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Why Students Drink: Testing a Conceptual Model of how Social Anxiety and Drinking
Motives Influence Drinking

by

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Abstract

Socially anxious students may be at risk for heavy drinking and alcohol-related problems (e.g., injuries), because they may endorse more maladaptive drinking motives, such as drinking to cope with their anxiety or to conform to peer-pressure (Hingson et al., 2005). This study assessed two conceptual models: 1) whether social anxiety predicts drinking motives, which in turn predict alcohol-outcomes (i.e., a *mediation* model), and 2) whether social anxiety exacerbates the effect of drinking motives on alcohol-outcomes (i.e., *moderation* model). Undergraduates ($N = 387$) completed an online survey, and of these $n = 76$ completed a follow-up brief survey study. Both surveys assessed social anxiety, drinking motives, and alcohol-outcomes. Results showed that coping and conformity motives explained the associations between social anxiety and alcohol-related problems, and coping motives explained the association between social anxiety and heavy drinking. Drinking motives should be targeted to reduce alcohol-use on campuses, especially for socially anxious students.

Keywords: social anxiety, drinking motives, heavy drinking, alcohol-related problems, brief surveys, university students.

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Why Students Drink:

Testing a Conceptual Model of how Social Anxiety and Drinking Motives Influence Drinking

Alcohol is one of the most widely consumed substances, especially for young adults. Young adults drink more alcohol than any other age group – a trend that has been consistently found across cohorts and national samples (Chen, Dufour, & Yi, 2004; Hingson, Heeren, Winter, & Wechsler, 2005). Furthermore, young adults in university drink more than those not in university (Chen et al., 2004; O'Malley & Johnston, 2002). University students are also more likely to binge drink and drink heavily than their non-university attending peers (Cranford, McCabe, & Boyd, 2006). Moreover, although university students are more likely to screen above a clinical cut-off for an alcohol use disorder (AUD) than those not attending university, this is not reflected in higher diagnoses in students (Slutske, 2005). Thus, university students may be at greater risk for alcohol-related problems, such as negative academic (e.g., lower grade point average) and health consequences (e.g., injuries due to alcohol use; Perkins 2002).

In addition to more frequent heavy drinking, mental health difficulties are more prevalent in university students than their non-attending peers (Stallman, 2010), and have increased from previous years (Erdur-Baker, Aberson, Barrow, & Draper, 2006; Katz & Davison, 2014; Kitzrow, 2003). Social anxiety is one of the most common mental health difficulties, and is more prevalent among university students than community populations (Brook & Willoughby, 2015; Russell & Shaw, 2009; Shields, 2004). Furthermore, social anxiety is related to less positive social interactions (Heerey & Kring, 2007), lower relationship satisfaction, lower self-esteem (Tackett, Nelson, & Busby, 2013), and

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predicts lower grades over time in university students (Brook & Willoughby, 2015, Dell'Osso et al., 2014; Duru, 2008). Given the poor social relations that people with social anxiety experience, their resources for coping with their anxiety may be limited (Mackenzie & Fowler, 2013). Consequently, socially anxious people often turn to alcohol to cope with feelings of anxiety (Buckner & Turner, 2009).

Social anxiety is associated with alcohol-related problems in students (e.g., more frequent hangovers), and predicts developing an AUD later in life (Buckner & Heimberg, 2010; Buckner, Timpano, Zvolensky, Sachs-Ericsson, & Schmidt, 2008; Morris, Stewart, & Ham, 2005; Terlecki, Ecker, & Buckner, 2014). However, results of research examining the relation between social anxiety and drinking quantity in students have been inconsistent (Sher, Grekin, & Gross, 2007; Terlecki et al., 2014). For example, some researchers report that social anxiety is associated with binge-drinking (Buckner & Heimberg, 2010), others that social anxiety has no relation to drinking quantity (O'Grady, Cullum, Armeli, & Tennen, 2011), and still others that it is negatively related to drinking quantity (Ham, Bonin, & Hope, 2007). Despite these contradictory findings between social anxiety and alcohol consumption, when heavy drinking and social anxiety do co-occur in students it is especially concerning.

Socially anxious students may not drink more frequently, but they appear to experience more alcohol-related problems than non-socially anxious people (Buckner & Heimberg, 2010). Social anxiety combined with heavy drinking may increase students' chances of later developing addiction problems, more so than students who are heavy drinkers without social anxiety, or who are anxious but drink in moderation (Buckner & Heimberg, 2010; Kuntsche, Knibbe, Gmel, & Engels, 2005). The mixed findings for the

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amount of alcohol consumed by socially anxious students suggests that there may be another, more proximal process that better explains the association between social anxiety and alcohol use, such as the reasons people drink alcohol (i.e., drinking motives; Villarosa, Madson, Zeigler-Hill, Noble, & Mohn, 2014).

Drinking motives are particularly relevant for people with social anxiety because being socially anxious often leads to using alcohol to cope with feelings of distress and anxiety (Buckner & Turner, 2009). In other words, drinking motives may be predicted by social anxiety. The most common drinking motives are those that take place in social settings and are aimed at increasing positive consequences, such as drinking to celebrate with friends (Cooper, 1994). Motives aimed at decreasing negative consequences are less common, and are often related to drinking alone (Grant, Stewart, & Mohr 2009), such as drinking to cope (Cooper, 1994). In general, motives aimed at increasing positive experiences are not associated with negative alcohol-related outcomes, but motives aimed at decreasing negative experiences are associated with negative outcomes, such as missing classes due to alcohol use (e.g., hangovers; Read, Merrill, Kahler, & Strong, 2007; Villarosa et al., 2014).

Drinking to cope with negative affect (e.g., feelings of depression and/or anxiety) predicts the poorest outcomes including missing school, failing to fulfill obligations, and injuries (Villarosa et al., 2014; Kuntsche et al., 2005). For students who struggle with social anxiety, these findings suggest that drinking to cope may explain the association between social anxiety and alcohol problems, and the inconsistencies in prior research linking social anxiety to drinking behaviour may be accounted for in part by drinking motives. Using brief surveys, the present study tested a conceptual model of whether

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social anxiety predicts drinking motives, which in turn predict heavy drinking later that day, in university students. Furthermore, although drinking motives are theoretically considered to be antecedents (i.e., mediators) to drinking (Cooper, 1994; Terlecki & Buckner, 2015), this study also tested whether social anxiety exacerbates (i.e., moderates) the association between drinking motives and heavy drinking and alcohol-related problems (Ham et al., 2007).

Overview of Drinking among University Students

Young adults drink more alcohol than any other age group, particularly if they are in university (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Approximately 70% of university students drink alcohol (O'Malley & Johnston, 2002). Of this portion, 40% of students report *heavy drinking*, a percentage that has remained consistent over the past decade (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2015). Heavy drinking is typically defined as consuming five or more drinks for men, and four or more for women, on a single occasion, typically assessed over the past two weeks or month (Johnston et al., 2011; Substance Abuse and Mental Health Service Administration [SAMHSA], 2015). A drinking episode is generally classified as a *binge* if the drinker exceeds the gender-specific threshold within a two-hour period, and university students tend to binge drink more than their non-student peers (35% compared to 29%; Johnston et al., 2015). Comparisons between studies can be difficult, because the terms *binge* and *heavy drinking* are often used interchangeably where the latter is not bound to a two-hour limit (O'Malley & Johnston, 2002).

In addition to differences between university students and those not in university, there are gender differences in alcohol use for young adults. Men report more daily

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drinking than women (7.4% compared to 4.1%, respectively), and more binge drinking than women (43% compared to 26%; Johnston et al., 2015). Men also report more extreme binge drinking than women, which is exceeding the binge drinking threshold by two times or more (i.e., having 10 or more drinks during one occasion; 17.2% compared to 5.7%; Johnston et al., 2015). Although there are contradictory findings, men experience more negative alcohol-related consequences overall than women, but when women have an AUD they experience more negative consequences than men in the areas of greater physical impairment and illnesses (Nolen-Hoeksema, 2004). In addition, women experience more negative alcohol-related problems when they drink heavily (LaBrie, Pedersen, Neighbors, & Hummer, 2008). However, women experienced fewer negative consequences in one study (Korcuska & Thombs, 2003). When women experience more alcohol-related problems it may be because of the presence of stronger social sanctions against drinking for women than for men (Nolen-Hoeksema, 2004; Strahan, Panayiotou, Clements, & Scott, 2011). Heavy drinking is typically associated with stereotypical male characteristics, such as aggression, thus women who drink heavily, and potentially display behaviours (e.g., aggression, obnoxiousness) that are not consistent with stereotypical femininity, may receive a stronger negative reaction from peers, leading to more negative consequences (Nolen-Hoeksema, 2004). Furthermore, alcohol use disorders may impair functioning for both women and men; however, since there is a greater societal emphasis for women to shoulder household responsibilities, alcohol-related impairment in these areas may have more social repercussions for women than for men (Nolen-Hoeksema, 2004).

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Binge and heavy drinking are considered high-risk alcohol use, and are associated with many problems, including developing an AUD (Perkins, 2002). An AUD is a problematic pattern of drinking that leads to impairment or distress. Some of the symptoms of an AUD are drinking more or for longer than was intended, failure to fulfill obligations, interpersonal problems as a result of drinking, tolerance to alcohol, and withdrawal symptoms. Moreover, people with an AUD may continue to drink alcohol, despite experiencing impairment to daily functioning or distress as a consequence of drinking (American Psychiatric Association [APA] 2013). Approximately 33% of American college students meet criteria for an AUD, compared to 20% of the general population (Ehlke, Hagman, & Cohn, 2012; Knight, Wechsler, Kuo, Seibring, Weitzman, & Schuckit, 2002; Kokotailo et al., 2004).

The high prevalence of drinking for university students may be due to the “alcohol promoting” culture that accompanies university attendance (Baer, 2002; Borsari & Carey, 2001). This culture is characterized by many alcohol-based social events (e.g., fraternity and sorority parties), being around peers who endorse alcohol use (e.g., drinking games), and being away from previous influences that mitigated alcohol use, such as parental restrictions (Borsari & Carey, 2001). Students are also likely to drink heavily on nights when they do not have classes the next day (e.g., “thirsty Thursdays”), and if they are members of Fraternities or Sororities they are likely to not take classes on Fridays. This indicates that some students are basing academic decisions around drinking culture, and that the structure of university may be contributing to harmful drinking (Wood, Sher, & Rutledge, 2007). The normative presence of heavy drinking on university campuses may be for many students a time-limited function of the social

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environment, but for others heavy drinking is an addiction (Simons, Carey, & Wills, 2009). Since drinking is a normative behaviour on university campuses, those who have or are developing an addiction to alcohol may be overlooked or dismissed because of social norms promoting alcohol consumption in university (Schulenberg & Maggs, 2002). The students who are drinking heavily and showing signs of developing an addiction to alcohol may be setting the stage for an AUD later in their life, as well as experiencing more alcohol-related consequences during their time in university, such as lower grades, worse social functioning, and missed opportunities for furthering their careers (Perkins, 2002).

Heavy drinking in university students is also influenced by biological, environmental, and psychological factors that go beyond the alcohol-promoting culture of university (Kramer et al., 2008). A family history of alcoholism may increase the likelihood of developing an AUD through a genetic predisposition (Kramer et al., 2008). Psychological factors, such as externalizing problems during childhood (e.g., Conduct Disorder, Attention Deficit-Hyperactivity Disorder; Kramer et al., 2008), as well as having low self-control (Simons et al., 2009), increase alcohol use and problems. Having low self-control leads to more alcohol consumption and exacerbates risky behaviours while drinking (Simons et al., 2009). In addition, affect lability, or emotional state variability, predicts drinking problems after controlling for consumption levels (Simons et al., 2009). There are also environmental factors that increase the likelihood of developing an AUD, such as parenting styles that lack support and discipline, and family conflict (Kramer et al., 2008). As well, for people with a genetic predisposition towards alcoholism, experiencing stressful events predicts heavy drinking, suggesting that

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alcoholism and heavy drinking are best predicted by taking into account biological, psychological, environmental factors, and their interactions (Kramer et al., 2008).

University students who are embedded in a social environment that promotes alcohol use and who also have alcoholism risk factors may be particularly vulnerable to developing an AUD. These students may also be vulnerable to experiencing other alcohol-related negative consequences such as lower grades and lower participation in social and volunteer activities (Read et al., 2007).

Over and above developing an AUD, the alcohol-related problems that young adult, heavy drinkers experience include higher rates of traffic accidents, academic impairment, short and long term health problems, mental illness, sexual violence, and criminal involvement (Hingson et al., 2005; Hingson & Zha, 2009; Perkins, 2002). Despite similar alcohol consumption rates across different cohorts, alcohol related injuries and accidents have increased in university samples (Hingson et al., 2005). The more alcohol university students drink, the more likely they are to miss classes, perform poorly on tests, and fall behind on school-work (Perkins, 2002). Long-term effects of alcohol misuse include lowered resistance to illnesses, such as respiratory infections, as well as engaging in risky behaviours that may compromise health and wellbeing (e.g., unprotected sexual intercourse; Perkins, 2002). Although drinking is clearly related to many problems for heavy drinkers, few students recognize when their drinking has become problematic (Prosavac, 1993). Given these undesirable outcomes, and the high prevalence of alcohol use in university students, understanding what predicts student drinking and when drinking becomes problematic is pivotal to reducing these problems.

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Social Anxiety

Mental health difficulties (including social anxiety) predict alcohol use and alcohol-related problems, such as not meeting obligations due to drinking (Hussong, Jones, Stein, Baucom, & Boeding, 2011), and are more common in university students (10 – 33%; Russell & Shaw, 2009; Strahan, 2003) than those not attending university (7 – 12%; Brook & Willoughby, 2015; Russell & Shaw, 2009; Shields, 2004). *Social Anxiety Disorder* is a debilitating mental illness characterised by an intense and persistent fear/anxiety of one or more social situations, in which a person is exposed to unfamiliar people or possible scrutiny by others (APA, 2013). The intensity of these fears varies along a continuum, as well as by group size, with some people fearing larger groups and others smaller (Book & Randall, 2002).

Social anxiety is the type of mental illness that is most commonly left untreated, and is associated with short and long-term interpersonal, occupational, and social impairment even at subclinical levels (Kasper, 2006). Social anxiety also frequently co-occurs with depression and other types of anxiety (Mackenzie & Fowler, 2013; Xu et al., 2012). Socially anxious people experience negative outcomes over the course of their lifetime: they are less likely finish high school or to go to university, have a lower personal income, and have lower life-satisfaction than non-socially anxious people (Mackenzie & Fowler, 2013).

There are also gender differences in both the prevalence and implications of social anxiety. First, women are diagnosed with social anxiety disorder more often and starting at a younger age than men (60% of women compared to 40% of men; Mackenzie & Fowler, 2013). Socially anxious women are more likely to experience comorbid

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depression than socially anxious men (Mackenzie & Fowler, 2013). In addition, socially anxious women are more likely to be single parents, to be unemployed, to have lower income, and to be widowed or divorced than socially anxious men. Socially anxious men are more likely to be single and living alone than women (Mackenzie & Fowler, 2013). Thus, not only does social anxiety affect more women than men, but socially anxious women also experience more negative consequences than socially anxious men. This may be because the interpersonal consequences of social anxiety (i.e., social withdrawal, relationship conflict), may impact women more than men, due to the greater importance women place on social relationships (Fowler, Wareham-Fowler, & Barnes, 2013; Mackenzie & Fowler, 2013).

Social anxiety may also lead to a smaller social network, because socially anxious people may be less likely to socialize, leading to diminished opportunities to access social support (Torgrud et al., 2004). When socially anxious people do interact with others, they may unintentionally elicit negative reactions by giving brief responses and appearing aloof in conversations – behaviours that reflect the anxiety they are experiencing (Torgrud et al., 2004). Such poor social relations may further limit resources for coping with anxiety (Mackenzie & Fowler, 2013). Socially anxious people may consequently use alcohol to cope with feelings of anxiety (Buckner & Turner, 2009).

Social anxiety is commonly associated with alcohol-related problems among university students, but research findings examining associations with *amount* of alcohol consumption have been mixed (Clerkin, Wertz, Magee, Lindgren, & Teachman, 2014; Ham et al., 2007; Sher et al., 2007; Terlecki et al., 2014). Despite the contradictory findings for alcohol consumption, socially anxious people are 15% more likely than the

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general population to develop an AUD (Kushner, Sher, & Beitman, 1990). This suggests that socially anxious people do not drink more often than others, but when they do drink they are more likely to drink in harmful ways, such as binge and heavy drinking.

Furthermore, different levels of social anxiety are associated with different alcohol-related consequences: women with high social anxiety have more personal consequences (e.g., feeling regret) and role functioning negative consequences (e.g., missing classes, not being able to study for a test, impaired functioning for sports) than women with low social anxiety (Norberg, Olivier, Alperstein, Zvolensky, & Norton, 2011). Higher social anxiety also predicts more physical dependence symptoms, but lower alcohol consumption than low social anxiety (Linden, Lau-Barraco, & Braitman, 2012).

Furthermore, being moderately to highly socially anxious predicts more alcohol related problems and more alcohol consumption, which was not found for low anxiety people (Ham et al., 2007).

Alcohol related consequences for socially anxious people also vary by gender, although findings have been mixed. In some studies women experienced more negative alcohol-related consequences than men (Norberg, Norton, Olivier, & Zvolensky, 2010; Norberg et al., 2009), but in others socially anxious men reported more consequences than women, such as hangovers, injuries to self or others, memory loss, passing out, fatigue, and overdose (Norberg et al., 2011). Further, in one study socially anxious men drank less than non-anxious men (Norberg et al., 2010), but in another men with moderate social anxiety drank the most (Strahan et al., 2011). Despite the lack of consistency for which gender is most at risk for negative alcohol-related consequences,

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these findings suggest that gender is an important factor for the link between social anxiety and drinking.

One explanation for the relation between drinking and social anxiety is the *tension reduction hypothesis*, which posits that socially anxious people use alcohol to reduce the stress of feeling anxious (Book & Randall, 2002; Conger, 1956; Hussong et al., 2011; Thomas, Randall, & Carrigan, 2003). The reduction in aversive feelings such as anxiety leads to the negative reinforcement of alcohol use; in other words, people drink more alcohol because it makes them feel less anxious (Conger, 1956; Kushner, Sher, Wood, & Wood, 1994; Thomas et al., 2003). Supporting the tension reduction hypothesis, social anxiety in childhood predicts more alcohol-related problems in adolescence and young adulthood, such as interpersonal skills deficits and drinking alone, primarily to cope with stress (Hussong et al., 2011). This indicates that alcohol use is motivated by a desire to alleviate stress and anxiety, as opposed to stress and anxiety being products of alcohol use. Tension-reduction drinking may lead to a positive feedback loop, where anxiety motivates alcohol use as a method of coping, and problematic alcohol use adds to existing stress and anxiety (Bacon & Thomas, 2013; Battista et al., 2015; Buckner & Turner, 2009). Lindfor and Lindman (1987) found that participants displayed lower indices of social anxiety (e.g., less insecurity, embarrassment, and irritation) during interactions after drinking, regardless of whether they knew the people they were talking to. This suggests that alcohol does have anxiolytic effects. However, once alcohol use has developed into an AUD, socially anxious people do not drink more alcohol in response to a stress test (Bacon & Thomas, 2013). It may be that social anxiety catalyzes a cycle of problematic drinking, but once an AUD has developed, it is not the main motivator

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(Bacon & Thomas, 2013). Thomas and colleagues (2003) reported that socially anxious people were more likely to avoid social situations that do not have alcohol, to drink before social situations, and to report feeling that alcohol relieved their anxiety.

Furthermore, people were more likely to drink in interactive social situations (e.g., having conversations with others) than in performance situations (e.g., giving speeches; though this did not differ by social anxiety; Thomas et al., 2003). This may be because interactive social situations have lower evaluative components, and less opportunity for impairment-related embarrassment.

Drinking Motives

The tension-reduction hypothesis implies a motivational link between experiencing social anxiety and choosing to drink alcohol. *Drinking motives* are the reasons people drink alcohol (Cooper, 1994; Cox & Klinger, 1988). A motivational model for alcohol use describes these reasons as feelings that are present before drinking alcohol and can motivate drinking, or feelings one hopes to achieve after using alcohol (Cox & Klinger, 1988). Antecedent feelings and desired consequences both interplay to create drinking motives (Cooper, 1994). Drinking motives can be separated using two dimensions: valence (positive or negative), and source (internal or external). *Valence*, or the types of consequences one hopes to achieve through the use of alcohol, can be either to obtain a positive outcome (positive reinforcement) or to avoid a negative outcome (negative reinforcement; Cooper, 1994). In addition, the *source* of these positive or negative reinforcement motivations may originate either internally (i.e., emotional states) or externally (i.e., social factors; Cooper, 1994).

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The dimensions of valence and source combine to create four classes of drinking motives: (1) internally motivated, positive reinforcement (*enhancement motives*); (2) externally motivated, positive reinforcement (*social motives*); (3) internally motivated, negative reinforcement (*coping motives*); and (4) externally motivated, negative reinforcement (*conformity motives*; see Table 1). Enhancement motives are about drinking to improve a positive mood or a situation, such as wanting to make a party more fun. Social motives are about drinking to obtain social rewards, such as celebrating a special occasion with friends. Coping motives are about drinking to alleviate negative feelings, such as anxiety or depression, and conformity motives are about drinking to fit in, or to avoid being teased for not drinking (Cooper, 1994).

Although each class of drinking motive is related to different drinking outcomes, recent research shows that people may feel more than one motive at any given time, and their reported primary motive may be variable, depending on where they are and individual factors such as variations in mood (O'Hara, Armeli, & Tennen, 2015). These fluctuations in mood suggest that drinking motives may differ for socially anxious people, depending on their levels of anxiety at a given time (O'Grady et al., 2011; Mohr, Arpin, & McCabe, 2015). Because levels of social anxiety may influence the primary drinking motives a person is experiencing, these changes may in turn affect drinking (e.g., higher coping motives may lead to more alcohol use for a socially anxious person that is feeling particularly anxious on a given day).

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Table 1

Drinking Motives: Valence and Source Organization.

Valence			
		Positive Reinforcement	Negative Reinforcement
Source	Internal	Enhancement	Coping
	External	Social	Conformity

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Socially motivated drinking, such as drinking to celebrate with friends, is the most commonly endorsed drinking motive (Cooper, 1994; Van Damme et al., 2013; Kuntsche et al., 2005), with 72.4% of students reporting this as a reason they drink (Van Damme et al., 2013). Social motives are related to drinking more alcohol, to a higher frequency of drinking, and to more binge drinking (Clerkin & Barnett, 2012; Cooper, 1994; Van Damme et al., 2013; Grant et al., 2009), especially for men (Kairouz, Glikzman, Demers, & Adlaf, 2002). Although social motives are related to *more* drinking, they are not typically related to drinking problems (Cooper, 1994; Kuntsche et al., 2005); however, findings have been mixed and there is some support for an association with alcohol-related problems (Clerkin & Barnett, 2012). Social motives are most often reported in relation to drinking at parties and with mixed-gender peer groups (Cooper, 1994).

Enhancement is the next most common motivation for alcohol use (Cooper, 1994). Although there are some findings where social and enhancement motives are equally endorsed (Kuntsche et al., 2005), enhancement motives are more commonly lower than social motives, with 62.3% of students endorsing enhancement motives (Van Damme et al., 2013). Enhancement motivated drinking is the strongest predictor of amount and frequency of alcohol use, as well as likelihood to drink heavily, particularly for men (Cooper, 1994; Grant et al., 2009). There are mixed findings regarding enhancement motives and alcohol-related problems (Kuntsche et al., 2005), with some studies finding that they predict alcohol related problems (Cooper, 1994), and others showing only indirect associations to problems (e.g., poor self-care, alcohol dependence, academic problems; Merrill & Read, 2010). Other findings show that enhancement motives are associated with only physical alcohol-related consequences, such as memory

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loss, injuries, and hangovers (Norberg et al., 2011). Enhancement motives are most often reported in settings where alcohol is tolerated, such as bars, and predominantly with same-gender peer groups (Cooper, 1994).

Conformity motives are rarely reported (Cooper, 1994; Kairouz et al., 2002; Van Damme et al., 2013). Only 6% of students report drinking to conform to peer pressure as their sole reason for drinking (Kairouz et al., 2002). Conformity motives are related to lower alcohol consumption and frequency of drinking, but they are related to more alcohol problems (Cooper, 1994; Merrill & Read, 2010; Van Damme et al., 2013). Conformity motives are associated with alcohol use during parties (Cooper, 1994).

Coping motives are also not commonly endorsed among university students (Cooper, 1994), who report drinking to cope as their main reason for drinking only 11.7% of the time (Kairouz et al., 2002). However, coping motives are associated with the most negative outcomes, such as lower academic achievement and expectations of achievement, as well as developing alcohol dependence later in life (Kuntsche et al., 2005). Coping motives are also related to negative social consequences, such as being rude or obnoxious and getting into verbal conflicts as a result of drinking (Norberg et al., 2011). Endorsing coping motives is related to more indices of an AUD during the university years (Villarosa et al., 2014). Although coping motives appear to be higher among men (Grant et al., 2009; Mohr et al., 2001), which leads to heavier drinking (Rutledge & Sher, 2001), some studies have found no gender differences (Kairouz et al., 2002). Drinking alcohol to cope is related to solitary and heavy drinking (Grant et al., 2002).

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Despite a comparatively low endorsement of coping motives, the potential consequences are severe (e.g., increased risk of developing alcohol dependence, lost occupational opportunities as a result of academic problems; Kuntsche et al., 2005; Villarosa et al., 2014), and are important to study in university students (Stallman, 2010). Coping motives are related to internalizing problems such as social anxiety (Hussong et al., 2011), and feelings of social anxiety may lead some students to manifest coping motives for drinking, subsequently increasing the likelihood of heavy and problematic drinking. Furthermore, physiological stress reactivity, which is how reactive a participant is to a negative mood induction, predicts drinking to cope (Colder, 2001). This suggests that the anxiety socially anxious people feel may lead to drinking to relieve this anxiety. Coping motives also fully mediated the relation between stress reactivity, and social and enhancement drinking motives (Colder, 2001). In other words, the link between stress reactivity and social, enhancement, and conformity drinking motives is explained by drinking to cope, suggesting that drinking to cope is the most important motive for stress reactivity (Colder, 2001). These findings reinforce the predictor role social anxiety may play for coping motives, since stress reactivity is a component of social anxiety (Bacon & Thomas, 2013).

Linking Social Anxiety and Drinking Motives

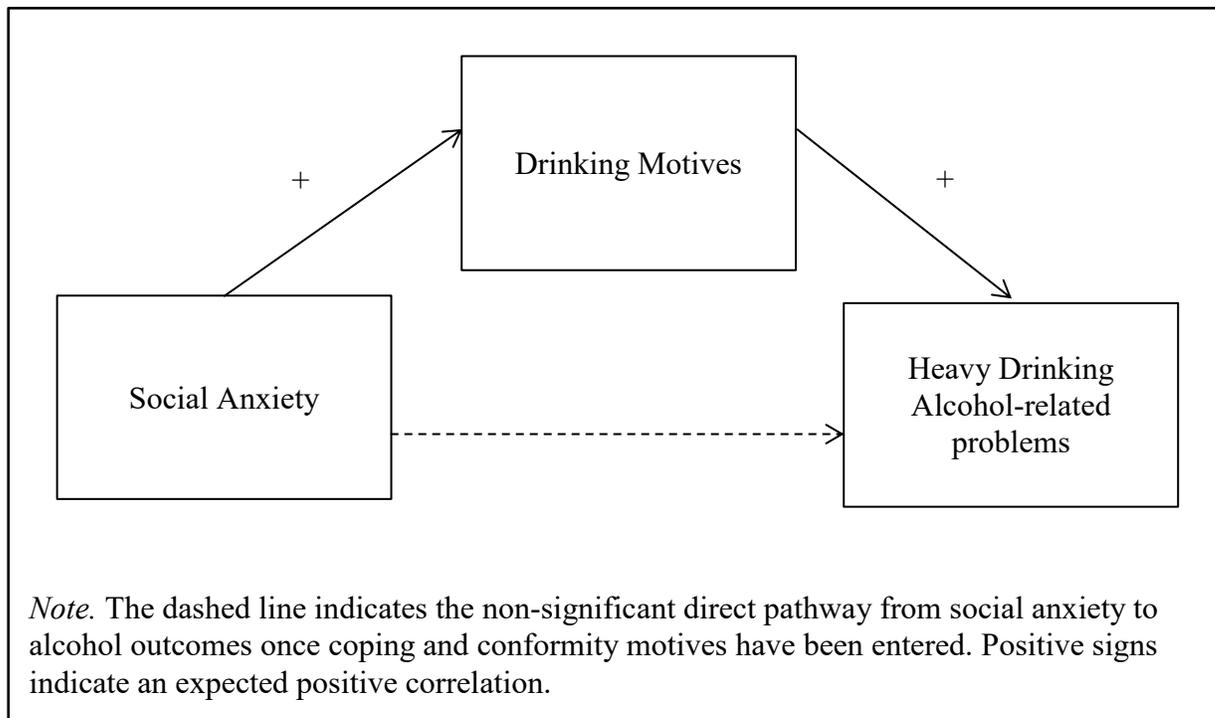
Drinking in university students is common, and heavy drinking may lead to alcohol-related problems (e.g., development of an AUD; Johnston et al., 2011). In addition, social anxiety may be a contributing factor to heavy and problematic drinking in university students, through drinking motives. In the motivational model for alcohol use, drinking motives are antecedents that cause drinking (Cooper, 1994). This leads to the

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hypothesis that social anxiety predicts heavy and problematic drinking via a mediated pathway through drinking motives (see Figure 1). Negative reinforcement motives (i.e., conformity and coping) are thought to be most important in linking social anxiety and drinking (Lewis et al., 2008; Stewart et al., 2006). In contrast, although positive reinforcement motives (i.e., social and enhancement) may be associated with social anxiety, they do not generally lead to alcohol-related problems.

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Figure 1. *Proposed Mediating Role of Drinking Motives on the Association Between Social Anxiety and Heavy/Problematic Drinking.*



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Positive reinforcement motives. Positive reinforcement motives were not a primary focus of the current study. First, social anxiety is inconsistently related to social motives. There are some findings that it is the only drinking motive that is *not* related to social anxiety (Villarosa et al., 2014), that only social avoidance and social fear are related to social motives, but not social interaction anxiety (Lewis et al., 2008), and that only concerns about opinions of others are related to social motives (Stewart et al., 2006). In addition, social motives partially mediated the association between social anxiety and lower alcohol consumption for men, but not women (Norberg et al., 2010). Specifically, highly anxious men may drink less alcohol, due to lower social motives.

Social anxiety is also inconsistently related to enhancement motives, with evidence that social anxiety and enhancement motives are positively related (Buckner, Schmidt, & Eggleston 2006; Lewis et al., 2008), that they are negatively related (Clerkin & Barnett, 2012), and that they are unrelated (Stewart et al., 2006). For people with low social anxiety, high enhancement motives predicted more alcohol consumption (Clerkin & Barnett, 2012; Ham et al., 2007). Enhancement motives are also related to more drinking problems (Clerkin & Barnett, 2012), but the same association was mediated by binge-drinking in a different study (Villarosa et al., 2014), suggesting that the alcohol-related problems that enhancement drinkers face may be due to binge-drinking and alcohol consumption rather than alcohol dependence or tolerance (Lewis et al., 2008). Enhancement motives partially mediated the association between social anxiety and lower alcohol consumption, but only for men (Norberg et al., 2010). Highly anxious men may drink less, due to lower endorsement of enhancement motives.

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Negative reinforcement motives. It was expected that negative reinforcement motives would be key mediators of the links between social anxiety and drinking. Social anxiety is consistently related to conformity motives (Clerkin & Barnett, 2012; Stewart et al., 2006; Terlecki & Buckner, 2015). In addition, students who are highly socially anxious and who also endorse high conformity motives drink more alcohol, while students who are low in social anxiety and endorse high conformity motives drink less alcohol (Linden et al., 2012), suggesting that alcohol consumption for those who drink to conform depends on social anxiety. Conformity motives partially explained the link between social anxiety and alcohol-related problems (Stewart et al., 2006; Villarosa et al., 2014), and there is evidence for this finding even after controlling for alcohol consumption (Lewis et al., 2008). In addition, highly socially anxious women experience more alcohol-related problems, due to conformity motives, but men do not (Norberg et al., 2010).

Social anxiety is also consistently related to coping motives (Lewis et al., 2008; Stewart et al., 2006; Terlecki & Buckner, 2015; Clerkin & Barnett, 2012), and in some studies it was the only drinking motive that was related to social anxiety (Blumenthal, Leen-Feldner, Frala, Badour, & Ham, 2010; Ham et al., 2007). Coping motives mediated the association between social anxiety and alcohol-related problems (Stewart et al., 2006), even after controlling for alcohol consumption (Lewis et al., 2008). Coping motives partially mediated the association between social anxiety and alcohol-related consequences for women, but not men (Norberg et al., 2010). Supporting this finding in a more recent study, socially anxious women were more likely to drink to cope with anxiety than men, and coping motives mediated the association between social anxiety

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and alcohol-related problems, but also only for women (Buckner & Shah, 2015). In contrast, there are findings that coping motives mediated the relation between social anxiety and drinking, but only at times of emotional distress (e.g., after a fight or when angry at others), and in personal-intimate situations (e.g., while on a date; Terlecki & Buckner, 2015). In one study, coping motives did not mediate the association between social anxiety and binge drinking or alcohol-related problems (Villarosa et al., 2014). Despite contradictory findings, there is evidence to suggest that coping motives and conformity motives may be potential mediators between social anxiety and alcohol use and problems.

To clarify the mixed findings for drinking motives as a mediator between social anxiety and alcohol use for university students, motives should be examined in relation to same-day drinking, as well as to drinking on average (i.e., cross-sectionally). Examining whether social anxiety, felt earlier in the day, predicts drinking motives, and whether drinking motives in turn predict heavy drinking later that night, would allow causality to be established. Specifically, this temporal order would determine whether social anxiety causes heavy drinking through coping and conformity motives.

Moderation effects. Although there is some, albeit mixed, evidence for a mediation, social anxiety and drinking to cope also interact to influence drinking: for moderately and highly socially anxious people, but not low-anxiety people, drinking to cope predicted more alcohol use, as well as more alcohol-related problems (Ham et al., 2007; Linden et al., 2012; Terlecki & Buckner, 2015). Drinking to cope predicts the most drinking, especially for socially anxious people (Grant et al., 2009). Feeling anxious without endorsing coping motives predicts the least amount of drinking (Grant et al.,

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2009). For all other drinking motives (social, conformity, and enhancement), alcohol consumption decreases as anxiety increases (Grant et al., 2009). These findings show that the effect of drinking to cope on heavy drinking and alcohol-related problems depends on social anxiety, suggesting an interaction with social anxiety as the moderator, in addition to a mediation effect.

The Current Study

Social anxiety and drinking motives may be the mechanisms through which alcohol-related problems and heavy drinking are influenced. Since heavy drinking is associated with negative consequences (e.g., academic, health, and legal), and is so prevalent among university students, determining which motives lead to heavy drinking and alcohol-related problems is important. Previous studies have demonstrated associations between social anxiety, drinking motives, and alcohol-related problems (Arpin, Mohr, & Brannan, 2015; Book & Randall, 2002; Cooper, 1994; Mohr et al., 2015). However, the inter-associations among all of these constructs remain underexplored.

Social anxiety is not typically associated with alcohol consumption and is sometimes associated with heavy drinking; however, social anxiety is frequently associated with alcohol-related problems. It may be that coping and conformity motives play a bigger role in explaining heavy drinking and problems for socially anxious people, even though enhancement motives are associated with heavy drinking. To examine the associations among social anxiety, drinking motives, heavy drinking, and alcohol-related problems a series of mediation models were tested. Negative reinforcement motives (i.e., coping and conformity) were tested as possible mediators of the links between social

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anxiety and heavy drinking (on average, as well as later that day). Similarly, coping and conformity motives were tested as mediators of the link between social anxiety and alcohol-related problems (on average).

In addition to mediation analyses, there is evidence that social anxiety may moderate the association between drinking motives and alcohol use. As with the mediation models, coping and conformity motives may be the most influential for alcohol-related problems. Thus, social anxiety was tested as a moderator of the relations between drinking motives and alcohol-related problems, and between drinking motives and heavy drinking. The moderation model was examined for whether motives and social anxiety predicted drinking on average. As illustrated in the conceptual model depicted in Figure 2, the following research questions and hypotheses were proposed:

(1) Does social anxiety predict alcohol-related problems and heavy drinking in university students? Social anxiety was expected to be positively associated with alcohol-related problems and heavy drinking (Villarosa et al., 2014).

(2) Does social anxiety predict drinking motives in university students? Social anxiety was expected to be positively related to the endorsement of coping and conformity motives (Ham et al., 2007).

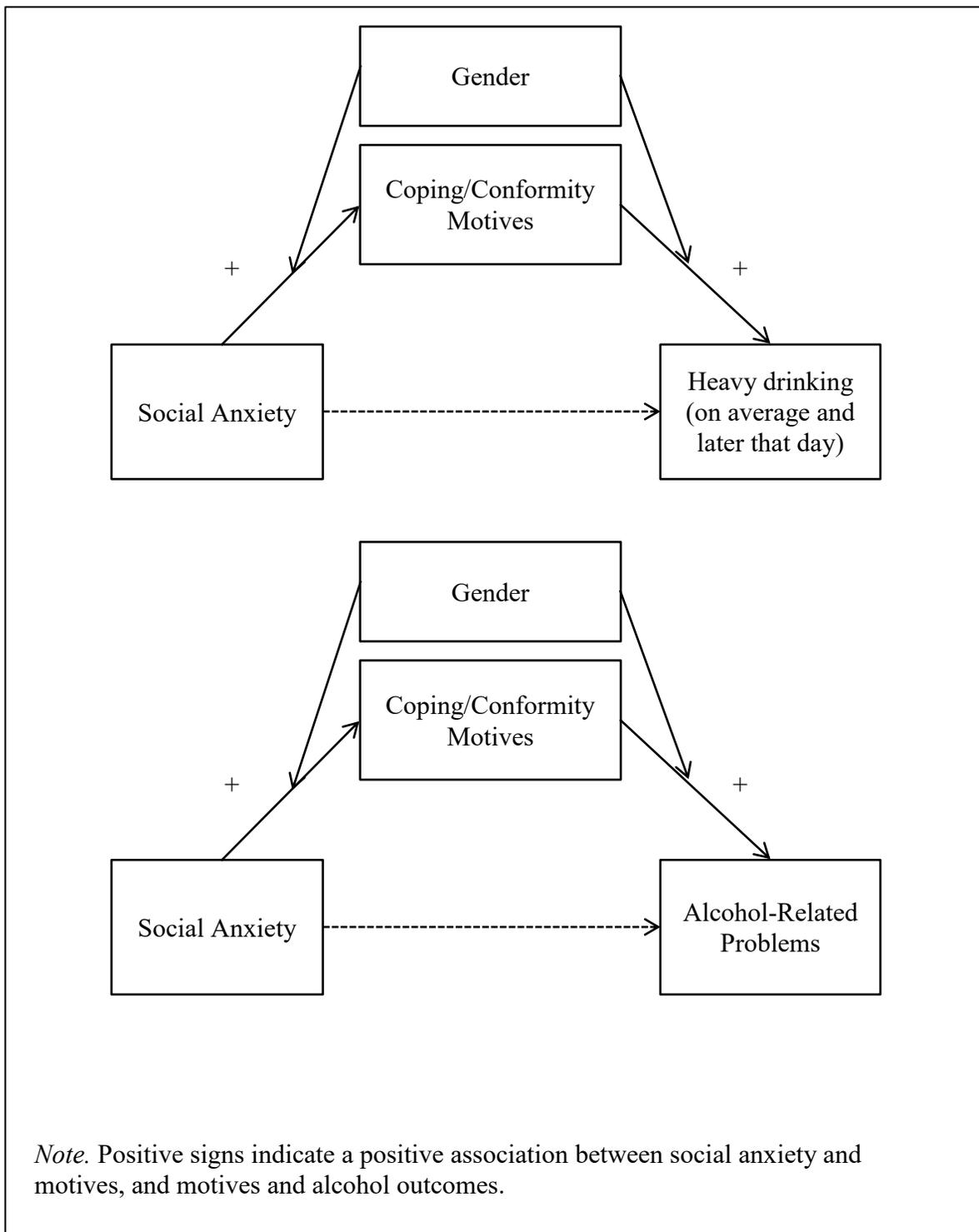
(3) Do drinking motives mediate the effects of social anxiety on alcohol-related problems and heavy drinking in university students? Coping and conformity motives were expected to mediate the effects of social anxiety on alcohol-related problems, in that being more socially anxious than others would predict more coping and conformity motives, which in turn would predict more alcohol-related problems. Second, coping and conformity motives were expected to mediate the effects of social anxiety on heavy

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drinking in that social anxiety would predict more coping and conformity motives, which in turn would predict heavy drinking later that day, as well as heavy drinking on average (see Figure 2).

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Figure 2. *Proposed Mediation Model with Coping and Conformity Motives Mediating the Association Between Social Anxiety and Alcohol outcomes. Gender was expected to moderate the indirect effect from social anxiety to alcohol outcomes.*



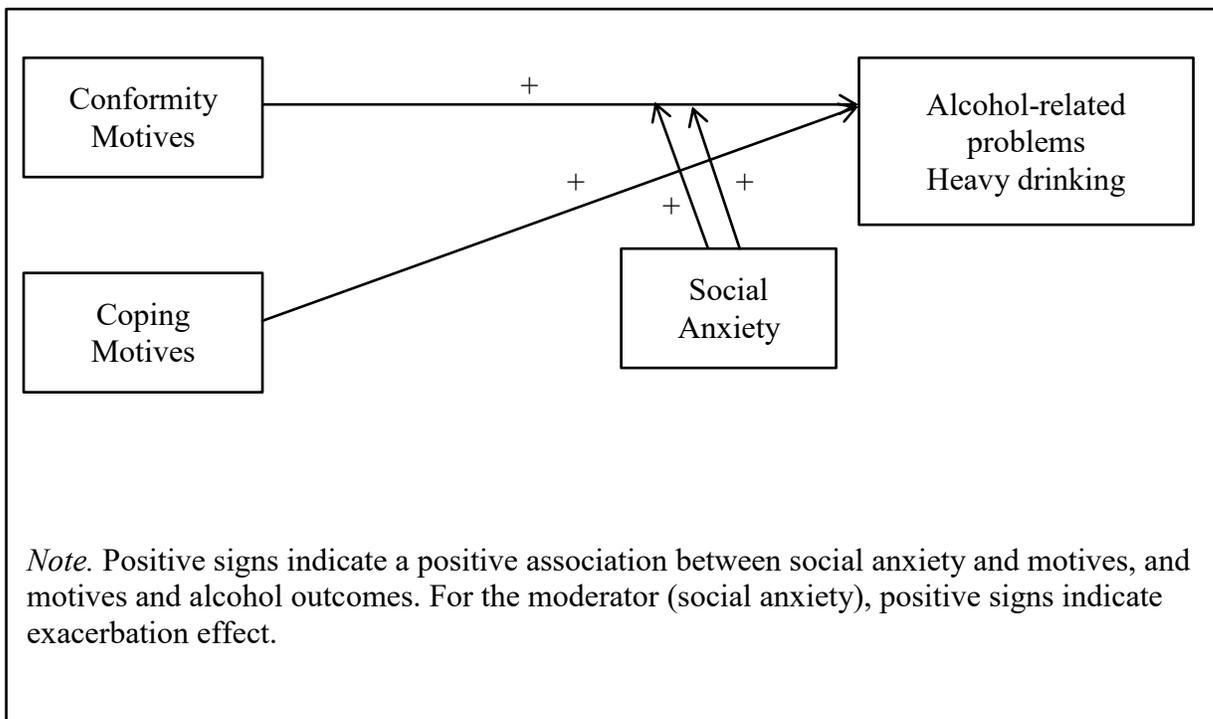
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4) Does gender moderate the association between social anxiety and alcohol-related problems, as well as heavy drinking? Gender was expected to moderate the mediation between social anxiety and alcohol outcomes (see Figure 2). However, given the mixed findings of previous studies, analyses of gender moderation were exploratory and there were no a priori hypotheses.

5) Does social anxiety moderate the relation between drinking motives and alcohol-related problems, and heavy drinking? (see Figure 3 for proposed moderation models; Grant et al., 2009). Social anxiety was expected to exacerbate the relation between coping and conformity motives and alcohol outcomes (i.e., alcohol-related problems and heavy drinking).

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Figure 3. *Proposed Moderating Role of Social Anxiety on the Association between Drinking Motives and Heavy Drinking and Alcohol-Related Problems*



Method

Participants

Participants were $N = 387$ Canadian undergraduate students ($M = 19.98$ years old, $SD = 2.24$, ranging from 17 to 29; 71.7% female, 16 participants did not report gender) recruited from two sources: Qualtrics ($n = 79$) and SONA ($n = 308$). After completing a baseline survey, $n = 28$ participants from Qualtrics and $n = 48$ participants from SONA were followed up via brief surveys for a total brief survey sample of $N = 76$ ($M = 21.11$ years old, $SD = 2.48$, ranging from 17 to 28; 70.1% female, 11 did not report gender).

Students most frequently attended school in Ontario (91%; includes all SONA-recruited Carleton University students), followed by British Columbia (2.80%), Quebec (1.80%), Alberta (1.60%), Nova Scotia (1.30%), Saskatchewan (.26%), Newfoundland (.26%), and New Brunswick (.26%). The majority of participants were Caucasian (59.70%), followed by Asian (18.90%), Black (6.70%), Latin American (1.30%), and Aboriginal (1%). One person reported being Jewish. The median reported parental income fell between \$80,000 and \$90,000. Reported highest education obtained for the participants' parents was a bachelor's degree (mothers: 34.60%; fathers: 28.70%), community college (mothers: 30.50%; fathers: 25.60%), high school (mothers: 20.80%; fathers: 23.30%), masters or PhD (mothers: 7.20%; fathers: 13.10%), and elementary school (mothers: 1.80%; fathers: 4.10%). Students reported living with their parents or guardians the most frequently (34.10%), followed by living in residence (25.60%), living off campus with roommates (22.80%), living off campus alone (11.30%), and 1.60% of participants reported living with their partner.

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Procedure

Participants were recruited in two waves using Qualtrics and SONA. The first wave was recruited in September, 2015 ($n = 79$) using Qualtrics, a survey technology company that partners with companies operating actively-managed market research panels. Qualtrics has access to more than 6 million potential research participants in North America. Participants who were viewed as likely to be eligible for the study, based on the information Qualtrics had already obtained from them, were randomly selected from among Qualtrics panel members. Once participants were randomly selected, they were told the approximate length of time needed to complete the survey. The details of the study were not revealed at this stage to avoid self-selection bias (i.e., opting in to studies featuring topics of interest to the respondent). Participants were retained if they met the inclusion criteria of owning a smartphone, being a student at a Canadian university aged 29 years or younger, and reporting that they drink alcohol at least once per month.

The study had two parts: a baseline survey, followed by brief surveys completed on participants' smartphones or other mobile devices. Participants who completed the study through Qualtrics were compensated for the baseline independently through the Qualtrics system: Qualtrics' partners offer and administer participant incentives, typically gift cards, cash, or loyalty points. Participants who completed the baseline survey through Qualtrics and continued as participants in the brief survey portion of the study were compensated by receiving \$2 for each 3-5-minute survey completed (up to \$6 per day, \$42 in total). Participants who did not miss more than three surveys received an \$8 bonus, for a maximum total of \$50 in compensation.

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A second wave of participants at Carleton University was recruited in February, 2016 using SONA ($n = 308$), an online research portal that allows undergraduate students to participate in research for course credit. Participants viewed a short explanation of the study, describing the requirements and what the study is about. As with Qualtrics, if the participant met the inclusion criteria they were eligible to sign up for the study. Once they signed up, they were directed to the Qualtrics baseline survey, and were invited to participate in the brief surveys at the end. Participants who completed the study through SONA were offered 0.25% course credit for completing the baseline survey, 0.5% credit for starting the brief surveys, and 0.5% credit for missing no more than three surveys for the duration of the study, for a possible total of 1.25% of course credit. This study was approved by the Carleton University Research Ethics Board (see Appendix A for a copy of the approval certificate).

Participants first completed a 30-minute baseline questionnaire that asked about demographics, drinking motives, social anxiety, alcohol-related problems, binge and heavy drinking, and typical alcohol consumption. Participants were then invited to complete the brief survey portion of the study and given a new consent form. For the brief surveys, participants were administered short (3-5 minute) surveys on their mobile devices (smart phone or tablet), at random intervals three times per day, between designated hours (4pm and midnight), for seven days. The brief surveys asked about setting (i.e., where are you and who are you with), alcohol consumption (number of drinks consumed), motives for drinking, and social anxiety.

Participants completed 927 brief survey instances out of a possible 1596, for a 58% overall compliance rate. Of those who completed surveys, 33.77% of participants

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completed at least 17 out of the 21 surveys per week, 32.48% completed at least half of the surveys (11/21), and 33.77% completed fewer than 10 out of the 21 surveys. Seventy-three percent of participants completed the survey using an iPhone, and 27% used an Android phone.

Measures

Measures overlapped for baseline and brief surveys, however some measures were administered only at the baseline or the brief surveys (see Table 2). Baseline measures appear in Appendices B through D, and the brief survey setting questions appear in Appendix E. Measures were adapted for use in the brief surveys by modifying the instructions of surveys designed for longer timeframes to refer to the past 30 minutes. In addition, to reduce participant burden, each time a participant was prompted for a brief survey, they viewed a randomly selected subset of items. The items shown varied from person to person, and from each brief survey instance to the next. This approach created planned missing data, conforming to a *missing completely at random* (MCAR) mechanism. Since the data is MCAR, the validity of the measures used should not be compromised. Correlations between the measures at baseline and brief surveys were analyzed to assess the validity of altered measures referencing a 30-minute timeframe.

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Table 2

Measures Used at Baseline and Measures Used for the Brief Surveys

Measure	Baseline	Brief Surveys
Drinking Motives (DMQ-R)	All items	Randomly selected subset of four items
Social Anxiety (SIAS)	All items	Randomly selected subset of three items
Alcohol-Related Problems	AUDIT	None
Heavy Drinking	<i>Monitoring the Future</i> item	Compiled using reported number of drinks over evening
Setting	None	All items

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Drinking motives. Drinking motives were measured using the 20-item Drinking Motives Questionnaire – Revised (DMQ - R; Cooper, 1994; See Appendix B).

Participants were asked to complete this questionnaire at baseline, as well as answer one randomly selected item from each subscale for the brief surveys, for a total of four items for the brief surveys. This questionnaire has four 5-item subscales: coping motives, enhancement motives, conformity motives, and social motives for drinking. Social and enhancement motives were measured, but were not included in analyses as they were not part of the research questions of this study. Participants responded to questions on a 5-point scale, ranging from 1 (*never/almost never*) to 5 (*always/almost always*). Sample items include “you drink to forget your worries” and “you drink to be sociable”. Factor analyses in previous samples consistently showed a four-factor structure (Cooper, 1994; Kuntsche, Knibbe, Gmel, & Engels, 2006). Test-retest scores were also stable across the four subscales in one sample of 2440 adults in the Netherlands (Crutzen & Kuntsche, 2013). In the present study, internal reliability was satisfactory for the baseline data (Cronbach’s $\alpha = .87$ for social motives; $\alpha = .82$ for conformity motives; $\alpha = .84$ for enhancement motives; $\alpha = .85$ for coping motives). For the baseline DMQ-R in this study, there were 24 missing cases.

The DMQ-R was used for daily diary surveys (once per day) in one study that showed daily drinking motives were positively associated with aggregate daily diary drinking motives (O’Hara et al., 2015). This supports the validity of brief survey measures of drinking motives, as they are positively related to mean drinking motives, which have been well-established and validated (Kuntsche et al., 2006; O’Hara et al., 2015). The internal consistency for coping motives in another daily diary study was high

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($\alpha = .93$ for the first day, $\alpha = .86$ on the last; Arbeau, Kuiken, & Wild, 2011). These findings are promising, but no study to date has examined drinking motives for repeated brief surveys per day, thus reliability and validity information for this method is not yet available. Students were asked to report drinking motives for the brief surveys even if they did not report drinking.

Social anxiety. Participants completed the 20-item Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998; see Appendix C) at baseline, as well as subsets of three randomly selected items for the brief surveys. The SIAS measures the specific social anxiety facet of interacting with others (Mattick & Clarke, 1998). A sample item from this scale is “I have difficulty making eye contact with others”, rated on a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*).

This measure has good psychometric properties, and is one of the most commonly used social anxiety scales (Rodebaugh, Woods, Heimberg, Liebowitz, & Schneier, 2006). Factor analyses in previous samples showed that the SIAS does uniformly assess interaction anxiety (Mattick & Clarke, 1998), however the reverse scored items had lower factor loadings (Rodebaugh et al., 2006). The SIAS displayed excellent internal consistency (Cronbach’s alpha = .90, in a community sample) and test-retest reliability ($r = .92$ over 12 weeks, in socially phobic participants) in Mattick and Clarke’s (1998) study. There were no mean differences in SIAS scores between community and undergraduate samples (Mattick & Clarke, 1998). In another study, scores on the SIAS were weakly and negatively related to the Social Desirability Scale ($r = -.09$; Crowne and Marlowe, 1964), suggesting that this questionnaire is not affected by social desirability

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influences (Rodebaugh et al., 2006). In the present study, Cronbach's α was .95 at baseline, and there were 25 missing cases.

Since the SIAS has not been used in brief surveys previously, reliability and validity information for this method is not yet available. However, the similar state social anxiety (SSA) questionnaire has been used for brief surveys (Battista et al., 2015; Kashdan & Steger, 2006). The SSA was reliable from day to day, and adequate at detecting changes across timeframes (two hour windows; Battista et al., 2015). In addition, in another study the correlation between trait social anxiety as assessed with the SIAS and state social anxiety as assessed with the SSA was $r = .56$, supporting the construct validity of the (Kashdan & Steger, 2006). All other previous studies have used the SIAS only as a baseline or cross-sectional measure (Lewis et al., 2008; Stewart et al., 2006).

Alcohol related problems. At baseline only, alcohol related problems were measured using the Alcohol Use Disorders Identification Test (AUDIT; World Health Organization, 1993; see Appendix D). This 10-item measure assesses three areas of symptoms: hazardous alcohol use (items 1-3), dependence symptoms (items 4-6), and alcohol-related problems (items 7-10). Scores range from 0 to 40, where hazardous or problematic drinking is indicated with scores above 7 (8 for men), and alcohol dependence is indicated by a score of 20 or higher (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993). A sample item from the alcohol-related problems section of the scale is "How often in the past year have you had a feeling of guilt or remorse after drinking?" rated on a scale from 0 (*never*) to 4 (*almost daily*).

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The AUDIT has evidence of internal consistency in university student samples (Cronbach's α of .81; Kokotailo, Egan, Gangnon, Brown, Mundt, & Fleming, 2004). In the present study, and as expected, the distribution for alcohol problems was positively skewed, with most students having low scores for alcohol-related problems. The AUDIT was categorized, with participants scoring at or above the cut-off of 7 (8 for men) coded as reporting problem drinking behaviour, while those who scored below were coded as reporting no problem drinking. In previous samples, the AUDIT was able to correctly classify problematic drinking and drinking dependence (12% of the sample had an AUD, and 14% were classified as risk drinkers) when compared to clinical interviews, showing that it is a valid scale (Lundin, Hallgren, Balliu, & Forsell, 2015). In the present study, Cronbach's $\alpha = .80$, and there were 19 missing cases. In addition, the mean AUDIT sum was 8.64 ($SD = 5.27$) for women, and 10.46 ($SD = 6.89$) for men.

Heavy Drinking. At baseline and the brief surveys participants were shown an image depicting a 'standard drink' prior to completing drinking questions (see Figure 4). Participants were instructed that "A drink is a bottle of beer, a glass of wine, a wine cooler, a shot glass of liquor, a mixed drink, ect." In the image, one drink was defined as .60 fluid ounces of 100% alcohol (e.g., 12 ounces of 5% beer, 5 ounces of 12% wine). Heavy drinking was assessed at baseline using the following question adapted from the *Monitoring the Future Study* (Johnston et al., 2015): "How often have you had five or more drinks in a row?" with six answer options ranging from *none* to *ten or more times*, assessed over the past two weeks. Participants who chose any option more than *none* were coded as endorsing heavy drinking. For the brief surveys, participants were asked to report how many standard alcohol drinks they have consumed, within the past 30

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minutes. The number of drinks consumed in one night for each participant was calculated across the different brief surveys for that evening. Heavy drinking was determined for the brief surveys by compiling the number of drinks consumed over an evening for each participant. If they consumed four or more drinks (for women) or five or more drinks (for men), participants were coded as engaging in heavy drinking that night. There were 21 missing cases in this study.

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Figure 4

Standard Alcoholic Drink Image



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Brief Survey Data Management

A cross-sectional data set was constructed by averaging brief survey responses across days for each participant while preserving temporal precedence wherever possible (as described next). Multiple assessments per day enabled, in some cases, the measurement of social anxiety (the predictor) close in time, but prior to, drinking motives and drinking (the mediator and outcome variables). Late afternoon assessments of social anxiety were used as predictors of evening motives and drinking.

Each day participants completed up to three surveys and rated their anxiety, drinking motives, and number of drinks consumed in the past 30 minutes. Composite scores for each of social anxiety, motives, and drinking were created using decision rules designed to maximize temporal precedence for tests of a mediation model linking social anxiety to drinking through motives. Reports of anxiety that preceded reports of motives, that in turn preceded reports of drinking, were preferred. The following decision rules were implemented: (1) reports of social anxiety and motives should precede drinking; (2) reports of anxiety should precede motives; and (3) if #2 cannot be satisfied, reports of anxiety and motives were selected from the same brief survey. If #1 cannot be satisfied, reports of all three variables were selected from the same brief survey. Table 4 shows potential combinations of reports selected for aggregation. An ideal response set for a given day would be when a participant completes all three surveys, but only reports drinking on the third survey, thus observing social anxiety before motives, and motives before drinking (see Day 2 in Table 3). However, this did not reflect all sets of surveys for a given day: drinking was sometimes reported for all three

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Table 3

Example of the Break Down for the Brief Survey Aggregate Process

Day	Survey	Social Anxiety	Motives	Drinking	Heavy Drinking
1	1	*	--	No	
	2	--	*	No	
	3	--	--	No	Yes/No
2	1	*	--	No	
	2	--	*	No	
	3	--	--	Yes	Yes/No
3	1	*	*	Yes	
	2	--	--	Yes	
	3	--	--	Yes	Yes/No
4	1	*	*	No	
	2	--	--	Yes	
	3	--	--	Yes	Yes/No
5	1	*	*	Yes	
	2	--	--	No	
	3	--	--	No	Yes/No
	Mean Scores:	Social Anxiety Mean score	Motives Mean Score	Average number of drinks consumed	Yes/No

Note. Data points with the * symbol are examples of the instances that will be used to form the aggregate social anxiety, motive, and heavy drinking variables. After following the rules of priority, the temporal order of the variables will be kept intact for predicting heavy drinking, later that night.

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surveys, for only two surveys, for earlier surveys but not later in the evening, or not at all. Similarly, participants sometimes had missing data that prevented ordering social anxiety before motives before drinking. For the cases where temporal precedence could not be preserved, data were cross-sectional. However, selecting instances of social anxiety, motives, and drinking following these decision rules allowed aggregate scores to be computed that maximally retained temporal precedence, improving confidence in the mediational chain linking social anxiety to heavy drinking, through coping and conformity motives.

For students who reported one or more occasions of drinking ($n = 50$), their scores on drinking days were isolated and, following temporal ordering rules, social anxiety, drinking motives, and number of drinks on these occasions were each averaged to create one score per participant. Students who reported no occasions of drinking ($n = 26$) were considered non-drinkers and their scores on all available days were averaged, preserving the temporal order of social anxiety before motives on a given day wherever possible. The majority of the data (i.e., drinkers and non-drinkers combined) were based on a single day of surveys (40.5%), followed by the average of two days of surveys (17.1%), the average of three days (13.2%), four days (9.2%), five days (6%), six days (5.3%), and seven days (6.6%). For only those who reported no drinking ($n = 26$), 19.2% of the data was based on one day of surveys, 7.7% were based on the average of two days, 7.7% on three days, 7.7% on four days, 23.1% on five days, 15.4% on six days, and 19.2% on the average of seven days. For only those who reported drinking ($n = 50$), 52% of the data was based on one day of surveys, 22% was based on the average of two days, 16% on three days, and 10% on four days. The temporal order was kept intact across three-

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consecutive surveys for 37% of the surveys, 34% kept the temporal order intact using two consecutive surveys, and 29% used only one survey.

Drinking occurred at least once for 65.8% of the participants ($n = 50$ of 76) and heavy drinking for 3.9% of the participants ($n = 3$ of 76). Since heavy drinking did not occur often enough to have sufficient statistical power as its own category, students were classified as having engaged in any drinking (reporting one or more drinks on one or more occasions) or non-drinkers (reporting no drinks). This binary classification variable was used as the outcome measure of drinking behaviour.

Results

Preliminary Analyses

Assumptions. Baseline survey data and the brief survey data were tested for assumptions, missing data, and screened for outliers. The assumption of normality for each drinking motive was inspected using histograms. Coping and conformity motives were positively skewed for both the baseline and brief surveys. Conformity motives for both baseline and the brief surveys were transformed using an inverse transformation with an added constant. Coping motives were transformed for both the baseline and brief surveys using a square root transformation. Q-Q plots showed a slight improvement for their distributions. Mediation models were tested with the non-transformed and the transformed versions to determine the influence of the skewed distribution on the results.

Bivariate scatterplots for study variables showed that brief survey social anxiety was linearly and positively related to coping motives and conformity motives, and unrelated to number of drinks. Baseline social anxiety appeared to be linearly and positively related to baseline coping motives and conformity motives, but unrelated to

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heavy drinking and alcohol-related problems. Brief survey coping motives and conformity motives appeared unrelated to number of drinks. Baseline coping motives and conformity motives appeared to be weakly but positively related to alcohol-related problems.

Multicollinearity was examined by inspecting Pearson correlations. No predictor variables were correlated above .50, suggesting no problematic multicollinearity. Outliers were identified by inspecting boxplots. There were two outliers in brief survey conformity motives that were 3.12 standard deviations above the mean. There was one outlier for alcohol-related problems that was 2.64 standard deviations above the mean, and two outliers for mean number of drinks for the brief surveys. One was 6.54 standard deviations above the mean, and the other was 2.95 standard deviations above the mean. Analyses of correlations showed that there were no apparent differences between the correlations in data sets with and without the outliers (differences in correlations did not exceed +/- .05 of their original values). One exception was that number of drinks was no longer significantly related to social motives for the dataset without the outliers ($r = .234$, $p = .04$ for data set with the outliers, compared to $r = .198$, $p = .09$ without the outliers). Given these modest discrepancies, all outliers were retained.

To assess the influence and extent of missing data across repeated measures, a variable was created summarizing the numbers of missing brief survey instances for each student, ranging from 0 (for a student with complete data) to 20 (for a student who completed just 1 of the 21 possible brief surveys). Correlations were tested with all variables, including demographics. Only brief survey social ($r = .32$, $p < .05$) and enhancement motives ($r = .25$, $p < .05$) were significantly related to the number of

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missing instances. This suggests that students reporting stronger enhancement and social motives for drinking completed fewer survey instances. There were no significant associations between missing instances and drinking, alcohol problems, coping or conformity motives, and social anxiety. There were also no demographic differences between students missing more versus fewer instances. Thus, results of the primary analyses of brief survey data are not likely to be biased by missing data.

Method of Analysis

Mediation analyses were tested using PROCESS, an analysis tool that constructs mediation and moderation models using SPSS syntax, and also incorporates bootstrapping (Hayes, 2012). Bootstrapping is a statistical method that constructs a sampling distribution for a statistic of interest (e.g., a regression coefficient summarizing an indirect effect) and its confidence interval from several thousand samples by taking random draws with replacement from the existing data. This technique ensures a normal sampling distribution for the indirect effect and a corresponding confidence interval that is not too small (Hayes, 2012). Bootstrapping was set at 5000 samples for all models tested. Since the models are binary logistic regression, odds ratios (ORs) and probabilities were examined for all models.

Descriptive Statistics

Correlations between baseline social anxiety and motives were examined, as well as means and standard deviations for all variables (see Table 4). Mean differences on all variables for women and men are shown in Table 5. Independent samples t-tests and chi-square tests (for drinking, heavy drinking, and alcohol-related problems) showed no gender differences.

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For alcohol-related problems, 58.40% were coded as having alcohol-related problems using a cut-off of seven for women and eight for men, and 41.60% were coded as non-problematic drinkers. This is higher than the 33% of students with alcohol use disorders found in Knight and colleagues (2002) study, but not surprising given that screening criteria for the present study included drinking at a frequency of at least once per month. There were no non-drinkers or very infrequent drinkers in the present study, and oversampling drinkers has been shown to produce higher scores on measures of alcohol-related problems (Battista, Mackinnon, Sherry, Barrett, MacNevin, & Stewart, 2015).

Depression was measured on the baseline and brief surveys but it was not included in the analyses because it was beyond the scope of this study. However, baseline depression and social anxiety were positively and significantly related ($r = .53, p < .001$). In a sensitivity analysis, a model with social anxiety predicting heavy drinking showed no indirect effect of depression ($b = .19, SE = .11, CI = -.01, .42$), but depression did have a significant indirect effect ($b = .26, SE = .09, CI = .10, .47$) on the association between social anxiety and alcohol-related problems. This suggests that depression did not explain the association between social anxiety and heavy drinking, but that depression may be important for the link between social anxiety and alcohol-related problems. Furthermore, the moderate correlation suggests that depression may have conceptual overlap with social anxiety.

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Table 4

Means, Standard Deviations, and Inter-correlations among Study Variables

			Baseline		Brief Surveys		Brief Surveys							
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
Baseline	1	Social Anxiety	2.52	.86	2.08	.90	.44*	.23*	.22*	.48*	.49*	--	--	.11
	2	Social Motives	3.53	.96	2.72	1.25	.04	-.02	.63*	.59*	.53*	--	--	.34*
	3	Enhancement Motives	2.92	.98	2.68	1.24	.01	.76*	.33*	.45*	.41*	--	--	.21
	4	Coping Motives	2.18	.95	2.37	1.19	.25*	.43*	.57*	.46*	.58*	--	--	.19
	5	Conformity Motives	1.72	.75	1.89	.99	.31*	.24*	.23*	.45*	.49*	--	--	.13
	6	Alcohol-Related Problems	8.82	5.87	NA	NA	-.01	.29*	.41*	.40*	.13*	--	--	--
	7	Heavy Drinking	--	--	NA	NA	-.12*	.30*	.32*	.23*	.03	.41*	--	--
	8	Number of Drinks	2.25	1.72	1.25	1.72	--	--	--	--	--	--	--	--

* $p < .05$

Note. Upper triangle correlations are between brief survey variables, lower triangle correlations are between baseline variables, and the diagonal, bolded correlations are between corresponding brief survey and baseline variables.

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Table 5

Means and Standard Deviations of Study Variables, Reported Separately by Gender

		Women		Men	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Brief Surveys	Social Anxiety	2.08	.95	2.11	.67
	Social Motives	2.70	1.29	2.82	1.10
	Conformity Motives	1.91	1.06	1.75	.62
	Coping Motives	2.39	1.19	2.58	1.14
	Enhancement Motives	2.74	1.27	2.38	1.10
	Drinking (%)	70.40%	--	54.50%	--
	Gender	<i>N</i> = 54		<i>N</i> = 11	
Baseline	Social Anxiety	2.57	.87	2.41	.80
	Social Motives	3.56	.95	3.46	.98
	Conformity Motives	1.71	.74	1.74	.75
	Enhancement Motives	2.93	.97	2.91	1.02
	Coping Motives	2.23	.74	2.04	.94
	Heavy Drinking (%)	76.30%	--	82.70%	--
	Alcohol-Related Problems (%)	72.73%	--	27.23%	--
Gender	<i>N</i> = 105		<i>N</i> = 266		

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Brief survey settings. Overall, out of all the brief surveys ($N = 927$) participants reported being at home on 622 of survey instances, and away from home 326 of the instances (15 of instances did not include participants' whereabouts). Participants reported being alone for 396 instances, with others and interacting for 374 instances, and with others but not interacting for 172 instances (participants did not report if they were with others for 21 instances).

Drinking. Participants drank at home on 59 of all drinking instances recorded ($n = 117$), and drank away from home on 58 of instances. Of the drinking instances reported, drinking alone occurred on eight instances, drinking with others while interacting occurred on 103 of the instances, and drinking with others without interacting occurred on seven. Of the drinking instances that occurred while interacting with others ($n = 103$), 11 reported being the only person drinking, 14 reported that some people around them were also drinking, 19 reported that most people around them were drinking, and 59 reported that everyone was drinking. Also on these instances, 37 reported being with an intimate partner, 82 reported being with friends, 19 reported being with family, and 30 reported being with acquaintances.

Not drinking. Of the instances with no drinking (827 surveys) 560 were completed at home, and 266 were away from home. Being alone was reported on 388 of the instances, being with others and interacting on 271 of the instances, and with others but not interacting on 165. For the instances that were with others ($n = 441$), nobody was drinking on 132 of them, some people were drinking on 16 instances, most people were drinking on two instances, and everyone was drinking on five instances. Of the instances where being with others and interacting was reported ($n = 271$), 73 instances were with

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an intimate partner, 80 instances were with family, 159 were with friends, and 39 were with acquaintances. Of the instances where students were with others but not interacting ($n = 165$), 23 instances were with an intimate partner, 31 were with family, 43 were with friends, and 63 were with an acquaintance. For the instances where students were with others that were drinking but were not drinking themselves ($n = 23$), there were eight reports of being the designated driver.

Main Analyses

Hypothesis 1. Social anxiety was expected to be positively associated with alcohol-related problems and heavy drinking. The results did not support this hypothesis: baseline social anxiety was significantly and negatively related to heavy drinking ($r = -.12, p < .05$), and not significantly related to alcohol-related problems ($r = -.01, p = .93$). For the brief surveys, social anxiety was not significantly related to whether students drank ($r = .14, p = .22$).

Hypothesis 2. Social anxiety was expected to be positively related to the endorsement of coping and conformity motives. Results supported this hypothesis: at baseline, social anxiety was significantly and positively related to coping motives ($r = .25, p < .05$) and conformity motives ($r = .31, p < .001$). For the brief surveys, social anxiety was significantly and positively related to coping motives ($r = .48, p < .001$) and conformity motives ($r = .49, p < .05$).

Hypothesis 3. Coping and conformity motives were expected to mediate the effects of social anxiety on alcohol-related problems, with socially anxiety predicting greater use of coping and conformity motives, which in turn would predict more alcohol-related problems. Second, coping and conformity motives were expected to mediate the

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effects of social anxiety on heavy drinking in that social anxiety would predict more coping and conformity motives, which in turn would predict heavy drinking (both on average, and later that day).

Hypothesis 4. It was expected that gender would moderate the mediation between social anxiety and alcohol outcomes, moderated mediation models with social anxiety as the predictor, motives as the mediator, and drinking, alcohol-related problems, or heavy drinking as the outcomes were tested, with gender as the moderator.

Six mediation models were tested. Two models examined brief survey data with whether students drank as the outcome, and coping and conformity motives as the mediators, respectively. Two models examined baseline data with alcohol-related problems as the outcome, and baseline coping and conformity motives as the mediators, respectively. Finally, two models were tested using baseline data with heavy drinking as the outcome, and baseline coping and conformity motives as the mediators, respectively. In addition, to test hypothesis four, gender was tested as a moderator for the links between social anxiety and motives (pathway a), and motives and alcohol-outcomes (pathway b). The brief survey moderated mediation models only tested gender as a moderator for the association between social anxiety and motives (pathway a), due to concerns over power, as very few men drank alcohol. Each model was tested with the mean-centered, non-transformed versions of coping and conformity motives, as well as with the mean-centered, transformed versions of coping and conformity motives.

Brief Survey Mediation Analyses

Coping Motives. This model tested whether coping motives mediated the relation between social anxiety and students' odds of drinking, aggregated over brief survey

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instances. (see Table 6 for coefficients). Social anxiety significantly predicted coping motives, such that a one-unit increase in social anxiety predicted a .62-unit increase in coping motives (see Figure 5). Coping motives did not significantly predict drinking after controlling for social anxiety, and there was a non-significant indirect effect, suggesting no mediation. Social anxiety did not have a significant total effect on drinking and the direct effect (social anxiety predicting drinking, after controlling for coping motives) was also not significant. There were no changes in the direction or statistical significance of any effects tested when coping motives were transformed as compared to their raw form.

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Table 6

Mediation Model for Social Anxiety Predicting Students' Drinking Through Coping Motives

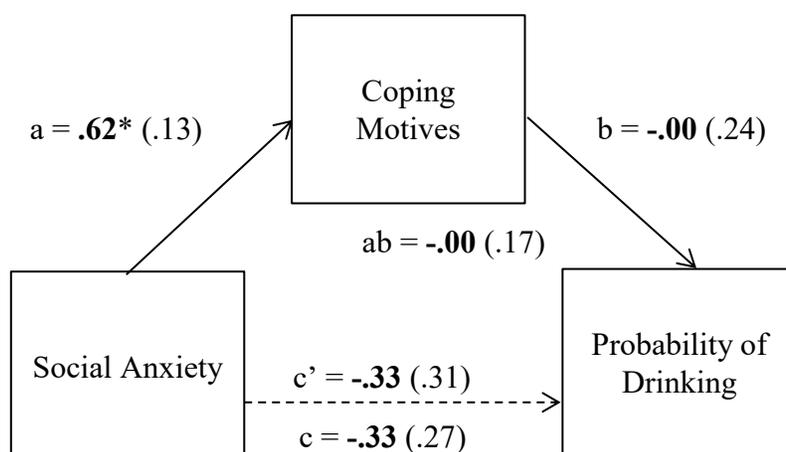
	Outcome	Predictor	Intercept	<i>B</i>	<i>SE</i>	OR
Pathway a	Coping	Social Anxiety	.00	.62***	.14	--
			.64			1.90
Pathway b	Drinking	Coping		-.00	.24	1.00
Direct Effect		Social Anxiety		-.33	.31	.72
Indirect Effect				-.00	.17	--
Total Effect				-.33	.27	.72

*** $p < .001$

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Figure 5

Mediation Model for Social Anxiety Predicting Students' Drinking Through Coping Motives



Note. Bolded numbers are beta coefficients; standard errors are in parentheses. a, b, c', and c correspond to pathway a, pathway b, the direct effect, and the total effect of the mediation model, respectively.

** $p < .001$

* $p < .05$

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Conformity Motives. This model tested whether conformity motives mediated the relation between social anxiety and students' drinking, aggregated over brief survey instances (see Table 7 for coefficients). Social anxiety significantly predicted conformity motives, such that a one-unit increase in social anxiety predicted a .55-unit increase in conformity motives. Conformity motives did not significantly predict drinking after controlling for social anxiety, and there was a non-significant indirect effect, suggesting no mediation (see Figure 6). Social anxiety did not have a significant total effect on drinking and the direct effect (social anxiety predicting drinking, after controlling for conformity motives) was also not significant. There were no changes in the direction or statistical significance of any effects tested when conformity motives were transformed as compared to their raw form.

The mediation models for coping and conformity motives described above were adapted to test the moderating role of gender, as described in hypothesis four. Gender was tested as the moderator for the pathway between social anxiety and coping/conformity motives (pathway a). Results showed that gender did not moderate the association between social anxiety and coping motives ($b = .74, SE = .52, p > .05$), or the association between social anxiety and conformity motives ($b = .00, SE = .39, p > .05$). Models with transformed coping and conformity motives showed the same pattern of results.

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Table 7

Mediation Model for Social Anxiety Predicting Students' Drinking Through Conformity Motives

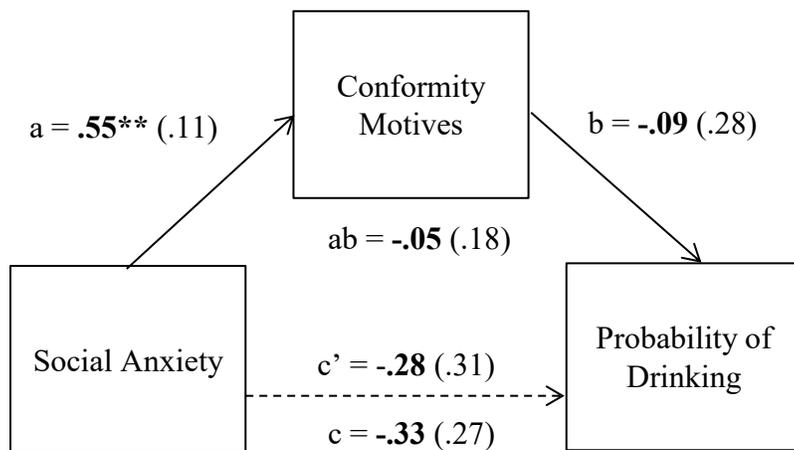
	Outcome	Predictor	Intercept	<i>B</i>	<i>SE</i>	OR
Pathway a	Conformity	Social Anxiety	-.00	.55***	.11	--
			.67			1.95
Pathway b	Drinking	Conformity		-.08	.28	.92
Direct Effect		Social Anxiety		-.28	.31	.76
Indirect Effect				-.05	.18	--
Total Effect				-.35	.27	.70

*** $p < .001$

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Figure 6

Mediation Model for Social Anxiety Predicting Students' Drinking Through Conformity Motives



Note. Bolded numbers are beta coefficients; standard errors are in parentheses. a, b, c', and c correspond to pathway a, pathway b, the direct effect, and the total effect of the mediation model, respectively.

$**p < .001$

$*p < .05$

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Baseline Mediation Analyses of Alcohol-Related Problems

Coping Motives. This model tested whether coping motives mediated the relation between social anxiety and students' alcohol-related problems assessed at baseline ($N = 365$). Twenty-two cases (6% of the sample) were lost due to listwise deletion of cases with incomplete data on one or more variables in the analysis. Social anxiety significantly predicted coping motives, such that a one-unit increase in social anxiety predicted a .28-unit increase in coping motives. Coping motives also significantly predicted alcohol-related problems after controlling for social anxiety, such that a one-unit increase in coping motives predicted an increase of 3.63 in the odds of meeting criteria for an alcohol-related problem. The indirect effect was significant, suggesting coping motives mediate the association between social anxiety and alcohol-related problems (see Table 8; see Figure 7). Calculations of predicted model values show that when coping motives are one-unit above average, the probability of meeting criteria for alcohol-related problems rises to 87% (compared to the 64% chance at average levels of social anxiety and coping motives). In contrast, when coping motives are one-unit below average, the probability of alcohol-related problems reduces to 33%. The total effect of social anxiety on alcohol-related problems was not significant and the direct effect of social anxiety on alcohol-related problems, after controlling for coping motives, was not significant.

Tests of moderated mediation showed that gender did not interact with social anxiety to predict coping motives (pathway a; $b = .14$, $SE = .13$, $p = .29$), but gender did interact with coping motives, when predicting alcohol-related problems (pathway b; $b = -.87$, $SE = .45$, $p = .05$). However, the test of whether the indirect effect of coping motives on the association between social anxiety and alcohol-outcomes differed by gender

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showed that they were not significantly different ($b = .01$, $SE = .31$, $CI = -.66, .58$), suggesting that gender did not moderate the mediation. The transformed results showed the same pattern of effects for all models.

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Table 8

Mediation Model for Social Anxiety Predicting Students' Alcohol-Related Problems Through Coping Motives

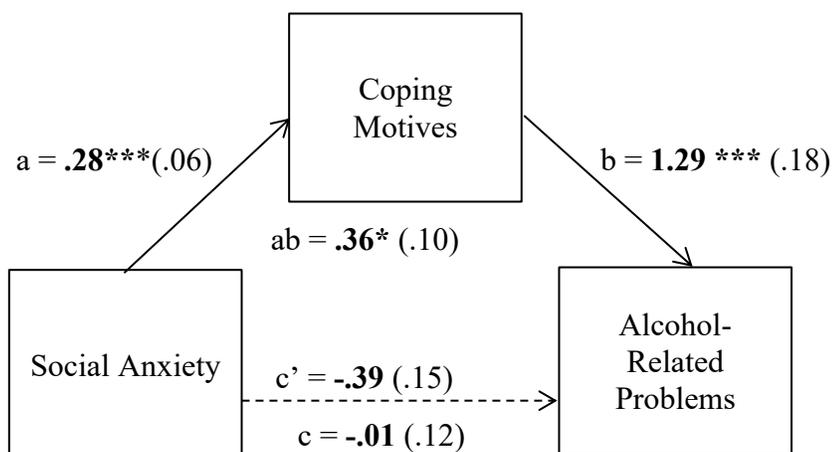
	Outcome	Predictor	Intercept	<i>B</i>	<i>SE</i>	OR
Pathway a	Coping	Social Anxiety	.00	.28***	.06	--
			.57			1.77
Pathway b	Alcohol-Related Problems	Coping		1.29***	.18	3.63
Direct Effect		Social Anxiety		-.39	.15	.68
Indirect Effect				.36*	.10	--
Total Effect				-.01	.12	.99

* $p < .05$; *** $p < .001$

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Figure 7

Mediation Model for Social Anxiety Predicting Students' Alcohol-Related Problems Through Coping Motives



Note. Bolded numbers are beta coefficients; standard errors are in brackets. a, b, and c correspond to pathway a, pathway b, and the total effect of the mediation model, respectively. The c' is the direct effect.

*** $p < .001$

** $p < .01$

* $p < .05$

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Conformity Motives. This model tested whether conformity motives mediated the relation between social anxiety and students' alcohol-related problems assessed at baseline ($N = 365$). Social anxiety significantly predicted conformity motives, such that a one-unit increase in social anxiety predicted a .27-unit increase in conformity motives. Conformity motives also significantly predicted alcohol-related problems after controlling for social anxiety, such that a one-unit increase in conformity motives predicted an increase of 1.55 in the odds of meeting criteria for an alcohol-related problem. The indirect effect was significant, suggesting that conformity motives also mediate the association between social anxiety and alcohol-related problems (see Table 9; see Figure 8). Calculations of predicted model values show that when conformity motives are one unit above average, the probability of meeting criteria for alcohol-related problems rises to 70% (compared to the 60% chance at average levels of social anxiety and conformity motives). In contrast, when conformity motives are one-unit below average, the probability of alcohol-related problems decreases to 57%. The direct effect of social anxiety on alcohol-related problems, after controlling for conformity motives, was not significant.

Tests of moderated mediation showed that gender interacted with social anxiety to predict conformity motives ($b = .26, SE = .10, p < .01$), but not with conformity motives to predict alcohol-related problems ($b = -.65, SE = .38, p = .08$). However, the indirect effect of conformity motives on the association between social anxiety and alcohol-related problems was not moderated by gender, as the indirect effect did not significantly differ between men ($b = .07, SE = .11, CI = -.10, .35$) and women ($b = .09, SE = .07, CI = -.04, .30$). The transformed results showed the same pattern of effects for all models.

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Table 9

Mediation Model for Social Anxiety Predicting Students' Alcohol-Related Problems Through Conformity Motives

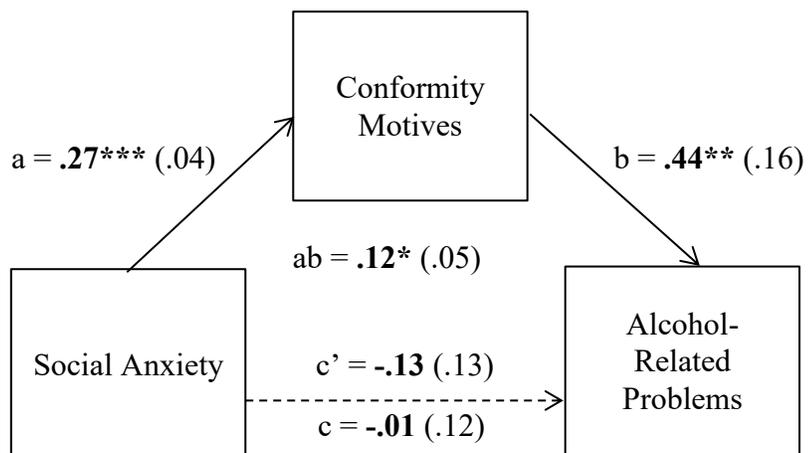
	Outcome	Predictor	Intercept	<i>B</i>	<i>SE</i>	OR
Pathway a	Conformity	Social Anxiety	.00	.27***	.04	--
			.42			1.52
Pathway b	Alcohol-Related Problems	Conformity		.44**	.16	1.55
Direct Effect		Social Anxiety		-.13	.13	.89
Indirect Effect				.12*	.05	--
Total Effect				-.01	.12	.99

*** $p < .001$

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Figure 8

Mediation Model for Social Anxiety Predicting Students' Alcohol-Related Problems Through Conformity Motives



Note. Bolded numbers are beta coefficients; standard errors are in brackets. a, b, and c correspond to pathway a, pathway b, and the total effect of the mediation model, respectively. The c' is the direct effect.

$***p < .001$

$**p < .01$

$*p < .05$

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Baseline Mediation Analyses of Heavy Drinking

Coping Motives. This model tested whether coping motives mediated the relation between social anxiety and students' heavy drinking assessed at baseline ($N = 365$). Social anxiety significantly predicted coping motives, such that a one-unit increase in social anxiety predicted a .28-unit increase in coping motives. Coping motives also significantly predicted heavy drinking after controlling for social anxiety, such that a one-unit increase in coping motives predicted an increase of 2.48 in the odds of heavy drinking. The indirect effect was significant, suggesting coping motives mediate the association between social anxiety and heavy drinking (see Table 10; see Figure 9). Calculations of predicted model values show that when coping motives are one unit above average, the probability of heavy drinking rises to 71% (compared to the 60% chance at average levels of social anxiety and coping motives). In contrast, when coping motives are one-unit below average, the probability of heavy drinking decreases to 48%. The total effect of social anxiety on heavy drinking was not significant and the direct effect of social anxiety on heavy drinking, after controlling for coping motives, was significant.

Tests of moderated mediation showed that gender did not interact with social anxiety to predict coping motives ($b = .14$, $SE = .13$, $p = .29$), but that gender interacted with coping motives to predict heavy drinking (pathway b; $b = -1.30$, $SE = .64$, $p < .05$). However, the indirect effect of coping motives on the association between social anxiety and alcohol-related problems was not moderated by gender, as the indirect effect did not significantly differ between men and women ($b = -.11$, $SE = .36$, $CI = -.99, .44$). The transformed results showed the same pattern of effects for all models.

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Table 10

Mediation Model for Social Anxiety Predicting Students' Heavy Drinking Through Coping Motives

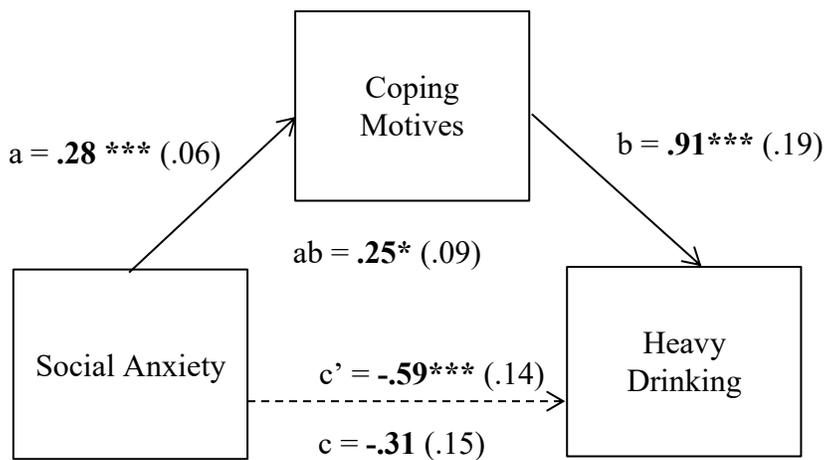
	Outcome	Predictor	Intercept	<i>B</i>	<i>SE</i>	OR
Pathway a	Coping	Social Anxiety	.01	.28***	.06	--
			1.46			4.31
Pathway b	Heavy Drinking	Coping		.91***	.19	2.48
Direct Effect		Social Anxiety		-.59***	.14	.55
Indirect Effect				.25*	.09	--
Total Effect				-.32	.15	.73

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

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Figure 9

Mediation Model for Social Anxiety Predicting Students' Heavy Drinking Through Coping Motives



Note. Bolded numbers are beta coefficients; standard errors are in brackets. a, b, c', and c correspond to pathway a, pathway b, the direct effect, and the total effect of the mediation model, respectively.

*** $p < .001$

** $p < .01$

* $p < .05$

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Conformity motives. This model tested whether conformity motives mediated the relation between social anxiety and students' heavy drinking assessed at baseline ($N = 365$). Social anxiety significantly predicted conformity motives, such that a one-unit increase in social anxiety predicted a .27-unit increase in conformity motives. Conformity motives did not significantly predict heavy drinking after controlling for social anxiety. The indirect effect was not significant, suggesting conformity motives did not mediate the association between social anxiety and heavy drinking (see Table 11; see Figure 10). The total effect of social anxiety on heavy drinking was not significant and the direct effect of social anxiety on heavy drinking, after controlling for conformity motives, was significant.

Tests of moderated mediation showed that gender interacted with social anxiety to predict conformity motives (pathway a; $b = .26$, $SE = .10$, $p < .01$), but that gender did not interact with conformity motives to predict heavy drinking (pathway b; $b = -.43$, $SE = .47$, $p = .36$). However, the indirect effect of coping motives on the association between social anxiety and alcohol-related problems was not moderated by gender, as the indirect effect did not significantly differ between men and women ($b = .00$, $SE = .14$, $CI = -.31, .20$). The transformed results showed the same pattern of effects for all models.

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Table 11

Mediation Model for Social Anxiety Predicting Students' Heavy Drinking Through Conformity Motives

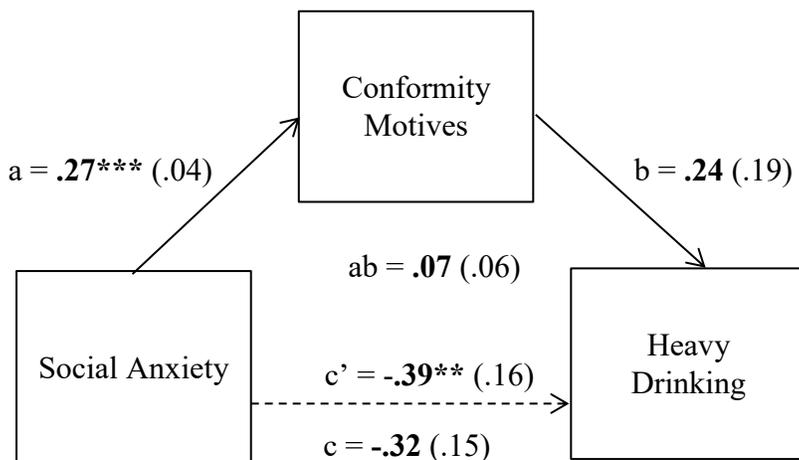
	Outcome	Predictor	Intercept	<i>B</i>	<i>SE</i>	OR
Pathway a	Conformity	Social Anxiety	.00	.27***	.04	--
			1.30			3.67
Pathway b	Heavy Drinking	Conformity		.24	.19	1.27
Direct Effect		Social Anxiety		-.39**	.16	.68
Indirect Effect				.07	.06	--
Total Effect				-.32	.15	.72

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

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Figure 10

Mediation Model for Social Anxiety Predicting Students' Heavy Drinking Through Conformity Motives



Note. Bolded numbers are beta coefficients; standard errors are in brackets. a, b, c', and c correspond to pathway a, pathway b, the direct effect, and the total effect of the mediation model, respectively.

*** $p < .001$

** $p < .01$

* $p < .05$

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Mediation and Moderated Mediation Model Summaries

Consistent with hypotheses, social anxiety significantly predicted higher coping and conformity motives for the brief surveys and at baseline. Neither coping nor conformity motives predicted drinking for the brief survey models – contrary to what was predicted. Both coping and conformity motives predicted alcohol-related problems, but only coping motives predicted heavy drinking. Social anxiety did not directly predict whether or not students drank, alcohol-related problems, or heavy drinking. Tests of mediation showed that both coping and conformity motives mediated the association between social anxiety and alcohol-related problems, but only coping motives mediated and the association between social anxiety and heavy drinking. There were no differences in the transformed models. This indicates that the models were not influenced by non-normality. Tests of gender effects on the mediational chain of social anxiety predicting motives, which in turn predict alcohol outcomes show that gender did not moderate any of the mediation models.

Hypothesis 5: Social anxiety was expected to exacerbate the relation between coping and conformity motives and alcohol outcomes (i.e., alcohol-related problems and heavy drinking).

Brief Survey Moderation Analyses

Two models tested whether coping and conformity motives moderated the relation between social anxiety and students' drinking, aggregated over brief survey instances. Main effects of coping motives, conformity motives, or social anxiety were not significant, as in the corresponding brief survey mediation models, and there were no

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significant interactions between social anxiety and coping motives ($b = -.40, SE = .28, p > .05$) or between social anxiety and conformity motives ($b = -.05, SE = .23, p > .05$).

Baseline Moderation Analyses

Alcohol-related problems. Two models tested whether coping and conformity motives moderated the relation between social anxiety and students' alcohol-related problems. Main effects of coping motives, conformity motives, and social anxiety were all significant, as in the corresponding baseline mediation model, but there were no significant interactions between social anxiety and coping motives ($b = -.04, SE = .18, p = .83$) or between social anxiety and conformity motives ($b = .07, SE = .17, p = .69$).

Heavy Drinking. Two models tested whether coping and conformity motives moderated the relation between social anxiety and students' heavy drinking. Main effects of social anxiety and coping motives were significant, but there was a non-significant main effect of conformity, as in the corresponding baseline mediation model. There were no significant interactions between social anxiety and coping motives ($b = -.28, SE = .18, p = .12$), or between social anxiety and conformity motives ($b = .02, SE = .19, p = .91$).

Discussion

This study examined the influence of social anxiety and drinking motives on drinking and alcohol-related problems in university students. Direct associations between social anxiety, drinking motives, and alcohol outcomes were examined. Coping and conformity motives were tested as mediators between social anxiety and alcohol outcomes, and gender was tested as a moderator for these mediation models. Along with tests of mediation, whether social anxiety exacerbated the links between drinking motives and alcohol outcomes was also examined.

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It was hypothesized that social anxiety would be positively associated with alcohol-outcomes and coping and conformity motives, and that coping and conformity motives would mediate the association between social anxiety and alcohol-outcomes. Gender was expected to moderate the mediation analyses, though no a-priori hypotheses were made for which pathway or which direction, as there have been inconsistent previous findings. Lastly, it was hypothesized that social anxiety would strengthen the association between coping and conformity motives and alcohol-outcomes.

There were two key findings: (1) social anxiety was significantly and negatively related to heavy drinking assessed at baseline, but not significantly associated with brief survey drinking or baseline alcohol-related problems; and (2) coping and conformity motives both mediated the links between social anxiety and alcohol-related problems, but only coping motives mediated the link between social anxiety and heavy drinking. In addition, gender did not moderate any of the mediations, and social anxiety did not moderate any associations between coping and conformity motives and alcohol-outcomes.

Direct Associations between Social Anxiety and Alcohol Outcomes

Previous research has shown that social anxiety is consistently associated with alcohol-related problems (Buckner & Heimberg, 2010; Buckner et al., 2008; Morris, Stewart, & Ham, 2005; Terlecki et al., 2014). In contrast, the links between social anxiety and drinking quantity and heavy drinking in students have been mixed (Sher et al., 2007; Terlecki et al., 2014), with some studies showing that social anxiety is positively associated with heavy drinking (Buckner & Heimberg, 2010), some that social anxiety is negatively associated with drinking quantity, and some that social anxiety is not

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significantly related to drinking quantity (Ham, Bonin, & Hope, 2007; O'Grady, Cullum, Armeli, & Tennen, 2011).

In the present study, social anxiety was significantly and negatively related to heavy drinking, but not significantly related to alcohol-related problems or students' drinking. The negative association between social anxiety and heavy drinking was not what was predicted, but this has been found in some previous studies (Ham et al., 2007; Ham & Hope, 2006; Labrie et al., 2008; Schry & White, 2013). One reason why social anxiety may be inconsistently related to heavy drinking in other studies and negatively related to heavy drinking in this study, is that there may be *heterogeneous* drinking patterns for socially anxious students. For example, some socially anxious students may avoid social situations due to their anxiety, thus limiting their opportunities to drink heavily (Brook & Willoughby, 2016). This postulation is consistent with the previously reported finding that significant negative associations between social anxiety and frequency/quantity of drinking become non-significant once frequency of exposure to alcohol is controlled (Buckner & Terlecki, 2016; Strahan et al., 2011). Further, socially anxious students in one study who were more likely to avoid social situations drank less, due to lack of attendance of social situations that have alcohol (Brook & Willoughby, 2016).

Avoidance of social situations may tap into the *social evaluative fear* facet of social anxiety. Heightened social evaluative concerns typically manifest as fears of being observed and negatively appraised by others while experiencing anxiety, or as fears of displaying signs of distress such as trembling and blushing. Social evaluative concerns are related to social avoidance behaviours, which are similar to social phobia and

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performance anxiety (Carleton, Collimore, & Asmundson, 2007; Mattick & Clarke, 1998). In support of this notion, studies show that socially anxious students drink less before a speech task (likely to provoke social evaluative fears) compared to silent reading (Abrams, Kushner, Medina, & Voight, 2002; Morris et al., 2005). During social situations with alcohol present, socially anxious students may avoid drinking for fear of being embarrassed by cognitive and behavioural impairment, or they may not attend the social event at all, indirectly linking social evaluative fears to reduced drinking (Eggleston et al., 2004). These students could be characterized as socially anxious ‘avoiders’, in terms of their drinking behaviours.

In contrast, some socially anxious students may not avoid social situations, perhaps because they possess a stronger need to interact with others compared to their counterparts who avoid social situations (Brook & Willoughby, 2016). Such students may experience the same level of social anxiety as those who avoid social situations, but instead of coping by avoiding the situation, they may drink more alcohol. Supporting this, socially anxious students in one study who were higher on a measure of desire to interact with others drank more alcohol than those who avoided social situations (Brook & Willoughby, 2016). Further, the social anxiety group with a higher desire to interact were more likely to report self-medicating using alcohol (Brook & Willoughby, 2016). Socially anxious students who do not avoid social situations in university may show different drinking behaviours than those who do, which may explain why there are inconsistencies in previous studies, and why there was a negative association in this study (i.e., this study may have sampled more ‘avoiders’).

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Drinking more during social situations may tap into the *interaction anxiety* facet of social anxiety, which refers to anxiety that is felt while interacting with others (e.g., concerns over being inarticulate, boring, unintelligent, or being excluded; Mattick & Clarke, 1998). This indicates that students who do not avoid social situations may self-medicate in anticipation of—and to cope with—social interaction anxiety. This is supported by the finding of one study that socially anxious students drank more before a social event (Keough, Battista, O'Connor, Sherry, & Stewart, 2016). In a supplementary analysis of data from the present study, students who scored high on social anxiety (i.e., scores above four on the SIAS), drank on 24% of the brief survey instances where social anxiety was high ($n = 25$), whereas those who were lower on social anxiety (i.e., below four) drank on 12% of the instances where social anxiety was low ($n = 898$), suggesting that being socially anxious may make drinking more likely than being non-socially anxious. Furthermore, for all of the brief survey instances where high social anxiety and drinking occurred, students were with others, and during these instances there were more reports of being the only person drinking (12%) than during instances with low social anxiety (1%). These findings suggest that some socially anxious students may indeed be more likely to drink to alleviate social interaction anxiety. These students could be characterized as socially anxious ‘drinkers’, in terms of their drinking behaviours. Despite that there may be a subsample of socially anxious drinkers, it may be that socially anxious students are more frequently avoiding social situations with alcohol, which may obscure the pattern that some socially anxious students are drinking maladaptively, and provides an explanation for the negative association between social anxiety and heavy drinking. This sample showed that students who reported being

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socially anxious at the time were slightly less likely to report being with others (36% of instances) than students lower on social anxiety (40.31% of instances) – supporting that although there is evidence for more nuanced drinking behaviours among socially anxious students, avoiding social situations may be more common, or was at least more prevalent in this sample.

Despite the differences in reports of drinking for high and low instances of social anxiety, social anxiety was not correlated, overall, to drinking as assessed via the brief surveys in this study. However, the small sample size presents a limitation and this (lack of significant) finding should be interpreted with some caution. Since there were only 25 brief survey instances of high social anxiety, there may not have been sufficient power to detect an association. Furthermore, the supplementary observation from this data that students who feel socially anxious are drinking more frequently while they are with others – even when no one else is drinking – suggests potentially maladaptive drinking patterns, even though they may not consume more than others. Namely, these students may be relying on alcohol as a coping mechanism in social settings where drinking may not be appropriate, which may be one reason socially anxious students tend to experience more alcohol-related problems despite drinking less. This is corroborated by the finding that socially anxious students in this study experienced more alcohol-related problems, through drinking to cope. In addition, few previous studies have examined whether social anxiety predicts subsequent drinking later that evening using brief surveys, and social anxiety has been inconsistently related to retrospective reports of amount of alcohol consumed, making it difficult to infer strong conclusions from the brief survey results of the present study (Clerkin et al., 2014; Ham et al., 2007; Sher et al., 2007; Terlecki et al.,

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2014). However, results from one study indicated that social anxiety was only directly related to drinking later that day if the socially anxious student had experienced an embarrassing event (O'Grady et al., 2011). This finding, combined with descriptive reports of more drinking instances reported by socially anxious students in the present study, suggest that oversampling socially anxious students for brief survey studies may be a useful strategy in future research.

The lack of a direct association between social anxiety and alcohol-related problems in the present study was unexpected, and inconsistent with the report of a previous meta-analysis concluding that social anxiety is positively related to alcohol-related problems, regardless of the measure that was used (i.e., AUDIT or other; Schry & White, 2013). In the present study, the mean social anxiety score for those with alcohol-related problems was the same for those who did not qualify for alcohol-related problems. There may not have been enough socially anxious students meeting screening criteria for alcohol-related problems to find a significant difference (only nine people scored above four on the SIAS and met criteria for alcohol problems on the AUDIT).

Social Anxiety and Drinking Motives

Previous research has shown that social anxiety is positively related to coping and conformity motives (Clerkin & Barnett, 2012; Terlecki & Buckner, 2015), and the same association was predicted in this study. Overall, social anxiety was related to coping and conformity motives at baseline and for the brief surveys, and social anxiety predicted higher levels of both coping and conformity motives in all of the models tested. The robustness of these associations suggest that both trait- and state-levels of social anxiety and motives are related (Mohr et al., 2001).

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This is the first study to examine drinking motives using repeated brief surveys, and the results showed that social anxiety is associated with same-day coping and conformity motives. Furthermore, the correlations between the baseline drinking motives and corresponding motives assessed with brief surveys were within the range of $r = .33$ to $r = .49$, suggesting that they are related, but that brief surveys of motives may be assessing something slightly different than cross-sectional assessments (O'Hara et al., 2015). It may be that trait-level drinking motive measures of typical drinking habits are influenced by recall biases and students' beliefs about their usual reasons for drinking. A student's recollection of their drinking motives may be more general than a student's motives on a given drinking occasion. Drinking motives as assessed using brief surveys may be more variable and easily influenced by proximal factors such as positive or negative affect, anxiety, setting, and daily events that influence a student's decision to drink (e.g., failing a test; O'Hara et al., 2015). Indeed, although no studies have examined drinking motives using repeated brief surveys per day, the few studies that have assessed drinking motives on a daily level have shown that daily coping motives are positively associated with daily negative affect (Arbeau et al., 2011). In another study, coping motives assessed as a trait were associated with solitary drinking, but coping motives assessed as a state were associated with both social and solitary drinking, suggesting that students may have fluctuating drinking motives over time (O'Hara et al., 2015). Perhaps social anxiety acts as a deterrent to social situations in general (a trait-level association), but when socially anxious people are in social situations, they drink more (a state-level association). Therefore, social anxiety may be related to drinking and drinking to cope and to conform, but only in social situations. The lack of an association between social

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anxiety and drinking in this study may have been due to the low number of instances of highly socially anxious people reporting being in social situations and drinking.

Drinking Motives Mediate Links Between Social Anxiety and Alcohol Outcomes

The mediating roles of coping and conformity motives on the associations between social anxiety and alcohol-outcomes were the primary goals of the present study. It was expected that social anxiety would predict whether students drank, heavy drinking, and alcohol-related problems, through the endorsement of coping and conformity motives. In addition, this study examined gender as a moderator for the links between social anxiety, drinking motives, and alcohol-outcomes.

Overall, support was found for the mediating role of drinking motives in the links between social anxiety and more problematic aspects of drinking (i.e., alcohol problems, heavy drinking). Coping and conformity motives did not mediate the links between social anxiety and whether students drank during the brief surveys, which was not what was hypothesized. However, these results should be interpreted with caution given the small sample size in the brief survey portion of the study. In contrast, coping and conformity motives mediated the links between social anxiety and alcohol-related problems, and coping motives (but not conformity motives) mediated the links between social anxiety and heavy drinking. Similar to previous studies, coping and conformity motives appear to be central to alcohol-related problems for socially anxious students, and coping motives appear to be important for heavy drinking (Howell et al., 2016; Lewis et al., 2008).

The findings that coping and conformity motives explain socially anxious students' alcohol-related consequences, and that coping motives explain socially anxious students' heavy drinking are consistent with the tension reduction hypothesis (Conger,

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1956). Drinking to cope and to conform to peer pressure are both negative reinforcement motives, and point towards socially anxious students using alcohol to reduce the discomfort of feeling anxious (i.e., drinking to cope), as well to avoid potential negative social interactions arising from peer pressure (i.e., drinking to conform). As shown in this study, this pattern of drinking behaviour is maladaptive, and highlights the need to address drinking motives as well as alcohol use for socially anxious students. Socially anxious students who are endorsing coping and conformity motives may be inappropriately using alcohol to deal with their anxiety. In addition, socially anxious students who endorse coping motives may be at even greater risk of negative alcohol-related consequences, as coping motives also indirectly predicted heavy drinking. Thus, exploring alternative ways to manage anxiety besides alcohol, practicing alcohol-refusal techniques, and addressing false beliefs about typical alcohol-consumption on campuses to avoid potential feelings of needing to ‘keep up’, are areas that intervention programs should pursue.

The results of this study suggest that superficially, socially anxious students appear to not be at risk for harmful drinking behaviours and the negative consequences that accompany those behaviours – and may even be protected, given the negative correlation between social anxiety and heavy drinking. However, upon a more nuanced examination (i.e., mediational analyses), socially anxious students are indeed showing maladaptive drinking behaviours.

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Gender Similarities in the Links between Social Anxiety, Motives, and Alcohol

Outcomes

The moderated mediations showed that there was no effect of gender. This may be because of the smaller proportion of men in the sample, which may have made gender differences harder to detect for men, and easier to detect for women. However, these findings are consistent with some previous studies showing that the association between social anxiety and alcohol-related problems, through coping motives, did not vary by gender (Ham et al., 2009; Lewis et al., 2008). The lack of significant gender effects may also reflect the less rigid gender roles and stereotypes on modern campuses. Specifically, gender stereotypes that were once prohibitive of heavy drinking for women and more accepting of heavy drinking for men in previous years may be less prevalent (LaBrie et al., 2008; Nolen-Hoeksema, 2004). These societal changes may lead to smaller differences in the nature of drinking for men and women on university campuses than there were previously.

Moderation models

Social anxiety did not moderate any of the associations between motives and alcohol-outcomes. Although there has been previous support for social anxiety as a moderator of the association between drinking motives and alcohol-outcomes (Grant et al., 2009), the results of the present study did not replicate this finding. Rather this study points towards social anxiety, motives, and alcohol-outcomes working sequentially, instead of motives and social anxiety acting together to influence alcohol use in students. The lack of significant moderation findings reinforces the mediational sequence of social anxiety predicting coping and conformity motives, and motives predicting drinking and

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alcohol-related consequences. Although there have recently been speculations about the ability for mediational analyses to reliably uncover causal effects in cross-sectional data (Maxwell, Cole, & Mitchell, 2011), it has been suggested that cross-sectional mediation analyses may be a starting place to direct future longitudinal analyses if there is a strong theoretical underpinning outlining the temporal precedence of one variable causing another, which in turn causes another (Shrout, 2011). In this study, despite that the mediation models were cross-sectional, the strong theoretical underpinning (i.e., the tension-reduction hypothesis and the nature of drinking motives as being antecedents to drinking) provides a rationale for testing mediation models using data that are not longitudinal (Conger, 1956; Stewart et al., 2006; Lewis et al., 2008).

Strengths, Limitations, and Future Directions

A notable strength of this study is the repeated brief survey design. This methodology increases external validity, as assessments of social anxiety, drinking motives, and drinking are made as they are happening in their natural environments. This design also allowed the temporal order to be kept intact where possible, increasing the validity of results involving the brief surveys. Another strength of this study is that it is the first to examine drinking motives using repeated brief surveys. Although previous studies (O'Hara et al., 2015) have used motives in brief surveys, this is the first study to have used multiple assessments of drinking motives per day.

This study also separately measured alcohol-consumption, heavy drinking, and alcohol-related problems. Previous studies have shown inconsistencies regarding the association between these alcohol-outcomes and social anxiety and motives. This study has replicated that social anxiety is differentially associated with whether students drank,

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heavy drinking, and alcohol-related problems, and supports the separation of these alcohol-outcomes for future research. In addition, this study oversampled drinkers, which increases the generalizability to university students who use alcohol. Despite these strengths, the results of this study should be interpreted within the context of some limitations.

A notable limitation of this study was the relatively small sample size. Some analyses were underpowered, such as the moderated mediations exploring gender for the brief surveys. There was also a disproportionate number of women and only $n = 11$ men ($n = 3$ of whom drank) and it is likely that there were not enough men to demonstrate any effects of gender for the brief survey models. For the baseline data, there was a larger proportion of women ($n = 266$) than men ($n = 105$), which may have also biased the results in that effects for men may have been underpowered.

Another limitation is that depression was moderately correlated with social anxiety, and depression explained the association between social anxiety and alcohol-related problems. This suggests that there may be conceptual overlap between social anxiety and depression, and it is possible that some alcohol-related problems are products of depressive symptoms, rather than social anxiety. Future studies should include depression as a covariate in analyses. In addition, individual differences such as personality should be included in future analyses, as there is evidence that neuroticism is related to coping motives and neuroticism may share aspects with social anxiety (i.e., feeling anxious around those in positions of authority; Mezquita, Stewart, & Ruipérez, 2010).

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Limitations specific to the brief surveys were that drinking was assessed within the past 30 minutes. Limiting reports of drinking to the past 30 minutes may have missed drinking that occurred between surveys, reducing the number of drinking episodes captured. In addition, although the goal of repeated brief surveys is to assess short-term processes (i.e., within-day fluctuations), longer-term data, such as fluctuations across the academic year, could also be fruitfully explored. Finally, data were aggregated across brief surveys to accommodate conventional linear and logistic regression analyses. Repeated measures data such as these are well suited to random effects models (a.k.a. multilevel or hierarchical linear modeling), and the present study did not take advantage of the repeated measures structure of the data to examine within-day associations.

Future studies should examine social anxiety in greater depth and nuance, particularly whether there are social-avoiders and social-drinkers, and whether these potential sub-groups exhibit different drinking patterns (Brook & Willoughby, 2016). From the results of this study, different approaches to intervention for these groups may be warranted. Specifically, socially anxious students should be informed about alternative methods of coping with anxiety and how to maintain their drinking-boundaries in response to peer-pressure to drink.

In addition, measuring internal motives (i.e., coping and enhancement motives), as implicit motives (i.e., subconscious associations, or automatic responses to a stimulus) may be an interesting avenue for exploration. One study that examined implicit coping and enhancement motives found that those who are at greater risk of alcoholism genetically had a stronger association between implicit coping motives and drinking behaviour (Hendershot, Lindgren, Liang, & Hutchison, 2012). In other words, some

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people may be predisposed to drinking to cope, which may set them up for later alcohol-related problems, as shown in the present study. Future studies should examine whether socially anxious students who drink to cope do so partly because they may be genetically inclined to harmful alcohol use.

Another area that warrants exploration is the continued use of brief surveys to measure state social anxiety, drinking motives, setting, and alcohol-outcomes. At present, there is a dearth of studies examining alcohol-consumption and alcohol-related problems while they are happening in relation to social anxiety. The theoretical underpinning of drinking motives as immediate antecedents to drinking makes this especially important (Cooper, 1994), as temporal order can be discerned through the use of brief surveys, but not through cross-sectional methods. In addition, exploring which settings lead to drinking and alcohol-related problems for socially anxious students, and whether motives differ depending on who students are with and where they are, will clarify why some students report alcohol-related problems despite drinking less overall.

Finally, although the DMQ-R has shown that it is valid and reliable for use in cross-sectional studies, there are potential limitations for its use with brief surveys. During brief surveys students may endorse more than one motive at a given time, and distinguishing between ‘drinking to have fun’ and ‘drinking to cope with negative emotions’ may be difficult, because students may drink to cope with negative emotions *in order* to have fun. Further, a qualitative study found that men reported attempting to keep up with their peers by drinking the same as or more than them, which alludes to conformity motives, but with a more social-facilitative orientation (Dodd, et al., 2010). This suggests that there may be a missing dimension in the conformity motives subscale,

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and that there may be more overlap between positive and negative (i.e., conformity, coping) reinforcement motives than previously conceptualized. Future studies should examine the validity of and factor loadings for the DMQ-R items for brief survey methods, as well as explore adding more nuanced items that tap into social anxiety specifically (e.g., drinking because you are finding it hard to interact with people).

Conclusion

This study examined the associations among social anxiety, drinking motives, and alcohol outcomes, and explored drinking motives and social anxiety using repeated brief surveys. In addition, how drinking motives influence the associations between social anxiety and alcohol-related problems and heavy drinking was examined. The results showed that the links between social anxiety and drinking may be more complex than previously conceptualized, through the potentially heterogeneous subgroups of socially anxious students: those who avoid social situations and as a result drink less, and those who attend but drink more (Brook & Willoughby, 2016). There was also support for the mediational role of drinking motives: coping and conformity motives explained the association between social anxiety and alcohol-related problems, and coping motives explained the association between social anxiety and heavy drinking. Given the lack of significant moderation effects of social anxiety, these results provide greater support for a mediating role of drinking motives: social anxiety likely strengthens students' motivations to drink, which in turn increase the likelihood of potentially maladaptive drinking patterns and alcohol-related problems. The results of this study offer important cautions for socially anxious students attending university who are using alcohol as a means of coping with their anxiety, and who are drinking in response to a perceived

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social culture emphasizing drinking. Intervention efforts that address maladaptive drinking motives may be particularly beneficial for socially anxious students.

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Appendix A

Research Ethics Board Approval Certificate

Carleton University Research Ethics Board (CUREB)

Certificate of Ethics Clearance

Principal Investigator

Department

Study Number

Andrea Howard**Psychology****15-122**

Co-Investigators and other researchers:

Researcher	Study Role	Position
Andrea Howard	Faculty Supervisor	Faculty
Noelle Strickland	Other Research Personnel	Graduate Student
Robert Coplan	Other Research Personnel	Faculty

Study Title: **Drinking in University Students: A Motivational Model of Social Anxiety, Loneliness, and Context**

Approval Date: **02/03/2016**Expiry Date: **08/31/2016**Approval Type: **Final**

Submitted Date	Study Component	Approval Date
01/29/2016	Addendum	02/03/2016
01/07/2016	Addendum	01/08/2016

Validity Term:

Comments:

Certification

The protocol describing the above-named project has been reviewed by Carleton University Research Ethics Board and the research procedures were found to be acceptable on ethical grounds for research involving human participants.



Chair, Carleton University Research Ethics Board (CUREB)

This Certificate of Clearance is valid for the above term provided there is no change in the research procedures.

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Appendix B
Drinking Motives Questionnaire – Revised

DMQ DRINKING MOTIVES

Listed below are 20 reasons people might be inclined to drink alcoholic beverages. Using the five-point scale below, decide how frequently your own drinking is motivated by each of the reasons listed.

You drink...

	Almost never/Never	Some of the time	Half of the time	Most of the time	Almost always/Always
1. To forget your worries.	<input type="radio"/>				
2. Because your friends pressure you to drink.	<input type="radio"/>				
3. Because it helps you enjoy the party.	<input type="radio"/>				
4. Because it helps you when you feel depressed or nervous.	<input type="radio"/>				
5. To be sociable.	<input type="radio"/>				
6. To cheer up when you are in a bad mood.	<input type="radio"/>				
7. Because you like the feeling.	<input type="radio"/>				
8. So that others won't kid you about <i>not</i> drinking.	<input type="radio"/>				
9. Because it's exciting.	<input type="radio"/>				
10. To get high.	<input type="radio"/>				
11. Because it makes social gatherings more fun.	<input type="radio"/>				
12. To fit in with a group you like.	<input type="radio"/>				
13. Because it gives you a pleasant feeling.	<input type="radio"/>				
14. Because it improves parties and celebrations.	<input type="radio"/>				
15. Because you feel more self-confident and sure of yourself.	<input type="radio"/>				
16. To celebrate a special occasion with friends.	<input type="radio"/>				
17. To forget about your problems.	<input type="radio"/>				
18. Because it's fun.	<input type="radio"/>				
19. To be liked.	<input type="radio"/>				
20. So you won't feel left out.	<input type="radio"/>				

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Appendix C

Social Interaction Anxiety Scale

Page 1 of 1

Patient Name:Date:

Instructions: **For each item, please circle the number to indicate the degree to which you feel the statement is characteristic or true for you. The rating scale is as follows:**

- 0 = Not at all characteristic or true of me.**
1 = Slightly characteristic or true of me.
2 = Moderately characteristic or true of me.
3 = Very characteristic or true of me.
4 = Extremely characteristic or true of me.

CHARACTERISTIC	NOT AT ALL	SLIGHTLY	MODERATELY	VERY	EXTREMELY
1. I get nervous if I have to speak with someone in authority (teacher, boss, etc.).	0	1	2	3	4
2. I have difficulty making eye contact with others.	0	1	2	3	4
3. I become tense if I have to talk about myself or my feelings.	0	1	2	3	4
4. I find it difficult to mix comfortably with the people I work with.	0	1	2	3	4
5. I find it easy to make friends my own age.	0	1	2	3	4
6. I tense up if I meet an acquaintance in the street.	0	1	2	3	4
7. When mixing socially, I am uncomfortable.	0	1	2	3	4
8. I feel tense if I am alone with just one other person.	0	1	2	3	4
9. I am at ease meeting people at parties, etc.	0	1	2	3	4
10. I have difficulty talking with other people.	0	1	2	3	4
11. I find it easy to think of things to talk about.	0	1	2	3	4
12. I worry about expressing myself in case I appear awkward.	0	1	2	3	4
13. I find it difficult to disagree with another's point of view.	0	1	2	3	4
14. I have difficulty talking to attractive persons of the opposite sex.	0	1	2	3	4
15. I find myself worrying that I won't know what to say in social situations.	0	1	2	3	4
16. I am nervous mixing with people I don't know well.	0	1	2	3	4
17. I feel I'll say something embarrassing when talking.	0	1	2	3	4
18. When mixing in a group, I find myself worrying I will be ignored.	0	1	2	3	4
19. I am tense mixing in a group.	0	1	2	3	4
20. I am unsure whether to greet someone I know only slightly.	0	1	2	3	4

CO-OCCURRING DISORDERS PROGRAM: SCREENING AND ASSESSMENT

Document is in the public domain. Duplicating this material for personal or group use is permissible. 19

Appendix D

Alcohol Use Disorders Identification Test

APPENDIX B | 31

Box 10**The Alcohol Use Disorders Identification Test: Self-Report Version**

PATIENT: Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest.

Place an X in one box that best describes your answer to each question.

Questions	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year	
					Total	

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Appendix E
Setting Questions

Where are you right now?

- 1) At home
- 2) Away from home

Who are you with right now?:

- 1) I'm alone
- 2) I'm with others but not interacting (talking to people; doing an activity together)
- 3) I'm with others and interacting

If with others, will follow up by asking:

I'm currently with the following people (choose all that apply):

- 1) Intimate partner
- 2) Family member
- 3) Friend
- 4) Acquaintance (someone you just met or don't know very well)

If with others, will be asked:

In the past 30 minutes, were any of the people you are with drinking alcohol?

- 1) Nobody was drinking,
- 2) I was the only person drinking,
- 3) Some of the people I'm with were drinking,
- 4) Most of the people I'm with were drinking,
- 5) Nearly every one was drinking.

If response to above is #3, 4, or 5, AND indicates in a previous question that s/he is not drinking, will be asked:

You indicated that you aren't drinking but some others around you are drinking.
Are you the designated driver? (yes/no/there is no designated driver)

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Appendix F
Demographic Questions

- 1) What is your age? Years/months (1 box for each)
- 2) What university are you currently attending? [open ended response]
- 3) What year in university are you currently completing? (1-6)
- 4) Based on the number of credits you've completed so far, would you be considered a...
 - a. First-year student
 - b. Second-year student
 - c. Third-year student
 - d. Fourth- or final-year student
- 5) What is your racial/ethnic background (check all that apply)?
 - a. Aboriginal/First Nations/Inuit/Metis,
 - b. Black (African or Caribbean origins),
 - c. White/Caucasian (European origins),
 - d. South Asian origins (e.g., East Indian, Pakistani, Sri Lankan),
 - e. West Asian/Middle Eastern/Arabic origins (e.g., Iranian, Lebanese, Afghan)
 - f. Southeast Asian origins (e.g., Chinese, Filipino, Japanese, Korean, Vietnamese)
 - g. Latin American origins (e.g., Mexican, Colombian, Guyanese),
 - h. Oceanic origins (Australian, New Zealander, Pacific Islands)
 - i. Other origins (please specify)
- 6) What is your biological sex? (Male/Female)
- 7) What is your parents' estimated combined yearly income, before taxes? (\$20,000 or less; 20-30; 30-40; 40-50; ect. up to \$120,000 or more)
- 8) What is your mother's highest level of completed education?
 - a. Elementary school,
 - b. High school,
 - c. Community college/vocational diploma or Associate's degree,
 - d. Bachelor's degree (includes law and medical degrees),
 - e. Master's degree,
 - f. PhD.
- 9) What is your father's highest level of completed education (same options as above)
- 10) What is your current living situation?
 - a. In university residence/campus housing (alone or with roommates)
 - b. Living with parents or other guardians
 - c. Living off-campus, on my own
 - d. Living off-campus, with roommates (not parents or guardians)
 - e. Other (please specify)