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Social Anxiety and Alcohol-Related Impairment: The Mediational Impact of Solitary Drinking

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ABSTRACT

Social anxiety disorder more than quadruples the risk of developing an alcohol use disorder, yet it is inconsistently linked to drinking frequency. Inconsistent findings may be at least partially due to lack of attention to drinking context – it may be that socially anxious individuals are especially vulnerable to drinking more often in specific contexts that increase their risk for alcohol-related problems. For instance, socially anxious persons may drink more often while alone, before social situations for "liquid courage" and/or after social situations to manage negative thoughts about their performance. Among current (past-month) drinkers (*N* = 776), social anxiety was significantly, positively related to solitary drinking frequency and was negatively related to social drinking frequency. Social anxiety was indirectly (via solitary drinking frequency) related to greater past-month drinking frequency and more drinking-related problems. Social anxiety was also indirectly (via social drinking frequency) negatively related to past-month drinking frequency and drinking-related problems. Findings suggest that socially anxious persons may be vulnerable to more frequent drinking in particular contexts (in this case alone) and that this context-specific drinking may play an important role in drinking problems among these high-risk individuals.

Keywords**:** drinking contexts; drinking problems; solitary drinking; alcohol; social anxiety; social phobia

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INTRODUCTION

Accumulating evidence suggests that social anxiety appears to be a risk factor for alcohol-related impairment. To illustrate, social anxiety disorder more than quadruples the risk of developing an alcohol use disorder (Buckner, Schmidt, et al., 2008; Kushner, Abrams, & Borchardt, 2000). Social anxiety tends to onset prior to alcohol use disorder among dually diagnosed individuals (Buckner, Timpano, Zvolensky, Sachs-Ericsson, & Schmidt, 2008) and the prospective relation of social anxiety to subsequent alcohol use disorder remains after controlling for relevant comorbid disorders (Buckner, Schmidt, et al., 2008). Drinking to cope with social anxiety (physiologically or psychologically) is thought to reinforce regular use of alcohol (Sher & Levenson, 1982), thereby increasing likelihood of continuing to drink despite experiencing more alcohol-related problems.

Consistent with tension-reduction based models (Conger, 1956), it has been theorized that socially anxious persons are vulnerable to alcohol-related impairment due to reliance on alcohol as a strategy to help manage chronically negative affective states (cf, Battista, Stewart, & Ham, 2010; Buckner, Heimberg, Ecker, & Vinci, 2013; Carrigan & Randall, 2003). Despite accumulating data of a relation between social anxiety and alcohol problems (for review, see Buckner et al., 2013), data are mixed regarding whether social anxiety is related to greater quantity or frequency of drinking, with some studies finding a positive relation between social anxiety and drinking quantity and frequency (e.g., Neighbors et al., 2007; Stewart, Morris, Mellings, & Komar, 2006; Terlecki, Buckner, Larimer, & Copeland, 2011) and others finding social anxiety to be inversely (e.g., Eggleston, Woolaway-Bickel, & Schmidt, 2004; Ham & Hope, 2005) or unrelated to alcohol use quantity and frequency (e.g., Bruch, Heimberg, Harvey, & McCann, 1992; Bruch, Rivet, Heimberg, & Levin, 1997; Buckner, Ecker, & Proctor, 2011; Buckner, Mallott, Schmidt, & Taylor, 2006; Ham & Hope, 2006; O'Grady, Cullum, Armeli, & Tennan, 2011; Terlecki, Ecker, & Buckner, 2014). Further delineation of whether and under

what circumstances social anxiety is related to heavy drinking will be critical to inform alcohol intervention efforts given that socially anxious students appear vulnerable to heavy drinking after undergoing alcohol treatment (Terlecki et al., 2011).

One possible explanation for the mixed findings is that drinking behavior varies in different social and contextual situations (O'Hare, 1997; Terlecki et al., 2014). Thus, socially anxious persons may be especially likely to drink in situations in which they believe drinking will help them manage their negative affectivity. It is possible that socially anxious persons therefore drink to manage elevated anxiety during social situations. In partial support of this hypothesis, social anxiety is related to drinking to cope in social situations and avoidance of social situations if alcohol is unavailable (Buckner & Heimberg, 2010; Thomas, Randall, & Carrigan, 2003). However, Terlecki et al. (2014) found that although social anxiety was related to drinking in situations involving negative affect, it was unrelated to drinking in social contexts. Thus, it may be that socially anxious individuals do not necessarily drink in social situations, given they may fear losing control and behaving in embarrassing ways as a result of heavy drinking in social contexts. Rather, they drink to manage negative affect while alone, such as prior to a social event for “liquid courage”. In support of this hypothesis, social anxiety was positively related to more frequent solitary “pre-drinking” (drinking prior to a social event), which mediated the relation of social anxiety with drinking-related problems (Keough, Battista, O'Connor, Sherry, & Stewart, 2016). Social anxious participants reported less frequent social pre-drinking, which protected them from drinking problems. Yet, it remains unclear whether social anxiety is related to solitary drinking more generally, which is important to determine given that social avoidance may lead some socially anxious persons to drink alone rather than attend social events. Further, socially anxious persons may engage in solitary drinking following social interactions to manage negative affect associated with post-event processing (PEP; i.e., negative rumination about one’s performance during a social event; see Brozovich & Heimberg, 2008).

Thus, the current study sought to elucidate the relationships of social anxiety, drinking context, and drinking outcomes in several ways. Specifically, we sought to extend Keough et al. (2016) in three key ways: (1) we tested whether social anxiety was positively related to solitary drinking frequency and negatively related to social drinking frequency more broadly; (2) we tested whether solitary drinking frequency mediated the relation of social anxiety with drinking-related problems and with drinking frequency generally; and (3) we tested whether social drinking frequency mediated the relation of social anxiety with drinking-related problems and with drinking frequency generally. These hypotheses were tested among college students given that research consistently shows that college students experience greater alcohol impairment relative to non-college attending peers (Blanco, Okuda, Wright, & et al., 2008; Johnston, O'Malley, Bachman, Schulenberg, & Patrick, 2013; Knight et al., 2002; Slutske, 2005). Further, social anxiety often increases when young adults make the transition to college (Spokas & Heimberg, 2009) and socially anxious persons may be especially vulnerable to drinking to cope with novel, social anxiety-provoking interactions (e.g., making new friends, meeting new people) given that the college environment promotes drinking (e.g., living in residence halls; Cross, Zimmerman, & O'Grady, 2009; Page & O'Hegarty, 2006; National Institute on Alcohol Abuse and Alcoholism, 2002).

1. METHOD

2.1 Participants and Procedures

Participants were recruited through the psychology participant pool from at a large state university in the southern United States for a study on college substance use. Participants completed computerized self-report measures using a secure, on-line data collection website (surveymonkey.com). Participants received research credit for their psychology courses and referrals to university-affiliated psychological outpatient clinics for completion of the survey. The university's Institutional Review Board approved the study and all participants provided informed consent prior to data collection.

Of the 1,009 students who completed the survey, 779 endorsed past-month alcohol use and were eligible for the current study. Of those, 3 were excluded to due questionable validity of their responses (described below). The final sample of 776 was predominately female (83.5%) and the racial/ethnic composition was 9.3% non-Hispanic African American, 0.3% Hispanic African American, 2.7% Asian American, 79.3% Non-Hispanic Caucasian, 3.5% Hispanic Caucasian, 0.8% Native American, 2.1% multiracial, and 2.2% "other". The mean age was 20.2 (*SD* = 1.9) and the majority (60.1%) were under 21 years old.

2.2 Measures

Social versus solitary drinking was assessed using the strategy outlined in Gonzalez and Skewes (2013) such that participants reported the number of days on which drinking occurred in the past year in social (i.e., with others) and in solitary (i.e., alone) settings.

The *Daily Drinking Questionnaire* (DDQ; Collins et al., 1985) assessed typical weekly drinking frequency in the past month. The DDQ has demonstrated good convergent validity (R. L. Collins, Parks, & Marlatt, 1985) and test-retest reliability (S. E. Collins, Carey, & Sliwinski, 2002). Participants are asked to rate how often they drank in the past month from 0 (*I did not drink at all*) to 6 (*once a day or more*).

Past-month alcohol problems were assessed with the past-month version of the 23-item *Rutgers Alcohol Problems Index* (RAPI; White & Labouvie, 1989). Both the original and the past-month versions of the RAPI have demonstrated adequate psychometric properties (Buckner, Eggleston, & Schmidt, 2006; White & Labouvie, 1989). Consistent with prior work (e.g., Morean & Corbin, 2008), endorsed items were summed to provide a total count of alcohol-related problems. In our sample, the RAPI demonstrated good internal consistency (α=.87).

The *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998) assessed social anxiety with 20 items scored from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). The SIAS has demonstrated good internal consistency in both community and undergraduate samples and have been shown to be specific for social anxiety

relative to other forms of anxiety (i.e., trait anxiety; Brown et al., 1997). Internal consistency of the SIAS was excellent in the current sample (α = .93).

The *Infrequency Scale* (IS; Chapman & Chapman, 1983) was used to identify random responders who provided random or grossly invalid responses. Four questions (e.g., “I find that I often walk with a limp, which is the result of a skydiving accident") from the IS were included. As in prior online studies (e.g., Cohen, Iglesias, & Minor, 2009), individuals who endorsed three or more infrequency items were excluded from this study (n = 3).

2. RESULTS

Inspection of the data (Table 1) revealed that some variables were not normally distributed (skew > 3.0; kurtosis > 10; Kline, 2005), which has occurred with similar drinking variables (e.g., Keough et al., 2016; Keough, O'Connor, Sherry, & Stewart, 2015).

Table 1

Descriptive statistics.

	M	*SD*	*Skew*	*Kurtosis*
Social anxiety	21.55	13.04	1.04	1.08
Social drinking frequency	7.76	6.29	1.61	2.68
Solitary drinking frequency	1.29	3.07	4.18	21.88
Drinking frequency	2.43	0.94	0.08	0.19
# drinking problems	3.86	4.15	1.56	2.90

Thus, hypotheses were tested using bootstrapping, which is robust against violations of assumptions of normality (Erceg-Hurn & Mirosevich, 2008). Specifically, we tested whether drinking contexts mediated the relation of social anxiety to general drinking frequency and to alcohol-related problems using maximum likelihood bootstrapping (10,000 samples were drawn)

within the structural equation modeling program AMOS 22. Estimated standard errors and confidence intervals (95%) were calculated for the direct and indirect effects. Effects of social anxiety on drinking contexts and from drinking contexts to drinking outcomes represent unique associations after controlling for shared variance. Covariances were estimated among drinking contexts and among drinking outcomes to control for shared variance. Mediation is present if the indirect effect *CI* does not contain zero (Hayes, 2013).

Both drinking contexts were significantly associated with drinking outcomes (Figure 1). As hypothesized, social anxiety was significantly, positively related to solitary drinking frequency. Social anxiety was also negatively related to social drinking frequency. Social anxiety was indirectly (via solitary drinking frequency) related to greater past-month drinking frequency and more drinking-related problems (Table 2). Social anxiety was also indirectly (via social drinking frequency) negatively related to past-month drinking frequency and drinking-related problems (Table 2).

Table 2

Bootstrap estimates of the standard errors and 95% confidence intervals for the indirect effects of social anxiety predicting past-month typical drinking frequency and number of drinking-related problems.

	β	*SE*	CI (lower)	CI (upper)	*p*
Social anxiety → Solitary drinking frequency → Typical drinking frequency	.013	.007	.003	.032	.003
Social anxiety → Solitary drinking frequency → Drinking problems	.008	.005	.001	.023	.014
Social anxiety → Social drinking frequency → Typical drinking frequency	-.053	.014	-.08	-.03	<.001
Social anxiety → Social drinking frequency →	-.040	.010	-.06	-.02	<.001

Drinking problems

3. DISCUSSION

The present study elucidates social anxiety's relation with drinking and drinking-related impairment in several ways. First, the study extends work aimed at understanding contexts in which social anxiety may be related to greater drinking (Keough et al., 2016; Terlecki et al., 2014) by determining that social anxiety was related to more frequent solitary drinking and less social drinking. This is similar to the pattern recently observed by Keough et al. (2016) for pre-drinking with one exception -- the current study found that more frequent solitary drinking mediated the relation of social anxiety with general drinking frequency, whereas Keough et al. found that solitary pre-drinking did not. This emerging corpus of work suggests that socially anxious persons who engage in more frequent solitary drinking (whether pre-drinking or otherwise) are vulnerable to more drinking-related problems. Those socially anxious persons who engage in more frequent solitary drinking generally (i.e., not necessarily pre-drinking) also drink more frequently generally. On the other hand, socially anxious persons engage in less frequent social drinking, which may protect them from more frequent drinking generally and from more drinking-related problems.

There are several possible explanations for the current findings. First, socially anxious individuals may engage in more frequent solitary drinking as a result of greater social isolation due to social avoidance. Socially anxious individuals endorse more social avoidance generally as well as more avoidance of social situations if alcohol is unavailable, and avoidance of alcohol-free situations mediated the relation of social anxiety group status to drinking problems (Buckner & Heimberg, 2010). Taken together, these data suggest that socially anxious persons may engage in more frequent solitary drinking as a result of their greater tendency to avoid social situations and future research testing this hypothesis will be an important next step.

Second, socially anxious individuals may be prone to social withdrawal while experiencing negative affect and/or reluctance to engage social support. To illustrate, socially anxious individuals report lower perceived social support (Torgrud et al., 2004), lower friendship quality (Rodebaugh, 2009), and more problems in close relationships (Davila & Beck, 2002). Socially anxious individuals may also fail to seek available social support when experiencing emotional distress due to fear of rejection or ridicule. Existing close relationships may be marred with problems due to avoidance of emotional expression, lack of self-assertion, and difficulties with conflict management (Davila & Beck, 2002). Among alcohol treatment-seeking adults, patients with social anxiety disorder reported lower perceived social support and scored lower in social role behaviors than patients without social anxiety disorder (Thevos, Thomas, & Randall, 1999). Socially anxious drinkers are particularly vulnerable to drinking to cope with negative affect, which mediates the relation of social anxiety and drinking problems (e.g., Buckner, Eggleston, et al., 2006; Buckner & Shah, 2015; Lewis et al., 2008). Social anxiety was related to more drinking in situations involving negative affect but unrelated to drinking in social contexts (Terlecki et al., 2014), suggesting that socially anxious individuals may drink more to attenuate emotional distress in solitary settings in an attempt to cope with negative affect rather than engaging in more adaptive emotion regulation strategies (e.g., seeking social support). In fact, solitary drinking is associated with lower levels of perceived social support and higher levels of loneliness among undergraduate samples unselected for social anxiety (Clum & Febbraro, 1994). Although future research is needed to test these hypotheses, lack of perceived social support and/or reluctance to seek social support during periods of emotional distress may be related to heavy solitary drinking and greater alcohol problems among socially anxious drinkers.

Third, more frequent solitary drinking may be more related to an inability to control the urge to drink during a negative affective state rather than simply experiencing negative affect alone. Specifically, individuals who have difficulty abstaining from alcohol or resisting the urge to drink could have the greatest risk of solitary drinking. In partial support of this contention, the

relationship between negative affect and solitary drinking was fully mediated by resistance to drink during a negative affective state among an adolescent sample unselected for social anxiety (Creswell et al., 2015). Importantly, Creswell et al. found that negative affect was not directly associated with solitary drinking, but rather the inability to refuse a drink during a negative affective state was found to promote problematic drinking behavior. In fact, self-efficacy for refusing heavy drinking in anxiety-provoking situations moderated the relationship between social anxiety and drinking (Burke & Stephens, 1999). Thus, it could be that socially anxious undergraduates with low self-efficacy for avoiding heavy drinking, especially during negative affective states, may be the most vulnerable to engaging in solitary drinking, although additional research is necessary to test this contention.

Overall, the findings have important clinical implications. First, the current findings provide insight into specific drinking circumstances (i.e., solitary drinking) that may render socially anxious undergraduates especially vulnerable to more frequent drinking and to more drinking-related problems. This finding is important because it suggests that socially anxious undergraduates may have a different alcohol risk vulnerability profile than non-socially anxious undergraduates. Specifically, although brief interventions for addressing problematic alcohol use among undergraduates exist, socially anxious undergraduates do not benefit as much from existing protocols and continue to drink heavily after receiving the intervention (Terlecki et al., 2011). Brief intervention protocols such as the *Brief Alcohol Screening and Intervention for College Students* (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999) typically include a personalized summary of drinking habits, psychoeducation about the nature of alcohol and its effects, and components to reduce risky drinking and related problems. However such content is primarily structured around social drinking. The current findings suggest that brief alcohol intervention protocols may need to be adapted for socially anxious undergraduate drinkers to include components targeting solitary drinking, especially when such drinking occurs in response to coping with negative affect (Buckner, Eggleston, et al., 2006; Lewis et al., 2008;

Terlecki & Buckner, 2015). Second, our data suggest that clinicians may consider monitoring alcohol use among socially anxious patients to determine high-risk solitary use times. For example, solitary drinking could occur in advance of a feared social event as a means to cope with anticipatory negative affect (per Keough et al., 2016). Or, solitary drinking could occur following a social event to manage ruminative negative affect about one's performance during a social event (i.e., post-event processing; Brozovich & Heimberg, 2008), which may explain the differential pattern of findings regarding solitary drinking's relation to drinking frequency generally obtained in the current study versus Keough et al. In order to develop successful treatment and prevention interventions with socially anxious risky drinkers, it will be important to establish the timing of heavy solitary drinking and mechanisms that promote such risky drinking.

The results of the current study should be interpreted in light of limitations that can inform future research on this important topic. First, the sample was comprised of predominantly homogenous young adults and additional work is necessary to test whether results generalize to more diverse samples of drinkers, including non-undergraduate samples. Second, the sample was predominantly female, precluding our ability to test the moderational role of gender. This limitation is important in light of prior work finding gender to moderate the relation of social anxiety to drinking variables (e.g., Norberg, Norton, & Olivier, 2009) and future work testing the impact of gender on heavy solitary drinking among socially anxious drinkers will be an important next step. Third, the study was cross-sectional in nature, limiting our ability to test causation, and future work could benefit from prospective and experimental designs. Fourth, data were based on retrospective self-report and a multi-method (e.g., collection of use data via a daily diary method) and/or multi-informant (e.g., collateral reports of social and solitary drinking) approach will be an important next step in this line of work. Fifth, we did not assess the specific context in which social anxiety was related to heavy solitary drinking and an important next step will be to identify the triggers of heavy solitary drinking among socially anxious drinkers.

Despite these limitations, the current study provides novel data indicating that social anxiety is related to more frequent solitary drinking and such drinking mediated the relationship between social anxiety and more frequent drinking generally as well as more drinking-related problems. Consistent with Keough et al. (2016), data also suggest that those socially anxious persons who engage in less social drinking are protected from frequent drinking and drinking-related problems. Identifying solitary use as a particularly high-risk time for socially anxious drinkers has important clinical implications that warrant additional investigation. Further, identification of solitary use among socially anxious drinkers as especially problematic informs theoretical models of the social anxiety-drinking relation, as such models strive to determine under what circumstances socially anxious persons engage in the risky drinking that increases their problem risk (Buckner et al., 2013).

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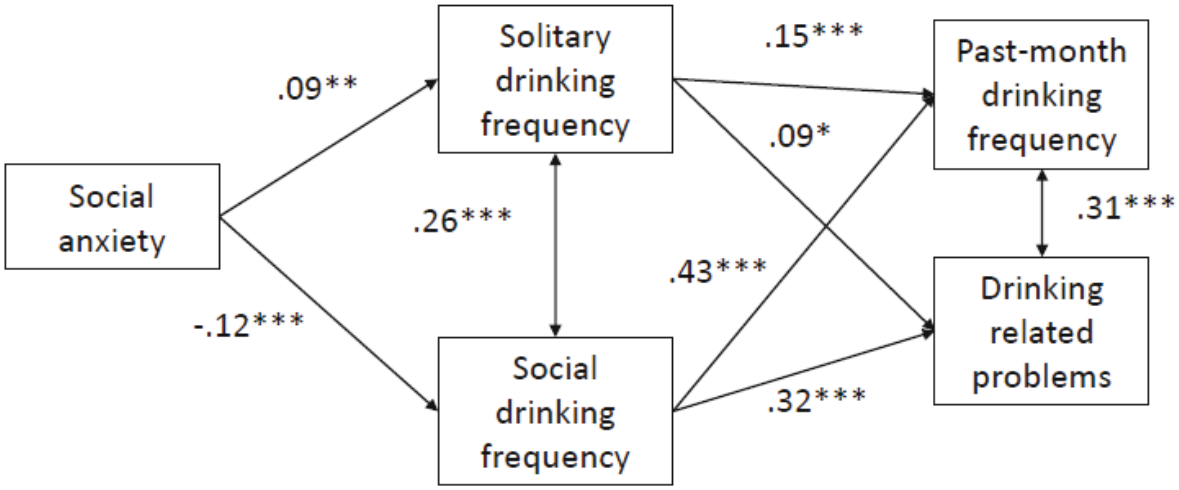

Figure 1. Structural equation model for drinking contexts mediating the relation of social anxiety to drinking outcomes. Standardized path estimates are presented. Paths between drinking contexts and between drinking outcomes are covariances. * $p < .05$, ** $p < .01$, *** $p < .001$.

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Statement 2: Contributors

Dr. Buckner designed the study, wrote the protocol, and conducted statistical analyses. Drs. Buckner and Terlecki wrote the manuscript and both authors approved the final manuscript.

Statement 3: Conflict of Interest

Authors declare that they have no conflicts of interest.

Highlights

- Social anxiety was related to more solitary and less social drinking
- Solitary drinking mediated the social anxiety-more drinking frequency/problems links
- Social drinking mediated the social anxiety-less drinking frequency/problems links