SOCIAL ANXIETY AND COLLEGE DRINKING RISK: EXPLORING THE MODERATING EFFECT OF EXPERIENTIAL AVOIDANCE

by

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A DISSERTATION

Presented to the Department of Counseling Psychology and Human Services
and the Division of Graduate Studies of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

September 2024

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DISSERTATION ABSTRACT

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Higher levels of social anxiety predict greater incidence of alcohol-related *consequences* among college students, yet little is known about for whom social anxiety may pose the greatest risk of experiencing alcohol-related consequences and the significance and direction of association between social anxiety and alcohol *use* remain unclear. This investigation aims to help elucidate the relationships between social anxiety and both alcohol consequences and use by examining experiential avoidance, or a tendency to suppress unwanted internal experiences, as a potential moderator of different aspects of the social anxiety–alcohol link. The current study utilizes data from the Healthy Minds Study, a national survey of college student mental health, which was collected across 79 U.S. colleges during the 2018-2019 academic year. Respondents who were (a) aged 18–30 years old and (b) given the opportunity to complete all key measures included for present analysis comprised the final sample (N = 1,584). A series of regression models using Hayes conditional process analysis were conducted to test experiential avoidance as a moderator of the relationship between social anxiety and alcohol-related consequences and a moderator of the relationship between social anxiety and heavy episodic drinking. Findings revealed a significant, positive association between social anxiety and alcohol-related consequences, while social anxiety was not significantly related to alcohol use. Experiential avoidance was positively linked to both alcohol-related consequences and alcohol use but did not

moderate the associations between social anxiety and either outcome. Overall, findings suggest that higher levels of social anxiety may potentially increase risk for alcohol-related consequences but not for alcohol use among a sample of young adult college students, and that experiential avoidance may not modify the strength of either prospective relationship. This investigation paves the way for future explorations into the role of experiential avoidance in the social anxiety–alcohol link and offers insight relevant to the enhancement of preventive intervention efforts to reduce the burden of alcohol-related risk among socially anxious college students.

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Cronce, J. M., Marchetti, M. A., Jones, M. B., & Ehlinger, P. P. (2022). A scoping review of brief alcohol interventions across young adult subpopulations. *Psychology of Addictive Behaviors, 36*(6), 648–663. https://doi.org/10.1037/adb0000800

Mintz, B., Marchetti, M. A., Ehlinger, P. P., & Cronce, J. M. (2020). SBIRT in college and university settings: Unique challenges and opportunities. In M. D. Cimini & J. L. Martin (Eds.), *Screening, brief intervention, and referral to treatment for substance use: A practitioner's guide* (pp. 125–142). APA Books. https://doi.org/10.1037/0000199-008

Sayette, M. A., Marchetti, M. A., Herz, R. S., Martin, L. M., & Bowdring, M. A. (2019). Pleasant olfactory cues can reduce cigarette craving. *Journal of Abnormal Psychology, 128*(4), 327–340. https://doi.org/10.1037/abn0000431

ACKNOWLEDGEMENTS

First and foremost, I wish to express my deepest appreciation to my advisor, Dr. Jessica Cronce, for her unwavering guidance, expertise, and investment throughout the completion of this dissertation, as well as every high and low of my doctoral training. I can only aspire to her example of generosity, flexibility, integrity, and kindness in mentorship. I am also grateful to my committee members for their thoughtful feedback and encouragement throughout this process. Thank you to Dr. Michael Sayette for trusting in my ability well before I imagined myself on this path. I acknowledge the contributions of the Healthy Minds Study team and the research participants who made this project possible, as well as the clients who have shared their stories, challenges, and joys with me throughout my training and hugely influenced me in the process.

The solidarity and support I have shared with my colleagues and friends has been crucial to my perseverance in graduate school. It has been a particular privilege to learn with and from so many brilliant women working toward meaningful change, both inside and well beyond academia. Yahaira, Lindsey, Lue, Jordan, Maureen, and Emma—thank you. I recognize the efforts of fellow University of Oregon graduate workers who first unionized nearly 50 years ago and have continued collectively striving toward improved labor conditions, without which my experience of graduate school would have looked vastly different. I would also like to thank my family for teaching me the necessity of both compassion and curiosity and for believing in and supporting me unconditionally. Finally, to my partner and co-struggler, in both graduate school and in life, Alex—I cannot adequately express how profoundly you have held me up, helped me grow, and enabled me to persist toward this goal. Thank you for everything.

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CHAPTER I

INTRODUCTION

Alcohol Use and Consequences Among College Students

Alcohol consumption contributes to over 200 diseases and conditions (Rehm et al., 2017) and is a leading preventable cause of death in the United States (Centers for Disease Control and Prevention, 2022). While alcohol use at any amount carries risk (Anderson et al., 2023), the risk for most negative consequences generally increases monotonically with volume of use (Rehm et al., 2010; 2017) and relatively small differences in consumption can add up to large differences in consequences. For instance, Barnett and colleagues (2014) found that, for each additional drink consumed on a drinking day among a sample of college students, the incidence of negative alcohol-related consequences more than doubled.

Of course, certain patterns of drinking are more likely than others to be associated with the experience of consequences (Astudillo et al., 2010). For example, binge drinking or *heavy episodic drinking*, which is generally defined as consumption of 4+ and 5+ alcoholic drinks in a row for those assigned female at birth and male at birth, respectively (Courtney & Polich, 2009; Wechsler et al., 1995), is associated with acute and long-term problems, including poor academic performance, increased interpersonal conflict, sleep problems, cognitive impairments, injury, and mortality (Krieger et al., 2018; White & Hingson, 2013). Engaging in heavy episodic drinking in young adulthood also predicts an increased risk of developing alcohol use disorder (AUD) and other chronic alcohol-related consequences in later life (Addolorato et al., 2018). Of note, despite widespread implementation of efficacious preventive interventions (Cronce & Larimer, 2011; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2019; Nelson et al., 2010), college students in the United States exhibit disproportionately high rates of alcohol consumption

and alcohol-related negative consequences relative to their same-age noncollege-attending peers (Schulenberg et al., 2021).

Social Anxiety as a Predictor of Alcohol Outcomes

Social anxiety, characterized by worry regarding one's social skills and interpersonal competence (Karasar & Baytemir, 2018), also disproportionately affects young adults, with approximately 1 in 10 reporting a known diagnosis of social anxiety disorder (SAD; Burstein et al., 2011; National Comorbidity Survey, 2017) and 1 in 3 reporting a perception of themselves as socially anxious (Jefferies & Ungar, 2020). High levels of self-reported social anxiety have demonstrated a steady upward trend across college campuses over the past 5-10 years (Center for Collegiate Mental Health, 2023; Xiao et al., 2017), which is worrisome given its positive association with alcohol-related consequences (Grant et al., 2005; Morris et al., 2005; Schneier et al., 2010; Villarosa-Hurlocker & Madson, 2020).

SAD among college students has been demonstrated to correlate strongly and positively with alcohol-related consequences (Kushner & Sher, 1993), as well as to precede and significantly increase the risk for experiencing alcohol-related consequences (Buckner et al., 2008). Buckner and colleagues (2008) found these explanatory effects hold true even after controlling for other known predictors of alcohol consequences (i.e., gender identity, lifetime history of mood and conduct disorders) and the presence of other forms of anxiety (i.e., generalized anxiety disorder, specific phobia, panic disorder, obsessive compulsive disorder, overanxious disorder, and separation anxiety disorder). Among a college student sample, Buckner and Heimberg (2010) found that greater self-reported social anxiety predicted more alcohol-related consequences, while the reverse association (i.e., alcohol-related consequences predicting social anxiety) was not significant. These findings suggest a unique, directional link

from social anxiety to alcohol-related consequences and raise concern regarding the compounded alcohol-related risk for socially anxious young adults navigating the highly social college environment (Hurtado, 2007).

Compared to the relationship between social anxiety and alcohol-related consequences, the relationship between social anxiety and alcohol use among college students is less clear. Some studies have reported a positive correlation between social anxiety and alcohol use (e.g., Buckner et al., 2019; Neighbors et al., 2007). In particular, self-reported social anxiety is positively associated with frequency of pregaming (i.e., drinking before going out; Buckner et al., 2020; Keough et al., 2016), a practice strongly predictive of heavy episodic drinking (Barry et al., 2013; Labhart et al., 2013). Additionally, experiencing elevated social anxiety during a social drinking event has been shown to temporally predict heavier alcohol consumption at subsequent social events (Goodman et al., 2018; Ogniewicz et al., 2019). However, other studies have failed to find a significant relationship between social anxiety and alcohol use (e.g., Buckner et al., 2011; O'Grady et al., 2011) or report finding a significant negative relationship between these constructs (e.g., Ham & Hope, 2005; Lewis et al., 2008; Schry & White, 2013).

Of note, a recent investigation by Terlecki et al. (2020) found that social anxiety was significantly positively associated with peak (i.e., maximum) number of drinks consumed on one occasion during the past 30 days but negatively associated with typical drinking quantity and typical drinking frequency over the same timeframe. Thus, differences in how alcohol use is operationalized may help explain mixed findings within and across studies regarding the association between social anxiety and alcohol use, especially as relatively few studies operationally define alcohol use in terms of heavy episodic drinking frequency as compared to typical drinking quantity and typical drinking frequency (see Schry & White, 2013). The limited

investigations of the relation between social anxiety and heavy episodic drinking frequency to date reveal similarly mixed results, however. One study by Eggleston et al. (2004) found a significant negative association between social anxiety and heavy episodic drinking frequency among a sample of college students, while another study conducted with college student participants by Bernstein (2014) found no significant relationship. The former study (Eggleston et al., 2004) employed a usual frequency measure of heavy episodic drinking (i.e., "average number of binge episodes per week") whereas the latter (Bernstein, 2014) measured heavy episodic drinking frequency by self-reported number of episodes "over the past 2 weeks," suggesting that differences in the assessment of heavy episodic drinking also contribute to inconsistent findings within the literature.

Importantly, although alcohol use is necessary for a given individual to experience certain alcohol-related consequences (e.g., a hangover, blacking out), an individual may experience other alcohol-related consequences *without* having consumed alcohol (e.g., injury sustained as a passenger in a car where the driver was intoxicated). Moreover, some individuals may be at greater risk for experiencing certain alcohol-related consequences due to nonalcohol factors (e.g., alcohol contributes to perpetration of sexual assault, and women are more likely than men to be targets of sexual assault [Cantor et al., 2020]). Consistent with this, there is substantial variability in alcohol-related consequences among college student samples that is *not* explained by the quantity or frequency of personal alcohol consumption (>77%; Prince et al., 2018), highlighting the importance of examining the association between social anxiety and these two alcohol outcomes separately.

Experiential Avoidance as a Potential Moderator of the Associations between Social Anxiety and Alcohol Outcomes

Although various theoretical accounts for the association between social anxiety and negative alcohol-related consequences have been proposed (e.g., Buckner et al., 2013; 2021) and the affect regulation model (i.e., drinking to cope) as a theory for the relation between social anxiety and alcohol use has been partially supported (e.g., Thomas et al., 2003), more research is needed to elucidate the nuances of the social anxiety–alcohol relationship. For instance, an investigation among a sample of young adult college students found that the association between social anxiety and alcohol-related consequences was significant for participants with lower (but not higher) levels of resistance to peer influence (Villarosa et al., 2016). Likewise, there is evidence to suggest that the association between social anxiety and alcohol use may be moderated by individual difference variables such as sex assigned at birth (Norberg et al., 2011) and self-efficacy for controlling drinking behavior (Pocuca et al., 2020). However, relatively few studies to date have examined potential moderators of the associations between social anxiety and alcohol outcomes and only one has explored the potential moderating effect of experiential avoidance (Feingold & Zerach, 2021), despite its strong theoretical relevance.

Experiential avoidance refers to an unwillingness to remain in contact with aversive private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioral predispositions) and subsequent attempts to escape, avoid, or modify the experiencing of these events (Hayes et al., 1996). According to *Relational Frame Theory* (Barnes-Holmes et al., 2001), the bidirectional and evaluative nature of human language necessarily expands the range and frequency of cues that can create discomfort. For example, one might learn to associate certain memories, thoughts, images, sensations, or any other number of cues with a negative self-

evaluation and encountering one of these cues at any given moment may trigger distress (e.g., social anxiety). Because these cues are so often internal and, therefore, unable to be avoided situationally, Hayes (2004) asserts that humans instinctually begin trying to avoid aversive thoughts and feelings themselves (Hayes et al., 1996). Attempts to avoid aversive private experiences lead to a paradoxical increase in their occurrence as the underlying relational frame is strengthened (i.e., the thought "don't think of x" becomes a cue for "x" and its psychological sequelae).

This normative human response to distress (Hayes et al., 2006) has been largely conceptualized as a trait-like construct that tends to remain stable across time and different contexts (Kirk et al., 2021; Spinhoven et al., 2014). Individuals who, by disposition, are high in experiential avoidance possess decreased contact with their private experience and, thereby, have reduced access to personal data necessary for informing subsequent adaptive behavior change (Hayes & Gifford, 1997). In this way, experiential avoidance may be understood as a risk factor for the exacerbation of wide-ranging psychological and behavioral problems (Boulanger et al., 2010), a view which is supported by a growing body of empirical work. For example, positive associations have been demonstrated to exist between experiential avoidance and elevated social anxiety (Broman-Fulks et al., 2021), alcohol-related consequences (Levin et al., 2012; Shorey et al., 2017), and alcohol use (Kingston et al., 2010; Luoma et al., 2020). Further, experiential avoidance has been demonstrated to moderate the relationship between various dispositional risk factors (e.g., anxiety sensitivity, motivational sensitivity) and negative psychological outcomes (e.g., Bardeen et al., 2013, Williams et al., 2019), including alcohol-related consequences (Feingold & Zerach, 2021).

An individual high in both social anxiety and experiential avoidance may fail to attend to important internal cues (e.g., discontent engaging with a particular person or environment, fear of entering a vehicle with an intoxicated driver) and subsequently fail to adjust their behavior (e.g., by declining an invitation, by vocalizing concern and seeking alternative transportation). As a result, one might experience increased negative alcohol-related consequences (e.g., feelings of regret, guilt, or embarrassment, incurring injury), regardless of their personal level of alcohol consumption, and, due to experiential avoidance of such consequences, fail to appropriately modify their response to similar situations in the future (Hayes & Gifford, 1997) such that a pattern of alcohol-related consequences emerges over time.

Experiential avoidance may also moderate the association between social anxiety and alcohol use. Theoretically, experiential avoidance represents a trait-based manner of responding to one's internal experience that may serve to exacerbate maladaptive behavioral responses to distress (Hayes et al., 2006). It is possible that someone who is high in both social anxiety and trait experiential avoidance may be more likely to engage in heavy episodic drinking in response to socially anxious discomfort as compared a peer who is lower in trait experiential avoidance. However, this association remains to be demonstrated empirically.

The Current Study

Despite theoretically and empirically demonstrated links between alcohol-related consequences, alcohol use, social anxiety, and experiential avoidance, no known studies to date have explored the relationship among these variables. Moreover, the emphasis in the extant literature on clinical populations (i.e., individuals with diagnosed SAD and AUD) limits our understanding about how social anxiety (i.e., elevated levels, with or without a known diagnosis) may influence alcohol use outcomes (e.g., alcohol-related consequences and frequency of heavy

episodic drinking) among *all* college students, which is an important question given the ubiquity of self-reported social anxiety among college students (e.g., 55% report moderate or high levels of social anxiety [Nordstrom et al., 2014] versus only 6% meeting diagnostic threshold for SAD [Healthy Minds Network, 2019b]). Therefore, the purpose of this study is to enhance understanding of whether and for whom (in terms of trait experiential avoidance) social anxiety is associated with alcohol-related risk (in relation to alcohol consequences and heavy episodic drinking) among young adult college students and help inform preventive intervention efforts to reduce alcohol-related harm across college campuses. Specifically, the following questions will be interrogated through this research:

(1) After controlling for known predictors of alcohol-related consequences (i.e., age, gender identity, racial/ethnic identity, living arrangement, and heavy episodic drinking frequency), what is the association between social anxiety and alcohol-related consequences?

(2) Does the association between social anxiety and alcohol-related consequences vary as a function of trait-level experiential avoidance?

(3) While controlling for known predictors of alcohol consumption (i.e., age, gender identity, racial/ethnic identity, and living arrangement), what is the association between social anxiety and frequency of heavy episodic drinking?

(4) Does the association between social anxiety and frequency of heavy episodic drinking vary as a function of trait-level experiential avoidance?

Consistent with research demonstrating positive associations between social anxiety and alcohol-related consequences (e.g., Buckner et al., 2011; Schneier et al., 2010; Villarosa-Hurlocker & Madson, 2020), I hypothesize that greater levels of social anxiety will be associated with more alcohol-related consequences. Additionally, in light of research indicating experiential

avoidance as a moderator between various risk factors and deleterious psychological outcomes (e.g., Bardeen et al., 2013, Williams et al., 2019) including alcohol-related consequences (Feingold & Zerach, 2021), I hypothesize that experiential avoidance will strengthen the association between social anxiety and alcohol-related consequences. Given mixed findings regarding the link between social anxiety and alcohol use (e.g., Buckner et al., 2011; Lewis et al., 2008; Neighbors et al., 2007), the last two research questions are considered exploratory.

CHAPTER II

METHOD

Data

Data were collected as part of the Healthy Minds Study (HMS; Healthy Minds Network, 2019a), an annual web-based survey examining mental health, service utilization, and related factors among undergraduate and graduate students. The present study utilizes deidentified HMS data that were collected during the 2018-2019 academic year from students across 79 U.S. colleges and universities. As the most recent wave of data collected prior to the onset of the COVID-19 pandemic, the 2018-2019 academic year dataset was selected for utmost external validity (i.e., generalizability to a world where a global pandemic with significant restrictions on social gatherings is not occurring). Refer to the Appendix for a list of participating institutions.

The HMS survey items are grouped into modules. Three of the modules (i.e., demographics, mental health status, and mental health utilization/help-seeking) are standardly included in each administration of the survey. Two distinct versions of the mental health status module were developed, and administration depended upon a school's membership status in the Center for Collegiate Mental Health (CCMH). The CCMH is a "multidisciplinary, member-driven, practice research network" (CCMH, 2023) that collects standardized mental health data from participating colleges on an ongoing basis (i.e., independent from HMS). The CCMH version of the mental health status module utilized measures consistent with extant CCMH efforts. In addition to the three standard modules, schools may choose to administer one or more elective modules that assess other domains (e.g., substance use, mental health climate, financial stress).

Procedures

Participating institutions with > 4,000 students provided researchers with a randomly selected sample of 4,000 currently enrolled students from the student population. At institutions with ≤ 4,000 students, all enrolled students were invited to participate. Students were invited to participate via emails that were timed to avoid the first 2 weeks of the term, the last week of the term, and major holidays, to the extent possible. Each email contained a personalized uniform resource locator (URL) to the Qualtrics survey, to track responses. Non-responders were contacted up to three times by email 2-4 days apart to remind them to complete the survey. Upon clicking a personalized URL, students were presented with an informed consent statement. If students provided consent to the study, they were directed to begin the survey. Participants were invited to skip any questions they would like and informed they could end their participation at any time. To incentivize participation, students who completed the survey were entered into a single random drawing across all participating campuses for one of two $500 prizes or 1 of 10 $100 prizes.

The HMS was approved by the Health Sciences and Behavioral Sciences Institutional Review Board (IRB) at the University of Michigan and covered by a Certificate of Confidentiality from the National Institutes of Health. The current study is a secondary analysis of previously collected, deidentified HMS data. The use of deidentified data with no interaction between investigator and participants does not constitute human subject research and, therefore, this study did not necessitate IRB approval.

Participants

To participate in the HMS study, students had to self-report being age 18 years or older. A total of 62,026 students completed the survey (65.9% self-identified as cisgender women; M_{age}

$_{18\text{-}30}$ [SD] = 23.1 [6.9]). To be included in the present study, individuals had to (a) be between 18-30 years old, as this age range is typically used to define young adulthood (Arnett, 2014; Lee et al., 2018; Tanner-Smith & Lipsey, 2015), and (b) have had the opportunity to complete all measures used to assess variables included in the present analyses (i.e., social anxiety, experiential avoidance, heavy episodic drinking, and alcohol-related consequences), as indicated by completion of at least 1 item in a given scale. This indicator was selected in the absence of a variable in the dataset specifying which modules (and, consequently, which measures) were administered to each participant. A total of 6,031 (9.7%) participants were excluded based on age (i.e., over 30 years old); 33,158 (53.5%) were excluded due to not having had the opportunity to complete the assessment of experiential avoidance; 19,909 (32.1%) were excluded due to not having had the opportunity to complete the social anxiety and alcohol-related consequences measures; and 1,337 (2.1%) were excluded due to not having completed the single-item heavy episodic drinking frequency measure. To ensure a meaningful ordinal scale and data, participants who responded *don't know* on the heavy episodic drinking frequency measure (n = 7) were also excluded.

Thus, the final sample comprised 1,584 respondents (64.5% self-identified as cisgender women; $M_{age\ 18\text{-}30}$ [SD] = 22.1 [3.3]). The majority of the sample reported their racial and ethnic identity as non-Hispanic White (65.9%) and reported living in off-campus, non-university housing (58.7%). See Table 1 for complete demographic information for the final sample. While analyses will focus on self-reported social anxiety and broad alcohol-related consequences, descriptive statistics on lifetime diagnoses of anxiety disorders and substance use disorders are provided in Table 2 to further contextualize the sample.

Table 1. Participant demographics (*N*=1,584).

Variable			
Age	*M*	Median	*SD*
	22.14	21.0	3.28
Gender identity	*n*	%	
Cisgender woman	1021	64.5	
Cisgender man	535	33.8	
Gender non-conforming	16	1.0	
Transgender woman	3	0.2	
Transgender man	3	0.2	
Other/Self-identify	5	0.3	
Racial/ethnic identity	*n*	%	
African American/Black	54	3.4	
American Indian or Alaskan Native	2	0.1	
Asian American/Asian	214	13.5	
Hispanic/Latino/a	80	5.1	
Native Hawaiian or Pacific Islander	0	0.0	
Middle Eastern, Arab, or Arab American	13	0.8	
White	1044	65.9	
Other/Self-identify	14	0.9	
Two or more races	160	10.1	
Living arrangement	*n*	%	
On-campus housing, residence hall	386	24.3	
On-campus housing, apartment	42	2.7	
Fraternity or sorority house	52	3.3	
On- or off-campus co-operative housing	17	1.1	
Off-campus, non-university housing	930	58.7	
With parents or other relatives	134	8.5	
Other	22	1.4	

Note. Percentages for some variables do not total 100% due to missing data. One participant did not report on gender identity, 3 participants did not report on racial/ethnic identity, and 1 participant did not report on living arrangement.

Table 2. Descriptive statistics on the presence of anxiety and substance use disorders (*N*=1,584).

Variable	*n*	%
Any anxiety disorder	427	27.0
Social Anxiety Disorder (SAD)	90	5.7
Generalized Anxiety Disorder	338	21.3
Panic Disorder	64	4.1
Agoraphobia	8	0.5
Specific Phobia	14	0.9
Other	7	0.5
Don't know	55	3.5
None	1073	67.7
Any substance use disorder	14	0.9
Alcohol abuse or other alcohol-related disorder	8	0.5
Other	9	0.6
Don't know	0	0.0
None	1484	93.6

	n	% endorsing SAD who also endorsed an alcohol-related disorder
Both Social Anxiety Disorder and alcohol abuse or other alcohol-related disorder	3	3.3

% endorsing an alcohol-related disorder who also endorsed SAD
37.5

Note. The summed percentage of respondents endorsing lifetime diagnoses of specific anxiety disorders exceeds the percentage of respondents endorsing "any anxiety disorder," because multiple diagnoses could be endorsed (i.e., "select all that apply"). Eighty-four participants did not report on anxiety disorders, and 86 participants did not report on substance use disorders.

Measures

Demographics

Participants were asked to report across a range of demographic characteristics including their age, gender identity, racial and ethnic identity, and living arrangement. All demographic items employed predefined categories and, for gender identity and racial and ethnic identity, an additional open-ended response option in which participants could elect to self-describe. A single item assessed both racial and ethnic identity by asking respondents to "select all that apply" from

the following response options: African American/Black, American Indian/Alaskan native, Asian American/Asian, Hispanic/Latino/a, Native Hawaiian or Pacific Islander, Middle Eastern, Arab, or Arab American, White and Other (please specify). Respondents who endorsed more than one racial or ethnic identity (10.1%) were coded as multiracial (i.e., "two or more races") and, as such, all other racial and ethnic identity groups capture respondents who only endorsed that single identity.

Social Anxiety

Social anxiety was assessed using the abbreviated Counseling Center Assessment of Psychological Symptoms (CCAPS-34; Locke et al., 2012) social anxiety subscale. The CCAPS-34 is a 34-item multidimensional instrument developed to assess college students' distress across eight domains, including social anxiety. The CCAPS-34 has been well-validated among large college student samples (e.g., Sherman et al., 2020) and is widely utilized across university and college counseling centers. Participants indicate how well each statement, such as "I am concerned that other people do not like me" or "I feel uncomfortable around people I don't know," describes them during the past 2 weeks, from 0 (*not at all like me*) to 4 (*extremely like me*). Items on each subscale are averaged, with higher scores indicating greater social anxiety. Data from cases missing responses for 33% or more of the subscale items were not included in creation of the composite score (i.e., the composite score for that case was coded as missing data), consistent with established scoring guidelines for the measure (Locke et al., 2012). Two cut scores indicate three ranges of society anxiety level (low, moderate, and high) that aid interpretation of the continuous scores used in the analyses. Social anxiety subscale scores above 1.4 indicate moderate social anxiety, while subscale scores above 2.5 suggest high social anxiety. While the CCAPS-34 is not a diagnostic tool, the lower subscale cut scores were calculated using

cut off method “C” by Jacobson and Truax (1991), which detects the point at which scores resemble a nonclinical population more than a clinical population. Social anxiety subscale scores in the moderate and high elevation ranges, then, may be interpreted as indicative of potentially clinically significant social anxiety (Youn et al., 2015). Internal consistency of the CCAPS-34 social anxiety subscale in this sample was good (α = .83).

Experiential Avoidance

Trait experiential avoidance was assessed using the 7-item Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011). This unidimensional scale was developed through confirmatory factor analyses in three different samples, including university students and individuals seeking substance use treatment (Bond et al., 2011). The AAQ-II describes everyday experiences of experiential avoidance, such as “I’m afraid of my feelings” or “emotions cause problems in my life.” Respondents are asked to indicate how true each statement is for them on a scale from 1 (*never true*) to 7 (*always true*). Items are summed, with higher scores (above 4) indicating greater experiential avoidance and lower scores (below 4) indicating greater *experiential acceptance* (Bond et al., 2011), or tendency to relate to one’s experience with flexible, non-reactive awareness–the opposite of experiential avoidance. Given that individual items are summed to create a total score and consistent with scoring guidelines for the measure (S. Hayes, personal communication, January 16, 2023), data from cases with missing responses for any of the 7 items were not included in creation of the composite score and were, instead, coded as missing data. The AAQ-II has demonstrated strong psychometric properties across racially and ethnically diverse samples of college students (e.g., Correa-Fernández et al., 2020; Edwards & Vowles, 2020; Flynn et al., 2016), with good test-retest reliability across 3 months (α = .81) and 12 months (α = .79; Bond et al., 2011), indicating temporal stability of the construct.

Fledderus and colleagues (2012) found that the responses to the AAQ-II in a large sample of adults fit a unidimensional item response theory model, providing further support for the use of the AAQ-II as a measure of trait-based experiential avoidance. Internal consistency of the AAQ-II in this sample was excellent ($\alpha = .91$).

Heavy Episodic Drinking

Frequency of heavy episodic drinking was measured using a single item. Participants who identified as a cisgender woman were asked, "Over the past 2 weeks, about how many times did you have 4 or more alcoholic drinks in a row." Participants who identified as a cisgender man were instead asked how many times they consumed "5 or more alcoholic drinks in a row." Finally, participants who identified as a transgender man, transgender woman, genderqueer/gender non-conforming, or elected to self-describe their gender were asked how many times they consumed "4 or 5 or more alcoholic drinks in a row." The item also provided an imprecise (i.e., lacking specification of ounces and percentage of alcohol by volume) definition for one standard drink (i.e., "1 drink is a can of beer, a glass of wine, a wine cooler, a shot of liquor, or a mixed drink."). Ordinal response options were: *0 times* (1), *1 time* (2), *2 times* (3), *3 to 5 times* (4), *6 to 9 times* (5), and *10 or more times* (6). Psychometric information for this measure was not available, so I assessed convergent validity by computing the Pearson product-moment correlation coefficient between the heavy episodic drinking measure and item 3 on the Alcohol Use Disorder Identification Test (AUDIT; Babor et al., 2001), which also assessed frequency of heavy episodic drinking, on the full HMS sample ($N = 62{,}026$). The items were significantly, positively correlated ($r = .74$, $p < .001$), indicating good convergent validity.

Alcohol-related Consequences

The alcohol use subscale of the CCAPS-34 was used to measure alcohol-related consequences, with participants indicating how well each statement describes them "during the past 2 weeks," from 0 (*not at all like me*) to 4 (*extremely like me*). Example items include "I have done something I have regretted because of drinking" and "I drink more than I should." Items on the subscale were averaged into a continuous variable, with higher scores indicating more alcohol-related consequences. Data from cases missing responses from 33% or more of the subscale items were not included in creation of the composite score (i.e., coded as missing data), consistent with established scoring guidelines for the measure (Locke et al., 2012). Standardized CCAPS-34 cut scores offer a reference point for interpreting continuous scores, with alcohol use subscale scores above 0.6 indicating a moderate number of alcohol-related consequences and scores above 1.1 indicating a high number of alcohol-related consequences. Research suggests that individuals scoring above the first cut score may be experiencing clinically significant alcohol-related consequences and would benefit from further assessment (Youn et al., 2015). The CCAPS-34 alcohol use subscale demonstrates a high degree of convergent validity with the AUDIT (Babor et al., 2001; Locke et al., 2012), which is a widely validated screening measure for AUD and alcohol-related consequences. Internal consistency of the CCAPS alcohol use subscale in this sample was good ($\alpha = .82$).

Data Analysis

Covariates

Both frequency of heavy episodic drinking and alcohol-related consequences have been shown to vary as a function of several demographic characteristics among college students. In particular, studies have demonstrated a developmental pattern whereby the prevalence of heavy

episodic drinking and alcohol-related consequences tend to peak in the early 20s and then gradually decrease across adulthood (e.g., Muthén & Muthén, 2000; Patrick et al., 2019; Schulenberg et al., 2021). Gender identity has been shown to covary with alcohol outcomes, as well, such that undergraduate students who identify as cisgender men typically endorse the most frequent heavy episodic drinking of any gender identity group (American College Health Association, 2022). Empirical evidence further suggests that, in comparison to cisgender men, cisgender women and individuals with minoritized gender identities (i.e., transgender women and men and nonbinary individuals) experience disproportionate alcohol-related consequences (e.g., Coulter et al., 2015; Dermody et al., 2022; Patrick et al., 2020).

Literature also points to meaningful associations between racial and ethnic identities and alcohol outcomes. Most data suggests that non-Hispanic White students tend to engage in the most frequent heavy episodic drinking and report the most alcohol-related consequences (Gardner et al., 2020; Healthy Minds Network, 2020; Skidmore et al., 2012). Students living on a college campus (e.g., in a dormitory, with a campus Greek organization) also tend to report more frequent heavy episodic drinking and greater alcohol-related consequences than those living at home (i.e., with their parents; Ham & Hope, 2003; Patrick et al., 2020). Thus, age, gender identity, racial and ethnic identities, and living environment were statistically controlled for across all analyses in the current study. Heavy episodic drinking frequency was also included as a covariate in research questions 1 and 2, considering demonstrated associations between heavy episodic drinking and alcohol-related consequences (Jackson, 2008).

Missing Data

The amount of item-level missing data was evaluated and found to be <2% for all explanatory and response variables. The pattern of missing data was assessed using Little's

(1988) MCAR test and no statistically significant differences were detected between the means of the different missing-value patterns, $\chi^2(230) = 210.64$, $p = .815$, suggesting that data were missing completely at random. Given the minimal levels of missingness (<5%; Buhi et al., 2008), listwise deletion (for complete case analysis) was employed. Listwise deletion does not generally produce biased estimates when data are missing completely at random (Peng et al., 2006) and the large sample size in the current study provides robustness against loss of statistical power that would threaten statistical conclusion validity (McNeish, 2017; Schlomer et al., 2010).

Primary Analyses

All analyses were performed using IBM SPSS Statistics (Version 26) predictive analytics software for Mac OS. My research questions were tested using the Hayes (2018) PROCESS macro in SPSS, which is an ordinary least squares (OLS) regression-based approach that uses bootstrapping to estimate effects. The heavy episodic drinking frequency variable was treated as an approximation of a continuous variable, which is considered appropriate for ordinal variables comprising at least five response options (Norman, 2010; Sullivan & Artino, 2013; Zumbo & Zimmerman, 1993). Use of such response variables in PROCESS macro analyses is therefore tenable, as shown in extant literature (e.g., McCleary et al., 2022; Roush et al., 2017). Though a benefit of bootstrapping procedures is that they can still produce valid inferences for regression analyses when some of the typical assumptions of OLS regression are violated (Hansen et al., 1999), I still ran OLS regression diagnostics in SPSS for planned regression models in advance of conducting the primary analyses.

For both planned regression models, casewise diagnostics detected the presence of 10 potentially significant outliers, as indicated by residuals with absolute values greater than 3. Potential outliers were further investigated by checking for high leverage points (i.e., leverage

values > 0.2; Laerd Statistics, 2015) and highly influential points (i.e., Cook's Distance > 1.0; Laerd Statistics, 2015) and none were detected, indicating the potential outliers in question were not considered likely to bias results and, therefore, all cases were retained. I generated and visually inspected scatterplots of the relationships between each explanatory and response variable pair and scatterplots of the residuals to test for the assumptions of linearity and homoscedasticity, respectively. These assumptions were deemed met for both planned models, as the scatterplots demonstrated approximately linear relationships and no funnel- or fan-shaped systemic patterns on the residual plots were detected (which would have signaled the presence of heteroscedasticity). To characterize the sample and participant responses, all variables were summarized with means and standard deviations. I then computed a series of Pearson product-moment correlation coefficients to identify significant associations between all control, explanatory, and response variables (Cohen, 1988), with correlation coefficients (*r*s) being used as effect sizes to interpret the direction and magnitude of bivariate associations. I found no evidence of collinearity between explanatory variables, as indicated by all *r*s < |0.8| (Berry & Feldman, 1985). However, when constructing the regression models, I requested the PROCESS software to mean-center explanatory variables after performing listwise deletion (Hayes, 2018) to improve interpretability and reduce multicollinearity (Cohen et al., 2014).

For my first planned regression model (i.e., testing research questions 1 and 2), a Durbin-Watson statistic between 1 and 3 indicated that independence of observations was met (Durbin-Watson = 1.83; Field, 2009). The independence of observations assumption was also met for my second planned regression model (i.e., testing research questions 3 and 4; Durbin-Watson = 1.89). In terms of normality, inspection of standardized residual plots revealed slightly positively skewed, non-normally distributed residuals for both planned regression models. Research

suggests that violations of the normality assumption are commonplace and unlikely to influence the validity of statistical inferences in linear regression with large samples (Edgell & Noon, 1984; Hayes, 1996, 2018) and the bootstrapping procedures involved in conditional process modeling further increase robustness against violation of the assumption of normality (Hayes, 2018). Further investigation of normality also revealed acceptable skewness and kurtosis statistics (i.e., all < |1|; Garson, 2012) of the standardized residuals in both models; therefore, I proceeded with the planned analyses.

I employed the Hayes' (2018) PROCESS Model 1 to test each of my research questions. For my first model exploring (1) the association between social anxiety and alcohol-related consequences and (2) whether trait-level experiential avoidance moderates this association (see Figure 1), I entered social anxiety as the explanatory variable, alcohol-related consequences as the response variable, sociodemographic variables (age, gender identity, racial/ethnic identity, and living arrangement) and heavy episodic drinking frequency as covariates, and trait-level experiential avoidance as a moderator. For my second model testing (3) the association between social anxiety and heavy episodic drinking and (4) moderation on this association by experiential avoidance (see Figure 2), heavy episodic drinking frequency was entered as the response variable and omitted as a covariate; all other variables were entered similarly to my first model. Consistent with recommendations by Hayes and Cai (2007), I utilized heteroscedasticity-consistent standard error estimators in both models for optimal robustness against potential violations of homoscedasticity. I employed 95% confidence intervals (CI) to determine the significance of effects (Hayes, 2018).

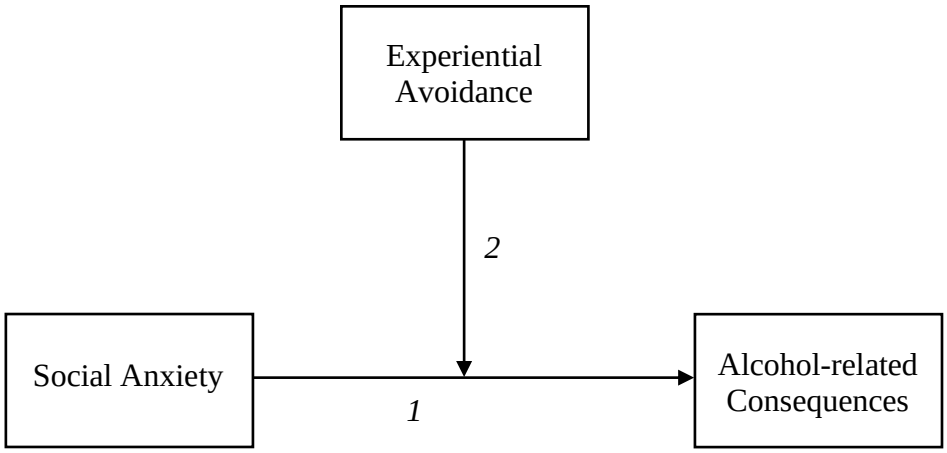

Figure 1. Conceptual model for research questions 1 and 2.

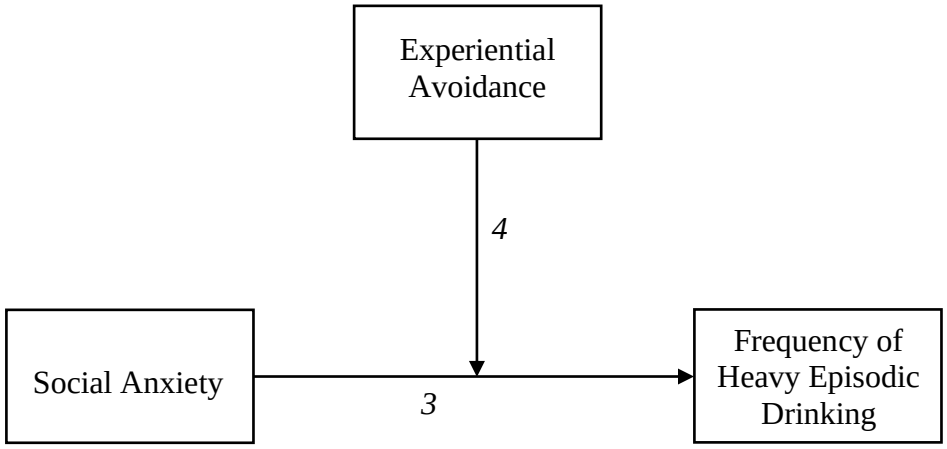

Figure 2. Conceptual model for research questions 3 and 4.

For both models, if the social anxiety x experiential avoidance interaction term was found not to be statistically significant ($p \geq .05$), I examined the direct effect of social anxiety on alcohol-related consequences and heavy episodic drinking frequency, respectively, for statistical significance ($p < .05$), direction (sign of the unstandardized regression coefficient [b]), and

magnitude of the effect (whereby a 1 unit change in social anxiety translates into a change of *b* units in the response variable; Hayes, 2018). Specifically, the unstandardized regression coefficients were interpreted within the context of the relevant scales and their practical meaning to indicate the size of the effect, as recommended by Hayes (2018). Alternatively, if both a significant effect for the interaction term and a significant ΔR^2 for the interaction were present in either model (*p*s < .05), moderation was determined to be occurring (Hayes, 2018). In this case, I interpreted ΔR^2 as a measure of the size of the moderation effects ($0.02 \leq \Delta R^2 < 0.13$ indicating a small effect, $0.13 \leq \Delta R^2 < 0.26$ a medium effect, and $\Delta R^2 \geq 0.26$ a large effect; Cohen, 1988). I then conducted a post-hoc simple slopes analysis using PROCESS to determine if experiential avoidance had an enhancing, buffering, or antagonistic effect on the relationship between social anxiety and the response variable(s) in question.

CHAPTER III

RESULTS

Descriptive Analyses

A total of 54.3% and 19.3% of participants had CCAPS-34 social anxiety scores above 1.4 and 2.5, respectively. Consistent with this, participants had a mean CCAPS-34 social anxiety score of 1.62 (*SD* = 1.00), suggesting moderately elevated levels of social anxiety within the sample. Participants had a mean AAQ-II (experiential avoidance) score of 20.98 (*SD* = 9.20), which is consistent with other samples of college students (Bond et al., 2011; Correa-Fernández et al., 2020) and suggests that the sample was neither exceptionally low nor high in terms of their average level of experiential avoidance. A total of 48.4% and 33.2% of participants had CCAPS-34 alcohol consequences scores above 0.6 and 1.1, respectively, suggesting moderate severity of alcohol-related consequences among the sample. Concordantly, participant means on the CCAPS-34 alcohol use (consequences) subscale and the heavy episodic drinking item were 0.88 (*SD* = 0.94) and 2.19 (*SD* = 1.24), respectively, with the latter corresponding to 1 heavy episodic drinking episode in the past 2 weeks. Social anxiety and heavy episodic drinking frequency were not significantly correlated. While testing for moderation in the absence of a significant linear association between an explanatory and a response variable may seem counterintuitive given assumptions of OLS regression (Laerd, 2015), significant interaction effects under this condition are tenable as demonstrated in literature (e.g., Borders & Hennebry, 2015; Stefan & Cheie, 2022; Weibel et al., 2011). For example, when disordinal moderation occurs, such that different levels of a moderator exert opposite effects on the relationship between two variables (i.e., differential prediction; Carte & Russell, 2003), one might expect to observe a near-zero linear association between the explanatory and response variable (Cohen et al., 2014; Van Iddekinge et al., 2021). I

therefore proceeded with planned moderation analyses. All other explanatory, response, and moderator variable pairs were positively and significantly correlated. Refer to Table 3 for correlations among all measures.

Table 3. Pearson product-moment correlations among measures.

Variable	1	2	3	4	5	6	7
1. Social anxiety							
2. Experiential avoidance	.66**						
3. HED frequency	.02	.06*					
4. Alcohol consequences	.24**	.25**	.56**				
5. Age	-.02	-.07**	-.15**	-.02			
6. Gender	.17**	.15**	-.12**	-.05	-.03		
7. Race/ethnicity	.08**	.02	.09**	.10**	-.05*	.01	
8. Living arrangement	-.03	-.06*	-.04	.01	.50**	-.004	.01

Note. HED = heavy episodic drinking.
*p< .05; **p<.01.

Primary Analyses

Research Questions 1 and 2

The results of my moderation analysis testing (1) whether social anxiety and alcohol-related consequences are significantly associated and (2) whether trait-level experiential avoidance moderates this association are presented in Table 4.

Table 4. Summary of moderation analysis for social anxiety and experiential avoidance regressed on alcohol-related consequences, controlling for demographic variables and alcohol use.

Variable	*b*	*SE*	*t*	*p*	*95% CI [LL, UL]*
Constant	-.521	.162	-3.211	.001	[-.839, -.203]
Social anxiety	.146	.025	5.924	<.001	[.097, .194]
Experiential avoidance	.012	.003	4.347	<.001	[.007, .018]
Social anxiety x experiential avoidance	-.001	.002	-.442	.659	[-.005, .003]
Age	.019	.007	2.819	.005	[.006, .032]
Gender identity	-.033	.029	-1.166	.244	[-.089, .023]
Racial/ethnic identity	.019	.009	2.128	.034	[.002, .037]
Living arrangement	.005	.012	.401	.689	[-.018, .027]
HED frequency	.418	.017	24.821	<.001	[.385, .451]
		R^2	*F*	*p*	
Model summary		.381	109.180	<.001	

Note. Analyses conducted using Davidson-Mackinnon heteroscedasticity-consistent standard error estimators. HED = heavy episodic drinking.

Explanatory variables in this model accounted for 38.1% of the variance in alcohol-related consequences, $F(8, 1559) = 109.18$, $p < .001$. Related to research question 1 and in support of my hypothesis, a significant positive direct effect between social anxiety and alcohol-related consequences was observed. Experiential avoidance was also significantly related to alcohol-related consequences, such that higher levels of trait-level experiential avoidance were associated with higher alcohol-related consequence scores. Related to research question 2 and contrary to my hypothesis that experiential avoidance would strengthen the association between social anxiety and alcohol-related consequences, the interaction of social anxiety and experiential avoidance was nonsignificant.

Research Questions 3 and 4

The results of my moderation analysis testing (3) whether social anxiety and frequency of heavy episodic drinking are significantly associated and (2) whether trait-level experiential

avoidance moderates this association are presented in Table 5.

Table 5. Summary of moderation analysis for social anxiety and experiential avoidance regressed on frequency of heavy episodic drinking, controlling for demographic variables.

Variable	*b*	*SE*	*t*	*p*	*95% CI [LL, UL]*
Constant	3.516	.241	14.612	<.001	[3.044, 3.988]
Social anxiety	-.034	.040	-.853	.394	[-.112, .044]
Experiential avoidance	.011	.005	2.504	.012	[.002, .020]
Social anxiety x experiential avoidance	.004	.004	.977	.329	[-.004, .011]
Age	-.061	.011	-5.822	<.001	[-.082, -.041]
Gender identity	-.260	.056	-4.629	<.001	[-.370, -.150]
Racial/ethnic identity	.054	.015	3.612	<.001	[.025, .083]
Living arrangement	.028	.019	1.474	.141	[-.009, .065]
		R^2	*F*	*p*	
Model summary		.227	11.273	<.001	

Note. Analyses conducted using Davidson-Mackinnon heteroscedasticity-consistent standard error estimators.

The overall model was statistically significant, $R^2 = .227$, $F(7, 1560) = 11.273$, $p < .001$. Related to research question 3 exploring the association between social anxiety and frequency of heavy episodic drinking, no significant direct effect between social anxiety and frequency of heavy episodic drinking was observed. Related to research question 4 assessing whether the association between social anxiety and frequency of heavy episodic drinking varied as a function of trait-level experiential avoidance, while experiential avoidance was significantly related to heavy episodic drinking frequency, the social anxiety x experiential avoidance interaction term was not statistically significant. In other words, the relationship between social anxiety and heavy episodic drinking did not systematically vary as a function of experiential avoidance in this sample.

CHAPTER IV

DISCUSSION

Consistent with hypotheses related to the first research question, social anxiety was significantly and positively associated with alcohol-related consequences. Specifically, for each 1-unit increase in their CCAPS-34 social anxiety subscale score, participants reported an average increase of 0.15 in their CCAPS-34 alcohol use (consequences) subscale score. Given the small range (0-4) of possible scores and the low clinical cutoff scores (with 0.6 and 1.1 indicating a moderate and high number of alcohol-related consequences, respectively) for the alcohol-related consequences measure, this effect size is appreciable. For example, a 0.15 increase above the participant mean in alcohol-related consequences (0.88) translates to a change from a moderate to a high number of consequences, suggestive of an increased likelihood that a respondent is experiencing clinically significant alcohol-related consequences (Youn et al., 2015). Higher levels of experiential avoidance were significantly associated with more alcohol-related consequences, as well. The second hypothesis, which postulated that experiential avoidance would strengthen the association between social anxiety and alcohol-related consequences, was not supported. In regard to the third and fourth exploratory research questions, no significant association between social anxiety and heavy episodic drinking frequency was found and moderation of this relationship by experiential avoidance did not occur. However, higher levels of experiential avoidance were significantly related to more frequent heavy episodic drinking.

The observed positive association between trait social anxiety and alcohol-related consequences corroborates the findings of other researchers investigating this relationship (e.g., Buckner & Heimberg, 2010; Schneier et al., 2010; Villarosa-Hurlocker & Madson, 2020). Findings specifically indicate that elevated levels of social anxiety (i.e., distinct from diagnostic

status) are associated with increased incidence of alcohol-related consequences among a general sample of young adult college students with typical levels of diagnosed SAD and AUD (5.7% and 0.5%, respectively; Healthy Minds Network, 2019b), whereas most extant research emphasizes clinical populations (e.g., Buckner et al., 2008) and/or diagnostic measures (e.g., Buckner & Heimberg, 2010). Moreover, the present study extends prior work by utilizing measures of social anxiety and alcohol-related consequences not previously employed in similar investigations yet widely utilized within college and university counseling centers (CCMH, 2023) as brief assessment instruments. While CCAPS-34 is not a diagnostic tool, it was developed for use with college students (Locke et al., 2012) and has been well-validated among large college samples (Sherman et al., 2020) such that replication of this effect with CCAPS-34 scores increases confidence that the relationship between social anxiety and alcohol-related consequences is clinically meaningful among this population. Moreover, clinicians at sites who administer the CCAPS-34 may heed this association when reviewing the social anxiety and alcohol subscale scores of their clients and use it to inform their work. For example, clinicians may wish to conduct a more thorough assessment for alcohol-related risk in cases where the social anxiety subscale score is elevated and, when both scores show elevation, clinicians may consider possible connections between these presenting concerns in their assessment, conceptualization, and treatment planning.

The lack of a significant association between social anxiety and frequency of heavy episodic drinking in this study concurs with several investigations that have failed to find a significant relationship between social anxiety and different indices of alcohol use (e.g., Buckner et al., 2011; O'Grady et al., 2011). While some research signals the possibility that social anxiety increases risk for a pattern of heavy episodic drinking (Kidorf & Lang, 1999; Ogniewicz et al.,

2019; Terlecki et al., 2020), other studies have found either no significant relationship between heavy episodic drinking frequency and social anxiety (Bernstein, 2014) or a significant negative association (Eggleston et al., 2004). One possibility for these inconsistent findings is that the usual frequency measure utilized by Eggleston et al. (2004) may have led respondents to underestimate actual consumption (Stockwell et al., 2008) such that a negative effect emerged. Conversely, the more recent recall measure used by Bernstein (2014), consonant with the measure used in the present study, may have captured heavy episodic drinking frequency more accurately and thereby failed to demonstrate a significant effect. More research is needed to help clarify whether and how these constructs are related. Specifically, testing the association between social anxiety and heavy episodic drinking frequency using multiple measures and/or definitions of the heavy episodic drinking frequency construct would shed light on the discrepant findings to date.

While findings from the current study cannot be understood as evidence for the absence of a relationship, it could be that socially anxious students' avoidance of social settings, in which most college drinking occurs (Simons et al., 2005), counteracts any increases in alcohol consumption in response to socially anxious distress when they do drink (McGrath et al., 2016), such that no significant relationship between social anxiety and heavy episodic drinking frequency manifests overall. This account is partially supported by evidence that social anxiety is related to less frequent social drinking and more frequent solitary drinking (Buckner & Terlecki, 2016). Solitary drinking, when compared to social drinking, has been shown to predict lower levels of alcohol consumption (Monk et al., 2020) but is more strongly predictive of negative alcohol-related consequences (Creswell, 2021). Social anxiety also appears to be associated with coping and conformity motives to drink (Terlecki & Buckner, 2015), which have been

prospectively linked to greater alcohol-related consequences (Lewis et al., 2008). These findings highlight a range of experientially avoidant behaviors (e.g., drinking alone, forgoing social events, drinking to manage distress or "fit in" with peers) an individual with elevated social anxiety may employ in response to the aversive private experiences comprising social anxiety (Buckner et al., 2021) and which may influence alcohol use and related consequences in distinct, potentially contrasting ways. To better understand these tentative effects, future work should explore whether experiential avoidance moderates the relation between social anxiety and a broader range of specific alcohol use outcomes (e.g., solitary drinking, pre-gaming, peak drinking).

The finding that experiential avoidance was positively associated with both alcohol-related consequences and heavy episodic drinking implies that, regardless of trait-level social anxiety, relating to one's private experiences in an experientially avoidant manner may be associated with increased alcohol-related risk. This corresponds to previous findings suggesting that experiential avoidance increases risk for alcohol use (Luoma et al., 2020) and alcohol-related consequences (Levin et al., 2012). This finding also highlights the potential utility of acceptance-based prevention and intervention approaches (e.g., brief mindfulness-based interventions [Marchetti, 2021]; Acceptance and Commitment Therapy [Hayes, 2004]) to mitigate alcohol-related risk among college students, which is supported by a growing body of empirical work (Osaji et al., 2020; Levin et al., 2014). Consonant with extant research (Broman-Fulks et al., 2021), social anxiety and experiential avoidance were also strongly and positively associated. It is possible that associations between social anxiety, experiential avoidance, and alcohol use and related consequences exist, but not in the manner tested herein. For example, it could be that the picture is more nuanced, with constructs such as social context (Caumiant et al.,

2023; Terlecki et al., 2014) and drinking motives (Buckner et al., 2019; Ham et al., 2009) influencing the posited relationships.

Study Strengths and Limitations

The present study offers numerous strengths, including the use of a large national sample of colleges students, which lends statistical power to detect effects and good generalizability of findings, and measures of experiential avoidance, social anxiety, and alcohol-related consequences that have been well-validated with diverse college samples (Bond et al., 2011; Correa-Fernández et al., 2020; Sherman et al., 2020), which increases confidence in the interpretation of findings. This study was also the first known examination of the relationship between social anxiety and alcohol-related risk as moderated by experiential avoidance, thereby shedding light on novel research questions.

These strengths notwithstanding, it is also important to consider the limitations of this study when interpreting results. The cross-sectional nature of this study precludes the ability to make causal claims about the associations among these variables. Additionally, there was a 16% response rate to the study survey invitation. It is possible there were meaningful differences between survey responders and non-responders such that findings are not representative of the invited student population, thereby threatening the external validity of the findings. Findings must also be considered within the context of the missing data. Specifically, the absence of a variable indicating which measures were administered to each participant prevents examination of any additional respondents who may have had the opportunity to provide data on the study measures, but did not, and how they might differ in meaningful ways from those who did provide data. While partial responses on the social anxiety, experiential avoidance, and alcohol-related consequences measures were minimal (<2%) and estimated to be missing completely at random,

the heavy episodic drinking frequency measure was a single item, such that no information could be gleaned about respondents who may have been administered that item but did not complete it. The sample also comprised predominately non-Hispanic White (65.9%) students and cisgender women (64.4%), further compromising generalizability to the general college student population. This is especially notable since women engage in less frequent heavy episodic drinking than men (Schulenberg et al., 2021), such that their overrepresentation in our sample could have conceivably obscured significant associations between explanatory variables and frequency of heavy episodic drinking. Meaningful associations between explanatory variables and frequency of heavy episodic drinking may have also been hidden as a result of missing data. For instance, if students who engaged in heavy episodic drinking the most frequently were less likely to respond to that measure, associations among heavy episodic drinking frequency and other variables would have been more difficult to detect.

Another limitation is that data were collected from different institutions at different times in the academic year. In light of findings that college drinking varies considerably as a function of time within the academic and calendar year (Goldman et al., 2011; Neighbors et al., 2011; Tremblay et al., 2010), this methodological choice represents a possible threat to internal validity. Survey distributions were timed to avoid the most predictable fluctuations in college drinking (i.e., start and end of the academic terms, major holidays) to help minimize this potential confounding effect; however, the possible effect cannot be entirely discounted. Other variables that have previously been demonstrated to predict college drinking outcomes but that were not available for inclusion in the current study may have decreased the explanatory power of the statistical models tested in this study, as well. For example, alcohol expectancies (i.e., subjective beliefs about how alcohol will impact one's behavior or experience; Goldman et al.,

1999), drinking motives (i.e., reasons individuals endorse for consuming alcohol; Cox & Klinger, 1988), and age of alcohol use initiation have all been shown to predict alcohol-related consequences and alcohol use among college students (Ham & Hope, 2003). These factors could have exerted meaningful effects on the outcome variables that were not accounted for in the current study.

The assessment of heavy episodic drinking frequency represents an additional limitation of this study. Participants were provided a standard drink definition that lacked necessary specificity (e.g., number of fluid ounces, exact alcohol by volume) for consistent and accurate interpretation of the question. In light of ubiquitous misperceptions of standard alcohol serving sizes among college students and resultant underreporting of alcohol use in the absence of clear standard drink guidelines (Bergen-Cico & Kilmer, 2010), this may have resulted in an inaccurate (most likely under-reported) measurement of heavy episodic drinking frequency. Further, this measure utilized a definition of heavy episodic drinking based on participants' self-reported *gender* identity, which is flawed. Demonstrable *sex*-based differences in gut alcohol dehydrogenase and, consequently, in alcohol metabolism (Chrostek et al., 2003) inform the biological sex-based definitions of heavy episodic drinking that are typically used (see NIAAA, 2015, which links binge drinking criteria directly to blood alcohol concentration). Basing the heavy episodic drinking definition on gender identity, rather than on sex assigned at birth, therefore introduces additional measurement error. It is possible these issues could further help explain the lack of a significant association between social anxiety and heavy episodic drinking frequency in this study. However, replication of this study with a refined heavy episodic drinking frequency measure is needed to determine if this is the case.

Future Directions

Continued exploration of the relationship among the variables tested in this study is warranted. For example, while experiential avoidance was not found to influence the strength of the association between social anxiety and alcohol-related consequences in this sample, it could be that experiential avoidance helps to explain the mechanism through which social anxiety increases alcohol-related consequences. Previous work showing that experiential avoidance mediates the link between various dispositional risk factors (e.g., negative affect, psychological distress) and negative psychological outcomes (e.g., Merwin et al., 2009; Reddy et al., 2006; Shi et al., 2016), including alcohol-related consequences (Levin et al., 2012) lends further credibility to this prospective research question. Future studies employing methodology that allow for testing mediation (e.g., structural equation modeling) are therefore recommended. Research using longitudinal data would also provide valuable insight into these research questions, as researchers could examine causal relationships between social anxiety, experiential avoidance, and alcohol-related consequences and alcohol use. University counseling centers that already utilize the CCAPS-34 as a repeated measure (i.e., to assess treatment outcomes) may be well-positioned to undertake such longitudinal investigations. Longitudinal data collected using ecological momentary assessment (EMA), which captures real-time self-report data, could provide additional benefit through attenuation of recall bias inherent to survey-based assessments like those used in this study. In comparison to other prospective methodologies that also seek to decrease recall bias (e.g., transdermal monitoring, experience sampling), EMA gathers uniquely rich, fine-grained data (Neal et al., 2006) that could shed light on potential moment-to-moment fluctuations, in addition to temporal ordering of effects, among these variables. In regard to measurement, future studies testing the third and fourth questions with refined and multiple

measures of alcohol use, including heavy episodic drinking frequency, are advised. For instance, a single item that provides a precise definition of heavy episodic drinking and bases the definition of heavy episodic drinking on sex assigned at birth (e.g., NIAAA, 2015) may increase confidence in the present findings. An added measure such as a timeline follow-back assessment (TLFB; Sobell & Sobell, 1992), in which respondents provide retrospective estimates of their daily drinking over a specified time period in a calendar format and from which frequency of heavy episodic drinking can be determined, could help provide converging evidence. The use of a visual timeframe and contextual cues (i.e., memorable events such as birthdays and holidays) in TLFB methods have been shown to aid the accuracy of retrospective recall (Glasner & van der Vaart, 2009; Searles et al., 2000). Assessing drinking via TLFB across a 30-day window, specifically, would offer a representative estimate of participants' typical drinking (Searles et al., 2002; Vakili et al., 2008) without overburdening participants.

In light of this study's non-significant findings for the model exploring social anxiety and heavy episodic drinking frequency and a mixed literature suggestive of a complex relationship between social anxiety and alcohol use (e.g., Buckner & Terlecki, 2016; Villarosa-Hurlocker et al., 2020), future work should examine whether experiential avoidance moderates the relation between social anxiety and a broader range of alcohol use outcomes. Pre-gaming, for example, is a high-risk drinking behavior that has been linked to social anxiety (Buckner et al., 2020) and it is conceivable that an individual high in social anxiety and experiential avoidance might be more likely to engage in pre-gaming (potentially without engaging in heavy episodic drinking; Keough et al., 2016) as compared to a peer who is more experientially acceptant. This would need to be tested empirically, however. The etiological complexity of high-risk alcohol use (MacKillop & Ray, 2018) also underscores the importance of incorporating other variables demonstrated to

influence alcohol-related consequences and alcohol use among colleges students (e.g., drinking motives, age of alcohol use initiation) into future explorations of these variables. Such expansions of the present work might reveal nuances and associations that did not emerge in the current study and aid in the elucidation of the clinical picture between social anxiety, experiential avoidance, and alcohol-related risk. For example, perhaps high (but not low) levels of experiential avoidance exacerbate the positive effect of social anxiety on alcohol-related consequences among individuals who endorse high (but not low) coping motives for alcohol use. Examination of such moderated moderation models is warranted.

It is also important that future studies exploring these associations recruit a more diverse sample of college students than those represented in the current study to ensure that results are generalizable to the heterogenous population of college students across the United States. This is especially critical considering pervasive health disparities, including in alcohol burden, among students with one or more identities marginalized by systems of power (e.g., Fish et al., 2017; Lipson et al., 2019) that result from social and systemic stressors, including experiences of discrimination (Aneshensel, 1992; Livingston, 2017). Despite a consistent trend whereby non-Hispanic White individuals engage in the heaviest drinking (Gardner et al., 2020; Healthy Minds Network, 2020), for example, Black and Latinx individuals report a disproportionately high incidence of social (Mulia et al., 2009; Witbrodt et al., 2014) and health (Witbrodt et al., 2014) alcohol-related consequences relative to White individuals. Research among young adult college students has also found that, despite similar or lower levels of drinking overall, transgender and gender non-conforming individuals are more likely than their cisgender peers to report having experienced alcohol-related blackouts (Tupler et al., 2017), alcohol-related sexual and physical assault (Coulter et al., 2015; Tupler et al., 2017), and suicidal ideation while drinking (Coulter et

al., 2015; Dermody et al., 2022), as well as more frequent heavy episodic drinking occasions (Coulter et al., 2015). Ensuring that college students who hold these and other marginalized identities are better represented in subsequent basic research exploring social anxiety, experiential avoidance, and alcohol-related risk will critically enhance empirical validity of the findings and more equitably inform downstream brief alcohol intervention research (Cronce et al., 2022) and efforts.

Overall, this study suggests the potential for increased risk for alcohol-related consequences, but not necessarily alcohol use, among college students who report higher social anxiety than their peers. Findings help shed light on a mixed literature on social anxiety and alcohol outcomes, and previously unknown associations between social anxiety, experiential avoidance, and alcohol-related risk. Clinically, this study underscores the importance of heeding potential links between social anxiety and alcohol-related consequences in the assessment, case conceptualization, and treatment planning for socially anxious clients. This research also lays groundwork for future investigations by revealing direct links between experiential avoidance and alcohol outcomes but no moderating effects on the social anxiety–alcohol link. Continued research in this area stands to further inform efforts to prevent and alleviate the incidence of alcohol-related harm among socially anxious college students.

APPENDIX: PARTICIPATING INSTITUTIONS IN HMS 2018-2019

Bennington College, VT
Brock University, ON, CA
California Institute of the Arts, CA
Cape Cod Community College, MA
Castleton University, VT
Christian Brothers University, TN
College of William & Mary, VA
Columbia Gorge Community College, OR
Cooper Union, NY
Creighton University, NE
Delta Tau Delta Fraternity
Elon University, NC
Gettysburg College, PA
Green Mountain College, VT
Green River College, WA
Hamilton College, NY
Housatonic Community College, CT
Kenyon College, OH
Landmark College, VT
Langston University, OK
Maryville College, TN
Mercer University, GA
Michigan Technological University, MI
Middlebury College, VT
Montana State University, MT
Montclair State University, NJ
Montgomery County Community College, PA
Northeast Ohio Medical University, OH
Northeast State, TN
Northeastern Junior College, CO
Northwestern University, IL
Norwich University, VT
Oberlin College, OH
Owens Community College, OH
Pellissippi State Community College, TN
Penn State Altoona, PA
Randolph-Macon College, VA
Rider University, NJ
Rollins College, FL
Saint Joseph's University, PA
Saint Michael's College, VT
San Jose City College, CA
Sewanee: The University of the South, TN
St. John's School, TX
Stonehill College, MA
SUNY Erie Community College, NY
Syracuse University, NY
Texas A&M University - Commerce, TX
Texas Tech University Health Sciences Center, TX
Truckee Meadows Community College, NV
Tulsa Community College, OK
University of Dayton, OH
University of Houston, TX
University of Massachusetts - Boston, MA
University of Massachusetts - Lowell, MA
University of Memphis, TN
University of Michigan - Ann Arbor, MI
University of Michigan - Dearborn, MI
University of Nebraska - Lincoln, NE
University of North Carolina School of the Arts, NC
University of Oregon, OR
University of Rhode Island, RI
University of Richmond, VA
University of South Carolina, SC
University of Southern California, CA
University of Tampa, FL
University of Tennessee at Chattanooga, TN
University of Vermont, VT
University of Virginia, VA
University of Wisconsin - Madison, WI
Vermont Technical College, VT
Volunteer State Community College, TN
Wabash College, IN
Washington State University, WA
Western Carolina University, NC
Western Oregon University, OR
Winona State University, MN
Wofford College, SC
Worcester State University, MA

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