxiety has also been related to alcohol-related impairment among college students (Buckner, Eggleston, & Schmidt, 2006; Buckner & Heimberg, 2010; Stewart, Morris, Mellings, & Komar, 2006). Among college students mandated by their university and students who volunteered to receive a brief motivational intervention for heavy drinking, those with higher levels of social anxiety reported greater alcohol use quantity than those without elevated social anxiety allocated to an assessment-only control group (Terlecki, Buckner, Larimer, & Copeland, 2011). Given these findings, adolescence and young adulthood appear to be critical time periods for identifying factors related to alcohol-related impairment among those with elevated social anxiety.

Despite the observed associations between social anxiety and alcohol-related problems, the relationship between social anxiety and drinking quantity and frequency among college students is less clear. Social anxiety has been found to be unrelated to drinking quantity and frequency in most studies (Bruch, Heimberg, Harvey, & McCann, 1992; Bruch, Rivet, Heimberg, & Levin, 1997; Buckner, Ecker, & Proctor, 2011; Buckner, Mallott, Schmidt, & Taylor, 2006; Ham & Hope, 2006). Yet some find social anxiety to be inversely related to alcohol use quantity (Ham & Hope, 2005) and frequency (Eggleston, Woolaway-Bickel, & Schmidt, 2004). Some work has also found that higher social anxiety is related to greater alcohol use quantity and frequency (Neighbors et al., 2007). Given these mixed findings, it may be that other variables moderate the relationship between social anxiety and alcohol use quantity and frequency.

Variables related to social anxiety and alcohol use

Alcohol Effect Expectancies. Alcohol outcome effect expectancies (AOEs) have received the most empirical attention in efforts to understand the relationship between social anxiety and drinking behaviors. AOE refers to the effect that an individual expects to experience as a result of using alcohol (Brown, Goldman, Inn, & Anderson, 1980). AOE can be classified into positive expectancies (e.g., alcohol will help one relax or be more social) or negative expectancies (e.g., alcohol will cause unpleasant physical symptoms). Early work in AOE found

that both the specific type of AOE and degree to which an individual believes an AOE are related to one's pattern of alcohol consumption (Brown et al., 1980; Johnson, 1994).

In support of the contention that AOE plays a role in the relationship between social anxiety and drinking, social anxiety has been found to be positively related to tension reduction and social assertiveness AOE (O'Hare, 1990). Drinkers who reported alcohol-related impairment reported higher levels of social anxiety and higher positive AOE than drinkers not experiencing alcohol-related impairment (B. A. Lewis & O'Neill, 2000). Among college students with clinical levels of social anxiety, students with high social facilitation AOE and low self-efficacy for refusing to drink heavily in social situations reported higher drinking quantity and frequency than those with lower social facilitation AOE and higher self-efficacy (Carrigan, Ham, Thomas, & Randall, 2008). College students with high social anxiety, high social facilitation AOE, and low self-efficacy to refuse drinks reported higher drinking quantity and frequency (assessed using a combined measure of quantity and frequency) than students with low social anxiety and other variations of social facilitation AOE and self-efficacy (Gilles et al., 2006). Among college students with clinical levels of social anxiety, tension-reduction AOE moderated the relationship between social anxiety and drinking games (a behavior related to alcohol-related problems; Borsari, Murphy, & Barnett, 2007), such that those with higher social anxiety who endorsed tension reduction expectancies engaged in drinking games more frequently that those with higher social anxiety who did not endorse tension-reduction expectancies (Ham, Zamboanga, Olthuis, Casner, & Bui, 2010). AOE (positive and negative) mediated the relationship between social anxiety and alcohol-related problems (Ham & Hope, 2005). However this finding was no longer significant after controlling for negative affect.

Further, positive AOE in a party or gathering context moderated the relationship between social anxiety and hazardous drinking (defined as a combined measure of alcohol use quantity and frequency, AUD symptoms, and alcohol-related problems) such that among those endorsing high positive AOE, social anxiety was related to hazardous drinking (Ham,

Zamboanga, & Bacon, 2011). Among those endorsing high negative AOE, social anxiety was negatively related to hazardous drinking, but the relationship was positive when low negative AOE were endorsed.

Although there is some evidence that AOE is related to risky drinking among people with social anxiety, other studies suggest that the nature of the relationships among these variables does not support this hypothesis. For example, social AOE moderated the relationship between social anxiety and alcohol use frequency (Tran, Haaga, & Chambless, 1997). However, the nature of the moderation did not support the idea that socially anxious students with high social anxiety and high social AOE would drink more often than those with low social anxiety. Rather, the pattern of findings suggests that those with higher social anxiety and high tension-reduction expectancies may actually drink less than those with low social anxiety. Further, students who endorsed high social AOE did not differ based on social anxiety levels, and those students with low social AOE and high social anxiety drank less often than those with low social anxiety. Moderation was not observed with tension-reduction AOE in that study. AOE failed to mediate the relationship between social anxiety and alcohol use (Bruch et al., 1992). Interestingly, in that sample, positive sociability AOE served as a suppressor variable in the relationship between shyness and drinking patterns. That is, when individuals endorsed higher levels of sociability AOE, the inverse relationship between shyness and drinking quantity/frequency (combined measure) was weaker compared to the relationship observed when low sociability expectancies were endorsed. A similar suppression effect was replicated by Bruch et al. (1997). AOE (positive and negative) also did not mediate the relationship between social anxiety and alcohol consumption (i.e., combined measure of quantity, frequency, and binge drinking) among college students (Eggleston et al., 2004). Similarly, general positive and negative AOE did not moderate the relationship between social anxiety and alcohol-related problems (Ham & Hope, 2006). Social AOE also did not moderate the relationship between social anxiety and alcohol-related problems (Ham, Zamboanga, Bacon, & Garcia, 2009).

Further complicating the study of AOE, recent work suggests that researcher-defined AOE (i.e., positive and negative) may not map on to what college students define as positive and negative consequences of drinking (Patrick & Maggs, 2011). That is, although researchers may believe they are measuring positive and negative AOE, college students may have more heterogeneous beliefs regarding how they perceive AOE. Given that there is little agreement within the literature regarding AOE's role as a mediator or moderator of the relationship between social anxiety and alcohol use behavior, it may be that variables other than AOE are involved in the relationship between social anxiety and drinking.

Drinking Motives. Drinking motives have also been identified as variables that may play a role in drinking behaviors among socially anxious individuals. Drinking motives refer to the reasons that an individual chooses to use alcohol, which may be more relevant to an individual's decision to use alcohol than AOE. In a model tested by Cooper et al. (1995), AOE shape an individual's reasons for drinking, and these reasons for drinking are in turn related to alcohol consumption and alcohol-related problems. For example, if an individual expects that alcohol will help to relieve stress or anxiety (i.e., tension-reduction AOE) then it is likely that the individual drinks to relieve stress or anxiety (i.e., coping motives). Higher tension-reduction AOE were related to higher endorsement of coping motives, which were in turn were related to greater alcohol consumption and alcohol-related problems (Cooper et al., 1995).

Emerging literature has investigated the role of drinking motives in the relationship between social anxiety and alcohol use among college students. Coping motives and conformity motives (i.e., drinking to conform to social pressure) mediated the relationship between social anxiety (assessed by a combined score on measures of social interaction anxiety, social fears, and social avoidance) and alcohol-related problems (M. A. Lewis et al., 2008). Coping and conformity motives also mediated the relationship between fear of negative evaluation and drinking-related problems (Stewart et al., 2006). Given these findings, students who drink to cope with social anxiety and drink to conform to others may be at particular risk for alcohol-

related problems. However, like AOE, coping motives' role in social anxiety and drinking may not be that simple. Buckner et al. (2006) found that enhancement motives (e.g., enhancing a pleasant experience), but not coping motives, mediated the relationship between social interaction anxiety and alcohol-related problems. Further, Ham et al. (2007) did not observe significant relationships between social anxiety (interaction and performance anxiety) and any drinking motives. Rather, only among those with high social anxiety, coping motives were related to more drinking-related problems, although this relationship was not observed after controlling for alcohol use quantity and frequency. Yet in another study social anxiety was related to coping, conformity, enhancement, and social drinking motives (Ham et al., 2009). However, coping motives (but not conformity motives) mediated the relationship between social anxiety and hazardous drinking. In a related population (adolescents aged 12-17), social anxiety was related to coping motives for alcohol use, but no other motives (Blumenthal, Leen-Feldner, Frala, Badour, & Ham, 2010). However, coping motives did not moderate the relationship between social anxiety and alcohol use frequency. Taken together, the extant literature suggests that although coping motives (and perhaps other motives) may play an important role in the relationship between social anxiety and alcohol use problems, it may be that other variables are involved in the relationship.

In sum, it appears that although AOE and drinking motives may be related to risky drinking behaviors among some with elevated social anxiety, these constructs do not sufficiently account for differences observed in findings regarding the relationship between social anxiety and alcohol use. It may be that lack of attention to social norms' role in these constructs contributes to the inconsistencies in findings. Further, socially anxious students' perceptions of others' drinking norms may shape their AOE and motives for drinking, as they may be drinking to cope, conform, or for social facilitation only if they believe that others approve of drinking. Therefore, it seems that perceived social norms are important to the relationship between social anxiety and drinking behaviors.

Perceived Social Norms

Perceived social norms play a role in college student problematic drinking (for review see Borsari & Carey, 2001). Those with elevated social anxiety may use alcohol to cope with their anxiety because they believe it is socially acceptable to do so based on their perception that others drink much alcohol and approve of drinking. That is, they may be using alcohol because they believe others will not judge them for using alcohol (Buckner, Heimberg, Ecker, & Vinci, 2012). The two types of social norms that have received the most empirical attention are perceived descriptive norms and perceived injunctive norms.

Perceived descriptive norms refer to one's perception of how much other students drink. College students typically overestimate the amount that other students drink (Borsari & Carey, 2003; M. A. Lewis & Neighbors, 2004; Martens, Dams-O'Connor, Duffy-Paiement, & Gibson, 2006) and the amount of alcohol-related impairment experienced by other students (Baer, Stacy, & Larimer, 1991). Higher perceived descriptive norms are related to greater alcohol use quantity and frequency (Clapp & McDonnell, 2000; Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006), drinking five or more drinks on one occasion (Clapp & McDonnell, 2000), and drinking-related problems (Ham & Hope, 2005).

Perceived injunctive norms refer to one's perception of the extent to which others approve of risky drinking behaviors. Students with higher perceived injunctive norms were more likely to report greater drinking quantity and frequency (Wood, Nagoshi, & Dennis, 1992). Further, it may be that the reference group of perceived norms plays an important role, as perceived injunctive norms were negatively correlated with alcohol use quantity when the reference group was students in general (Neighbors et al., 2008). However, when close friends were used as the reference group, higher perceived injunctive norms were related to greater drinking quantity. Thus, beliefs about proximal groups may serve as a more salient influence on drinking behaviors.

Despite theoretical reason to posit that perceived injunctive norms are associated with drinking-related problems, the literature has been mixed. Higher perceived injunctive norms have been shown to be both related (Buckner et al., 2011) and unrelated (Wood et al., 1992) to drinking-related problems. However these two studies may represent findings related to different constructs, as Buckner et al. defined injunctive norms as approval of risky drinking (e.g., drinking enough to pass out, driving while intoxicated), and Wood et al. defined injunctive norms as approval of drinking quantity and frequency. Taken together, these data suggest that injunctive norms assessed as perceived approval of risky drinking (rather than injunctive norms regarding quantity and frequency) are more relevant to alcohol-related problems.

Perceived Norms and Social Anxiety. Emerging data suggest that perceived social norms are related to drinking behaviors among those with social anxiety, although the extant findings are mixed as to the nature of norms in this relationship. In support of the role of descriptive norms in drinking behaviors among those with social anxiety, social anxiety moderated the relation between descriptive norms and drinking quantity such that students with higher levels of social anxiety who also endorsed high descriptive norms reported greater drinking quantity than those with lower social anxiety and high descriptive norms (Neighbors et al., 2007). Descriptive norms also mediated the relationship between social anxiety and alcohol use (quantity and frequency combined; Ham & Hope, 2006). However, counter to the notion that descriptive norms may be related to risky drinking among those with social anxiety, one study found that descriptive norms moderated the relationship between social anxiety and drinking quantity such that among college students with *low* descriptive norms, students with high social anxiety reported greater drinking quantity than those with low social anxiety (Buckner et al., 2011). Further, among young adolescents with high levels of social anxiety, high descriptive norms endorsement and low need for peer affiliation need were related to less drinking than those with lower levels of social anxiety (Anderson, Tomlinson, Robinson, & Brown, 2011). Descriptive norms may not influence the relationship between social anxiety and alcohol-related

problems, as descriptive norms have not been observed to moderate (Buckner et al., 2011) or mediate (Ham & Hope, 2005, 2006) this relationship.

The literature on injunctive norms' relation to social anxiety and alcohol use is similarly mixed. In support of the notion that injunctive norms may play a role in the relation between social anxiety and alcohol use, those with higher injunctive norms and elevated social anxiety reported having more drinks per month than those with elevated social anxiety who endorsed lower injunctive norms (LaBrie, Hummer, & Neighbors, 2008). Yet counter to the view that injunctive norms are related to risky drinking among socially anxious students, Buckner et al. (2011) found that injunctive norms moderated the relationship between social anxiety and drinking frequency such that those with high social anxiety and high perceived injunctive norms drank *less* frequently than those with low social anxiety and high injunctive norms. However, consistent with the evidence that injunctive norms related to risky drinking may be more relevant to problems than drinking quantity or frequency, injunctive norms moderated the relation between social anxiety and drinking problems such that those who endorsed clinical levels of social anxiety and high injunctive norms reported more severe alcohol-related problems than those with lower social anxiety and high injunctive norms, as well as those with both low social anxiety and low injunctive norms (Buckner et al., 2011).

It may be that the inconsistent findings regarding perceived norms' moderational role (Bruch et al., 1992; Bruch et al., 1997; Buckner et al., 2011; Ham & Hope, 2005, 2006; Neighbors et al., 2007) are due to a lack of attention to proximal peer influence. This may be due to the methods used to assess perceived norms. Neighbors et al. and Buckner et al. used typical students at the university as the reference group for perceived norms, but it has been shown that more proximal reference groups (e.g., close friends) relate to perceived norms differentially (Neighbors et al., 2008). Specifically, high endorsement of perceived injunctive norms of friends was related to heavy alcohol use, but high endorsement of perceived injunctive norms of typical students was not related to alcohol use. Ham & Hope (2005, 2006) used a

combined measure of typical student and friend norms, which may not have been able to tap into differences in reference groups. Bruch et al. (1992, 1997) also assessed friend norms, but in the context of a larger measure of peer influence including other (e.g., parent) reference groups. Further, although it has been observed that gender of the reference group also relates differentially to perceived norms (M. A. Lewis & Neighbors, 2004), prior work in the social anxiety literature has failed to account for gender of reference group (Bruch et al., 1992; Bruch et al., 1997; Buckner et al., 2011; Neighbors et al., 2007). It may be that perceived norms in reference to same gender close friends are more influential in the relationship between social anxiety and alcohol use behaviors than more distal, mixed-gender reference groups.

Some work on the effect of perceived norms on drinking behaviors has focused on the discrepancy between perceived and actual norms of distal groups (e.g., students at the university) by comparing individual students' endorsement of norms to a sample of students from the university (Borsari & Carey, 2003; Neighbors et al., 2007; Perkins, Haines, & Rice, 2005). However, this method does not allow for investigation of discrepancy between perceived and actual norms of more proximal groups (e.g., close friends), which prior research finds to be a better predictor of drinking behaviors than distal groups (Neighbors et al., 2008). Therefore, it may be important to investigate the role of normative misperceptions of proximal groups among college students with social anxiety. One methodology that could be used to measure discrepancy between proximal group perceived and actual norms is collateral reports (i.e., obtaining data from participants' friends). Collateral reports of college student alcohol use have been used in prior work to investigate the validity of self-reported alcohol use (e.g., Hagman, Clifford, Noel, Davis, & Cramond, 2007). However, we know of no studies that have used collateral report to investigate the role of the discrepancy between perceived norms and close friends' reports of actual drinking behaviors or approval or risky drinking behaviors.

The Current Study

The proposed study set out to fill gaps in the literature on social anxiety and drinking behaviors in several ways. First, the study aimed to examine whether social anxiety is related to greater frequency and/or quantity of alcohol use using continuous measures of social interaction and observation anxiety, and separate measures of alcohol use quantity and frequency. Given that prior work has found no relation between social anxiety and alcohol use quantity and frequency (Bruch et al., 1992; Bruch et al., 1997; Buckner et al., 2011; Buckner, Mallott et al., 2006; Ham & Hope, 2006), it was hypothesized that we would replicate the finding that social anxiety was unrelated to drinking quantity and frequency. Second, we planned to replicate prior work (e.g., Buckner et al., 2011; Gilles et al., 2006; Stewart et al., 2006) that social anxiety would be positively related to alcohol-related problems among college students.

Third, the study aimed to extend the literature on college student drinking broadly by determining if a discrepancy exists between participants' perceived norms regarding a close friend's drinking frequency, approval of risky drinking, and alcohol-related problems and the close friend's actual drinking frequency, approval of risky drinking, and alcohol-related problems. Perceived norms were investigated using close, same-gender friends as the reference group to determine if this type of reference is a salient influence on social anxiety and alcohol use and alcohol-related problems. Discrepancies were examined by subtracting actual norm scores from perceived norm scores (i.e., perceived – actual). Given that students typically misperceive others' alcohol use (Baer et al., 1991; Borsari & Carey, 2003; M. A. Lewis & Neighbors, 2004; Martens et al., 2006), it was hypothesized that a substantial discrepancy will exist. Fourth, the current study aimed to determine if discrepancies between perceived and actual descriptive and/or injunctive norms are related to drinking behaviors and drinking-related problems. It was hypothesized that greater discrepancies (i.e., positive discrepancy) would be associated with binge drinking, greater drinking quantity, frequency, and alcohol-related problems.

Fifth, in light of data suggesting that social anxiety is unrelated to perceived norms (Bruch et al., 1992; Bruch et al., 1997; Buckner et al., 2011; Neighbors et al., 2007), we explored whether social anxiety was related to our discrepancy variables. Sixth, the proposed study aimed to explore whether the discrepancies moderated the relationship between social anxiety and alcohol use quantity and frequency. As it was predicted that social anxiety would not be significantly related to drinking quantity or frequency, it is unlikely that a mediation effect will be observed. Rather, it was hypothesized that all discrepancies would moderate the relationships between social anxiety and alcohol quantity, frequency, binge drinking, and alcohol-related problems such that students with higher social anxiety and higher discrepancies would use alcohol more and more often, be more likely to engage in binge drinking, and report more severe alcohol-related problems. Given that prior work has observed differences between high and low social anxiety on measures of depression and anxiety (e.g., Buckner et al., 2011), depression and anxiety were assessed as possible covariates to be included in moderation analyses. Shared drinking occasions between participant were assessed as a possible covariate based on prior work that has found shared drinking occasions were related to agreement of college student collateral report of alcohol use (Hagman, Cohn, Noel, & Clifford, 2010).

Method

A Priori Power Analysis and Sample Size

Using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009), the sample size necessary to achieve the recommended power of .80 (Cohen, 1988) was calculated. Previous work investigating moderation relationships between social anxiety, perceived norms, and drinking behaviors has observed effect sizes ranging from small to large, although most observed effect sizes were medium (Buckner et al., 2011; LaBrie et al., 2008; Neighbors et al., 2007). Thus, power analyses were conducted to determine the sample size necessary to detect a medium effect. The sample necessary to achieve .80 power and to detect a medium effect size with three predictors (i.e., main effects and interaction) in hierarchical multiple regression for moderation is 55 participants with friend responses.

Sample and Procedures

The sample consisted of university students recruited through psychology classes for course credit. Inclusion criteria for the current study consisted of having at least one alcoholic drink in the past month and at least 18 years of age. Given previous work has shown that perceived norms differ with respect to same versus other gender norms (M. A. Lewis & Neighbors, 2004), referred friends were required to be the same gender as participants. Friends who were not the same gender as the participant were excluded from the study (n = 3). Participants included 716 students. Friends (n = 653) were invited. A friend was not invited if the participant did not provide a valid email address (n = 63). Of the 653 friends invited, 90 participated in the study. Only current drinking participants (i.e., past month) were included in the current sample (referred friends were not required to be current drinkers); therefore, 34 participant-friend pairs were excluded because the original participants were not current drinkers. The final sample consisted of 56 pairs of current alcohol-using participants and their close friends. The mean age of participants was 20.73 (SD = 3.14, ranged from 18 to 40) and mean age of their referred friends was 23.16 (SD = 8.97, ranged from 18 to 53). Participants

and their referred friends were predominately female (89.3%). Ethnic composition of participants was 8.9% Hispanic/Latino and racial composition was as follows: African American = 7.1%, Caucasian = 85.7%, American Indian = 1.8%, Asian = 3.6%, Mixed = 1.8%. Referred friends' ethnic composition was 1.8% Hispanic/Latino and racial composition was African American = 5.4%, Caucasian = 87.5%, American Indian = 1.8%, Asian = 1.8%, and Mixed = 3.6%.

Participants signed up for the survey using Louisiana State University's online study sign-up system and were asked to complete a battery of self-report measures (see Measures section below) online using a secure data collection website, www.surveymonkey.com. Data collection ran from February 2012 to August 2012 Participants were first asked to provide informed consent (which included consent to email their friend) and were then asked to begin the self-report measures. Participants were compensated with research credit points for their psychology classes. As part of this survey, participants were asked to provide the email addresses of one close, same gender friend.

After the participant completed the survey, their friend was emailed a unique ID number and a password and invited to complete collateral report surveys through www.surveymonkey.com. Participant responses were checked and invitations were sent each business day (i.e., excluding weekends and holidays). Each friend was asked to complete the survey within one month of receiving login information to help ensure the accuracy of participants' report of friends' drinking behavior. Referred friends were first asked to provide informed consent. They were then invited to complete measures of their own alcohol use quantity and frequency and approval of use (see Measures section below). Friends who completed the battery of self-report measures were entered into a drawing for one of five $20 prizes. All participants and referred friends received referrals to local alcohol, drug, and mental health treatment upon completion of their surveys.

Once downloaded, data were stored on a secure server in the investigators' research laboratory. All participant tracking information (i.e., name and email) was secured in a

password-protected file on a secure server accessed only by password-protected computers. Participants' responses were identified by unique ID numbers to preserve confidentiality, and all identifying information (i.e., name and email) were stored in a separate, password-protected file and deleted upon completion of the study. A certificate of confidentiality was obtained to further ensure security and confidentiality.

Measures

Participant measures. Social Interaction Anxiety Scale (SIAS): The SIAS (Mattick & Clarke, 1998) is a 20-item measure of social interaction anxiety. Respondents were asked to rate items on a 0 (not at all) to 4 (extremely) scale based on how true of them they feel a given item is (e.g., when I am mixing socially, I am uncomfortable). The SIAS has shown good internal consistency (α = 0.94) and test-retest reliability at 4 weeks, r = 0.91, and 12 weeks, r = 0.93 (Mattick & Clarke, 1998). Correlation with other measures of social anxiety supports the construct and discriminant validity of the SIAS (Mattick & Clarke, 1998). The SIAS has also shown good internal consistency (α ranging from 0.91 to 0.95) in previous studies in our lab (Buckner et al., 2011; Buckner, Schmidt, & Eggleston, 2006). The measure achieved an acceptable level of internal consistency in the current sample, α = 0.82.

Social Phobia Scale (SPS): The SPS (Mattick & Clarke, 1998) is a measure of social anxiety in situations in which the participant is being observed and evaluated by others. Scores range from 0 to 80 and higher scores represent greater anxiety in performance situations. The SPS has achieved a good level of internal consistency (α = 0.89) in previous studies (Mattick & Clarke, 1998). Further, construct validity and discriminant validity were supported by high correlations with other measures of social anxiety, but lower levels of correlation with measures of general distress (Mattick & Clarke, 1998). The SPS achieved good internal consistency (α = 0.94) in the current study.

Rutgers Alcohol Problem Index (RAPI)*:* The RAPI is a 23-item measure of alcohol-related problems experienced in the past month (White & Labouvie, 1989). For each item,

participants were asked to respond based on how many times they experienced an alcohol-related problem in the past month. Response options range from 0 (*never*) to 4 (*more than 10 times*). Higher scores reflected greater severity of alcohol-related problems, with a maximum score of 92. These responses were summed to create the total score. The RAPI has demonstrated convergent validity with other variables associated with drinking-related problems, such as drinking five or more drinks on one occasion (Martens, Neighbors, Dams-O'Connor, Lee, & Larimer, 2007). The RAPI has achieved acceptable levels of internal consistency (α ranging from 0.89 to 0.94) in previous studies in our lab (Buckner et al., 2011; Buckner, Schmidt et al., 2006). The RAPI achieved good consistency (α = .93) in the present study.

Rutgers Alcohol Problem Index- Perceived (RAPI-P): To obtain a measure of perceptions of friend's alcohol-related problems, participants also completed a version of the RAPI modified for the current study to use their referred friend as the reference group. All items and response options from the original RAPI were retained, but wording of items was modified to reflect the participant's estimate of the degree to which their close friend experiences alcohol-related problems. The RAPI-P achieved an excellent level of internal consistency (α = 0.96) in this study.

Daily Drinking Questionnaire (DDQ): The DDQ (R. L. Collins, Parks, & Marlatt, 1985) is a self-report measure of alcohol use quantity and frequency. Participants reported how many standard drinks they consumed each day in a typical week in the past month. Drinking quantity was determined by summing the total number of drinks reported per occasion, and drinking frequency was determined by totaling the total number of days on which alcohol was used. The DDQ has shown good convergent validity with other measures of quantity, frequency, and volume of alcohol use (R. L. Collins et al., 1985) and test-retest reliability (S. E. Collins, Carey, & Sliwinski, 2002). Participants completed one DDQ that used themselves as the reference, and another that used the referred friend as the reference to assess perceived descriptive norms.

Binge Drinking: To assess for the National Institute on Alcohol Abuse and Alcoholism (NIAAA) operational definition of binge drinking (i.e., five drinks within two hours for men, four drinks within two hours for women) participants were asked to provide the most drinks they consumed in a two-hour period in the past three months (Cranford et al., 2006). Those participants who reported at least the number of drinks for the NIAAA definition of binge drinking were coded as binge drinkers. This strategy has been used in previous work among college student binge drinking (Cranford et al., 2006), and is highly correlated with other measures of binge drinking developed before the addition of the two-hour time frame in the NIAAA definition of binge drinking (Cranford et al., 2006).

Perceived Injunctive Norms: Participants' perception of their referred friends' approval of risky drinking was assessed by asking participants four questions about how their friend would respond if he or she knew they drank alcohol every weekend, drank alcohol daily, drove their car after drinking every weekend, and drank enough alcohol to pass out (Baer, 1994). Responses ranged from 1 (strong disapproval) to 7 (strong approval*)*. This measure has been used successfully to assess perceived injunctive norms in previous research (e.g., Buckner et al., 2011). This measure has also achieved adequate internal consistency (α = 0.74) when using a typical same-sex student as the reference group (Neighbors et al., 2008). In the current study the measure achieved lower internal consistency than previously observed, α = 0.65.

Depression Anxiety Stress Scale-21 (DASS-21): The DASS-21 assesses depression, anxiety, and stress (Antony, Bieling, Cox, Enns, & Swinson, 1998). The DASS-21 is a shortened version of the DASS-41 (Lovibond & Lovibond, 1995), which was developed to measure depression, anxiety, and stress separately, without overlap observed in other separate measures these constructs. The anxiety and depression scales of the measure were used to control for depression and anxiety broadly (the stress scale was not examined in the present study). Respondents rated the degree to which they have experienced negative emotional symptoms in the past week. Subscales for levels of depression and anxiety were calculated by

adding the scores of the items that correspond to the subscale. Participants rated the frequency and severity of each symptom using a scale ranging from one to four (four being the most frequent/severe). Higher scores represent greater frequency and severity of symptoms. The subscales of the DASS-21 have achieved good internal consistency, with alphas ranging from 0.87-0.94 (Antony et al., 1998). The DASS-21 was also highly correlated with other measures of depression and anxiety, which supports the concurrent validity of the measure (Antony et al., 1998). The anxiety and depression scales of the DASS-21 have achieved adequate levels of internal consistency ($\alpha = 0.85$ and $\alpha = 0.89$) in a previous study in our lab (Buckner et al., 2011). Internal consistency of the subscales was acceptable in the current sample, with the depression subscale achieving $\alpha = 0.90$ and the anxiety subscale achieving $\alpha = 0.84$.

Friends' measures. Referred friends completed the DDQ and the measure of injunctive norms described above. The injunctive norms measure was modified to assess referred friends' own approval of risky drinking. The injunctive norms measure achieved a level of internal consistency similar to what was observed in the participant sample ($\alpha = 0.64$). Referred friends' scores on these measures were subtracted from participants' responses to create descriptive and injunctive norms discrepancy scores. Referred friends also completed the RAPI to assess their drinking-related problems, which were subtracted from the participant's modified RAPI (i.e., assesses participant's perception of friend's alcohol-related problems of their friend) to obtain a discrepancy score. The RAPI achieved an acceptable level of internal consistency ($\alpha = 0.86$) among referred friends. The friend's RAPI total score was subtracted from the participant's RAPI-P score to create an alcohol-related problem discrepancy index. Further, to assess the possible covariate of the referent's familiarity with the participant's drinking behaviors, referents were asked to report the number of drinking occasions they shared with the participant in the past month (Hagman et al., 2010).

Data Analytic Strategy

We first examined if any covariates needed to be included in the analyses by conducting correlation analyses between age, depression and anxiety scales of the DASS-21, shared drinking occasions, social anxiety scores, and alcohol variables (i.e., drinking quantity, drinking frequency, drinking-related problems). Analysis of variance (ANOVA) was used to determine if gender and binge drinking were differentially related to social anxiety or drinking behaviors. To test the hypothesis that social anxiety was unrelated to drinking quantity and frequency among participants, correlation analyses were conducted between social anxiety score (SIAS + SPS) and measures of drinking quantity and drinking frequency. Correlation analyses were conducted between participant social anxiety scores and RAPI scores to test the second hypothesis that social anxiety was positively related to drinking problems. To test the third hypothesis that a discrepancy existed between perceived and actual close friend norms a discrepancy index (perceived - actual norms) were created. The first discrepancy was created using the participant's DDQ (with referred friend as reference group) and the friend's actual DDQ to examine the magnitude of the difference for descriptive norms. Specifically, a "descriptive norms discrepancy index" was calculated (participant's perceived descriptive norm – friends' actual descriptive norm). An "injunctive norms discrepancy index" was created using the participant's perceived injunctive norms measure and the referred friend's perceived injunctive norm measure (participant's perceived injunctive norms – friend's actual injunctive norms). Further, an "alcohol-related problems discrepancy index" was created using the participant's and friend's RAPI (participant's modified RAPI score – friend's RAPI score). A paired *t*-test was used to determine if the difference score between perceived and actual norms is statistically significant. To test the fourth hypothesis that the discrepancies were related to greater participant drinking quantity and frequency, a correlation was calculated between the discrepancy indices and participants' alcohol use quantity, alcohol use frequency, and alcohol-related problems. A Bonferonni correction of alpha was applied to minimize the likelihood of Type I error. Logistic

regression was used to determine likelihood that discrepancies were related to the dichotomous variable of participant binge drinking status.

Fifth, to test whether participants' social anxiety was related to the discrepancies, a correlation was calculated between social anxiety scores and the discrepancy indices. Sixth, moderation analyses were conducted using hierarchical linear regression to determine if discrepancies moderated the relationship between participant social anxiety and alcohol use quantity, frequency, and alcohol-related problems as per guidelines set by Baron and Kenny (1986). Hierarchical logistic regression was used for the dichotomous binge drinking variable (Hayes & Matthes, 2009). Separate models were conducted for quantity, frequency, binge drinking, and alcohol-related problems as well as for all discrepancies. In Step 1, covariates (any variables significantly related to both independent and dependent variables) were entered. The main effects of social anxiety and discrepancy were entered in Step 2. The interaction between centered social anxiety and discrepancy variables was entered in Step 3. The hierarchical model ensured that variance accounted for by the interaction was above and beyond the variance accounted for by the main effects and covariates (Cohen & Cohen, 1983).

Results

Sample Characteristics and Correlation Between Study Variables

Average participant drinking quantity in an average week in the past month was 3.05 drinks per drinking day (*SD* = 2.34) and average drinking frequency was 1.8 days per week (*SD* = 1.26). Average alcohol problem severity was 8.94 (*SD* = 9.90). The participants' average social anxiety score was 38.80 (*SD* = 23.12). Referred friends' average drinking quantity was 2.62 drinks per drinking day (*SD* = 4.40) and average drinking days per week was 1.94 (*SD* = 1.96). Average alcohol problem severity for the referred friends was 4.14 (*SD* = 4.76). See Table 1 for correlations between relevant study variables. Consistent with hypothesis, social anxiety was unrelated to drinking quantity. However, counter to hypotheses, social anxiety was negatively correlated with drinking frequency and not significantly correlated with alcohol-related problems. Depression and anxiety were significantly correlated to both social anxiety and alcohol-related problems, and therefore included in moderation analyses as covariates. No other variables were significantly correlated.

Do Students Misperceive Their Close Friend's Drinking Behaviors?

Results of paired-samples t-test with Bonferonni correction ($\alpha = .0125$) supported at a medium effect size that students reported higher friend approval of risky drinking (*M* = 9.55, *SD* = 3.10) than their friends actually approved of risky drinking (*M* = 8.23, *SD* = 2.58), *t (55)* = 2.42, *p* = 0.019, *d* = 0.65. Further, participants reported perceiving a greater number of alcohol-related problems that their friend experienced in the past month (*M* = 8.59, *SD* = 10.88) than was actually reported by their friend (*M* = 4.14, *SD* = 4.77), *t* (55) = 3.1, *p* = 0.001, *d* = 0.81.

Table 1.

Correlations Among Study Variables

	Age	Drinking Quantity	Drinking Frequency	Problem Severity	Depression	Anxiety	Social Anxiety	Quantity Discrepancy	Frequency Discrepancy	Injunctive Discrepancy	Problem Discrepancy
Drinking Quantity	-.206	---									
Drinking Frequency	-.272*	.809**	---								
Problem Severity	-.232	.509**	.429**	---							
Depression	.001	.009	-.120	.463**	---						
Anxiety	-.097	.035	-.091	.561**	.835**	---					
Social Anxiety	.251	-.156	-.321*	.118	.591**	.565**	---				
Quantity Discrepancy	.290*	-.079	-.123	-.042	.031	.152	.151	---			
Frequency Discrepancy	.048	.012	.111	.100	-.037	.068	.100	.423**	---		
Injunctive Discrepancy	.101	-.232	-.162	-.340*	-.238	-.208	-.167	-.331*	-.026	---	
Problem Discrepancy	-.028	.284*	.205	.675**	.285*	.342**	.107	.234	.258	-.328*	---
Shared Drinking Occasions	-.094	.558*	.513*	.318*	.061	.041	-.177	-.073	-.071	-.074	.100

* $p < 0.05$.

** $p < 0.01$.

Quantity and frequency discrepancies were not supported t (54) = 0.63, p = 0.528, d = 0.17 and t (55) = 0.16, p = 0.871, d = 0.04, respectively.

Are Discrepancies Related to Drinking Behaviors and Social Anxiety?

See Table 1 for results of correlations between discrepancy indices and measures of alcohol use behavior. As expected, the alcohol-related problems discrepancy was positively related to participant alcohol-related problem severity and alcohol use quantity. Injunctive norms discrepancy was negatively correlated with participant alcohol-related problems. No other relationships between discrepancies and participant drinking behaviors were observed. Participants with higher injunctive norm discrepancies (OR = 0.76, 95% CI = 0.63- 0.91, p = 0.003) and problem severity discrepancies (OR = 1.09, 95% CI = 1.02 – 1.89, p = 0.014) were more likely to be classified as binge drinkers. This was not the case for quantity (OR = 1.05, 95% CI = 0.96-1.14, p = 0.33) and frequency discrepancies (OR = 1.06, 95% CI = 0.76 – 1.46, p = 0.75). Counter to hypothesis, discrepancies were not significantly correlated with social anxiety (Table 1).

Moderation Analyses

Effect sizes in hierarchical multiple regression (both linear and logistic) analyses were small and did not support any proposed moderators between participant social anxiety and alcohol use behaviors. See Tables 2-5 for results of multiple linear regression and multiple logistic regression analyses.

Table 2.

Hierarchical linear regression of potential moderators of social anxiety and alcohol use quantity relationship

	ΔR^2	ΔF	β	t	p	sr^2	f^2
Quantity Norms Discrepancy							
Step 1	.001	.03			.966		
Depression			-0.02	-0.07	.949	-0.01	
Anxiety			0.05	0.19	.848	0.02	
Step 2	.045	1.16			.323		
Social anxiety			-0.24	-1.38	.173	-0.19	
Quantity discrepancy			-0.06	-0.45	.653	-0.06	
Step 3	.055	2.93			.093		0.08
Social anxiety X Quantity discrepancy			-0.59	-1.71	.093	-.234	
Frequency Norms Discrepancy							
Step 1	.003	.071			.932		
Depression			-0.07	-0.27	.784	-0.04	
Anxiety			0.09	0.37	.712	0.05	
Step 2	.045	1.21			.080		
Social anxiety			-.269	-1.56	.126	-0.21	
Frequency discrepancy			0.03	0.22	.826	0.03	
Step 3	.013	.670			.417		0.01

(Table continued)

Social anxiety X Frequency discrepancy			-0.12	-0.82	.417	-.112	
Injunctive Norms Discrepancy							
Step 1	.003	.071			.932		
Depression			-0.07	-0.27	.784	-0.04	
Anxiety			0.09	0.37	.712	0.05	
Step 2	.103	2.94			.062		
Social anxiety			-0.27	-1.65	.106	-0.22	
Injunctive norms			-0.25	-1.83	.073	-0.24	
Step 3	.006	.359			.552		0.00
Social anxiety X Injunctive discrepancy			0.09	.59	.552	0.08	
Alcohol-related problem severity discrepancy							
Step 1	.003	.071			.932		
Depression			-0.07	-1.27	.784	-0.04	
Anxiety			0.09	0.37	.712	0.05	
Step 2	.115	3.34			.043		
Social anxiety			-0.23	-1.36	.180	-0.18	
Problem discrepancy			0.29	2.02	.048	0.27	
Step 3	.028	1.62			.210		0.03
Social anxiety X problem discrepancy			-0.17	-1.27	.210	-0.17	

Table 3.

Hierarchical linear regression of potential moderators of social anxiety and alcohol use frequency relationship

	ΔR^2	ΔF	β	t	p	sr^2	f^2
Quantity Norms Discrepancy							
Step 1	.007	.191			.827		
Depression			-0.07	-0.27	.790	-0.37	
Anxiety			-0.02	-0.80	.936	-0.01	
Step 2	.097	2.66			.080		
Social anxiety			-0.36	-2.13	.038	-0.29	
Quantity discrepancy			-0.87	-0.62	.541	-0.83	
Step 3	.057	3.24			.078		0.07
Social anxiety X Quantity discrepancy			-0.61	-1.79	.078	-0.24	
Frequency Norms Discrepancy							
Step 1	.015	.398			.674		
Depression			-0.15	-0.59	.557	-0.08	
Anxiety			0.03	0.13	.900	0.02	
Step 2	.121	3.59			.035		
Social anxiety			-0.42	-2.55	.014	-0.33	
Frequency discrepancy			0.15	1.27	.265	0.14	
Step 3	.001	.034			.854		0.00

(Table continued)

Social anxiety X Frequency discrepancy			-0.03	-0.19	.854	-0.02	
Injunctive Norms Discrepancy							
Step 1	.015	.398			.674		
Depression			-0.15	-0.59	.557	-0.04	
Anxiety			0.03	0.13	.900	0.05	
Step 2	.142	4.30			.019		
Social anxiety			-0.41	-2.50	.015	-0.32	
Injunctive norms			-0.21	-1.59	.116	-0.21	
Step 3	.014	.866			.357		0.02
Social anxiety X Injunctive discrepancy			0.15	0.93	.357	0.12	
Alcohol-related problem severity discrepancy							
Step 1	.015	.398			.674		
Depression			-0.15	-0.59	.557	-0.08	
Anxiety			0.03	0.13	.900	0.02	
Step 2	.147	4.47			.016		
Social anxiety			-0.37	-2.66	.028	-0.29	
Problem discrepancy			0.23	1.69	.097	0.22	
Step 3	.002	.11			.747		0.00
Social anxiety X problem discrepancy			-0.04	-.324	.747	-0.04	

Table 4.

Hierarchical linear regression of potential moderators of social anxiety and alcohol-related problem severity relationship

	ΔR^2	ΔF	β	t	p	sr^2	f^2
Quantity Norms Discrepancy							
Step 1	.315	11.71			<.001		
Depression			0.01	0.05	.959	0.01	
Anxiety			0.55	2.60	.012	0.30	
Step 2	.069	2.76			.073		
Social anxiety			-0.29	-2.04	.046	-0.22	
Quantity discrepancy			-0.10	-0.89	.380	-0.10	
Step 3	.025	2.02			.162		0.04
Social anxiety X Quantity discrepancy			-0.40	-1.42	.162	-0.16	
Frequency Norms Discrepancy							
Step 1	.315	12.23			<.001		
Depression			-0.02	-0.10	.920	-0.25	
Anxiety			0.58	2.80	.007	-0.24	
Step 2	.070	2.89			.065		
Social anxiety			-0.33	-2.34	.023	-0.26	
Frequency discrepancy			0.01	0.84	.405	0.09	
Step 3	.012	1.01			.319		0.02

(Table continued)

Social anxiety X Frequency discrepancy			-0.12	-1.01	.319	-0.11	
Injunctive Norms Discrepancy							
Step 1	.315	12.23			<.001		
Depression			-0.02	-0.10	.920	-0.25	
Anxiety			0.58	2.80	.007	-0.24	
Step 2	.118	5.31			.008		
Social anxiety			-0.32	-2.41	.019	-0.26	
Injunctive norms			-0.25	-2.26	.028	-0.24	
Step 3	.000	0.01			.918		0.00
Social anxiety X Injunctive discrepancy			0.01	0.10	.918	0.01	
Alcohol-related problem severity discrepancy							
Step 1	.315	12.23			<.001		
Depression			-0.02	-0.10	.920	-0.25	
Anxiety			0.58	2.80	.007	-0.24	
Step 2	.300	19.85			<.001		
Social anxiety			-0.24	-2.18	.034	-0.19	
Problem discrepancy			0.52	5.62	<.001	0.49	
Step 3	.004	0.48			.494		0.01
Social anxiety X problem discrepancy			0.06	0.69	.494	0.06	

Table 5.

Hierarchical logistic regression of potential moderators of social anxiety and binge drinking relationship

	β	*SE*	*Wald*	*OR*	*95% CI*	*p*
Quantity Discrepancy						
Step 1						
Depression	0.15	0.10	2.50	1.17	0.97-1.41	.114
Anxiety	0.08	0.09	0.73	1.08	0.91-1.29	.394
Step 2						
Social anxiety	-0.01	0.02	0.22	0.99	0.96-1.03	.638
Quantity Discrepancy	0.04	0.05	0.66	1.04	0.94-1.16	.418
Step 3						
Social anxiety X Quantity Discrepancy	-1.11	0.53	4.37	1.00	0.99-1.00	.491
Frequency Discrepancy						
Step 1						
Depression	0.10	0.08	1.43	1.10	0.94-1.30	.233
Anxiety	0.10	0.09	1.25	1.10	0.92-1.31	.264
Step 2						
Social anxiety	-0.01	0.02	0.32	0.99	0.96-1.02	.571
Descriptive Norms (Students)	0.08	0.19	0.18	1.08	0.75-1.58	.671
Step 3						
Social anxiety X Descriptive norms	0.00	0.01	0.23	1.00	0.99-1.02	.630

(Table continued)

Injunctive Discrepancy						
Step 1						
Depression	0.01	0.08	1.42	1.10	0.94-1.30	.233
Anxiety	0.01	0.09	1.24	1.10	0.93-1.31	.264
Step 2						
Social anxiety	-0.01	0.02	0.15	0.99	0.96-1.02	.698
Injunctive discrepancy	-0.25	0.10	6.52	0.78	0.65-0.94	.011
Step 3						
Social anxiety X Injunctive discrepancy	-0.94	0.56	2.85	0.39	0.98-1.01	.992
Problems Discrepancy						
Step 1						
Depression	0.10	0.08	1.43	1.10	0.94-1.30	.233
Anxiety	0.10	0.09	1.25	1.10	0.93-1.41	.264
Step 2						
Social anxiety	-0.01	0.02	0.07	0.10	0.96-1.03	.792
Descriptive Norms (Students)	0.07	0.04	3.34	1.08	1.00-1.62	.067
Step 3						
Social anxiety X Descriptive norms	0.00	0.00	0.00	1.00	0.99-1.00	.997

Discussion

This study was the first known investigation of college students' perceptions of drinking and social anxiety to use a multi-informant method with a proximal peer group. The current study was also the first known study to employ separate measures of quantity and frequency descriptive norms in relation to social anxiety. Further, the current study was the first known investigation to assess perceived alcohol-related problem norms. The current study replicates prior work that college students overestimate the amount that other students drink (Borsari & Carey, 2003; M. A. Lewis & Neighbors, 2004; Martens, Dams-O'Connor, Duffy-Paiement, & Gibson, 2006) and experience alcohol-related problems (Baer et al., 1991) and extends this work by showing that students tend to overestimate the degree to which their close friends approve of risky drinking behaviors and experience alcohol-related problems.

Results of the study replicate prior work that found no relation between social anxiety and drinking quantity (Bruch et al., 1992; Bruchet al., 1997; Buckner et al., 2011; Buckner et al., 2006; Ham & Hope, 2006). However, higher social anxiety was related to fewer drinking occasions per week. Despite research that has found no relationship between social anxiety and drinking frequency (Buckner et al., 2011; Buckner et al., 2006; Ham & Hope, 2006), some work has observed that social anxiety is negatively related to drinking frequency (Eggleston et al., 2004; Tran et al., 1997). It may be that similarities between the current study and Eggleston et al. and Tran et al. could account for these similarities in findings. Such similarities include employing a measure of average or "typical" drinking frequency and predominately young samples. However, similar methodologies were used in studies that did observe an effect (Buckner et al., 2011; Buckner et al., 2006; Ham and Hope, 2006). Alternatively, the differences in observed relations could reflect a continued need to examine potential moderators of the relationship between social anxiety and drinking frequency.

Unexpectedly, social anxiety was not related to alcohol-related problem severity. It may be that differences in methodology and samples partially account for differences between the

current study and studies that observed a relationship between social anxiety and alcohol-related problems (Buckner, Eggleston et al., 2006; Buckner & Heimberg, 2010; Stewart et al., 2006). For example, the current study specified current drinkers as having used any alcohol in the past month. However, Stewart et al. (2006), which observed a positive relation between social anxiety and alcohol-related problems, defined current drinking as having used any alcohol in the past year and did not specify how drinking quantity was calculated. Further the current sample may have had relatively low levels of average alcohol use frequency, as two studies that observed a relationship between social anxiety and alcohol-related problems (Buckner et al., 2011; Buckner & Heimberg, 2010) drank on average more than two days per week, but the students in the current sample drank approximately one to two days each week. These differences may reflect different levels of experience with alcohol and may influence the relationship between social anxiety and alcohol-related problems.

Prior work has found social anxiety to be unrelated to drinking quantity and frequency but related to alcohol problems (e.g., Buckner, Ecker, & Proctor, 2011), which supports the idea that socially anxious students may not be drinking more or more often than their less socially anxious peers, but experiencing greater alcohol-related impairment. Taken together, the pattern of findings in the current study suggests that social anxiety is related to alcohol use frequency, but not related alcohol-related problem severity. It may be that students with higher social anxiety do not drink as often as their peers, but may experience similar levels alcohol-related problem severity.

Results of the current study provide novel findings that students overestimate the degree to which one of their close friends approves of risky drinking behaviors, and overestimate the severity of alcohol-related problems their friend experiences. Despite injunctive norms overestimation being observed as a trend, a medium effect size was found. Although it was hypothesized that statistically significant discrepancies between perceived and actual descriptive norms would be observed, it may be that participants are more familiar with their

friend's actual drinking quantity and frequency than with their friends' attitudes about risky drinking and problems experienced. The participant may be less aware of beliefs about alcohol (injunctive norms) and problems experienced, which are not as easily observed as drinking quantity and frequency. Further, prior work (Hagman et al., 2010) found that students are generally accurate collateral reporters of friends' drinking quantity and frequency. It is possible that the lack of observed discrepancies for drinking quantity and frequency reflects the tendency for students to be accurate reporters of their close friends' overt drinking behaviors.

The current study was the first known study to directly investigate if students misperceive close friend norms, and if these misperceptions were related to drinking behaviors. It was hypothesized that all discrepancies would be positively related to alcohol quantity and frequency, binge drinking, and alcohol related problems. However, only problems discrepancy was related to greater problem severity and drinking quantity and injunctive norms and problems discrepancies were related to binge drinking status. These novel findings suggest that greater overestimation of a friend's attitudes and behaviors regarding risky alcohol use are related to greater endorsement of one's own risky drinking behaviors (i.e., high alcohol use quantity and binge drinking) and alcohol-related problem severity.

Unexpectedly, an inverse relationship between injunctive norms discrepancy and alcohol-related problems was observed. That is, greater overestimation of friend's beliefs about risky alcohol use was associated with the experience of less alcohol-related problem severity. This finding, taken together with the finding that overestimating the friend's alcohol problem severity was positively related to one's own alcohol problem severity suggests that students' experience of alcohol-related problems may be more likely to reflect what they think peers do, rather than what they perceive their peers to think. This possibility is reflected in prior work that observed that higher perceived descriptive norms are related to greater alcohol use quantity and frequency (Clapp & McDonnell, 2000; Neighbors et al., 2006).

Social anxiety was not related to any discrepancies. This is in line with prior work that found social anxiety to not be directly related to perceived norm endorsement (Bruch et al., 1992; Bruch et al., 1997; Buckner et al., 2011; Neighbors et al., 2007). Similarly, counter to study hypotheses, no discrepancies moderated a relationship between social anxiety and alcohol use behaviors. However, the moderations observed in previous studies have not been consistent across studies, such that one study found that high injunctive norms and high social anxiety were related to higher drinking frequency (LaBrie et al., 2008), and another study found that high injunctive norms and high social anxiety were related to less frequent drinking (Buckner et al., 2011). It may be that although misperceptions of norms have been related to alcohol use behaviors in the general population (Clapp & McDonnell, 2000; Ham & Hope, 2005; Neighbors et al., 2006), those with social anxiety may pay more attention to social norms than less socially anxious peers, and modify their behavior accordingly. Therefore, misperception of alcohol use norms may not play a role in exacerbation of risky alcohol use. Rather, simple norm endorsement (whether accurate or misperceived) may better account for differences in the relationship between social anxiety and alcohol use behaviors (Buckner et al., 2011; LaBrie, Hummer, & Neighbors, 2008; Neighbors et al., 2007). Additionally, the low levels of internal consistency observed for the injunctive norms measure ($\alpha = 0.65$) for both participants and friends could have contributed to the lack of findings for these hypotheses, as the measure may not have been reliable in the current sample.

Limitations and future directions

The current study should be interpreted in light of its limitations. First, the study is limited by its small sample size. Although the sample was powered to detect large effect sizes, the effects of normative misperceptions of proximal peer groups on the relationship between social anxiety and alcohol use behaviors were small effects, and a larger sample size may be more equipped to better detect smaller effects. Second, the sample was comprised entirely of college students and their friends. The sample was selected due to the large number of college

students who experience problems related to alcohol use and the lasting effect of such problems (e.g., O'Neill, Parra, & Sher, 2001), but findings may not be generalizable to other populations. Additionally, the current study was cross sectional, and therefore findings that perceived injunctive and problem norm discrepancies are related to alcohol use behaviors cannot be interpreted as causal. Finally, the current study used only one friend to calculate the discrepancy. It may be that a more comprehensive evaluation of proximal peer influence (e.g., three friends) is necessary to better assess the role of friends' norms in the role of social anxiety and alcohol use.

Conclusions

Results of the current study suggest that undergraduates overestimate the degree to which a close friend approves of risky alcohol use and experiences alcohol-related problems, and these misperceptions are related to more severe alcohol-related problems. Results underscore the importance of considering including proximal peer influence in research investigating the social norms' influence on drinking behaviors given the relationships observed between injunctive norms and problem norms discrepancies and alcohol use behaviors. Further clinical uses of perceived norms as they relate to drinking behaviors include considering proximal norm misperceptions as a target of norms-based interventions to reduce risky drinking among college students.

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Appendix: IRB Approval Form

Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu | lsu.edu/irb

ACTION ON PROTOCOL APPROVAL REQUEST

TO: Julia Buckner
Psychology

FROM: Robert C. Mathews
Chair, Institutional Review Board

DATE: January 30, 2012
RE: **IRB#** 3229

TITLE: Multi-informant investigation of college student perceived norms

New Protocol/Modification/Continuation: New Protocol

Review type: Full ___ Expedited _X_ **Review date:** 1/23/2012

Risk Factor: Minimal __X____ Uncertain _____ Greater Than Minimal_____

Approved_____X____ **Disapproved**_____

Approval Date: 1/30/2012 **Approval Expiration Date:** 1/29/2013

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 1000

Protocol Matches Scope of Work in Grant proposal: (if applicable)_____

By: Robert C. Mathews, Chairman _____

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –
Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. SPECIAL NOTE:

**All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at http://www.lsu.edu/irb*

Application for Approval of Projects Which Use Human Subjects

This application is used for projects/studies that cannot be reviewed through the exemption process.

LSU

Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
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– Applicant, Please fill out the application in its entirety and include two copies of the competed application as well as parts A-E, listed below. Once the application is completed, please submit to the IRB Office for review and please allow ample time for the application to be reviewed Expedited reviews usually takes 2 weeks. Carefully completed applications should be submitted 3 weeks before a meeting to ensure a prompt decision.

– A Complete Application Includes All of the Following:

(A) Two copies of this completed form and two copies of part B thru E.
(B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
(C) Copies of all instruments to be used.
*If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
(D) The consent form that you will use in the study (see part 3 for more information.)
(E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (http://phrp.nihtraining.com/users/login.php.)
(F) IRB Security of Data Agreement: (http://www.lsu.edu/irb/IRB%20Security%20of%20Data.pdf)

1) Principal Investigator*: Julia D. Buckner, Ph.D. **Rank** Assisstant Professo

*PI **must be** an LSU Faculty Member

Dept: Psychology **Ph:** 8-4096 **E-mail:** jbuckner@lsu.edu

2) Co Investigator(s): please include department, rank, phone and e-mail for each
Anthony H. Ecker, Graduate Student, 8-7792, tecker2@lsu.edu

3) Project Title: Multi-informant investigation of college student perceived norms.

IRB# 3229 LSU Proposal #

- ○ Full
- ✓ Expedited
- ✓ Human Subjects Training
- ○ Complete Application

4) Proposal Start Date: 12/1/11 **5) Proposed Duration Months:** 12

6) Number of Subjects Requested: 1000 partic **7) LSU Proposal #:**

8) Funding Sought From: NA

Study Approved By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Approval Expires: 11/29/2012

ASSURANCE OF PRINCIPAL INVESTIGATOR named above

I accept personal responsibility for the conduct of this study (including ensuring compliance of co-investigators/co-workers) in accordance with the documents submitted herewith and the following guidelines for human subject protection: The Belmont Report, LSU's Assurance (FWA00003892) with OHRP and 45 CFR 46 (available from http://www.lsu.edu/irb). I also understand that copies of all consent forms **must be maintained at LSU for three years after the completion of the project.** If I leave LSU before that time, the consent forms should be preserved in the Departmental Office.

Signature of PI _____ Date 11/29/11

ASSURANCE OF STUDENT/PROJECT COORDINATOR named above. If multiple Co-Investigators, please create a "signature page" for all Co-Investigators to sign. Attach the "signature page" to the application.

I agree to adhere to the terms of this document and am familiar with the documents referenced above.

Signature of Co-PI (s) _____ Date 11/29/11

Consent Form

Study Title:	Multi-informant investigation of college student perceived norms.
Performance Site:	This study will be completed online.
Investigators:	Julia D. Buckner, Ph.D.
Purpose of the Study:	Investigate the substance use and beliefs about substance use among undergraduates.
Participants Inclusion Criteria:	Participants must be undergraduate students at Louisiana State University.
Exclusion Criteria:	There are no exclusion criteria for this study
Number of Subjects:	We plan to enroll up to 1000 participants and up to 100 referred friends.
Study Procedures:	This study consists of an online survey that asks questions about your thoughts, feelings, and behaviors. Each participant will also be asked to provide an email of a close friend. The friend must be of the same gender and reside in the Baton Rouge area. Each friend will then be emailed surveys to be completed about his/her drinking behaviors and norms.
Benefits:	Participants will be compensated with research credit points for their psychology classes after the completion of the survey is confirmed. Referred friends who complete the battery of self-report measures will be entered into a drawing for one of five $20 prizes (chances of winning are 1 in 20). All participants and referred friends will also receive information regarding local alcohol, drug, and mental health treatment.
Risks/Discomforts:	There are no foreseen risks involved in this study. Though some participants may be uncomfortable answering about their personal thoughts, feelings, and behaviors, all participants' confidentiality will be protected through the use of a secure online service, which is password-protected, and stored on a secure, password-protected server in the primary investigator's laboratory.
Right to Refuse:	Participation in this study is completely voluntary, and there will be no penalization if participants wish to withdraw at any point throughout the study.

Privacy:	Once downloaded, data will be stored on a secure, password-protected server in Dr. Buckner's research laboratory in 105 Audubon Hall on LSU's campus. All participant-tracking information (i.e., name and email) will be secured in a password-protected file on the secure server. Participants' responses will be identified only by numbers to preserve confidentiality, and all identifying information (i.e., name and email) will be deleted upon completion of the study. For the purposes of friend referral, we will include your first name in an email to the referred friend. Your friend will not be informed that you have completed this study. You will not be informed whether your friend completed their survey. Neither you nor your friend will have access to each other's responses.
Financial Information:	There will be no financial compensation for the completion of the study. All participants will be able to receive psychology research credit. Friends of participants will be entered for a drawing of one of five $20 prizes.
Withdrawal:	All participants and friends have the opportunity to withdraw at any point throughout the study. Participants may withdraw from the study at any time without prejudicing their future relationships with the university.
Removal:	Participants may be removed from the study without consent if they are believed to be a danger to themselves or others. Removal may also occur if it would be in the best clinical interest of the participants.
Alternatives:	If you do not wish to participate in the present study but wish to seek psychological treatment for emotional or psychological programs, we will provide a list of referrals of treatment programs offered at Louisiana State University, but we cannot attest to their efficacy.
Unforeseeable Risks:	As with any study, confidentiality is a concern; however, confidentiality risk is unlikely given the steps we have taken to ensure that participant identifying information is kept confidentiality. Confidentiality is protected through use of a secure online service and password-protected access for study personnel. Referred friends' contact information will be kept in a password-protected file that will be erased at the conclusion of the study so that data cannot be linked to individual participants.
Certificate of Confidentially:	To help us protect your privacy, we have applied for a Certificate of Confidentiality (COC) from the National Institutes of Health. The COC is issued to protect the investigators on this study from being forced to tell people that are not connected with this study about your participation in this study, even under a subpoena. The protection offered by the COC does not stop us from voluntarily reporting

information about suspected or known sexual, physical, or other abuse of a child or older person, or a subject's threats of violence to self or others. If any member of the research team is given such information, he or she will make a report to the appropriate authorities. Even when a COC is in place, you and your family members must still continue to actively protect your own privacy. If you voluntarily give your written consent for an insurer, employer, or lawyer to receive information about your participation in the research, then we may not use the COC to withhold this information.

We will not ask you to include your name in this survey. Only our laboratory personnel will have access to the database that links your email address to your responses. Upon completion of the study and notification of the prizewinners, referred friends' contact information will be deleted from the database.

Study-related illness or injury: Participants are encouraged to seek any necessary medical care from their primary physician as well as contact the Principle Investigator, Dr. Julia Buckner (225-578-4096) if there is a medical illness or injury related to the study.

New Findings: Any new and relevant findings in regards to this study that may influence your willingness to continue this study will be made known to you.

Signatures: ***"The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Robert C. Mathews, Institutional Review Board, (225) 578-8692, irb@lsu.edu. I agree to participate in the study described above and acknowledge the investigator's obligation to provide me with a signed copy of the consent form."***

_____

Signature

Date

_____

Signature of Reader

Date

Study Approved By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Approval Expires: 11/29/2013

Vita

Anthony Ecker is a native of Louisiana and received his Bachelor of Science Degree in psychology from Louisiana State University in 2009. Mr. Ecker is currently pursuing a Doctoral Degree in clinical psychology at Louisiana State University under the supervision of Dr. Julia Buckner. Mr. Ecker's research interests include the etiology, maintenance, and treatment of anxiety and substance use disorders.