Perceived Approval of Risky Drinking in Undergraduate Students: Measurement Development and Testing the Association with Problematic Alcohol Use

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This is to certify that the thesis

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Abstract

Perceived Approval of Risky Drinking in Undergraduate Students: Measurement Development and Testing the Association with Problematic Alcohol Use

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Undergraduate students engage in risky alcohol use; this includes heavy drinking and drinking that leads to problems. The theory of planned behaviour and reasoned action approach identify injunctive norms – perceived approval of drinking behaviour – as central in predicting risky drinking. However, research linking injunctive norms and risky drinking has provided mixed support, thereby contributing to a possible under-utilization of injunctive norms in interventions. The unclear association of injunctive norms and risky drinking may be a result of extensive variability in the operationalization of injunctive norms and the utilization of injunctive norms measures that have poor psychometric properties. The first aim of this research is to improve the measurement of injunctive norms via the development of an injunctive norms measure in undergraduates. The second aim is to utilize this measure to investigate the social anxiety risk pathway to alcohol-related problems in undergraduates. In the first study, using best practices in scale construction, we developed and validated the Perceived Approval of Risky Drinking Inventory (PARDI), which assesses perceived friend, parent, and typical student approval of four risky drinking domains: heavy drinking, drinking-related problems, coping-related drinking, and sexual-risk taking. Psychometric evaluation indicated satisfactory scale score and composite reliability, support for convergent validity, and invariance across gender and drinking status. Utilization of the PARDI may allow researchers to ask more nuanced questions pertaining to undergraduate risky drinking aetiology. In the second study, we investigated the

effect of social anxiety and injunctive norms (perceived friend approval of drinking-related problems) on undergraduate alcohol-related problems. Undergraduates completed assessments of injunctive norms, social anxiety, and alcohol-related problems every four months for one year. Controlling for age and sex, higher participant injunctive norms were positively associated with alcohol-related problems (between-subjects analysis) and when injunctive norms were elevated in comparison to participants' own means, there was a concurrent elevation in alcohol-related problems (within-subjects analysis). Age, but not sex or social anxiety, moderated the within-person association: within-person injunctive norms was more strongly related to alcohol-related problems as age increased, suggesting that injunctive norms exert an increasing influence on risky drinking as students progress through university.

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Contribution of Authors

Chapter 1: General Introduction

The general introduction was written by Sarah Hines and revised by Dr. Roisin O'Connor.

Chapter 2: Development and Validation of the Perceived Approval of Risky Drinking Inventory in Undergraduate Students

Sarah Hines: Conceived and designed the study. Collected data, conducted data analysis, and wrote the chapter.

Alexander Morin: Contributed to data analysis, interpretation of results, and writing of the chapter.

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Jennifer Read: Contributed to data collection and writing of the chapter.

Roisin O'Connor: Conceived and designed the study. Contributed to data analysis, interpretation of results, and writing of the chapter.

Chapter 3: Bridge

The bridge was written by Sarah Hines and revised by Dr. Roisin O'Connor.

Chapter 4: Prospective Evaluation of Injunctive Norms and Social Anxiety in Predicting Undergraduate Alcohol-Related Problems

Sarah Hines: Conceived and designed the study. Collected data, conducted data analysis, and wrote the chapter.

Sean Mackinnon: Contributed to data analysis, interpretation of results, and writing of the chapter.

Roisin O'Connor: Conceived and designed the study. Contributed to data analysis, interpretation of results, and writing of the chapter.

Chapter 5: General Discussion

The general discussion was written by Sarah Hines and revised by Dr. Roisin O'Connor.

Table of Contents

List of Figures

Chapter 1

Chapter 4

List of Tables

Chapter 2

Chapter 4

Chapter 1: General Introduction

Alcohol Use and Problems in Undergraduates

Risky drinking, which includes heavy alcohol use and alcohol use that leads to negative consequences, is a pervasive issue in the undergraduate university culture. In Canada, a third of undergraduate students report binge drinking (i.e., consuming five or more drinks on a single occasion) in the past two weeks (American College Health Association, 2019) and nearly half (44%) report one or more negative consequences related to their drinking in the past year (Adlaf et al., 2005). Patterns of undergraduate drinking are similarly heavy in other countries, with 30-50% of undergraduate students drinking at hazardous or harmful levels in the United States (Hingson et al., 2017; Montauti & Bulmer 2014), Denmark, and England (Cooke et al, 2019). Slightly lower rates (e.g., 15-30%) are reported in South Africa (Nkoana et al., 2016), Germany, Italy, Portugal, and Switzerland (Cooke et al., 2019). The reported negative consequences of drinking range from poor academic outcomes (e.g., missing classes, late assignments, dropping out of school), to injury, physical assault, sexual victimization, legal difficulties, mental and physical health problems, and intentional and unintentional death (Hingson et al., 2017; Howard et al., 2008; Krebs et al., 2009; Tembo et al., 2017; White & Hingson, 2013). While approximately 5% of all deaths are attributed to alcohol misuse (World Health Organization, 2019), among those 20 to 35 years old, alcohol use is attributed as the cause of one in four deaths (Esser et al., 2022). The young adult years are associated with elevated alcohol use and alcohol use disorder (AUD) symptoms in comparison to other life stages (Lee et al, 2018) and young adults in university tend to drink more than their non-student counterparts (Schulenberg et al., 2021). Further, alcohol use in university has been found to predict problems beyond the

university context, including underemployment and addiction post-graduation (Jennison, 2004; Sloan et al., 2011).

Theoretical Models for Alcohol Misuse

Theoretical models of human behaviour, such as the reasoned action approach (RAA; Fishbein & Ajzen, 2011) and its predecessors, the theory of planned behaviour (TPB; Ajzen, 1991, 2002, 2011) and the theory of reasoned action (TRA; Ajzen & Fishbein 1980, Fishbein & Ajzen, 1975), may be useful in understanding risky drinking among undergraduate students. Figure 1 displays a schematic representation of the reasoned action approach with the contributions of the theories of planned behaviour and reasoned action. The TRA and TPB indicate that the most proximal determinant of planned behaviour is the intention to engage in that behaviour. Intention is predicted by extent of one's positive attitude towards the behaviour and extent of one's subjective beliefs that the behaviour is normative, particularly amongst those the individual identifies with. The TPB extends the TRA by proposing that perceived control over one's behaviour also influences intention, and that behavioural control additionally and directly influences behaviour. Subjective norms, attitudes, and perceived behavioural control have been shown to predict intentions to drink and subsequent drinking behaviours (Cooke et al., 2016). The RAA combines the TRA and TPB and expands attitude, subjective norms, and perceived behavioural control to each have two subcomponents. Attitude towards the behaviour include instrumental and experiential aspects, representing cognitive and affective appraisals, respectively. For example, instrumental attitude might refer to the extent an individual believes a behaviour would be harmful or beneficial, whereas experiential attitude might refer to the extent an individual perceives the behaviour will be painful or enjoyable. Subjective norms are differentiated into descriptive norms, representing beliefs regarding how much or how often

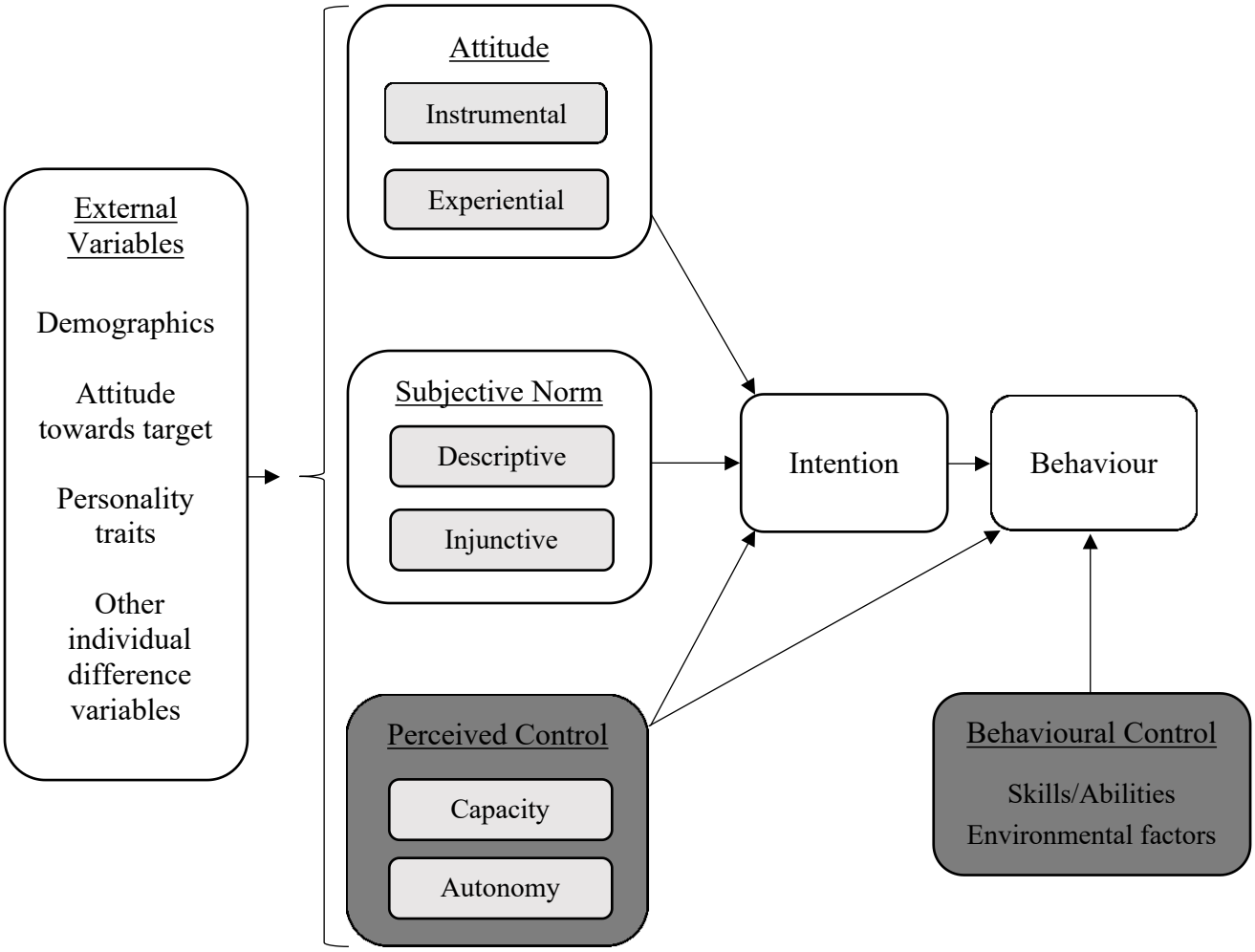

Figure 1. Schematic representation of the Theory of Reasoned Action (in white), the Theory of Planned Behaviour (contributions to TRA in dark grey), and the Reasoned Action Approach (contributions to TRA and TPB in light grey). Adapted from Montano & Kasprzyk (2015).

others engage in a behaviour, and injunctive norms, representing the extent one believes that others are approving or disapproving of a behaviour. Perceived behavioural control is expanded into beliefs regarding one's capacity, or ease or difficulty in performing the behaviour, and beliefs regarding one's autonomy, or control over performance or non-performance of the behaviour (Fishbein & Ajzen, 2011).

Subjective Norms and Risky Drinking

Subjective norms, including descriptive norms and injunctive norms, are a potent predictor of undergraduate drinking (Neighbors et al., 2007). They refer to perceptions of others' behaviour; these perceptions may or may not be consistent with the actual behaviours of others. Undergraduates tend to overestimate the extent that peers engage in and approve of risky drinking and these overestimations are positively associated with individuals' own risky drinking behaviours (Kypri & Langley, 2003; LaBrie et al., 2010; Lewis & Neighbors, 2004; Lewis et al., 2010; Neighbors et al., 2006; Neighbors et al., 2007; Perkins, 2007). As subjective norms have been shown to be modifiable with corrective feedback (Prince & Carey, 2010, Mattern & Neighbors, 2004; Neighbors et al., 2004; Ridout & Campbell, 2014), they present a viable target for interventions aiming to reduce undergraduate risky drinking.

To reduce risky drinking, social norms approach interventions aim to correct overestimations of others' alcohol use (Perkins & Berkowitz, 1986). This method involves the communication of accurate drinking norms, which amongst university students are typically lower than subjective norms. This, in turn, is thought to guide lower alcohol consumption through creating a new subjective norm more consistent with lower drinking practices and approval. Social norms approach interventions range in level of specificity to the target, from social marketing campaigns which provide the same message to all in the intended audience to

personalized normative feedback which provides information tailored to the individual as to the extent that their subjective norms are overestimating drinking behaviours (Lewis & Neighbors, 2006). Personalized feedback approaches typically report larger reductions in weekly alcohol consumption than social marketing campaigns, which is thought to be the result of personalized approaches being more salient to the individual than the broad messaging delivered in social marketing campaigns (Lewis & Neighbors, 2006).

While personalized feedback interventions have demonstrated success in reducing alcohol consumption, the effect on reducing alcohol-related problems is minimal (Dotson et al., 2015). This may be explained by interventions typically focusing on correcting descriptive norm misperceptions, which aim to correct beliefs regarding how much and how often others drink. Indeed, descriptive norms are a strong predictor of one's own quantity and frequency of alcohol use (Larimer et al., 2004; Neighbors et al., 2007). However, descriptive norms are not necessarily as meaningful of a predictor of the experience of alcohol-related problems. Injunctive norms, or a person's perception that others (e.g., their friends or parents) approve of them drinking in heavy and problematic ways, have been demonstrated to be a stronger predictor of the experience of alcohol-related problems than descriptive norms (Buckner et al., 2011; LaBrie et al., 2010; Larimer et al., 2004). Injunctive norms should be especially relevant to predicting behaviour from adolescence through young adulthood as these developmental periods represent a time where peer influence is at its height (e.g., Gardner & Steinberg, 2005; Andrews et al., 2002). Inclusion of injunctive norms into norms-based interventions may improve the capacity of these interventions to reduce problems experienced as a result of drinking.

Injunctive Norms and Risky Drinking

Some empirical studies report a positive association of injunctive norms and risky drinking (LaBrie et al., 2010, Larimer et al., 2004), however, this association is not always supported (Collins & Carey, 2007; Pearson & Hustad, 2014). LaBrie and colleagues (2010) demonstrated that perception of others approval of risky drinking was associated with undergraduate student alcohol-related problems. Similarly, among fraternity and sorority members, perceived acceptability by fellow fraternity or sorority members of drinking behaviours was shown to be associated with alcohol-related problems above and beyond perceived descriptive norms, both concurrently and at a one-year follow up (Larimer et al., 2004). However, other studies have failed to find this association (Collins & Carey, 2007) or have demonstrated a negative association between injunctive norms and drinking outcomes (Pearson & Hustad, 2014). For example, perceptions of how much closest friends or typical students would approve of "drinking to get drunk" failed to predict heavy, episodic drinking in undergraduates (Collins & Carey, 2007). Pearson and Hustad (2014) assessed students mandated to an alcohol intervention program and reported a negative association of perceived college student acceptability of drinking and alcohol use and problems. There is notable variability in how injunctive norms are measured across studies, ranging from single items to multi-question surveys. The mixed findings with respect to the association of injunctive norms and drinking outcomes may be due to a lack of consistency and reliability in the measurement of injunctive norms.

Injunctive Norms Measurement

Baer (1994), interested in the development of subjective drinking norms in first year college students, assessed whether living in a fraternity or sorority, rather than a dormitory or off-campus, was associated with beliefs that other students drink heavily and friends approve of

heavy and problematic drinking. In this study, perceived friend approval was assessed by asking students to report on a 7-point scale the extent they believe that friends approve of drinking every weekend, drinking every day, drinking enough to pass out, and driving a car after drinking. Building on Baer's work, subsequent research utilized these four items as a single measure of injunctive norms, which often demonstrated inadequate (or borderline) internal consistency (Neighbors et al., 2008; Neighbors et al., 2007; Chawla et al., 2007; Lau-Barraco & Linden, 2014). Low internal consistency is problematic as it suggests items are not necessarily measuring a coherent, unified construct. This leads to uncertainty as to what the four Baer (1994) items, subsequently utilized as a measure, are assessing and whether these four items truly capture a comprehensive or unified picture of injunctive norms. Lewis and colleagues (2010) modified the Baer (1994) measure to include an additional 11 items representing less and more severe injunctive drinking norms; this research group provided psychometric support, including strong factor loadings and scale score reliabilities across two subscales (less severe and more severe injunctive norms). While this was an improvement in the measurement of injunctive drinking norms, psychometric properties were only reported for perceptions of approval by same-sex typical students, with no information as to whether the instrument was appropriate for use in other reference groups (e.g., friends, parents). Further, the Lewis and colleagues (2010) 15-item measure has been inconsistently used with studies both adding (Wickham et al., 2023) and dropping (Pedersen et al., 2017; Ward & Guo, 2020) items. Others utilizing this measure have collapsed across the two-factors, using all items as a single scale (Neighbors et al., 2022). Ultimately, the first concern with respect to injunctive norms measurement is that the commonly used measure based on Baer's (1994) four items often exhibits inadequate internal consistency,

indicating that these four items may not be measuring a unified construct, and that extensions of this measure have not been consistently utilized.

A second concern is the variability in how injunctive norms have been operationalized and measured in the literature. While many studies have utilized the Baer (1994) measure or an adaptation to it (Lewis et al., 2010), a sizeable amount of injunctive drinking norms research has been done utilizing one or two study-specific, researcher-created questions (e.g., Tobin et al., 2014; Antin et al., 2014; Collins & Spelman, 2013; LaBrie et al., 2008; Turrisi et al., 2007; Carey et al., 2006; Robinson et al., 2014). For example, in one operationalization of injunctive norms, participants are asked to select one of five responses that they feel best represents the typical attitude among students at their university, ranging from "drinking is never a good thing to do" to "frequently getting drunk is okay if that's what the individual wants to do" (Pearson & Hustad, 2014; Carey et al., 2006). Alternatively, participants rated how much others (e.g., friends, family members) would approve of their drinking until they get drunk in the following month (Collins & Spelman, 2013). LaBrie and colleagues (2008) asked participants to indicate how acceptable they believe others would find becoming intoxicated at a party and missing a class because of a hangover. Others have adapted established alcohol use or related problems questionnaires via incorporating an aspect of perceived approval (DeMartini et al., 2011; Prince et al., 2015). The variability with which injunctive norms are measured in the literature results in the potential for drastically different constructs of *perceived approval of risky drinking* being assessed. This makes it difficult to compare results across studies, ultimately resulting in an unclear picture of the importance of injunctive drinking norms in predicting risky drinking.

A third concern regarding injunctive norms measurement is the utilization of many different reference groups when assessing perceived approval. Researchers often assess

perceived approval for one's friends and one's parents, as well as a "typical student" reference group with varying levels of specificity (e.g., same-sex students, same-race students). More proximal groups (e.g., friends, parents) impart a larger influence on one's own behaviour (LaBrie et al., 2010; Neighbors et al., 2008), however, people tend to be more accurate in estimating how much proximal groups approve of risky drinking behaviours (Baer et al., 1991). As the social norms approach (Perkins & Berkowitz, 1986) aims to correct misperceived norms, a key task for researchers has been to identify those reference groups that are proximal enough to influence one's own behaviour while simultaneously being distal enough for there to be a meaningful misperception of actual approval. This has led to the utilization of typical student reference groups at varying levels of specificity to the individual, however, these groups have not consistently imparted a greater influence on one's own behaviour compared to the more distal "typical students" group (LaBrie et al., 2010). Further, psychometric evaluation of the utilized injunctive norms measure within various reference groups (e.g., friends, parents, typical students) is typically absent.

A fourth concern with respect to measurement of injunctive drinking norms relates to item development. Typically, items are selected via rational methods, whereby researchers use their expertise and knowledge of the relevant literature to identify themes and create items that reflect the underlying construct. While efficient, this strategy may fail to capture aspects of a construct that are relevant but have not previously been investigated or of which the researcher is not aware. Empirical methods of item creation are guided by data collected from the target population of interest. Data collection in this context can take different formats, including questionnaires, individual interviews, and focus groups (Francis et al., 2004). Content is then analyzed such that dominant themes are identified, and associated items generated (Francis et al.,

2004). Researchers should seek maximal correspondence between the items measuring the attitude or belief and the associated behaviour, such as identifying specific and identical targets, actions, contexts, and timeframes, as, under conditions of high correspondence, stronger associations are typically found (Ajzen & Fishbein, 1977).

Rationale for Current Studies

The goal of the present work is to clarify the role of injunctive drinking norms in undergraduate risky drinking. This will be done through survey development and hypothesis testing. Our first aim is to follow best-practice guidelines in survey development to produce a reliable and valid measure of injunctive drinking norms in undergraduate students that is appropriate for use across commonly researched referent groups (i.e., friends, typical students, and parents). Our second aim is to assess the association between perceived friend approval of drinking-related problems and undergraduate risky drinking. Further, we will investigate the social anxiety pathway to risky drinking. Specifically, the association between injunctive norms and alcohol-related problems will be examined within the context of elevated social anxiety.

To meet the first aim, we conducted a three-phase study described in Chapter 2. In phase 1, we engaged the target population (i.e., undergraduate students) in focus groups to guide the creation of the initial injunctive norms items. In phases 2 and 3, we refined the survey and validated the final 20-item, four factor instrument – the Perceived Approval of Risky Drinking Inventory (PARDI) – and demonstrated its invariance across referent group, gender, and drinking status (high and low use and problems). Empirical development and validation of this measure will allow for researchers to use a common, psychometrically supported assessment tool in their research on injunctive drinking norms. Use of a common tool permits cross-study comparisons and thus pushes model development. This will provide for a richer understanding of how

subjective norms in general, and perceived approval in particular, influence drinking behaviour. Ultimately, improved measurement of injunctive norms and the utilization of a common measure across studies will facilitate the advancement of theoretical models of human behaviour.

To meet the second aim, we utilized the PARDI to prospectively investigate the role of social anxiety and perceived friend approval of drinking-related problems in undergraduate alcohol risk. This longitudinal project, described in Chapter 4, follows undergraduates for a year, tracking injunctive norms, social anxiety, and alcohol use behaviours every four months (four total assessments). Multilevel modeling was utilized to assess the association between injunctive norms and alcohol problems at both the between-subjects level (i.e., assessing who is at risk), as well as the within-subjects level (i.e., assessing when individuals are at elevated risk). In addition, cross-level interactions were employed to assess whether within-person association of injunctive norms with alcohol-related problems were affected by social anxiety, age, or gender.

Chapter 2: Development and Validation of the Perceived Approval of Risky Drinking Inventory in Undergraduate Students

Introduction

Risky drinking (i.e., using alcohol heavily and/or in a way that can lead to negative outcomes) is widespread among university and college undergraduate students (White & Hingson, 2013). Over a third of undergraduates report binge drinking (i.e., consuming ≥5 drinks in a single session) and 13% report extreme binge drinking (i.e., consuming ≥10 drinks in a single session) within the past two weeks (Johnston et al., 2015). Heavy drinking is associated with poorer academic performance (e.g., absenteeism, concentration difficulties, not getting assignments done), experiences of physical or sexual victimization, injury, overdose, and death (Hingson et al., 2017; Krebs et al., 2009; Tembo et al., 2017; White & Hingson, 2013). Risky drinking in university can also presage lifelong alcohol-related problems (Jennison, 2004; Sloan et al., 2011). Identifying malleable factors leading to risky drinking in young adulthood is critical to effective interventions.

The reasoned action approach (RAA; Fishbein & Ajzen, 2011) and its predecessor, the theory of planned behavior (TPB; Ajzen, 1991, 2002), provide a framework for understanding intentional behavior and can help identify viable targets for intervention. Together, these theories point to *intention* as the most proximal and potent determinant of behavior. Intention, in turn, is influenced by (1) evaluation of the behavior (i.e., *instrumental and experiential attitudes*), (2) beliefs that one is able to engage in the behavior and that it is under one's control (i.e., *capacity and autonomy*), and (3) perception that others also engage in, or approve of, the behavior (i.e., *descriptive and injunctive norms*). Each of these components (attitudes, perceived control, perceived norms) has been found to predict drinking intentions, which in turn reliably predict

drinking behaviors (Cooke et al., 2016).

Perceived norms represent a potentially important malleable target of intervention. Undergraduates tend to perceive peer risky drinking and associated approval as more normative than it actually is (Kypri & Langley, 2003; Lewis & Neighbors, 2004; Neighbors et al., 2006; Perkins, 2007; Perkins & Berkowitz, 1986). Moreover, this 'over-perception' has been found to predict risky drinking (LaBrie et al., 2010; Lewis et al., 2010; Neighbors et al., 2007). Importantly, perceived norms have been shown to be modifiable with corrective feedback and reductions in perceived prevalence and approval of risky drinking (via corrective feedback) are found to predict decreased risky drinking for the target individual (Bewick et al., 2010; Mattern & Neighbors, 2004; Prince & Carey, 2010; Ridout & Campbell, 2014; Young & Neighbors, 2019).

Perceived norms can refer to beliefs about how much others drink (*descriptive norms*) and about how much others approve of risky drinking (*injunctive norms*). There is a growing body of literature identifying descriptive norms as a strong predictor of the number of drinks individuals consume within a week (Larimer et al., 2004; Neighbors et al., 2007), but as a poor predictor of alcohol-related problems. The social norms approach to intervention (Perkins & Berkowitz, 1986) focuses on changing subjective perceptions of how much others drink (i.e., descriptive norms) through corrective feedback. While these interventions lead to reduced amount of alcohol consumed by students, the impact on decreasing alcohol-related problems is minimal (Dotson et al., 2015; Scott-Sheldon et al., 2014). Some evidence suggests that perceptions about risky drinking approval by others (i.e., injunctive norms) may be more central to prediction of alcohol-related problems (Buckner et al., 2011; LaBrie et al., 2010; Larimer et al., 2004), especially when considering proximal referents, such as friends (Dumas et al., 2019;

Collins & Spelman, 2013; Neighbors et al., 2008). However, injunctive norms are seldom used in interventions (Miller et al., 2013), possibly because the research linking injunctive norms to risky drinking is equivocal (Collins & Carey, 2007; Pearson & Hustad, 2014; Reid & Carey, 2015; Willis et al., 2020). These mixed results may, in part, be due to problems arising from the lack of a psychometrically sound measure of injunctive norms.

Research on injunctive drinking norms emerged with Baer's (1994) four items assessing perceived approval by friends of (1) drinking enough to pass out, (2) drinking every day, (3) drinking every weekend, and (4) driving a car after drinking. In this original work, change in each item over the course of an academic year was evaluated. Perceived approval of drinking frequency (i.e., every day and every weekend) decreased for most students but remained stable for those with Greek-status (i.e., living in a fraternity or sorority). Perceived approval of problem items (i.e., passing out and driving) decreased regardless of residence type (Baer, 1994). In the following years, many studies utilized these four items as a single measure of injunctive norms and reported borderline or inadequate scale score reliability (Chawla et al., 2009; Lau-Barraco & Linden, 2014; Neighbors et al., 2007, 2008). Low reliability suggests that these items may not work well together and that the resulting aggregation incorporates a problematic amount of random measurement error.

Other studies have relied on unique sets of questions to assess injunctive norms (Carey et al., 2006; Collins & Spelman, 2013; LaBrie et al., 2008; Pearson & Hustad, 2014; Robinson et al., 2014; Turrisi et al., 2007; Willis et al., 2020). These idiosyncratic measures were typically limited to one or two questions, thus again failing to properly control for random measurement error and contributing to extensive variability in the operationalization of injunctive norms across studies. Furthermore, it remains unclear whether any of these measures are appropriate to capture

the injunctive norms of different referent groups (e.g., friends, typical students, and parents) and whether they yield scores that are comparable across different groups (e.g., men and women, light and heavy drinkers). The aforementioned inconsistent findings linking injunctive norms to alcohol-related problems may be anchored in poor measurement practices.

The goal of the present study was to create an empirically-developed and psychometrically sound measure of injunctive drinking norms following best practice guidelines in survey development (Nunnally & Bernstein, 1994; Rattray & Jones, 2007). Phase 1 focused on item-generation and involved small focus groups of undergraduates. Phase 2 involved initial testing of items generated in phase 1 for suitability (pilot testing, part A) and relied on exploratory factor analysis (EFA) to remove unnecessary items, refine the scale, and establish a factor structure (scale refinement, part B). Phase 3 involved confirmation of the factor structure established in phase 2, while also assessing score reliability as well as validity in relation to measures of subjective norms, weekly alcohol use, alcohol-related problems, and drinking motives. Generalizability of psychometric properties was assessed through tests of measurement invariance across gender (men and women) and drinking status (high and low levels of alcohol use and related problems). This measure should allow for researchers to use a common psychometrically sound instrument in research on injunctive drinking norms. Accordingly, this measure will support cross-study comparisons, thereby providing improved understanding of the predictive influence of injunctive norms on drinking.

Method

Participants

Undergraduate students were recruited via posters and online announcements in 2016 and 2017 to take part in focus groups exploring alcohol-related beliefs (phase 1) or to participate in

an online questionnaire study (phases 2 and 3). For all phases, consenting participants were first asked to complete a short online screening questionnaire to confirm eligibility (i.e., undergraduate student between 18 and 25 years old, as 18 is the legal drinking age locally). Participation in any previous phase rendered an individual ineligible for subsequent phases. See Table 1 for demographics for each study phase. Across all phases, participants reported between zero and 36 drinks typically consumed in a week, with 24% reporting no alcohol consumed in the past three months. This is consistent with published data on Canadian undergraduate drinking practices (American College Health Association, 2019). Students who endorsed drinking in the past three months consumed 7.16 (*SD*=6.99) drinks per week on average. This too is consistent with published reports on Canadian undergraduate drinking (Adlaf et al., 2005).

Procedure

In phase 1, a graduate student and a research assistant led 90-minute audio-recorded focus group sessions with six groups of four to six participants. Participants first completed consent procedures and background questionnaires (i.e., demographics, alcohol use), before being introduced to the concept of injunctive drinking norms. Potential dimensions of injunctive norms were discussed and participants wrote down items related to the first dimension. The moderators then facilitated a discussion around this first dimension; participants were prompted to consider drinking behaviors that may be influenced by others' approval/disapproval. The same procedure was followed for all dimensions identified. Participants were given the opportunity to add any other items with an anonymous form at the end of the focus group as well as within the next two days via an optional online survey. Participants were compensated $20 or with partial course credit for their time.

Phases 2 and 3 each involved a new sample of undergraduate students. Following

Table 1
Descriptive Information

	Phase 1	Phase 2		Phase 3
		Part A	Part B	
N	31	249	338[1]	875
Age: Mean	21.30	20.76	20.04	20.77
(SD)	(1.49)	(1.59)	(1.79)	(1.845)
Gender (% women)	82%	81%[2]	66.3%[3]	82.9%[4]
Ethnicity				
East Asian, South-East Asian, Pacific Islander	3.2%	16.1%	18.0%	11.0%
Middle Eastern, North African, Central Asian	6.4%	10.8%	4.7%	6.5%
Hispanic or Latino	3.2%	3.2%	2.1%	4.3%
Caucasian or White	61.3%	58.2%	58.3%	61.0%
Black	9.7%	3.2%	6.5%	4.2%
Aboriginal	0.0%	0.0%	0.3%	0.6%
South Asian	6.4%	3.6%	3.0%	4.0%
Other	6.4%	4.8%	7.1%	8.4%
Weekly Drinks: Mean	5.24	5.78	6.13	5.13
(SD)	(4.73)	(7.61)	(7.25)	(6.50)

Note: [1]includes 181 follow-up assessments from participants in part A, with 158 new participants. [2]1.6% of sample identified as non-binary (i.e., any option other than "man/male" or "woman/female"); [3]0.9% of sample identified as non-binary; [4]1.0% of sample identified as non-binary.

screening and consent procedures, those eligible completed a series of online questionnaires assessing demographic information and alcohol use behaviors. Participants were compensated $10 or provided partial course credit for their participation. The study (phases 1, 2, and 3) was approved by the research ethics committee of the first author's institution. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Measures

The *Perceived Approval of Risky Drinking Inventory* (PARDI, see Appendix) was developed for this study to assesses injunctive drinking norms. Across study phases 2 and 3, 64 initial items were reduced to a 20-item measure. Using a 5-point scale (*1=Strongly Disapprove* to *5=Strongly Approve*) participants indicated how much they believed each reference group (friends, typical students at their university, and parents) approved of each risky drinking behavior.

An adapted version of the *Daily Drinking Questionnaire* (Collins et al., 1985) was used to assess alcohol use. Participants reported the typical number of drinks they consumed on each day of the week over the past three months. A sum score was derived which reflected total drinks in a typical week. This is a commonly used measure of alcohol use (Cahalan et al., 1969; Collins et al., 1985; Read & O'Connor, 2006).

The *Young Adult Alcohol Consequences Questionnaire* (YAACQ; Read et al., 2006) was used to assess alcohol-related problems. Participants responded dichotomously (*Yes/No*) to 48 items, indicating whether they had experienced each alcohol-related problem over the past month. Scores are summed with relatively higher values indicating more alcohol-related problems. The YAACQ demonstrates excellent scale score reliability (α=.96 to .98; Read et

al., 2007). In the current samples, YAACQ scale score reliability was excellent (all αs above .91).

The *Injunctive Norms Questionnaire* (INQ, Baer, 1994) was used to provide an additional measure of injunctive drinking norms. Participants responded on a 7-point response scale (*1=Strong Disapproval* to *7=Strong Approval),* indicating the extent to which they believe different reference groups (friends, typical students, parents) approve of drinking alcohol every weekend, drinking alcohol daily, driving a car after drinking alcohol, and drinking enough to pass out. A mean score was derived. Higher scores indicate stronger perceived approval. In the current sample, scale score reliability for friends, typical students, and parents were inadequate to borderline (αs=.67, .75, and .70, respectively).

The *Descriptive Norms Rating Form* (DNRF; Baer, 1991) was used to assess perceptions about others' alcohol use. Participants indicated the number of drinks they believe reference groups (friends, typical students, parents) had on each day of a typical week over the past three months. Sum scores were created reflecting perceived total drinks in a week for each reference group.

The *Modified Drinking Motives Questionnaire-Revised* (MDMQ-R; Cooper, 1994; Grant et al., 2007) was used to assess motives for drinking alcohol across five subscales (28 items total): coping with anxiety, coping with depression, enhancement, social, and conformity. Participants indicated how often their drinking is motivated by each reason on a 5-point scale (*1=Almost never/never* to *5=Almost always/always).* Mean subscale scores were derived, where relatively higher scores indicated more frequent drinking due to that motive. Scores on the MDMQ-R demonstrate adequate to excellent scale score reliability with Cronbach's α ranging from .76 (social) to .92 (coping-depression; Goldstein et al., 2010). Scale score reliability in the

current sample was excellent with Cronbach's α ranging from .84 (coping-anxiety) to .95 (coping-depression).

Data Analytic Procedures

Phase 1 analysis began with timely transcription and coding of information generated by focus groups, allowing for data collection to continue until information became redundant (i.e., sampling to redundancy; Bernard, 2011); this was achieved after six focus groups. Template analysis guided the analytic methods in phase 1. This permitted organization and analysis of textual data using a clear, systematic, and flexible approach (Brooks et al., 2015; King, 2004). A template of codes identifying unique concepts was created using Dedoose (2021) software and a directed content analytic approach (Hsieh & Shannon, 2005). The template, consisting of unique codes, was applied to the transcripts to evaluate the number of times each code was identified by focus group participants. Conceptually related codes were clustered and guided creation of the set of preliminary items.

Statistical analyses in phase 2 were completed in two parts. Part A involved pilot testing the initial items selected in phase 1. Problematic items, such as those with low endorsement variability (i.e., ceiling or floor effects), or that were either redundant or unrelated to the other items (e.g., Nunnally & Bernstein, 1994; Tay & Jebb, 2017) were identified and removed. Review of the remaining items and consultation with experts, literature, and the dominant focus group themes informed item retention decisions. Part B focused on identifying a structurally sound measure using EFA. To maximize the distinctiveness of the factors, we relied on a goemin rotation procedure with an epsilon value of .5 (Morin et al., 2013). Separate solutions were estimated for each reference group (friends, typical students, parents). The optimal number of factors was determined by conducting a parallel analysis (using 1000 random samples) and by

considering model fit indicators (Finch, 2020). Initial solutions were estimated using the full set of items retained at the end of part B. This led to selection of a reduced set of optimal items, as characterized by strong factor loadings (minimally higher than .40), negligible cross-loadings (minimally lower than .30), and similar performance across reference groups.

Phase 3 focused on confirming the factor structure with a new sample. This was done using confirmatory factor analyses (CFA; Kline, 2016) and tests of measurement invariance and convergent validity. Our reliance on CFA allowed us to test the utility of incorporating *a priori* correlated uniquenesses between two pairs of adjacent items with similar content (i.e., parallel wording), as recommended by Marsh et al. (2013): (a) Items 14 (*You drinking to help you forget about your problems*) and 15 (*You drinking to forget your worries*); (b) Items 5 (*You passing out as a result of drinking*…) and 6 (*You blacking out as a result of drinking*…). After testing the factor structure identified in phase 2 separately for each referent group, we then tested the measurement invariance (or equivalence; Millsap, 2011) of this factor structure across all three referent groups (configural invariance of the model, weak invariance of the loadings, strong invariance of the intercepts, strict invariance of the uniquenesses, invariance of the correlated uniquenesses, invariance of the latent variances and covariances, and invariance of the latent means). These tests were realized using a repeated measures approach (with the referent group treated as the repeated measures), while incorporating *a priori* correlated uniquenesses to account for the matching items used across informants, to avoid converging on inflated estimates of correlations (Marsh, 2007). We also tested the invariance of this factor structure as a function of drinking status (use and problems) and gender. Whereas the first three steps (configural, weak, and strong invariance) test for measurement biases (different construct definition), the next two steps (strict and correlated uniquenesses) test the presence of differences in precision (i.e.,

reliability), whereas the last two steps are about theoretically relevant differences (e.g., Millsap, 2011). Convergent validity was assessed via the estimation of correlations between our factors and scores on the convergent measures.

In phase 2/part B and phase 3, analyses were conducted in Mplus 8.5 (Muthén & Muthén, 2020) using maximum likelihood estimator robust to non-normality (MLR) and full information maximum likelihood (FIML; Enders, 2010) to handle the few missing responses (phase 2/part B: 1.77% to 4.13%; *M*=2.32%; phase 3: 0.29% to 1.06%; *M*=0.70%). Given known oversensitivity of chi-square to minor misspecification, sample size, and omitted variables, we relied on sample-size independent fit indices to assess model fit (Hu & Bentler, 1999; Marsh et al., 2005). Values ≥.900 and .950 on the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), and ≤.08 and .06 on the Root Mean Square Error of Approximation (RMSEA) indicate adequate and excellent fit. For tests of invariance, decreases in CFI and TLI ≤.010 and increases in RMSEA ≤.015 between one model and the previous one support the most invariant model (Chen, 2007).

Results

Phase 1 (Item Generation)

Overall, 228 unique codes, representing conceptually distinct drinking-related behaviors, were created from 1,232 units of information. Clustering codes according to thematic similarity resulted in the creation of 54 representative items (see Section S1 of the online supplements). Codes associated with a low endorsement and no conceptual overlap with other codes were not used to generate the initial items (see Section S2 of the online supplements). It was decided to include “your friends,” “typical students at your university” and “your parents” as referent groups given the well documented relevance of these groups in relation to young adult drinking (LaBrie et al., 2010; Neighbors et al., 2008). Also, these were by far the most often discussed

referent groups by participants, with other potential referent groups (e.g., significant others, supervisors) rarely acknowledged.

Phase 2 (Scale Refinement)

The summary of item removal can be found in section S3 of the online supplements. In part A/pilot testing, twelve items were trimmed from the initial 54 items, including seven items with low endorsement variability (>70% responses at one extreme in one reference group and >60% in a second reference group), four items with low correlations with other variables (r<.30 with >75% of items), and one redundant item (r>.60 with six other items). In part B/scale refinement, ten items related to coping motivated drinking, drawn from the MDMQ-R (Cooper, 1994; Grant et al., 2007), were added to the 42 remaining items to improve coverage of this domain (these items are presented in Section S4 of the online supplements). Thirteen of these 52 items exhibited redundancy (rs>.60) or low item endorsement variability (>50% of responses at an extreme) and were removed from further analyses. The model fit and the parallel analyses supported a four-factor solution for all three reference groups. The results revealed five items with low factor loadings and 14 items with problematic cross-loading which were also removed from the analysis. In the final four factor solutions, derived from the 20 remaining items, all items loaded on their respective factors with satisfactory factor loadings (λ=.415 to .905; M=.711) and no problematic cross-loadings. All factors (Heavy Drinking, Drinking-Related Problems, Coping-Related Drinking, and Sexual-Risk Taking) were highly reliable (ω=.811 to .955, M=.893; α=.848 to .957, M=.909). Parameter estimates are reported in Table 2 and model fit is reported in Table 3.

Phase 3 (Scale Validation)

Measurement Models. The fit of the alternative CFA solutions is reported in Table 3

Table 2

Standardized Factor Loadings (λ), Uniquenesses (δ), Correlations (r) and Reliability from the Exploratory Factor Analyses

	Friends					Students					Parents				
Item	F1 λ	F2 λ	F3 λ	F4 λ	δ	F1 λ	F2 λ	F3 λ	F4 λ	δ	F1 λ	F2 λ	F3 λ	F4 λ	δ
1. Binge drinking	**.704**	.124	-.033	.096	.411	**.774**	.122	.011	.009	.324	**.475**	.290	.088	.169	.382
2. Drinking games	**.847**	.003	.040	-.026	.270	**.905**	-.039	.042	.015	.170	**.815**	.100	.005	-.039	.290
3. Mixing drinks	**.543**	.160	.065	.155	.524	**.637**	.202	.030	.090	.420	**.608**	.162	.150	.069	.362
4. Pre-drinking	**.825**	.039	-.004	-.066	.316	**.796**	.075	.048	-.003	.300	**.855**	-.035	.061	.065	.199
5. Passing out	-.054	**.719**	.015	.155	.370	.026	**.765**	.017	.098	.312	.055	**.741**	.006	.207	.185
6. Blacking out	.047	**.856**	-.011	.017	.233	.068	**.762**	-.008	.086	.319	.047	**.722**	.029	.193	.223
7. Vomit	.082	**.575**	.084	.131	.500	.005	**.667**	.146	.147	.345	.118	**.622**	.087	.151	.334
8. Inappropriate	.091	**.519**	.018	.218	.526	.046	**.586**	.023	.238	.432	.080	**.674**	.137	.153	.229
9. Can't limit	.092	**.415**	.126	.230	.581	.100	**.566**	.073	.187	.453	.059	**.611**	.121	.217	.284
10. Sex	.118	.172	.010	**.691**	.324	.076	.071	.058	**.755**	.310	.094	.115	.053	**.784**	.157
11. Less protection	-.041	.036	.041	**.862**	.217	-.015	.104	-.017	**.852**	.193	.006	.095	.022	**.895**	.066
12. Risky situation	-.024	.058	-.039	**.823**	.296	-.024	.056	.005	**.869**	.200	.027	.102	.040	**.867**	.081
13. To get drunk	**.663**	.072	.130	.135	.400	**.650**	.052	.170	.112	.396	**.683**	.017	.081	.153	.366
14. To forget problems	.143	.121	**.667**	.062	.382	.282	.070	**.592**	.116	.346	.208	.097	**.624**	.160	.234
15. To forget worries	.137	.107	**.769**	.021	.259	.142	.095	**.758**	.026	.260	.111	.173	**.732**	.062	.178
16. Depressed	-.058	.050	**.863**	.132	.172	.010	.078	**.773**	.164	.235	.015	.190	**.732**	.172	.130
17. Nervous	.201	.131	**.696**	-.008	.325	.194	.091	**.732**	.049	.244	.250	-.028	**.704**	.100	.226
18. Hopeless	-.037	.064	**.825**	.132	.221	-.045	.095	**.767**	.183	.247	.039	.162	**.655**	.234	.199
19. Reduce anxiety	.134	.073	**.721**	.026	.361	.092	.093	**.785**	.024	.255	.203	.047	**.707**	.083	.228
20. Physical tension	.052	.107	**.473**	.242	.573	.073	.107	**.511**	.193	.537	.136	.178	**.583**	.107	.346
Correlations	F1	F2	F3	F4		F1	F2	F3	F4		F1	F2	F3	F4	
F1															
F2	.291*					.278*					.341*				
F3	.243*	.293*				.323*	.301*				.437*	.403*			
F4	.155*	.468*	.251*			.165*	.477*	.313*			.319*	.589*	.415*		
Reliability															
α	.878	.848	.925	.876		.907	.889	.938	.903		.898	.932	.957	.955	
ω	.870	.811	.916	.871		.898	.857	.919	.897		.881	.900	.936	.955	

Note. * $p < .001$; F1 = Heavy drinking; F2 = Drinking-related problems; F3 = Coping-motivated drinking; F4 = Sexual-risk taking; Main factor loadings are marked in bold; α = Cronbach alpha coefficient of scale score reliability; ω = McDonald (1970) omega coefficient of composite reliability.

Table 3

Model Fit of the Alternative Measurement Models

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI
Phase 2 Part B: Main Models					
Friends: Exploratory Factor Analysis	257.738 (116)*	.957	.929	.060	[.050; .070]
Students: Exploratory Factor Analysis	194.290 (116)*	.978	.973	.045	[.034; .056]
Parents: Exploratory Factor Analysis	214.383 (116)*	.967	.946	.050	[.040; .061]
Part 3: Main Models					
Friends: Confirmatory Factor Analysis	816.600 (164)*	.921	.909	.067	[.063; .072]
Students: Confirmatory Factor Analysis	702.447 (164)*	.943	.934	.061	[.057; .066]
Parents: Confirmatory Factor Analysis	530.640 (164)*	.921	.909	.051	[.046; .056]
Part 3: Main Models with A Priori Correlated Uniquenesses					
Friends: Confirmatory Factor Analysis	601.813(162)*	.947	.938	.056	[.051; .060]
Students: Confirmatory Factor Analysis	592.339(162)*	.955	.947	.055	[.051; .060]
Parents: Confirmatory Factor Analysis	460.542(162)*	.936	.925	.046	[.041; .051]

Note. * $p < .01$; χ^2: Scaled chi-square test of exact fit; *df*: Degrees of freedom; CFI: Comparative fit index; TLI: Tucker-Lewis index; RMSEA: Root mean square error of approximation; 90% CI: 90% confidence interval.

and revealed that all solutions had acceptable fit to the data, although solutions incorporating *a priori* correlated uniquenesses resulted in a substantially higher level of fit (ΔCFI=+.012 to +.026; ΔTLI=+.013 to +.029; ΔRMSEA=-.005 to -.011) and substantively identical parameter estimates. These models were thus retained for interpretation and further analyses. The parameter estimates from these models are reported in Table 4 and revealed factors that were well-defined in terms of factor loadings (λ=.625 to .869; *M*=.790), reliable (ω=.819 to .940, *M*=.885; α=.817 to .941, *M*=.887), and moderately to highly correlated (*r*=.287 to .883, *M*=.526), although clearly distinct. The highest correlation was systematically found between Drinking-Related Problems and Sexual-Risk Taking (*r*=.632 to .886), while the weakest was between Heavy Drinking and Sexual-Risk Taking (*r*=.287 to .399).

Measurement Invariance. The results from the tests of measurement invariance are reported in Table 5. Across all of these tests, the configural model resulted in an acceptable level of fit to the data, consistent with its applicability to all referent groups and groups of participants. Likewise, the weak and strong invariance of this model was supported for all comparisons, consistent with the lack of measurement biases. Although the invariance of the correlated uniquenesses was also supported across all comparisons, the strict invariance of the model was not supported in three of the comparisons involving (a) ratings across referent groups, (b) ratings about friends approval across groups of participants with high or low levels of alcohol-related problems, and (c) ratings about parents approval across groups of participants with high or low levels of alcohol-related problems. For all three comparisons, examination of the parameter estimates associated with the previous model of strong invariance and of the modification indices associated with the failed models of strict invariance revealed that the lack of invariance was limited to only a subset of uniquenesses. Once equality constraints were relaxed on these specific

Table 4

Standardized Factor Loadings (λ), Uniquenesses (δ), Correlations (r) and Reliability from the Confirmatory Factor Analyses

	Friends					Students					Parents				
Item	F1 λ	F2 λ	F3 λ	F4 λ	δ	F1 λ	F2 λ	F3 λ	F4 λ	δ	F1 λ	F2 λ	F3 λ	F4 λ	δ
1. Binge drinking	**.769**				.408	**.780**				.391	**.625**				.610
2. Drinking games	**.855**				.269	**.862**				.257	**.790**				.377
3. Mixing drinks	**.715**				.489	**.775**				.399	**.682**				.535
4. Pre-drinking	**.859**				.262	**.863**				.255	**.799**				.362
5. Passing out		**.712**			.493		**.780**			.392		**.813**			.339
6. Blacking out		**.757**			.428		**.803**			.355		**.843**			.289
7. Vomit		**.728**			.469		**.784**			.386		**.768**			.410
8. Inappropriate		**.669**			.553		**.714**			.491		**.774**			.402
9. Can't limit		**.710**			.496		**.739**			.454		**.731**			.466
10. Sex				**.806**	.350				**.811**	.343				**.822**	.324
11. Less protection				**.774**	.401				**.869**	.245				**.839**	.297
12. Risky situation				**.746**	.444				**.807**	.348				**.858**	.263
13. To get drunk	**.800**				.360	**.770**				.407	**.733**				.463
14. To forget problems			**.776**		.398			**.807**		.348			**.776**		.398
15. To forget worries			**.834**		.304			**.865**		.252			**.840**		.295
16. Depressed			**.826**		.317			**.858**		.264			**.820**		.327
17. Nervous			**.856**		.267			**.857**		.266			**.823**		.323
18. Hopeless			**.794**		.370			**.827**		.317			**.839**		.297
19. Reduce anxiety			**.840**		.294			**.861**		.259			**.814**		.337
20. Physical tension			**.703**		.506			**.746**		.444			**.730**		.468
Correlations	F1	F2	F3	F4		F1	F2	F3	F4		F1	F2	F3	F4	
F1															
F2	.465*					.530*					.471*				
F3	.486*	.494*				.574*	.586*				.542*	.619*			
F4	.287*	.632*	.367*			.399*	.666*	.544*			.343*	.883*	.572*		
Reliability															
α	.898	.850	.930	.817		.903	.882	.941	.886		.845	.887	.926	.877	
ω	.899	.840	.928	.819		.906	.875	.940	.869		.849	.890	.929	.878	

Note. * $p < .001$; F1 = Heavy drinking; F2 = Drinking-related problems; F3 = Coping-motivated drinking; F4 = Sexual-risk taking; Main factor loadings are marked in bold; α = Cronbach alpha coefficient of scale score reliability; ω = McDonald (1970) omega coefficient of composite reliability.

Table 5

Tests of Measurement Invariance

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI	CM	$\Delta\chi^2$ (*df*)	ΔCFI	ΔTLI	ΔRMSEA
Invariance Across Referent Group										
M1. Configural invariance	3112.034(1578)*	.951	.946	.033	[.032; .035]	-	-	-	-	-
M2. Weak invariance	3342.597(1610)*	.945	.940	.035	[.033; .037]	M1	193.334 (32)*	-.006	-.006	+.002
M3. Strong invariance	3628.443(1642)*	.937	.932	.037	[.036; .039]	M2	307.937 (32)*	-.008	-.008	+.002
M4. Strict invariance	6315.835(1682)*	.853	.846	.056	[.055; .058]	M3	1094.567 (40)*	-.084	-.086	+.019
M4’ Partial strict invariance	3786.031(1668)*	.933	.929	.038	[.036; .040]	M4	141.656 (26)*	-.004	+.003	+.001
M5. Correl. uniq. invariance	3862.929(1672)*	.931	.927	.039	[.037; .040]	M4’	34.161 (4)*	-.002	-.002	+.001
M6. Variance-covariance invariance	4816.279(1692)*	.901	.896	.046	[.044; .047]	M5	520.895 (20)*	-.030	-.031	+.007
M6’ Partial var.-covar. invariance	4008.010(1686)*	.926	.923	.040	[.038; .041]	M6	125.027 (14)*	+.025	+.027	-.006
M7. Latent means invariance	4996.632(1694)*	.895	.891	.047	[.046; .049]	M6’	1151.434 (8)*	-.031	-.032	+.007
Friends: Invariance Alcohol Use										
M1. Configural invariance	809.244(324)*	.939	.929	.059	[.053; .064]	-	-	-	-	-
M2. Weak invariance	825.744(340)*	.939	.932	.057	[.052; .062]	M1	15.633 (16)	.000	+.003	-.002
M3. Strong invariance	859.341(356)*	.937	.933	.057	[.052; .062]	M2	32.814 (16)*	-.002	+.001	.000
M4. Strict invariance	944.818(376)*	.929	.928	.059	[.054; .063]	M3	74.587 (20)*	-.008	-.005	+.002
M5. Correl. uniq. invariance	946.425(378)*	.929	.928	.059	[.054; .063]	M4	3.509 (2)	.000	.000	.000
M6. Variance-covariance invariance	1015.915(388)*	.921	.923	.061	[.056; .065]	M5	60.864 (10)*	-.008	-.005	+.002
M7. Latent means invariance	1129.965(392)*	.908	.910	.066	[.061; .070]	M6	137.095 (4)*	-.013	-.013	+.005
Friends: Invariance Alcohol-Related Problems										
M1. Configural invariance	791.834(324)*	.941	.931	.057	[.052; .063]	-	-	-	-	-
M2. Weak invariance	822.741(340)*	.939	.932	.057	[.052; .062]	M1	30.346 (16)	-.002	+.001	.000
M3. Strong invariance	866.650(356)*	.936	.931	.057	[.052; .062]	M2	44.729 (16)*	-.003	-.001	.000
M4. Strict invariance	1022.122(376)*	.919	.918	.063	[.058; .067]	M3	121.631 (20)*	-.017	-.013	+.006
M4’ Partial strict invariance	943.840(373)*	.928	.927	.059	[.054; .074]	M4	68.003 (17)*	-.009	-.005	+.002
M5. Correl. uniq. invariance	960.392(375)*	.926	.925	.060	[.055; .064]	M4’	10.162 (2)*	-.002	-.002	+.001
M6. Variance-covariance invariance	1009.527(385)*	.922	.923	.061	[.056; .065]	M5	43.927 (10)*	-.004	-.002	+.001
M7. Latent means invariance	1068.289(389)*	.915	.917	.063	[.059; .068]	M6	141.240 (4)*	-.007	-.006	+.002
Friends: Invariance Gender										
M1. Configural invariance	776.514(324)*	.947	.938	.057	[.052; .062]	-	-	-	-	-
M2. Weak invariance	803.491(340)*	.946	.939	.056	[.051; .061]	M1	23.868 (16)	-.001	+.001	-.001
M3. Strong invariance	846.038(356)*	.943	.939	.056	[.052; .061]	M2	43.203 (16)*	-.003	.000	.000
M4. Strict invariance	911.316(376)*	.937	.937	.057	[.053; .062]	M3	60.890 (20)*	-.006	-.002	+.001
M5. Correl. uniq. invariance	907.956(378)*	.938	.938	.057	[.052; .062]	M4	.016 (2)	+.001	+.001	.000
M6. Variance-covariance invariance	926.992(388)*	.937	.938	.057	[.052; .061]	M5	18.944 (10)	-.001	.000	.000
M7. Latent means invariance	976.328(392)*	.931	.934	.059	[.054; .063]	M6	53.106 (4)*	-.006	-.004	+.002
Students: Invariance Alcohol Use										
M1. Configural invariance	765.310(324)*	.954	.946	.056	[.051; .061]	-	-	-	-	-
M2. Weak invariance	786.283(340)*	.954	.948	.055	[.050; .060]	M1	14.450 (16)	.000	+.002	-.001
M3. Strong invariance	811.979(356)*	.953	.949	.054	[.049; .059]	M2	23.436 (16)	-.001	+.001	-.001
M4. Strict invariance	875.388(376)*	.948	.948	.055	[.050; .060]	M3	58.651 (20)*	-.005	-.001	+.001
M5. Correl. uniq. invariance	878.736(378)*	.948	.948	.055	[.050; .060]	M4	4.074 (2)	.000	.000	.000
M6. Variance-covariance invariance	1000.551(380)*	.947	.948	.055	[.050; .060]	M5	19.542 (10)	-.001	.000	.000
M7. Latent means invariance	938.530(392)*	.943	.945	.057	[.052; .061]	M6	47.345 (4)*	-.004	-.003	+.002

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI	CM	$\Delta\chi^2$ (*df*)	ΔCFI	ΔTLI	ΔRMSEA
Students: Invariance Alcohol-Related Problems										
M1. Configural invariance	820.350(324)*	.949	.940	.059	[.054; .064]	-	-	-	-	-
M2. Weak invariance	839.791(340)*	.948	.942	.058	[.053; .063]	M1	11.200 (16)	-.001	+.002	-.001
M3. Strong invariance	867.554(356)*	.947	.944	.057	[.053; .062]	M2	25.495 (16)	-.001	+.002	-.001
M4. Strict invariance	963.262(376)*	.939	.939	.060	[.055; .065]	M3	82.352 (20)*	-.008	-.005	+.003
M5. Correl. uniq. invariance	971.234(378)*	.939	.938	.060	[.055; .065]	M4	6.430 (2)	.000	-.001	.000
M6. Variance-covariance invariance	994.893(388)*	.937	.939	.060	[.055; .065]	M5	23.634 (10)*	-.002	+.001	.000
M7. Latent means invariance	1027.576(392)*	.934	.936	.061	[.057; .066]	M6	37.560 (4)*	-.003	-.003	+.001
Students: Invariance Gender										
M1. Configural invariance	750.574(324)*	.956	.949	.055	[.050; .061]	-	-	-	-	-
M2. Weak invariance	772.194(340)*	.956	.950	.054	[.049; .059]	M1	14.624 (16)	.000	+.001	-.001
M3. Strong invariance	823.941(356)*	.952	.949	.055	[.050; .060]	M2	55.221 (16)*	-.004	-.001	+.001
M4. Strict invariance	834.951(376)*	.953	.952	.053	[.048; .058]	M3	19.220 (20)	-.001	+.003	-.002
M5. Correl. uniq. invariance	832.177(378)*	.953	.953	.053	[.048; .058]	M4	1.242 (2)	.000	+.001	.000
M6. Variance-covariance invariance	850.881(388)*	.953	.954	.053	[.048; .058]	M5	18.100 (10)	.000	+.001	.000
M7. Latent means invariance	867.214(392)*	.951	.953	.053	[.048; .058]	M6	17.405 (4)*	-.002	-.001	.000
Parents: Invariance Alcohol Use										
M1. Configural invariance	670.499(324)*	.930	.917	.050	[.044; .055]	-	-	-	-	-
M2. Weak invariance	688.903(340)*	.929	.921	.049	[.043; .054]	M1	23.975 (16)	-.001	+.004	-.001
M3. Strong invariance	720.288(356)*	.926	.921	.048	[.043; .054]	M2	30.189 (16)	-.003	.000	-.001
M4. Strict invariance	741.289(376)*	.926	.925	.047	[.042; .052]	M3	32.622 (20)	.000	+.004	-.001
M5. Correl. uniq. invariance	735.502(378)*	.927	.927	.047	[.042; .052]	M4	1.262 (2)	+.001	+.002	.000
M6. Variance-covariance invariance	753.185(388)*	.926	.927	.046	[.042; .051]	M5	18.243 (10)	-.001	.000	-.001
M7. Latent means invariance	777.187(392)*	.922	.924	.048	[.043; .052]	M6	45.261 (4)*	-.004	-.003	+.002
Parents: Invariance Alcohol-Related Problems										
M1. Configural invariance	696.625(324)*	.926	.913	.051	[.046; .057]	-	-	-	-	-
M2. Weak invariance	703.916(340)*	.928	.919	.050	[.044; .055]	M1	16.907 (16)	+.002	+.006	-.001
M3. Strong invariance	735.603(356)*	.924	.919	.049	[.044; .055]	M2	7.517(16)	-.004	.000	-.001
M4. Strict invariance	834.637(376)*	.909	.908	.053	[.048; .058]	M3	110.180 (20)*	-.015	-.011	+.004
M4' Partial strict invariance	776.834(375)*	.920	.919	.050	[.045; .055]	M4	70.266 (19)*	-.004	.000	+.001
M5. Correl. uniq. invariance	781.907(377)*	.919	.919	.050	[.045; .055]	M4'	4.400 (2)	-.001	.000	.000
M6. Variance-covariance invariance	783.272(387)*	.921	.923	.048	[.044; .053]	M5	10.313 (10)	+.002	+.004	-.002
M7. Latent means invariance	802.682(391)*	.918	.920	.049	[.044; .054]	M6	35.810 (4)*	-.003	-.003	+.001
Parents: Invariance Gender										
M1. Configural invariance	732.104(324)*	.924	.911	.054	[.049; .059]	-	-	-	-	-
M2. Weak invariance	752.098(340)*	.923	.914	.053	[.048; .058]	M1	21.475 (16)	-.001	+.003	-.001
M3. Strong invariance	785.777(356)*	.920	.915	.053	[.048; .058]	M2	32.209 (16)*	-.003	+.001	.000
M4. Strict invariance	831.325(376)*	.915	.914	.053	[.048; .058]	M3	44.723 (20)*	-.005	-.001	.000
M5. Correl. uniq. invariance	831.128(378)*	.916	.915	.053	[.048; .058]	M4	2.741 (2)	+.001	+.001	.000
M6. Variance-covariance invariance	902.192(388)*	.904	.906	.056	[.051; .060]	M5	61.628 (10)*	-.012	-.009	+.003
M6' Partial var.-covar. invariance	856.893(387)*	.912	.914	.053	[.048; .058]	M6	25.911 (9)*	-.004	-.001	.000
M7. Latent means invariance	872.285(391)*	.910	.913	.054	[.049; .058]	M6'	22.620 (4)*	-.002	-.001	+.001

Note. * $p < .01$; χ^2: Scaled chi-square test of exact fit; *df*: Degrees of freedom; CFI: Comparative fit index; TLI: Tucker-Lewis index; RMSEA: Root mean square error of approximation; 90% CI: 90% confidence interval; CM: Comparison model; and Δ: Change in fit relative to the CM.

uniquenesses, the resulting model of partial strict invariance was supported. In the first of those comparisons, the model of partial strict invariance revealed a higher level of reliability (i.e., lower uniquenesses) in participant ratings of parents' approval of drinking behaviors, which suggests a greater level of familiarity with views of parents relative to those of friends or of typical students. When groups of participants with high and low levels of alcohol-related problems were compared, the model of partial strict invariance revealed that participants with lower levels of alcohol-related problems provided a slightly more reliable rating of friends' approval of two types of risky sexual behaviors (i.e., using less protection, and exposure to risky sexual situations), and of parents' approval of drinking in inappropriate ways.

The invariance of the latent-variances and covariances was supported for most comparisons, with only two exceptions: (a) ratings across referent groups, and (b) ratings about parents across men and women. For the first of those comparisons, the alternative model of partial invariance of the latent variances and covariances indicated that participant ratings of parents on all four factors displayed less inter-individual variability than ratings of friends or of typical students. These results also revealed higher correlations between participant ratings of factor 1 (Heavy Drinking) and 3 (Coping-Related Drinking), as well as between factors 2 (Drinking-Related Problems) and 4 (Sexual-Risk Taking) for parents than in relation to friends or typical students. For the second of those comparisons, the resulting model of partial invariance of the latent variances and covariances revealed a higher level of inter-individual variability for men, relative to women, on ratings of parents' approval of risky-sexual behaviors. Next, the invariance of the latent means was supported for all comparisons saved for that involving (a) referent groups, and (b) ratings about friends across samples of respondents with high compared to low levels of alcohol use. These results revealed that latent means differences were limited to

ratings about parents, suggesting a lower level of perceived parental approval relative to friends or typical students for all types of drinking-related behaviors (-1.491 SD for Heavy Drinking; -0.834 SD for Drinking-Related Problems; -0.969 SD for Coping-Related Drinking; -0.699 SD for Sexual-Risk Taking). Last, those with a low (relative to high) level of alcohol use reported a lower level of approval among friends for all types of drinking-related behaviors (-0.864 SD for Heavy Drinking; -0.361 SD for Drinking-Related Problems; -0.387 SD for Coping-Related Drinking; -0.400 SD for Sexual-Risk Taking).

Convergent Validity. First, considering participant ratings of each factor across the three referent groups we found that: (a) factor 1 (Heavy Drinking) ratings were more similar between friends and typical students (r=.644), than among parents and friends (r=.335), or parents and typical students (r=.223); (b) factor 2 (Drinking-Related Problems) ratings were more similar between friends and parents (r=.540), than among friends and typical students (r=.503), or parents and typical students (r=.268); (c) factor 3 (Coping-Related Drinking) ratings were more similar between friends and typical students (r=.540), than among friends and parents (r=.419), or parents and typical students (r=.140); and (d) factor 4 (Sexual-Risk Taking Behaviors) ratings were more similar between friends and parents (r=.620), than among friends and typical students (r=.436), or parents and typical students (r=.281). These results clearly support the complementary nature of considering all three types of referents.

Second, correlations between PARDI subscales and convergent measures are reported in Table 6. Our interpretations of what measures are statistically related are based on p-values < .05. Results indicate that perceptions of friends (but not parents) approval on all four subscales were positively related to alcohol use and alcohol-related problems. These results are consistent with research showing that friends are a source of influence on drinking behaviors (Neighbors et

Table 6
Convergent Validity

PARDI Subscale	AU	YAACQ	INQ	DNRF	DMQ (Anx)	DMQ (Dep)	DMQ (Enh)	DMQ (Soc)	DMQ (Con)
Heavy Drinking									
Friends	.153**	.172**	.288**	.269**	.174**	.049	.221**	.227**	.012
Students	.088**	.083*	.097	.210*	.049	-.049	.087*	.082*	-.066
Parents	.052	.066	.203*	.160	.048	.011	.072*	.047	-.006
Drinking-Related Problems									
Friends	.114**	.164**	.472**	.463**	.135**	.107**	.196**	.152**	.104**
Students	.064	.035	.424**	.376**	.060	.007	.013	.009	.015
Parents	.039	.019	.426**	.521**	.015	-.005	.038	.042	-.030
Coping-Related Drinking									
Friends	.080*	.134**	.377**	.317**	.173**	.167**	.141**	.122**	.069*
Students	.031	.031	.085	.160	.056	.037	.032	.032	.044
Parents	.065	.034	.414**	.371**	.056	.080*	.001	.000	.003
Sexual-Risk Taking									
Friends	.235**	.267**	.489**	.318**	.156**	.147**	.245**	.227**	.160**
Students	.061	.037	.449**	.216**	-.031	-.077*	.049	.006	-.064
Parents	.051	.047	.370**	.364**	.033	.060	.001	.014	.038

Note. * $p < .05$; ** $p < .01$. AU = weekly alcohol use. YAACQ = Young Adult Alcohol Consequences Questionnaire (alcohol related problems). INQ = Injunctive Norms Questionnaire (injunctive norms). DNRF = Drinking Norms Rating Form (descriptive norms). DMQ = Modified Drinking Motives Questionnaire – Revised (drinking motives): Anx = Coping-anxiety; Dep = Coping-depression; Enh = Enhancement; Soc = Social; Con = Conformity. INQ and DNRF correlations with PARDI subscales use scores from the corresponding referent group.

al., 2008). Perceptions of typical students' approval of heavy drinking (but not of other subscales) also shared a weak positive correlation with alcohol use and alcohol-related problems. In contrast, most of the PARDI subscales shared positive associations with participant ratings on other measures of perceived drinking norms (i.e., INQ and DNRF), with only a few exceptions (typical students' approval of heavy drinking was not related to the INQ, parents' approval of heavy drinking was not related to the DNRF, and typical students' approval of coping-related drinking was not related to the INQ or to the DNRF). Perceptions of friends' approval on all PARDI subscales were also related to all subscales of the MDMQ-R (coping with anxiety, coping with depression, enhancement, social, and conformity drinking motives). In contrast, perceptions of typical students' approval of heavy drinking were only positively related to ratings of enhancement and social motives, whereas perceptions of typical students' approval of sexual-risk taking behaviors were negatively related to coping with depression drinking motives. Finally, perceptions of parents' approval of heavy drinking behaviors were only related to enhancement motives, whereas perceptions of parents' approval of coping-motivated drinking were related to coping with depression drinking motives.

Discussion

Our study objective was to develop and validate a new measure of injunctive drinking norms. In phase 1, item creation was guided by focus groups conducted with undergraduates to ensure that the items included in our instrument would capture aspects relevant to their subjective reality. In phase 2, this list of items was refined to 20 items, covering four factors, via an analysis of the items (i.e., endorsement, correlations) and an EFA. In phase 3, we confirmed the four-factor structure identified in phase 2 across all three referent groups, its generalizability across gender and drinking status (high/low alcohol use and related problems), its discriminant

validity across referent group, and its convergent validity in relation to measures of alcohol use, alcohol-related problems, perceived norms, and drinking motives. The resulting PARDI instrument appears to provide a valid and reliable assessment of perceived friend, typical student, and parent approval of heavy drinking (e.g., drinking games, pre-drinking), drinking-related problems (e.g., hangovers, blackouts), coping-related drinking (e.g., to forget your worries, to reduce physical tension), and sexual risk-taking (e.g., having sex with someone intoxicated that you would not have if you were sober) with undergraduate students.

The PARDI adds meaningfully to the literature by providing a multidimensional measure of injunctive norms allowing researchers to consider not only across different types of referent groups, but also across different types of drinking behaviors. Indeed, whereas previous measures of injunctive norms typically included items capturing heavy drinking and drinking-related problems treated as if they were forming a single dimension, our analyses revealed that these two facets seem to capture different, and non-redundant, aspects of injunctive norms. Indeed, both of these factors were only moderately correlated with one another and displayed well-differentiated patterns of association with alcohol use and alcohol-related problems across referent groups. When considering the perceived approval of heavy drinking, norms related to friends and typical students both correlated with students' own alcohol use and alcohol-related problems. However, only perceptions of friends' approval of drinking-related problems correlated with students' own alcohol use and alcohol-related problems. In contrast, perceptions of parents' approval of heavy drinking and drinking-related problems did not share statistically significant associations with students' alcohol use and alcohol-related problems. This lack of association, however, could be partially explained by the fact that participants typically rated their parents as being far less approving than their friends and other students, and in a way that demonstrated far less inter-

individual variability. This range restriction, which reflects participants' perception of their parents as less tolerant of risky drinking, could explain this lack of association.

In addition to highlighting the relevance of differentiating perceived approval of heavy alcohol use and related problems, our results also suggest that it might be relevant to differentiate two additional facets of injunctive norms related to the perceived approval of coping-related drinking and sexual-risk taking (as a result of intoxication). These unique facets of injunctive norms have not previously been measured and studied on their own and appeared to be clearly distinct from the other facets of norms covered in the PARDI. For instance, participant scores on the perceived approval of coping-related drinking subscale were only moderately correlated with scores on the other PARDI factors (*r*s from .367 to .619), and for the more proximal referent groups (friends and parents) these scores correlated positively with participants' reported tendency to drink to cope with depression. Notably, perceptions of typical students' approval of drinking to cope was not associated with participants' own alcohol use, alcohol-related problems, or drinking motives. This suggests proximity may be particularly relevant when considering the influence of perceived approval of drinking to cope. Drinking to cope is one of the best predictors of severe alcohol-related problems and alcohol use disorders (Carpenter & Hasin, 1999; Merrill et al., 2014). As such, assessment of injunctive norms related to drinking to cope may help elucidate the link between perceived approval and risky drinking. Moreover, this points to the possible value of correcting overestimations of coping-related approval.

Perceived approval of sexual-risk taking while intoxicated also emerged as a distinct construct when considering friends and typical student perceived approval (r = .632 to .666). However, when considering perceptions of parental approval, this dimension was more highly

correlated to the drinking-related problems subscale (r = .883)[1]. This suggests that participants may consider approval of these two types of problematic behaviors (e.g., passing out and sexual risk-taking) more similarly by their parents than by their friends or typical students. Only participants' perceptions of friends approval of sexual risk-taking were associated with their own alcohol use and drinking-related problems, further reinforcing the idea that proximal referent groups play a larger role than more distal ones (Neighbors et al., 2008). Beyond this empirically-demonstrated value, incorporating this facet of injunctive norms in the PARDI could prove useful for the development of interventions designed to help reduce unplanned or unwanted sexual experiences based on changing perceived norms.

A key strength of the PARDI comes from the demonstration that it provides scores that are directly comparable (i.e., invariant) across subgroups of men and women irrespective of their level of alcohol use and alcohol-related problems. Perhaps more importantly, PARDI ratings were also found to be directly equivalent, and comparable, across all three types of referent groups considered in this study (friends, typical students, and parents). This evidence of generalizability indicates that the PARDI can be used to monitor group differences across all three referent groups, and to monitor the efficacy of various interventions seeking to modify injunctive norms in a generic (all referent groups) or specific (one referent only) manner. Pending further studies documenting the equivalence of these ratings across different stages of young adulthood, the PARDI could easily become a key tool for studying how injunctive norms emerge, evolve, and change over time (i.e., over the university context). Documenting this

[1] Despite this high correlation, we found no evidence that these two factors were redundant in relation to parents. Specifically, estimation of an alternative measurement model combining these two dimensions into a single factor resulted in a substantial decrease in model fit (e.g., ΔCFI=-.014, ΔTLI=-.015).

longitudinal equivalence would appear to be particularly important in relation to what we already know about drinking norms. For example, parental norms tend to have a small but unique effect on adolescent and early college drinking (Neighbors et al., 2007; Wood et al., 2004), but appear to become stronger predictors of drinking after individuals leave university (Hamilton et al., 2020). In contrast, perceived friend approval is consistently relevant to predicting drinking and drinking-related harm.

The ability to contrast injunctive norms across referent groups is also important, both for purposes of guiding intervention and of contributing to our understanding of the process via which injunctive norms come to influence behaviors. For instance, research has already shown that people tend to be better estimators of their friends' approval than of more distal groups, such as typical students (Cox et al., 2019). This suggests that friends may be a less useful target for interventions delivering norm-correcting feedback. LaBrie et al. (2010) found no significant differences between eight typical student referent groups with varying degrees of familiarity (sex, race, and fraternity/sorority), leading to the current broader category of "typical student". Similarly, Neighbors et al. (2008) found no differences between a broad category of "typical student" and a more specific category of "same-sex typical student". However, they did find that whereas parent and friend injunctive norms were associated positively with drinking behaviors, both typical student referent groups were negatively associated with personal drinking. Relying on our arguably more elaborate multidimensional measure of injunctive norms, we found that perceived typical student approval of heavy drinking demonstrated significant associations with participants' own drinking and alcohol-related problems. These results indicate the presence of nuances in relation to what kinds of perceived approval by distal groups may be most relevant to one's own drinking, and support the ability of the PARDI to detect such differences.

Limitations

Limitations of the present study must be acknowledged to help direct future research. First, it is important to recognize that the sexual-risk taking subscale was only associated with alcohol use and alcohol-related problems when referring to friends perceived approval of these behaviors, and was only weakly differentiated from the alcohol-related problems subscale when referring to perceived parental approval. Despite the potential utility of this subscale, especially in relation to friends, it would be useful for future studies to investigate the convergent validity of this subscale more thoroughly in relation to a broader range of outcomes, including engagement in risky sexual behaviors. In this regard, it is important to note that our 48-item measure of alcohol-related consequences only included two items specifically related to sexual consequences (i.e., *As a result of drinking, I have neglected to protect myself or my partner from a sexually transmitted disease (STD) or unwanted pregnancy,* and *My drinking has gotten me into sexual situations I later regretted*), which may explain part of this lack of associations. Indeed, the sexual-risk taking subscale displayed a more consistent pattern of correlations with these two items: (a) friends: r=.237 for the first of those items and .125 for the second one (both p<.01); (b) typical students r=.080 for the first of those items and .074 for the second one (both p<.01); (c) parents r=.132 (p<.01) for the first of those items, but only .049 for the second one (not statistically significant with p=.149).

A second limitation of this study is that women were over-represented in all phases. Research indicates that gender predicts differential patterns of alcohol use and associated behaviors, such as men being more approving of alcohol-related problems (DeMartini et al., 2011), and non-binary and transgender students endorsing more frequent binge drinking episodes (Ruppert et al., 2021). Future studies should include more men and participants with non-binary

genders to assess whether unique (i.e., gender-specific) aspects of injunctive norms in predicting risky drinking in these groups may be missing. However, phase 3 included sufficient men to test the invariance of the measure across men and women, and supported the equivalence of PARDI scores across both subgroups of respondents, while showing that men tend to display more inter-individual variability than women in their ratings of parental approval of risky sex behaviors. Third, due to the cross-sectional nature of the data in phase 3 (where the factor structure was confirmed), we are unable to assess retest reliability and predictive validity of the PARDI. However, 66.5% of the participants in phase 2/part B completed a four-month follow-up survey; retest reliability ranged from r=.505 (sexual-risk taking subscale with typical students reference group) to .819 (heavy drinking subscale with friends reference group; all ps<.001), thus providing preliminary support for the PARDI's retest reliability. Longitudinal research designs will be needed to further document the psychometric properties of this new measure.

Conclusion

In this study, we developed and validated a new measure of injunctive drinking norms designed to help improve theory testing and norms-based interventions. The PARDI – a four-factor, 20-item questionnaire – specifically assesses perceived approval of four types of risky drinking behaviors (heavy drinking, drinking-related problems, coping-related drinking, and sexual-risk taking) by friends, typical students, and parents. This multi-dimensional questionnaire was found to yield directly comparable results across each of these referent groups and across subgroups of men and women students displaying different types of drinking behaviors. As a result, the PARDI is a potentially useful tool that will inform theory development and interventions focused on injunctive norms. The widespread use of the PARDI in research should help achieve a clearer integration and comparison of results across studies,

referents, and groups of participants through the reliance on a more consistent operationalization and measurement than has been previously used in this area of research. Ultimately, more nuanced investigations exploring distinct facets of injunctive norms with a psychometrically-sound measure such as the PARDI, and the ability to compare results across studies and samples, should help shed light on the relevance of injunctive norms in prevention and intervention.

Chapter 3: Bridge

Chapter 2 describes the development and validation of a new measure of injunctive drinking norms for use with undergraduate students: the Perceived Approval of Risky Drinking Inventory. Consistent with best practice guidelines in survey development, item generation was informed by focus groups comprised of current undergraduate students. By drawing on the experiences of these students, we aimed to increase the likelihood that our measurement tool would be relevant to this population, resulting in a measure with four related but distinct subscales. As such, the PARDI can be utilized to assess perceived approval of heavy drinking, drinking-related problems, coping-related drinking, and sexual-risk taking. This allows for more nuanced investigations into what may develop or maintain different undergraduate risky drinking behaviours. Additionally, creation and validation of this measure considering three referent groups simultaneously allows researchers flexibility in how they utilize this measure, such that they may investigate the impact of perceived friend, typical student, or parent approval, or compare the relative impact across these different referent groups. This flexibility may encourage researchers to use this tool in their research on injunctive drinking norms, and utilization of a common tool facilitates cross-study comparisons. Ultimately, this provides for a richer understanding of how subjective norms in general, and perceived approval in particular, influence drinking behaviour and will facilitate the advancement of theoretical models of human behaviour.

In Chapter 4, we take the first step in utilizing the PARDI to empirically test theoretically rooted models of undergraduate alcohol misuse. Specifically, we investigate whether perceived friend approval of drinking-related problems predicts who is at risk for alcohol-related problems (between-subjects analysis), and if individuals exhibit more alcohol-related problems in

comparison to their own average (over the course of a year) when they have concurrently elevated norms (within-subjects analysis). Further, we assessed whether the mixed research findings regarding social anxiety and alcohol misuse in undergraduates might be explained by a stronger association of injunctive norms with alcohol-related problems for those with elevated social anxiety (cross-level interaction). Social anxiety disorder (SAD) and alcohol use disorders (AUDs) co-occur at a high rate, with SAD typically preceding the onset of AUDs. However, in undergraduates, the association of subclinical social anxiety to alcohol misuse is unclear. At times, social anxiety appears to confer risk for alcohol-related problems whereas in other studies, social anxiety is unrelated to drinking, or may even demonstrate a protective effect against risky drinking. As undergraduates with elevated social anxiety are concerned about being evaluated negatively by others, the belief that others with whom they strongly identify with (e.g., friends), approve or disapprove of drinking behaviours may have a heightened impact on their own alcohol risk behaviours in comparison to those with relatively lower levels of social anxiety. In this study, we first assess the predictive effect of perceived approval by friends of drinking-related problems (i.e., the PARDI's drinking-related problems subscale with friends as the referent group) on alcohol-related problems. This association is investigated at the between- and within-subjects level, allowing for an assessment as to the extent that differences in injunctive norms between students predicts who is at risk for alcohol-related problems, as well as assessing whether increases in one's own perceptions of friend approval over the course of a year correspond to elevations in one's own reported alcohol-related problems. Next, we investigate the moderating roles of between-subjects social anxiety, gender, and age on the within-person relationship of injunctive norms and alcohol-related problems. Here, we test the hypothesis that undergraduates with relatively higher levels of social anxiety will exhibit a stronger association

of changes in their beliefs regarding friend approval and their own reported alcohol-related consequences.

Chapter 4: Prospective Evaluation of Injunctive Norms and Social Anxiety in Predicting Undergraduate Alcohol-Related Problems

Introduction

Alcohol use is common among Canadian undergraduates: over 60% of students reported consumption of alcohol within the past month and 29% drank five or more drinks on a single drinking occasion within the past two weeks (i.e., binge drinking; American College Health Association, 2019). Alcohol use in undergraduates is associated with serious short- and long-term alcohol-related problems. In the past year, 26% of Canadian undergraduates reported engaging in a behavior while drinking they later regretted, 12.5% were physically injured while consuming alcohol, and one in 20 disclosed serious suicidal ideation while drinking (American College Health Association, 2019). Young adulthood is associated with elevated risk for alcohol-related problems with 20- to 24-year-olds experiencing the highest rate of alcohol use disorder (AUD) symptoms in comparison to other life stages (Lee et al., 2018). Further, undergraduates exhibit more annual and past 30-day alcohol use than same-age non-student peers (Schulenberg et al., 2021), suggesting undergraduates are at particular risk for heavy and problematic drinking. Research that elucidates malleable risk factors for alcohol-related problems in young adults is essential to improving the wellbeing and safety of undergraduates.

Social anxiety (i.e., fearing negative evaluation by others) is common in young adults, with one in three 16- to 29-year-olds reporting clinically significant levels of social anxiety (Jefferies & Ungar, 2020). Social anxiety disorder is associated with a two- to four-fold increase in AUD risk and typically precedes the onset of AUDs (Buckner et al., 2008; Buckner & Turner, 2009; Schneier et al., 2010). Theoretical models such as Tension Reduction Theory (TRT; Conger, 1956; Kushner et al., 1990), the Stress Response Dampening model (SRD; Sher &

Levenson, 1982) and the Self-Medication Hypothesis (SMH; Carrigan & Randall, 2003; Chutuape & de Wit, 1995; Khantzian, 1987) suggest this elevated co-occurrence is the result of negative reinforcement via alcohol's anxiolytic effects, such that undergraduates with elevated social anxiety are at increased risk for drinking alcohol to reduce the aversive experience of anxiety. However, at sub-clinical levels, the association between social anxiety and alcohol use and problems is less straightforward. One common pattern found in the literature is a negative association between social anxiety and amount of alcohol use (i.e., quantity and frequency) but a positive association between social anxiety and alcohol-related problems (Buckner et al., 2006; Lewis et al., 2008; Schry & White, 2013; Stewart et al., 2006; Terlecki et al., 2020). This would suggest that those with elevated social anxiety typically drink less than their peers but are at an elevated risk for alcohol-related problems when they do drink. However, the association between social anxiety and alcohol-related problems is not always supported (Eggleston et al., 2004; Ham & Hope, 2005; Ham et al., 2007) or has been demonstrated only in the context of other factors, such as elevated impulsivity (Keough et al., 2016), or identifying as a woman (Norberg et al., 2010). Further, a small, though statistically significant average association between social anxiety and alcohol-related problems was found for published studies only, which suggests publication bias (Schry and White, 2013). The mixed findings in sub-clinical and university populations point to the need for research to clarify the association between social anxiety and problematic drinking early in the developmental risk trajectory.

The reasoned action approach (RAA; Fishbein & Ajzen, 2011) identifies subjective norms as a relevant factor, in conjunction with a person's own attitude towards the behavior and their perceived capacity to accomplish the behavior, in predicting behavioral intentions and subsequent behaviors. Subjective norms are the beliefs individuals hold regarding what is

normative behavior and are amongst the strongest predictors of alcohol use in undergraduate students. Individuals who believe their peers engage in (i.e., descriptive norms) and approve of (i.e., injunctive norms) heavy or problematic drinking are at elevated risk to do so themselves (LaBrie et al., 2010; Lac & Donaldson, 2018; Larimer et al., 2004; Lewis et al., 2010; Neighbors et al., 2007; Pearson & Hustad, 2014). The effect of injunctive norms differs based on proximity to the individual, such that perceptions of approval by proximal referent groups such as close friends and parents are stronger predictors of alcohol-related problems than perceived approval of more distal referent groups, such as typical students (LaBrie et al., 2010).

Together, these theoretical models support inquiry into the combined effect of elevated social anxiety and perceived approval. As individuals with elevated social anxiety experience fear of being negatively evaluated by others, the extent to which they believe important others, such as friends, approve of drinking in problematic ways may clarify the conditions under which social anxiety might be a risk factor for alcohol-related problems. Previous research investigating the combined effect of social anxiety and injunctive norms has shown that problematic alcohol use is positively predicted by simultaneous elevations in social anxiety and injunctive norms (Buckner et al., 2011); however, others found this pattern only in the context of elevated conformity drinking motives (Linden et al., 2012). These studies utilized cross-sectional analyses, which allows for investigation of group-level differences and may provide some insight into who is at risk (i.e., those with elevated social anxiety and injunctive norms) but is unable to comment on the process of change within individuals (i.e., are individuals at elevated risk for alcohol-related problems relative to their within-person average when they believe others are more approving, and is this association stronger for individuals with elevated social anxiety). A longitudinal study (O'Grady et al., 2011) assessing the interaction of social anxiety and

subjective norms when predicting alcohol outcomes did not find that social anxiety moderated the association of norms to drinking outcomes; however, this study utilized descriptive norms and alcohol use rather than injunctive norms and alcohol-related problems. As social anxiety is typically more strongly associated with alcohol-related problems than alcohol quantity and frequency, and subjective norms tapping into beliefs of others approval may be more relevant to the socially anxious person that is motivated to behave in socially acceptable ways, longitudinal investigation of the association of social anxiety, injunctive norms, and alcohol-related problems is warranted.

In the present study, we attempt to clarify the effect of injunctive norms (i.e., beliefs that friends approve of drinking-related problems) in predicting one's own alcohol-related problems, and whether social anxiety moderates this association. Utilizing a longitudinal design and multilevel modelling, we predict:

(H1) At the between-subjects level, injunctive norms will positively predict alcohol-related problems.

(H2) At the within-subjects level, injunctive norms will positively predict alcohol related-problems. That is, during times when individuals have elevated injunctive norms compared to their own average, they will also have elevated alcohol-related problems.

(H3) Between-subjects social anxiety will moderate the positive relationship between within-subjects injunctive norms and alcohol-related problems. Specifically, this relationship will become stronger as social anxiety increases.

Method

Participants

Undergraduates (N=244 at baseline) were recruited in Montreal, Quebec for a longitudinal, online, questionnaire-based study. Participants ranged in age from 18 to 25 years at baseline (M_{age}=20.73, SD_{age}=1.58) and predominantly identified as women (81.1%), with four participants identifying as non-binary (1.6%). All participants reported their sex as either male (18.0%) or female (82.0%). Participants predominantly identified as "Caucasian or White" (57.8%), "East-Asian, South-East Asian, or Pacific Islander" (16.0%), and "Middle Eastern, North African, or Central Asian" (10.7%). No participants identified as "Aboriginal" and less than 5% of participants identified in each of the remaining ethnic groups ("Hispanic or Latino," "Black," "South Asian," and "Other"). Most participants were full-time students (92.2%) with the remainder registered part-time, and approximately half (52.9%) were Psychology majors. Participants reported living in their family's home (58.2%), with roommates (21.7%), alone (14.8%), with their significant other (4.5%), or as having no fixed address (0.8%).

Procedure

Posters and online advertisements were used to recruit participants, who then contacted the laboratory via email and were provided a brief online screening questionnaire. Eligibility criteria required participants to be undergraduate students, 18 to 25 years old, and fluent in English. Eligible students were emailed a link to an online survey that included a consent form. Participants completed questionnaires assessing demographic information, social anxiety, injunctive drinking norms, and alcohol-related problems in September and October 2017, and were invited to complete follow-up surveys at four-month intervals for one year (four total assessments). Participants were compensated with a $10 electronic gift card or 0.5 Psychology course credits for each completed survey. Bonus incentives (e.g., $50 draws) were utilized at each follow-up to reduce participant attrition.

Measures

The *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998) was used to measure social anxiety. Participants responded on a 5-point scale (*0=Not at all characteristic or true of me; 4=Extremely characteristic or true of me*) indicating how true each of 20 statements (e.g., *I worry about expressing myself in case I appear awkward*) was for them. Mean scores were computed, with higher scores indicating more social interaction distress. The SIAS reports excellent internal consistency in undergraduate samples and correlates with other established measures of social anxiety (Heimberg et al., 1992).

The *Young Adult Alcohol Consequences Questionnaire* (YAACQ; Read et al., 2006) was used to assess alcohol-related problems. Participants responded dichotomously (*Yes/No*) to 48 items indicating whether they had experienced each alcohol-related problem in the past month (e.g., *I have neglected my obligations to family, work*, *or school because of my drinking*). Total scores are computed with relatively higher values indicating more past-month alcohol-related problems. The YAACQ total score reports excellent internal consistency and positively correlates with alcohol use, binge drinking, and hazardous drinking (Read et al., 2007).

The *Perceived Approval of Risky Drinking Inventory* (PARDI; Hines et al., 2023) was used to assesses injunctive drinking norms. Participants responded on a 5-point scale (*1=Strongly Disapprove; 5=Strongly Approve*) regarding how much they believe their friends, parents, and typical students at their university approve of 20 behaviors associated with risky drinking. The PARDI has four subscales: heavy drinking (e.g., *you drinking a large amount of alcohol quickly [e.g., chugging instead of sipping, drinking shots, binge drinking*]), drinking-related problems (e.g., *you vomiting as a result of drinking too much*), sexual-risk taking (e.g., *you having sex*

using less protection than you normally would have [e.g., not using condoms] because you were intoxicated), and coping-related drinking (e.g., *you drinking because it helps you when you are feeling depressed*). The drinking-related problems subscale was utilized in the present study as we are interested in the prediction of alcohol-related problems, and items measuring theoretical constructs and associated behaviors should endeavor to have a high level of correspondence (Cooke et al., 2016). Further, we elected to assess perceived friend approval because proximal referents typically impart a larger influence on one's own drinking (LaBrie et al., 2010; Neighbors et al., 2008).

Missing Data Analysis

One-hundred and two (41.8%) of 244 participants had complete data across all four assessments, 22.1% completed three assessments, 17.6% completed two assessments, and 18.4% completed only the baseline assessment. In terms of survey completion at each follow up, 179 participants completed the 4-month follow up, 128 completed the 8-month follow up, and 150 completed the final 12-month follow-up. A dichotomous dummy variable was created to differentiate those who did and did not complete all assessments and a series of *t*-tests were conducted in SPSSv28 (IBM Corp., 2021) on the baseline variables of interest (age, sex, social anxiety, injunctive norms, alcohol-related problems, and ethnicity [Caucasian/white vs. non-Caucasian/white]). Results indicated that those with complete data differed at baseline from those with incomplete data in terms of sex ($t_{(240.7)} = 2.26$, $p = .03$) and social anxiety ($t_{(242)} = 2.62$, $p = .03$), with males and those with lower levels of social anxiety relative to the rest of the sample as less likely to complete all time points. Those with complete data did not differ at baseline from those with incomplete data in terms of injunctive norms ($t_{(242)} = 0.51$, $p = .31$),

alcohol-related problems ($t_{(242)} = -0.27$, $p = .39$), age ($t_{(242)} = 0.13$, $p = .45$), or white vs. non-white ethnic background ($t_{(221.348)} = 1.33$, $p = .19$).

Power Analysis

Statistical power was estimated utilizing the Monte Carlo simulation strategy outlined in Bolger & Laurenceau (2013) using Mplus 8.6 software. As the model was complex and many parameters were unknowable prior to conducting the study, we performed a set of power simulations where we (a) used the sample size, covariate slopes, means, variances, and missing data patterns from the present dataset and (b) varied the three slopes of interest for hypotheses 1-3 across a range of plausible population values. Thus, we could examine achieved power for a wide range of possible scenarios. As there is no straightforward method to standardize coefficients, we used an unstandardized effect size. Alcohol problems used sums (from 0-48), and both anxiety and norms are averages using a 5-point scale. Thus, an unstandardized slope of 1.0 can be interpreted as "a one-unit increase on the 5-point scale of predictors is associated with one additional alcohol problem." We ran simulations for between-subjects (H1) and within-subject (H2) slopes from 0.5 to 4 in increments of 0.5. For the interaction effect (H3) we treated the interaction as a fraction of the within-subjects slope (25%, 50%, 75% or 100%) for a total of 8*4=32 power simulations across all combinations. For the within and between-subjects slopes, we achieved greater than 80% power when the slope was 2.0 or higher. For the interaction effect, we achieved greater than 80% power when the within-subjects slope was large (3.0 or higher) and the interaction slope was almost equally as large (75% or 100% the size of the within-subjects slope). See online supplementary materials (Figures S1-S3) for power curves.

Data Analytic Procedure

Prior to analyses, the data were cleaned and screened according to the procedures outlined in Klein (2010) using SPSS v 28.0 software (IBM Corp., 2021). Outliers (<1.0% of responses) were identified as values corresponding to a *Z*-score of |3.27| standard deviations (*SD*s) beyond the mean and were Winsorized (i.e., replaced with the next most extreme raw value corresponding to a *Z*-score within |3.27| SDs). Multilevel modeling in Mplus 8.2 (Muthén & Muthén, 1998-2017) with robust standard errors (MLR) was used to test study hypotheses, as MLR is robust to violations of the normality assumption. A full information maximum likelihood approach was used to handle missing data (Enders & Bandalos, 2001). Descriptive statistics (i.e., means and standard deviations) are reported at each time point as well as at the between-subjects level via computing participants averaged total scores across their (up to four) assessment responses.

Data were analyzed using linear mixed models with repeated measures (level 1, within-subjects) nested within participants (level 2, between-subjects) when predicting alcohol-related problems. Time (coded as 1, 2, 3 or 4) was a within-subjects predictor. Sex (0=male, 1=female) and age (in years) were between-subjects predictors. Social anxiety and injunctive norms were partitioned into both within- and between-subjects variables using person-mean centering for level 1 and participant averaged (i.e., across all 4 waves) variables for level 2. Between-subjects predictors were grand-mean centered. We specified both random intercepts and random slopes for all within-subjects predictors. All random slopes were allowed to freely covary (i.e., an unstructured covariance matrix). Thus, the regression formula was:

$$\text{AlcoholProblems} = B_{00} + B_{10}(\text{Time}) + B_{20}(\text{Norms\_lev1}) + B_{30}(\text{SocialAnx\_lev1}) + B_{01}(\text{Norms\_lev2}) + B_{02}(\text{SocialAnx\_lev2}) + B_{03}(\text{Sex}) + B_{04}(\text{Age}) + r_1(\text{Time}) + r_2(\text{Norms\_lev1}) + r_3(\text{SocialAnx\_lev1}) + r_0$$

Following this model, three cross-level interactions were added, with sex, age, and between-subjects social anxiety interacting with the within-subjects slope of injunctive norms predicting alcohol-related problems. Main effects are reported and interpreted prior to the addition of interaction terms.

Results

Descriptive statistics and scale internal consistencies are presented in Table 1. The between-subjects bivariate correlations are presented in Table 2. Alcohol-related problems and injunctive norms specific to problematic drinking were positively correlated ($p < .001$). Social anxiety was not significantly correlated with alcohol-related problems ($p = .161$) or injunctive norms ($p = .082$). Alcohol-related problems were not significantly related to age ($p = .263$) but were negatively related to sex ($p = .020$) indicating that identifying as a male was associated with more alcohol-related problems. Injunctive norms were statistically significantly and negatively related to sex ($p = .006$) such that identifying as a male was associated with higher injunctive norms. Social anxiety was positively associated with sex ($p = .017$; females reported higher levels of social anxiety than males) and was not associated with age ($p = .333$). Effect sizes were generally small ($rs < .20$) except for alcohol problems and injunctive norms ($r = .36$). The intraclass correlation (ICC) for alcohol problems was .75, suggesting 75% of the variance available to be explained is at the between-subjects level.

Table 3 presents the main effects model. Within-subjects analyses assess the variations that occur within participants across assessment points. The slope of alcohol-related problems on time indicates that alcohol-related problem scores typically decline in a linear fashion by somewhere between 0.21 and 0.75 alcohol-related problems per 4 months. Both the within-subjects and between-subjects slopes for alcohol-related problems on injunctive norms were

Table 1
Descriptive Statistics

	Time 1 *M* (*SD*)	Time 2 *M* (*SD*)	Time 3 *M* (*SD*)	Time 4 *M* (*SD*)	Between-Subjects *M* (*SD*)	αs
YAACQ	7.50 (7.87)	7.01 (8.60)	5.91 (8.49)	5.76 (8.31)	6.71 (8.28)	.94 - .96
PARDI-DRP-Fr	1.84 (0.71)	1.89 (0.77)	1.77 (0.70)	1.79 (0.69)	1.83 (0.65)	.79 - .85
SIAS	1.43 (0.81)	1.46 (0.82)	1.41 (0.88)	1.43 (0.81)	1.40 (0.78)	.93 - .95

Note. *N* for Time 1 to 4 = 244, 179, 128, and 150. *N* for Between-Subjects is 244. YAACQ = Young Adult Alcohol Consequences Questionnaire (alcohol-related problems); PARDI-DRP-Fr = Perceived Approval of Risky Drinking Inventory, Drinking-Related Problems subscale for *friends* reference group (injunctive norms); SIAS = Social Interaction Anxiety Scale (social anxiety). αs = range of Cronbach's alphas reported across four time points.

Table 2

Bivariate Correlations for Between-Subjects Variables

	1	2	3	4	5
1. YAACQ	-				
2. Sex	-.149*	-			
3. Age	-.072	-.067	-		
4. SIAS	.090	.152*	-.062	-	
5. PARDI-DRP-Fr	.359***	-.176**	-.043	.112	-

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. YAACQ = Young Adult Alcohol Consequences Questionnaire (alcohol-related problems); SIAS = Social Interaction Anxiety Scale (social anxiety) PARDI-DRP-Fr = Perceived Approval of Risky Drinking Inventory – Drinking-Related Problems scale for friends reference group (injunctive norms).

Table 3

Multilevel Modeling Analysis, Main Effects Model

Variable	*b*	*SE*	*95% CI*	*p*
		Within-Subjects		
Time	-0.481	0.137	[-0.750, -0.211]	< .001
Injunctive Norms	1.349	0.581	[0.211, 2.487]	.020
Social Anxiety	0.146	0.581	[-0.992, 1.284]	.802
		Between-Subjects		
Injunctive Norms	4.088	0.882	[2.359, 5.818]	< .001
Social Anxiety	0.711	0.642	[-0.547, 1.969]	.228
Sex	-1.909	1.428	[-4.707, 0.889]	.181
Age	-0.243	0.307	[-0.854, 0.359]	.428
		Intercept		
Intercept	-0.538	1.779	[-4.026, 2.950]	.762

Note. Outcome is alcohol-related problems; Injunctive Norms refer to PARDI Drinking-Related Problems subscale in *friends* reference group. Random effects (e.g., variances and covariances) were specified, but not shown here as they were not related to hypotheses.

significant and positive (ps < .05), though effect sizes were much larger for the between-subjects effect (i.e., averaged across all 4 waves; 95% CI 2.36, 5.82) than within-subjects (i.e., elevations relative to one's own average; 95% CI 0.21, 2.49). Alcohol-related problems were also regressed on participant age, sex, within-subjects social anxiety, and between-subjects social anxiety, but all these slopes were nonsignificant (ps > .05), and thus inconclusive.

Table 4 presents the results for the cross-level interaction model, whereby the within-person slope of alcohol-related problems on injunctive norms interacts with age, sex, and between-subjects social anxiety in a set of two-way interactions. Contrary to expectations, social anxiety did not predict a statistically significant stronger association of injunctive norms to alcohol-related problems. Only the interaction with age was statistically significant (p =.033), suggesting the association of within-person variations in injunctive norms predicting alcohol-related problems is slightly stronger for older versus younger participants; for every one-year older participants were, the within-subjects slope for injunctive norms and alcohol-related problems got between 0.067 and 1.57 units more positive.

Discussion

Consistent with the reasoned action approach and study hypotheses, alcohol-related problems were associated with injunctive norms for problematic drinking at both the between- and within-subjects level, with a stronger association at the between-subjects level. This is consistent with previous research indicating that beliefs regarding friends' approval of problematic drinking can predict who is at higher risk for alcohol-related problems (LaBrie et al., 2010; Larimer et al., 2004; Neighbors et al., 2007). Our research is also consistent with Graupensperger et al. (2021), who also found within-subjects effects (i.e., when participants' normative beliefs are elevated relative to their within-person mean, alcohol problems are also

Table 4

Multilevel Modeling Analysis, Cross-Level Interaction Model

Variable	*b*	*SE*	*95% CI*	*p*
		Within-Subjects		
Time	-0.489	0.138	[-0.759, -0.218]	< .001
Injunctive Norms	2.098	1.127	[-0.110, 4.307]	.063
Social Anxiety	0.167	0.589	[-0.988, 1.321]	.777
		Between-Subjects		
Injunctive Norms	4.071	0.882	[2.342, 5.800]	< .001
Social Anxiety	0.720	0.640	[-0.535, 1.975]	.261
Sex	-1.991	1.418	[-4.769, 0.787]	.160
Age	-0.269	0.306	[-0.868, 0.330]	.379
		Cross-Level Interactions		
Sex * Level 1 Injunctive Norms	1.436	1.756	[-2.005, 4.876]	.414
Age * Level 1 Injunctive Norms	0.817	0.383	[0.067, 1.567]	.033
Level 2 Social Anxiety * Level 1 Injunctive Norms	-0.510	0.614	[-1.714, 0.693]	.406
		Intercept		
Intercept	-0.501	1.773	[-3.975, 2.973]	.778

Note. Outcome is alcohol-related problems; Level 2 Social Anxiety and Level 1 Injunctive Norms refer to between-person social anxiety and within-person injunctive norms (Drinking-Related Problems subscale, *friends* reference group) respectively. Random effects (e.g., variances and covariances) were specified but not shown here as they were not related to hypotheses.

elevated). Disentangling between and within person effects helps clarify how injunctive norms impact problematic drinking: Injunctive norms and alcohol problems contain both trait-like (between-subjects) and state-like (within-subjects) components, suggesting the dual role of stable individual differences and more malleable states that might be more amenable to treatment. Future analyses should investigate whether interventions aimed at reducing beliefs of friends' approval of drinking-related problems are successful in shifting perceptions, and whether this is associated with fewer alcohol-related problems, as this may be an important element in reducing problematic drinking in university students.

The third study hypothesis was not supported: Elevated social anxiety did not predict a stronger association of within-subjects deviations in injunctive norms and alcohol-related problems. Previous research supports an interactive effect of social anxiety and injunctive norms on alcohol-related problems such that those individuals who report higher levels of social anxiety and beliefs that friends approve of risky drinking exhibit more alcohol-related problems (Linden et al., 2012; Buckner et al., 2011). However, these analyses differ from the present study such that they utilized cross-sectional data and thus analyses assessing interactions unable to disentangle within- and between-subjects effects. As such, the present analyses differ such that rather than assessing if social anxiety and injunctive norms cross-sectionally predict elevated alcohol related problems, it assessed whether social anxiety impacts the strength of the association of within-person changes across time in perceived friends approval of problematic drinking on one's own problematic drinking. However, power simulations suggest that interaction effects would need to be comparatively large in size to be detected in the current data, so nonsignificant results are best considered inconclusive rather than an endorsement of the null hypothesis.

Exploratory analyses indicated that the within-subjects association between injunctive norms and alcohol-related problems appears to be stronger for older participants. As this finding was not indicated *a priori,* it should be interpreted with caution and replicated in future analyses. Prior research has identified varied associations between attitudes, norms, intentions, and behaviours across the university years. For example, Ferrer et al. (2012), assessing the perceived approval of typical same-age same-sex students, reported differential patterns of association in first year students compared to second year students. They found that first year university students aligned their drinking attitudes with perceived same-age same-sex typical student approval, thereby suggesting a tendency to conform. However, second year students were found to deviate from, rather than conform with, these subjective norms, thereby possibly reflecting a developmental shift away from fitting in and towards identity formation (Ferrer et al., 2012). The finding in the present study that the within-person association between perceived friend approval and alcohol-related problems strengthened with increased age may reflect a difference in how perceived approval by groups of varying proximity confer risk differentially across time. Our findings suggest that the perceived approval of the proximal referent group (i.e., friends) may continue to shape students' behaviour and confer risk for alcohol-related problems. This may point to the utility of intervening in the earlier undergraduate years, particularly for those who perceive friends as highly approving of alcohol-related problems.

Despite its notable strengths, our study has limitations. Our sample was predominantly female, and males were more likely to drop out of the study, which reduces our capacity to generalize our findings to males. Additionally, those with lower levels of social anxiety were also less likely to complete all assessment points, thereby restricting capacity to interpret results for those with less social anxiety. While theoretical models suggest norms precede intentions

which predict behavior, and previous research has demonstrated that manipulating norms with feedback can alter subsequent alcohol-related behaviors, our analyses did not test reciprocal effects and thus cannot imply direction of causality. It may be that, when experiencing elevated alcohol-related problems, a person's tendency is to believe others are more approving to protect oneself against feeling shameful of one's actions. Finally, while our power simulations suggested adequate power for moderate effect sizes for the main effect of injunctive norms at both the between and within-subjects levels, our study had only enough power to detect large interaction effects. More subtle interaction effects with smaller effect sizes might be detected in a larger sample. This may be partially due to the larger than expected ICC, indicating that the majority of the variance in the model was available to be explained at the between-subjects level. Future studies seeking to assess similar cross-level interactions should consider larger sample sizes to ensure adequate power to detect cross-level and within-person effects.

Conclusion

The goal of this study was to prospectively assess the interaction of social anxiety and injunctive norms in predicting who is, and when will they be, at risk for alcohol-related problems. While the present analysis does not help to clarify the mixed association of social anxiety to alcohol-related problems, it does suggest that injunctive norms are relevant for all students, regardless of level of social anxiety, sex, or age. Interventions targeting friends' normative beliefs with respect to approval or disapproval of alcohol related problems may be beneficial in prevention and intervention efforts on college campuses. Further, as the association of friend injunctive norms and alcohol-related problems gets stronger across the university years, early interventions that help to reduce beliefs regarding friends' approval may help to reduce alcohol-related problems in later years.

Chapter 5: General Discussion

Overall Summary

The primary aim of this research was to produce a measure of injunctive drinking norms that taps into relevant aspects of perceived approval for undergraduates and is acceptable for use across referent groups whose perceived approval may be influential in undergraduate risky drinking. As recommended by best practice guidelines in survey development, we generated our preliminary questionnaire items by engaging undergraduate students in focus groups to increase the likelihood that what is included is relevant to this population. This appears to be novel in the development of injunctive drinking norms measures. Item retainment decisions were informed by item analyses and exploratory factor analyses that considered the quality of items and their loading across three referent groups. This allows for a single survey that is appropriate for use when assessing perceived approval by friends, parents, and typical students. Exploratory and confirmatory factor analyses supported a four-factor solution, suggesting that perceptions of approval by others of Heavy Drinking, Drinking-Related Problems, Coping-Related Drinking, and Sexual-Risk Taking are related but distinct constructs. This is consistent with and extends the work of LaBrie and colleagues (2010) who reported the emergence of two factors in their survey: less severe and more severe norms, which broadly map onto our heavy drinking and drinking-related problems subscales, respectively. Invariance testing of our new measure supported the generalizability of the four-factor structure across referent groups, gender, and drinking status. The PARDI thus represents a psychometrically sound measure that allows researchers to ask – and empirically test – nuanced questions regarding the impact of perceived approval by different groups on diverse risky drinking behaviours and trajectories.

The second aim of this research was to prospectively test the interactive predictive effect of injunctive norms and social anxiety on alcohol-related problems in undergraduate students. Perceived friend approval of drinking-related problems predicted students' own alcohol-related problems at both the between- and within-subjects levels. This suggests that this facet of injunctive norms, the perceived approval by friends of drinking-related problems, is helpful in delineating who is at risk as well as when they are at elevated risk for alcohol-related problems. Further, the positive association between within-person injunctive norms and alcohol-related problems was magnified as age increased, suggesting that the effect of changes in one's perceived friend approval of drinking-related problems exerts a stronger influence on alcohol-related problems as students progress through university. Results did not support our hypothesis that the positive association of within-person variations in injunctive norms and alcohol-related problems would be stronger for those with elevated social anxiety; however, we were ultimately underpowered to detect small to medium effects for this analysis. This may have been the result of a much higher than expected intraclass correlation, meaning that the majority of variance to be explained in our model was at the between-subjects level, and thus future research assessing longitudinal cross-level interactions may benefit from larger sample sizes.

Implications

The development and psychometric evaluation of the PARDI provides researchers a flexible tool for the investigation of the role of perceived approval of risky drinking in the etiology of alcohol misuse and related problems in undergraduate students. Approval by proximal (i.e., parents and friends) and distal (i.e., typical student) referent groups across four domains of risky drinking can now be assessed which allows for greater specificity in terms of hypotheses that can be tested. Researchers may utilize this tool to assess the extent to which

perceived approval by a particular group (i.e., friends, parents, or typical students) corresponds with risky drinking as we have demonstrated in our prospective evaluation of perceived friend approval in predicting alcohol-related problems. Alternatively, researchers may wish to assess perceived approval by multiple referent groups simultaneously to compare the relative influence of friends, typical students, and/or parents on risky drinking. Researchers may also test hypotheses regarding the extent to which perceived approval of different domains of risky drinking behaviours, including heavy drinking, experiencing drinking-related problems, drinking to cope with aversive affect, or sexual risk taking as a result of drinking, are predictive of specific domains of problematic drinking behaviours and outcomes. This flexibility may encourage common use of this instrument, allowing for more cross study comparisons and thus providing greater clarity with regards to the role of injunctive norms in undergraduate risky drinking. Clarity in terms of the impact of perceived approval by different groups and of different risky behaviours in predicting alcohol use and problems may, in turn, improve the outcomes of norms-based intervention programs. Findings from the prospective analysis in Chapter 4, for example, suggest trait- and state-like components of perceived friend approval of drinking-related problems, both of which are positively associated with alcohol-related problems. The PARDI could potentially be utilized to help screen and identify undergraduates at elevated risk for alcohol-related problems, allowing for more targeted interventions. Further, our findings suggest that interventions aiming to reduce alcohol-related problems may benefit from targeting over-perceptions of friend approval of drinking-related problems. A next step for researchers will be to assess how accurate undergraduates are in their perceptions of friend approval of drinking-related problems and if interventions attempting to reduce this aspect of injunctive norms results in fewer reported undergraduate alcohol-related problems.

Limitations

Despite the notable strengths of this program of research, limitations need to be acknowledged; these will provide context to the findings and inform future research directions. First, we developed and validated this survey to assess perceived approval of risky drinking by friends, parents, and a non-specific "typical student at your university" referent group. Previous research has assessed the impact of subjective perceptions of approval by typical students of varying proximity to the individual (e.g., same-sex typical students, same-race typical students), as well as combinations of these and other characteristics (Fortson et al., 2023; LaBrie et al., 2010; Larimer et al., 2009; Neighbors et al., 2008). Some empirical research findings suggest that injunctive norms for typical student referent groups of greater similarity to the target individual exert a greater influence on behaviour, particularly when considering the approval of same-sex and same-race typical students (Fortson et al., 2023; Lewis & Neighbors, 2004). However, this is not always supported, with other research findings indicating no significant differences in the impact of perceived approval by typical student referent groups of varying proximity on alcohol use outcomes (LaBrie et al., 2010). Researchers wishing to utilize this measure for a more proximal typical-student category, or other referent groups, should ideally assess the acceptability of the measure in that referent group prior to conducting analyses with the measure. This may include assessing scale score reliability and invariance of the factor structure across gender and drinking status.

A second limitation of this research is the over-representation of participants identifying as women or females across both studies. The underrepresentation of those identifying as men or males, as well as those identifying as trans and non-binary, compromises the generalizability of our findings. Future research with the PARDI may benefit from oversampling individuals from

these groups to ensure adequate representation. Despite the overrepresentation of women, the PARDI demonstrated invariance across binary gender, providing evidence that the PARDI is appropriate for use in men. However, we were unable to test the invariance of the PARDI in non-binary and trans populations. Binary sex was included as a predictor in the main effects model and as a moderator in the cross-level interaction models in our second study and did not demonstrate a statistically significant effect, however, males represented less than 20% of participants in this study. Some research findings point to sex- and gender-based differences in the relationship between injunctive norms and alcohol use behaviours. Neighbors and colleagues (2007) findings suggest that undergraduates with higher (relative to lower) levels of social anxiety exhibit a stronger positive association of perceived drinking norms with alcohol use, and that this effect is larger in men than women. Future studies with university students should seek to recruit more men and males, as well as trans and non-binary students, to ensure sufficient power to detect sex- and gender-based effects.

A third limitation of our work is that Caucasian/white students represented the majority of participants in both studies. We did not have sufficient participants identifying in specific non-white ethnic groups to test the invariance of the PARDI across non-white ethnic identities, or to test if ethnic identity impacts the prospective association of injunctive norms to alcohol-related problems in our second study. The findings from research in undergraduate samples suggests differential drinking patterns and outcomes are predicted by ethnic identity. For example, Caucasian/white undergraduate students are more likely to drink and to experience alcohol-related problems than Black and Asian students (Greene & Maggs, 2020; Siebert et al., 2003). Further, research findings suggest that the association of subjective norms to drinking outcomes is stronger amongst Caucasian/white students in comparison to Hispanic/Latino students (LaBrie

et al., 2013) and Black students (McCabe et al., 2019). Future research should endeavor to assess the PARDI subscales in different ethnic and cultural groups to assess whether the PARDI performs similarly in and is acceptable for use with students of diverse ethnicities.

Future Research Directions

Invariance of the four-factor structure of the PARDI across referent groups provides researchers the opportunity to assess the relative influence of friend, parent, and typical student norms. Psychometric evaluation of this measure for use in adolescents may further provide an opportunity to observe how the relative influence of friend, parent, and typical student perceived approval changes over the adolescent to young adult developmental period. Parental and friend or close friend approval are typically predictive of adolescent drinking behaviours (Field et al., 2023; Voogt et al., 2013). Parental injunctive norms may continue to influence alcohol attitudes among youth but become less relevant to predicting drinking behaviour in university students (Lac & Donaldson, 2018). There is some evidence to suggest that association of perceived approval by family (parents, siblings, and significant others) with risky drinking increases after individuals leave university (Hamilton et al., 2020). The association of perceived approval by more distal groups (e.g., typical students, same-aged peers) with drinking behaviour is less consistent. Voogt and colleagues (2013) reported that the perceived approval of same-aged peers did not predict heavy drinking in 13 to 15-year-olds; however, other research findings indicate that perceived approval by typical students positively predicted alcohol use and negative consequences for 11th and 12th graders (Pedersen et al., 2017). This discrepancy could represent real changes in the impact of more distal groups on one's own drinking across adolescence or could be explained by the utilization of different measures of injunctive norms and referent groups (i.e., same aged peers versus typical students). Future research should endeavor to assess

the reliability and invariance of the PARDI factor structure with younger individuals (e.g., high school students) to assess if this measure is acceptable for use in tracking these developmental trajectories. Investigation of the relative influence of referent groups across development may improve the efficacy of interventions aimed at reducing alcohol risk through normative feedback as researchers clarify when referent groups may be more or less relevant to adolescent and young adult drinking behaviours.

The assessment of perceived approval of drinking to cope with negative affect provides a unique opportunity for researchers to assess the relevance of injunctive norms in predicting coping-motivated drinking, a particularly high-risk behaviour in undergraduates (Park & Levenson, 2002). Reasons for drinking, often referred to as drinking motives (Cooper, 1994), are found to be differentially associated with negative outcomes (Merrill & Read, 2010). Coping-motivated drinking in undergraduate students is predictive of specific problem domains, including academic and occupational problems, risky behaviours, and poor self-care (Merrill & Read, 2010). Further, research suggests that drinking to cope with negative affect may be etiologically linked with alcohol dependence (Carpenter and Hasin, 1999). While it is well established that drinking to cope confers risk for alcohol problems, how an individual develops a tendency to drink to cope with negative affect is less clear. Adverse childhood events (Zaso et al., 2021), neuroticism (Stewart & Divine, 2000), and impulsivity (Keough et al., 2016) predict elevated rates of drinking to cope with negative affect, however they do not necessarily provide an understanding of the development of this risky behaviour. Tension Reduction Theory (TRT; Conger, 1956; Kushner et al., 1990), the Stress Response Dampening model (SRD; Sher & Levenson, 1982) and the Self-Medication Hypothesis (SMH; Carrigan & Randall, 2003; Chutuape & de Witt, 1995; Khantzian, 1987) infer that alcohol becomes utilized to cope as

individuals experience relief from adverse internal states when consuming alcohol. Childhood events, personality, and anxiolytic effects of alcohol are not easily amenable to change and thus, identifying malleable mechanisms central to the development and maintenance of coping-motivated drinking is essential to improving prevention and intervention efforts. Research supports the relevance of peer drinking motives in predicting one's own drinking motives (Hussong, 2003; Litt et al., 2021), and thus perceived approval by others of one's own drinking to cope should be investigated as a pathway to the development of coping-motivated drinking. Perceived approval of coping-related drinking may be relevant, for example, to the social anxiety risk pathway for problematic drinking. For example, research suggests that drinking to cope with depression mediates the prospective association of social avoidance and alcohol-related problems (Collins et al., 2018) and that students endorse more coping drinking motives when reporting elevations in social anxiety (Walukevich-Dienst et al., 2022).

Sexual assault victimization and risky sexual behaviours represent another significant issue for undergraduate students (Abbey et al., 1996; Banyard et al., 2007; Carey et al., 2018; Connor et al., 2010). Sexual assault victimization, reported in 20-25% of undergraduate women and 7-8% of undergraduate men, typically occurs in the context of voluntary alcohol consumption (Abbey et al., 1996; Banyard et al.,2007; Koss et al., 1987) and predicts poorer mental health and academic outcomes (Carey et al., 2018; Jordan et al., 2014).

Alcohol consumption in undergraduates also increases the likelihood of risky sexual behaviours, including unplanned sexual encounters (Connor et al., 2010; Ingersoll et al., 2008, Paul et al., 2000). Research findings with undergraduate students indicate that unplanned sexual encounters decrease the likelihood for the use of protection (e.g., condoms), increasing risk for sexually transmitted diseases and unplanned pregnancy, as well as an increased likelihood for regret and

worsened self-esteem (Paul et al., 2000). The PARDI's sexual-risk taking subscale allows researchers to investigate the extent with which beliefs that parents, friends, or typical students approve or disapprove of alcohol-related sexual-risk taking behaviour impacts one's own risk for unplanned and unwanted sexual experiences. This may provide guidance to programs developed to reduce the risk of alcohol-implicated negative sexual experiences in undergraduate students.

Conclusion

Reliable and valid measurement of injunctive drinking norms is essential for clarifying the link between injunctive norms and undergraduate risky drinking. The development and validation of the PARDI represents an improvement to injunctive drinking norms measurement in undergraduate students. Researchers can assess nuances in the association of drinking norms and behaviours as the PARDI can assess perceived approval by different referent groups (i.e., friends, typical students, and parents) across a range of risky drinking behaviours. The flexibility this measure provides, in addition to its strong psychometric properties, may encourage its widespread use and thus allow for greater cross-study comparisons. The longitudinal assessment of injunctive norms, social anxiety, and alcohol-related problems described in Chapter 4 represents a first step in the utilization of the PARDI to empirically test theoretically rooted models of risky drinking in undergraduate students. Further clarification of the role of injunctive drinking norms in undergraduate risky drinking will help optimize intervention programs to reduce undergraduate risky drinking more effectively.

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Appendix 1
Perceived Approval of Risky Drinking Inventory (PARDI)

Please use the scale below to indicate how much you believe each specified group (your friends, your parents, and typical students at your university) would approve of each of the following behaviors.

1 = Strongly Disapprove
2 = Somewhat Disapprove
3 = Neutral or Indifferent
4 = Somewhat Approve
5 = Strongly Approve

1. You drinking a large amount of alcohol quickly (e.g., chugging instead of sipping, drinking shots, binge drinking).
2. You playing drinking games (i.e., social games that encourage or require drinking alcohol).
3. You drinking various types of alcohol (e.g., beer, wine, liquor) over a single drinking occasion.
4. You drinking alcohol prior to going out (e.g., to a bar or party) to get intoxicated beforehand (i.e., pre-drinking, pre-gaming).
5. You passing out as a result of drinking (i.e., drinking so much that you lose consciousness).
6. You blacking out as a result of drinking (i.e., not having a memory of what occurred during a drinking occasion).
7. You vomiting as a result of drinking too much.
8. You drinking in ways that were inappropriate to the context (e.g., chugging at dinner while others are sipping).
9. You being unable to limit the amount you drink once you start (i.e., you were unable to stop or drank more than you intended to).
10. You having sex with someone while intoxicated that you would not have if you were sober.
11. You having sex using less protection than you normally use (e.g., not using condoms) because you are intoxicated.
12. You being in a risky sexual situation while intoxicated (e.g., going home with a stranger, flirting when you didn't want it to go further).
13. You drinking with the intention of getting drunk.
14. You drinking to help you forget about your problems.
15. You drinking to forget your worries.
16. You drinking because it helps you when you are feeling depressed.
17. You drinking to stop you from feeling so hopeless about the future.
18. You drinking to reduce your anxiety.
19. You drinking because it makes it easier to be social when you are feeling nervous.
20. You drinking to reduce physical tension (e.g., sweating, racing heart).

Appendix 2

Online supplements for:

Prospective Evaluation of Injunctive Norms and Social Anxiety in Predicting Undergraduate Alcohol-Related Problems

Section S1

Code Endorsement and Item Generation of for Phase 1 (54 Item Survey)

Item	Code	Code Description	Endorsement
1. You drank a large amount of alcohol quickly (e.g., chugging instead of sipping, drinking shots, binge drinking).			
	Large quantity	Drinking a large amount of alcohol in a given period of time	14
	Small quantity	Drinking a small or normative amount (e.g., a glass of wine)	1
	Fast consumption	Consuming alcohol in a quick manner (e.g., chugging)	14
	Drinking shots	Drinking shots of hard liquor	4
	Binge drinking	Drinking large quantities in short periods of time	3
	From the bottle	Drinking "from the bottle" in situations in which it is inappropriate to do so (e.g., wine bottles, hard liquor)	1
	Higher content	Intentionally drinking alcohol with a higher alcohol content	5
	Dangerous administration	Administration of alcohol in ways that may be dangerous (e.g., rectally, vaginally)	1
2. You drank alcohol without consuming food (i.e., drinking on an empty stomach).			
	During a meal	Drinking alcohol as part of a meal	5
	Not during meal	Drinking when it is not within the context of a meal	3
	Drinking without eating	Drinking without eating / on an empty stomach	2
3. You played drinking games (i.e., social games that encourage or require drinking alcohol).			
	Drinking games	Playing games whereby individuals are encouraged to drink when they win/lose	13
	Competitive drinking	Drinking in competitive ways (e.g., "shot for shot" type drinking)	4
4. You drank beyond your personal limits or past the point of intoxication.			
	Beyond limits	Drinking beyond what you can personally handle	7
	Drinking beyond intoxication	Drinking beyond the point of intoxication	6
	Uncharacteristic drinking	Drinking in heavy/risky ways not characteristic of the person	2
	More than usual	Drinking more than you usually would	1
5. You drank various types of alcohol (e.g., beer, wine, liquor) over a single drinking occasion.			

Item	Code	Code Description	Endorsement
	Mixing types	Drinking various types of alcohol (beer, wine, hard liquor, etc)	6
6. You drank alcohol prior to going out (e.g., to a bar or party) to get intoxicated beforehand (i.e., pre-drinking, pre-gaming).			
	Pre-drinking	Drinking prior to going out	4
	Bringing alcohol	Bringing alcohol with you (e.g., in a flask)	1
7. You drank alcohol on most days and not just on weekends.			
	Daily drinking	Drinking every or most days	8
	Habitual drinking	Developing a habit or routine out of drinking	5
	Weekday drinking	Drinking heavily during the week	3
8. You drank alcohol in the morning or during the daytime.			
	Morning drinking	Drinking in the morning	4
	Daytime drinking	Drinking during the daytime	4
9. You passed out as a result of drinking (i.e., drinking so much that you lose consciousness).			
	Passing out	Drinking until you pass out from alcohol	9
10. You blacked out as a result of drinking (i.e., you did not have a memory of what occurred during a drinking occasion).			
	Black out	Drinking to the point where you do not remember, the following day, what occurred whilst intoxicated	7
11. You suffered from alcohol poisoning as a result of drinking.			
	Alcohol poisoning	Alcohol poisoning; getting stomach pumped	6
	Choking on vomit	Choking on one's vomit as a result of drinking	1
12. You vomited as a result of drinking too much.			
	Vomiting	Drinking to the point of throwing up	5
	Recurring vomiting	Vomiting due to drinking with a regular occurrence	1
13. You drank alcohol that was not yours (e.g., taking someone else's drink or drinks that were left behind by others).			
	Drinking others' drinks	Drinking alcohol that does not belong to you	5
14. You were drinking in ways that were inappropriate to the context (e.g., chugging at dinner while others are sipping).			
	Inappropriate to situation	Drinking in a way in which is inappropriate to the context (e.g., chugging a drink during a meal)	7
	Family observed drunkenness	Getting drunk in front of your family	1
	Heavier than friends	Drinking heavier/more than those who you are out drinking with (e.g., friends)	3
	Drinking at school	Drinking at, or being intoxicated at, school	11
15. You were unable to limit the amount you drank once you started (i.e., you were unable to stop or drank more than you intended to).			

Item	Code	Code Description	Endorsement
	Heavily every time	Every time a person drinks, they drink very heavily (i.e., never drinks mildly or moderately)	3
	Incapable of stopping	Being incapable of stopping drinking once you've started	3
	Addiction	Suffering from addiction	11
	Withdrawal	Feeling (physically or psychologically) like you need a drink	3
	Tolerance	Alcohol having less of an effect	1
	Refusing to stop	Refusing to stop drinking despite concern from others	2
16. You broke the law (e.g., trespassing, vandalism, theft) while intoxicated.			
	Getting arrested	Getting arrested due to behaviour while drunk	6
	Illegal acts	Engaging in acts (e.g., vandalism) that are against the law	4
	Unlawful behaviour	Engaging in unlawful behaviour (e.g., breaking into places) due to intoxication	8
	Underage drinking	Drinking when you're not legally allowed to	1
	Drinking in public	Drinking alcohol in public places (when you aren't supposed to do so)	2
17. You have used drugs that you otherwise would not have because you were intoxicated.			
	Using drugs	Using other substances because you're intoxicated	8
	Smoking	Smoking cigarettes while drinking	1
18. You engaged in dangerous behaviours that could result in injury (e.g., climbing, swimming, biking) while intoxicated.			
	Being irresponsible	Doing irresponsible things whilst drunk	2
	Dangerous behaviour	Dangerous behaviour, such as climbing things	12
	Injury	Injuring oneself due to intoxication	7
	Disinhibition	Being disinhibited and more likely to engage in risky behaviours	6
	Riding a bike	Riding a bike while intoxicated	1
	In the cold	Drinking outdoors in the cold	2
	Injury to others	Other people becoming injured due to one's drinking (e.g., stopping a fight that the intoxicated individual is in)	8
19. You were drinking alone.			
	Drinking alone	Drinking without anyone else present	5
	Drunk alone	Being drunk and alone, due to risk of injury (e.g., choking on vomit)	1
20. Your reputation was ruined (among peers, family, or coworkers) due to your drinking.			
	Saying inappropriate things	Saying things (such as making jokes) while drunk that are inappropriate or offensive	2

Item	Code	Code Description	Endorsement
	Poor role model	Being a poor role model for others (e.g., siblings)	2
	Stigmatization	Being stigmatized, having others think less of you because of drinking	8
	Social media	The usage of social media in potentially damaging ways whilst intoxicated	5
	Interpersonal consequences	Suffering interpersonal consequences (e.g., loss of friendships) due to drinking	15
	Cancelling plans	Cancelling plans	1
	Lying to parents	Lying to your parents about your drinking	4
	Lying to friends	Lying to your friends about your drinking	2
	Loss of children	Losing your children (i.e., to child protective services) due to drinking habits	1
	Isolation	Becoming socially isolated due to drinking	3
	Losing friendships	Losing friends as a result of drinking behaviours	1
	Regret	Saying or doing things that you later regret	2
21. You shared information that you were not supposed to (e.g., told others' or your own secrets) because you were intoxicated.			
	Divulging information	Sharing secrets or personal information while drunk that you otherwise would not have	8
22. You got into arguments or verbal fights while you were drinking.			
	Fighting (verbal)	Verbally fighting with others	7
	Fights with family	Having fights with family due to your drinking	1
	Fights with partner	Fighting with a significant other due to drinking	2
	Emotional abuse	Engaging in emotional abuse due to drinking	2
	Bullying	Bullying others whilst intoxicated	2
23. You were not doing well in school or your work was negatively affected due to your drinking (e.g., missed class, late to work).			
	Missing school	Missing school/class due to alcohol use	2
	Priorities	Changes in priorities due to alcohol use	4
	Being unproductive	Wasting time due to drinking or hangover	6
	Academic consequences	Doing poorly in school or not finishing one's degree due to drinking behaviours	10
	Occupational consequences	Experiencing problems at work or losing your job because of your drinking	4
	Drinking at work	Drinking alcohol while at work	2
	During exam period	Drinking during one's school exam period	2
	Neglecting responsibilities	Neglecting responsibilities due to intoxication or hangover	1
24. You were annoying or obnoxious while drinking.			

Item	Code	Code Description	Endorsement
	Being obnoxious	Doing obnoxious or annoying things while drinking	3
	Annoying others	Being annoying, bothering others	3
25. Others were burdened as a result of your drinking (e.g., others needing to take care of you because you're too drunk to take care of yourself).			
	Burdening others	Drinking to the point where others need to take care of you	8
26. You got into physical fights with others while drinking.			
	Fighting (physical)	Getting in fights, fighting with others	12
27. You spent more money than you had intended to or could afford on alcohol.			
	Wasting money	Money is wasted on alcohol	4
	Spending money	Spending money (e.g., buying others drinks, shopping) while drunk	3
28. Your belongings were damaged or lost as a result of your drinking.			
	Leaving things unattended	Leaving personal items unattended because you're intoxicated	1
	Losing belongings	Losing your personal belongings (e.g., wallet, phone) because you're drunk	1
	Damaging belongings	Damaging one's belongings (e.g., clothing) because of drinking	5
29. You accepted a ride from a driver that you knew was drunk while you were intoxicated.			
	Ride from drunk driver	Making the decision to receive a ride from a person who is too intoxicated to drive, because you are drunk	3
30. You drove a car after drinking alcohol.			
	Drunk driving	Driving after having consumed alcohol	11
	Car accident	Getting into a car accident due to drinking	5
	DUI	Getting charged with a DUI due to drinking and driving	5
31. You accepted drinks from strangers or left your drinks unattended.			
	Leaving drinks unattended	Leaving drinks unattended	4
	Drinks from strangers	Accepting drinks from strangers	4
32. You were generally less conscious of safety because of intoxication.			
	Walking home alone	Walking home alone in a situation in which it is dangerous to do so, because a person is intoxicated	1
	Ride from stranger	Taking a ride home from a stranger	3
	Less aware (safety)	Becoming less aware of safety due to intoxication	9
	Trusting others	Indiscriminately trusting others due to intoxication	3

Item	Code	Code Description	Endorsement
	Physical assault	Getting physically assaulted while drinking	4
	Getting attacked	Getting targeted or attacked due to your inebriation	2
	Clumsiness	Becoming clumsy (and increasing risk of injury) due to intoxication	2
	Getting lost	Getting lost due to being intoxicated	3
	Leaving friends	Leaving friends in unsafe situations because of drinking	2
	Getting stranded	Getting stranded because you miss your ride, for instance	1
	Loss of common sense	Loss of common sense while drinking	2
	Poor decisions	Making poorer decisions in general	1
33. You had a hangover as a result of your drinking.			
	Hangover	Having a hangover due to drinking	3
34. Your physical or mental health (e.g., weight or mood) were negatively affected by your drinking.			
	Neglect hygiene	Neglect to take care of their hygiene	1
	Mental illness	Drinking contributing to the development or maintenance of a mental illness	4
	Physical illness	Developing or maintaining a physical illness due to drinking	3
	Weight issues	Gaining or losing weight due to drinking behaviours	1
	Appearance issues	Appearance issues (e.g., breaking out) due to drinking behaviours	1
	Health effects	Negative health effects (e.g., brain damage) as a result of drinking	6
	Reduced self-esteem	Negative effects on one's self-esteem due to habitual problematic drinking	1
	Suicidal behaviour	Engaging in suicidal behaviour while intoxicated	2
	Drinking while taking medication	Consuming alcohol while on a medication that is contraindicated	2
	Losing interest	Loss of interest in activities you used to enjoy	2
	Normalizing illness	Getting used to the feelings of illness and pain associated with drinking, so it becomes your new normal	1
	Death	Dying because of drinking	2
	Cognitive Impairment	Experiencing cognitive impairment	1
	Denial	Being in denial, or being unwilling to acknowledge, one's drinking problems	3
35. You had sex with someone while intoxicated that you would not have if you were sober.			

Item	Code	Code Description	Endorsement
	Poor sexual decisions	Going home with / having sex with anyone that the person otherwise would not have wanted to have sex with	13
	Infidelity	Cheating on a romantic partner due to intoxication	2
36. You had sex using less protection than you normally would have (e.g., not using condoms) because you were intoxicated.			
	STI	Getting a sexually transmitted infection due to behaviour while intoxicated	4
	Unintended pregnancy	Becoming pregnant due to behaviour while intoxicated	4
	Unprotected sex	Drinking to the point where you unintentionally have unprotected sex	4
37. You were in a risky sexual situation while intoxicated (e.g., going home with a stranger, flirting when you didn't want it to go further).			
	Sexual assault	Getting physically assaulted while drinking	14
	Leaving with strangers	Leaving an event with a stranger, going home with strangers	2
	Sex with strangers	Having sex with strangers, those unfamiliar to you	2
	Sex in public	Sex in inappropriate public places	3
	Trading for sex	Trading alcohol for sex	1
38. You took advantage of someone else sexually while you were drunk.			
	Taking advantage	Taking advantage of someone who is too intoxicated to consent (sexually)	5
	Sexual advances	Making unwanted sexual advances due to alcohol consumption	1
39. You drank alcohol to relax or unwind.			
	To relax	Drinking to unwind or relax after school or work	8
	To calm down	Drinking to calm down	1
	To blow off steam	To "blow off steam" or to "let loose" or getting rid of pent-up energy or strong emotions	1
40. You drank alcohol with the intention of getting drunk.			
	To get drunk	Drinking with the intention of getting intoxicated	8
	Drinking to intoxication	Drinking to the point of inebriation or intoxication	1
41. You drank alcohol in order to connect with others and to socialize.			
	To socialize	Drinking to socialize / social drinking	8
	To connect	To connect or bond socially with others	7
	To meet people	To meet new people	2

Item	Code	Code Description	Endorsement
42. You drank alcohol in order to cope with a negative mood or take the edge off.			
	Because you're upset	Drinking in order to reduce the feeling of being upset	1
	Because of bad day	Drinking because you had a bad day	2
	Because of a breakup	Drinking to feel better after a break-up with a romantic partner	4
	Relieve negative mood	Drinking to alleviate negative affective states	1
	To relieve anxiety	Drinking to relieve or reduce anxiety	1
	Because of stress	Drinking because you are feeling stressed	1
	To reduce stress	Drinking to reduce one's stress	3
	To tolerate abuse	Drinking to tolerate the pain associated with physical abuse	2
	To be happy	Drinking in order to be happy	1
	Take edge off	To take the edge off, or to be able to tolerate an event or setting	2
	To cope	To cope with negative emotions	12
	To tolerate pain	To be able to tolerate (or to relieve) physical pain	1
	For catharsis	Drinking (particularly with others) for cathartic reasons (e.g., to relieve shared tensions about a problem or subject)	1
	To tolerate living situation	To tolerate a living situation (e.g., a roommate) that is unpleasant	1
43. You drank alcohol in order to feel more confident.			
	To be more confident	Drinking in order to be more confident (e.g., to talk to your "crush")	1
	To be confident	Needing to drink in order to be confident	6
44. You drank alcohol in order to flirt, have sex, or increase the likelihood of hooking up with someone.			
	Making out	Kissing people at the bar, etc.	2
	To meet people	Going to the bar to drink so you can meet people, pick people up (romantically)	2
	To explore sexuality	Drinking to explore your sexuality (e.g., same-sex interactions)	1
	To have sex	Drinking in order to have sex	4
45. You drank alcohol in order to forget about your problems.			
	To avoid responsibilities	Drinking to avoid other responsibilities (e.g., studying for an exam)	2
	To avoid problems	Drinking to avoid one's problems	6
	To forget	Drinking to forget (e.g., about one's troubles, problems)	7
	Because of hopelessness	Drinking because one is hopeless about the future, generally despondent	1

Item	Code	Code Description	Endorsement
46. You drank alcohol to celebrate an occasion.			
	To celebrate	Drinking to celebrate (e.g., birthday, vacation)	14
	After exams	Drinking after completion of exams	2
	On vacation	Drinking because you're on vacation	1
47. You drank because it was free, cheap, or available.			
	Because it's free	Drinking because you're provided alcohol for free, or because its cheap / inexpensive	9
	Because it's available	Drinking simply because you have access to alcohol and its available	5
48. You drank in order to fit in, impress others, or to appear cool.			
	Because of peer pressure	Drinking because others expect or encourage you to do so; to avoid social censure	9
	To be cool	Drinking to appear cool	6
	To fit in	Drinking to fit in with others	6
	To impress	Drinking to impress others	1
	Being hazed	Drinking because you're being hazed and being forced to	1
	At drinking event	Drinking because you're at a drinking event	4
	Because its normative	Drinking because it's the normal thing to do	2
	Because of media	Drinking because of media influences (music videos, cooking shows)	2
	To be polite	Drinking because refusing a drink would be impolite	2
	To get attention	Drinking in order to get attention from others	1
49. You drank because you were bored.			
	Because you're bored	Drinking to reduce or tolerate boredom	2
	Curiosity	Drinking out of curiosity of the effects	2
50. You drank in order to tolerate having sex when you didn't really want to.			
	To tolerate sex	Drinking in order to tolerate having sex in any situation in which you'd rather not have sex	2
51. You drank to have fun.			
	To have fun	Drinking to have fun / to have a good time	4
	Because you're happy	Drinking because you're in a good mood	1
52. You drank in order to be able to fall asleep.			
	To sleep	Drinking to fall asleep	3
53. You drank to reward or motivate yourself.			
	For reward	Drinking to reward oneself	3
	For motivation	Drinking to motivate oneself, or to help in beginning getting work done	1
	To work	Drinking in order to get work done (e.g., write a paper)	1
54. You drank for no apparent reason.			

Item	Code	Code Description	Endorsement
	No reason	Drinking for no apparent reason	2

Section S2

Codes and Code Descriptions for Items Not Included in Initial Survey Questions

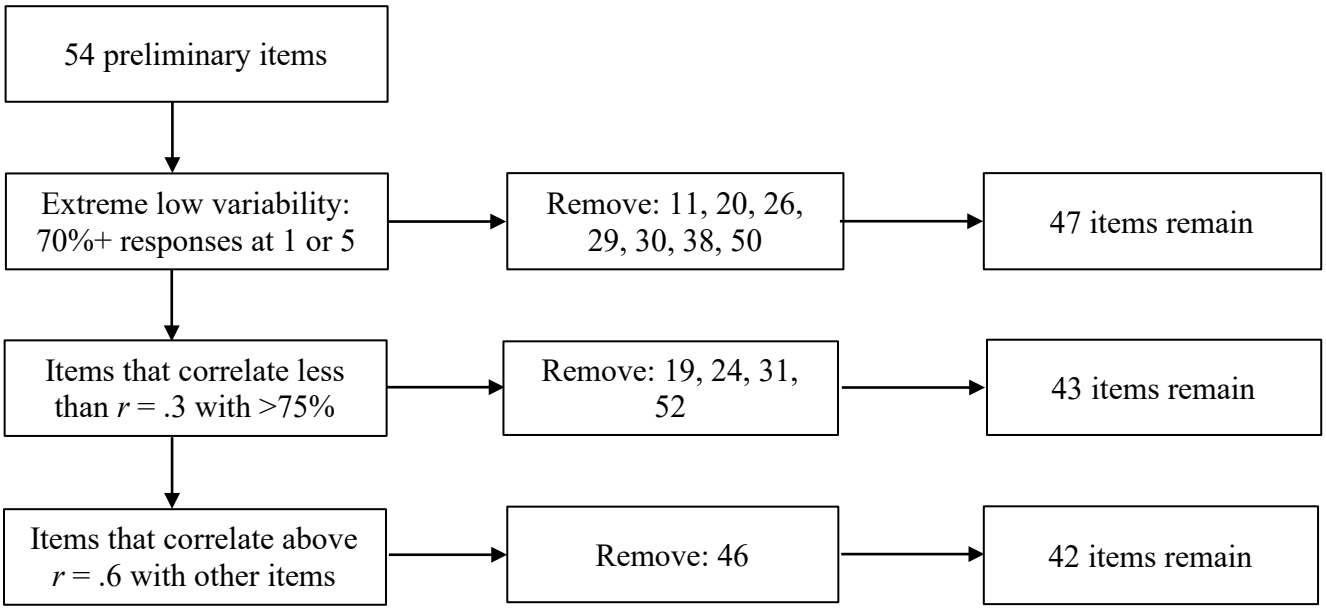
Code	Code Description	Endorsement
Repetition	Given to items that are mere verbal repetitions by the moderator or others	417
Example	Moderator provided example items	20
Family history	Drinking when you have a family history of alcoholism	3
Against culture or religion	Drinking when it is not approved of by your culture or religion	3
Explicit approval	Explicitly approving of heavy or risky drinking	1
Texting while drunk	Texting others (e.g., exes) while drunk	1
Babysitting while drunk	Taking care of siblings or children while intoxicated	1
Weekend drinking	Drinking exclusively on the weekends	2
Staying out late	Staying out late while drinking	1
Diminished moral judgement	Having your moral judgement impaired due to drinking	1
Soiling oneself	Drinking to the point of soiling (urinating, defecating) oneself	1
Uncharacteristic behaviour	Acting in ways that are uncharacteristic of a person due to intoxication	1
Poor sexual performance	Not being able to perform well sexually due to intoxication	1
Drunk next day	Still being drunk the following day after a night of drinking	1
Homelessness	Drinking resulting in homelessness	1
Enjoy the taste	Drinking because you enjoy the taste	1
Health benefits	Drinking (moderately) to receive possible health benefits	2
Drinking with strangers	Drinking with strangers or people you don't know very well	1
Unfamiliar place	Drinking in unfamiliar / foreign places	2
Frosh	Drinking because it's frosh / university initiation	2
Because you can	Drinking because you are now able to (e.g., came of age, moved out of parental home)	2
Making excuses	Finding any excuse to drink	1
Encouraging others' drinking	Encouraging others to drink because you want to drink	1

Not getting help	Not being able or willing to reach out to others to get help when needed	2
To rebel	To rebel against parents	1
Rationalizing	Rationalizing your drinking habits as okay because its not impacting particular areas of your life	2
Pressuring others	Pressuring others to drink	1
Getting kicked out	Getting kicked out of an establishment (or refused entry) due to being intoxicated	2
Become emotional	Becoming overly emotional (e.g., crying) because of intoxication	1
Alcoholic energy drinks	Mixing alcohol and energy drinks	1
Hiding your drinking	Drinking in secret	1
Robbed	Getting robbed while intoxicated	1

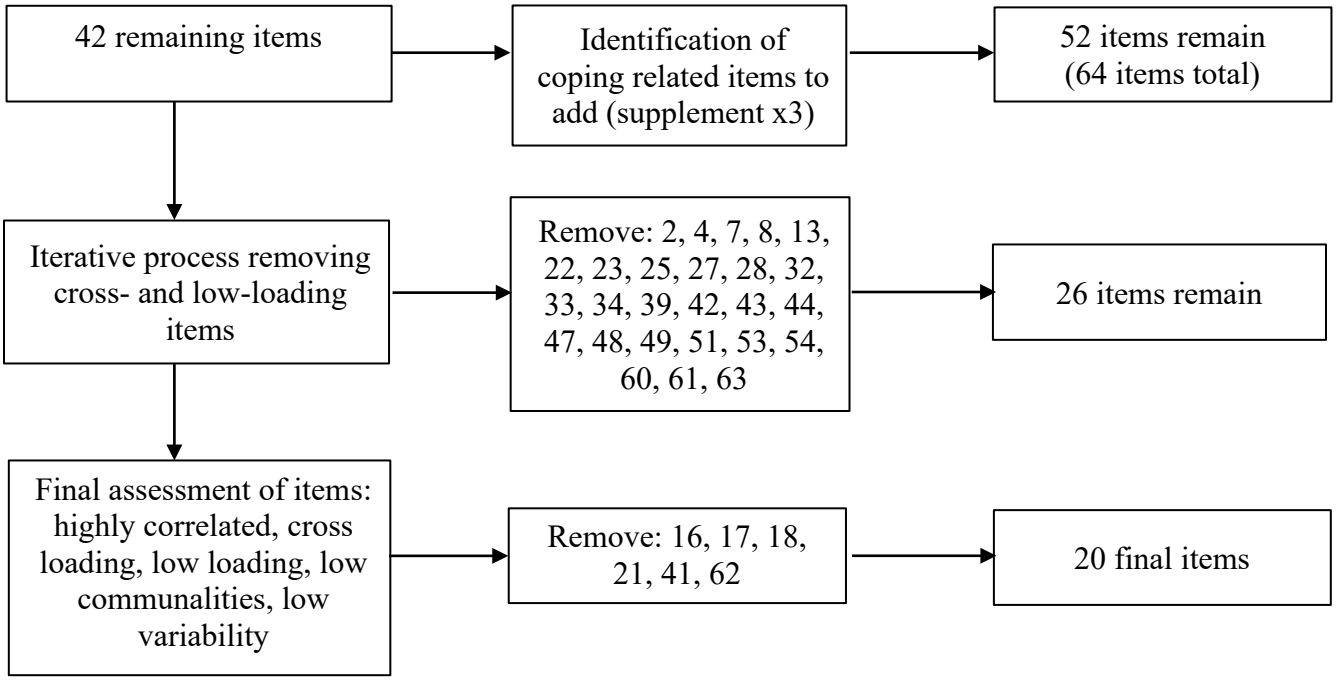
Section S3

Reasons and Sequence of Item Removal in Phase 2

Phase 2 Part A



Phase 2 Part B



Section S4

Coping-Motivated Drinking Items Added in Phase 2 Part B

55. You drank to forget your worries.
56. You drank because it helps you when you are feeling depressed.
57. You drank because it helps you when you feel nervous.
58. You drank to stop you from feeling so hopeless about the future.
59. You drank to reduce your anxiety.
60. You drank to help you feel less negative about things in your life.
61. You drank to help you stop from ruminating on things that make you sad.
62. You drank because it makes it easier to be social when you are feeling nervous.
63. You drank to help you stop from dwelling on things that make you worried.
64. You drank to reduce physical tension (e.g., sweating, racing heart).

Appendix 3

Online supplements for:

Prospective Evaluation of Injunctive Norms and Social Anxiety in Predicting Undergraduate Alcohol-Related Problems

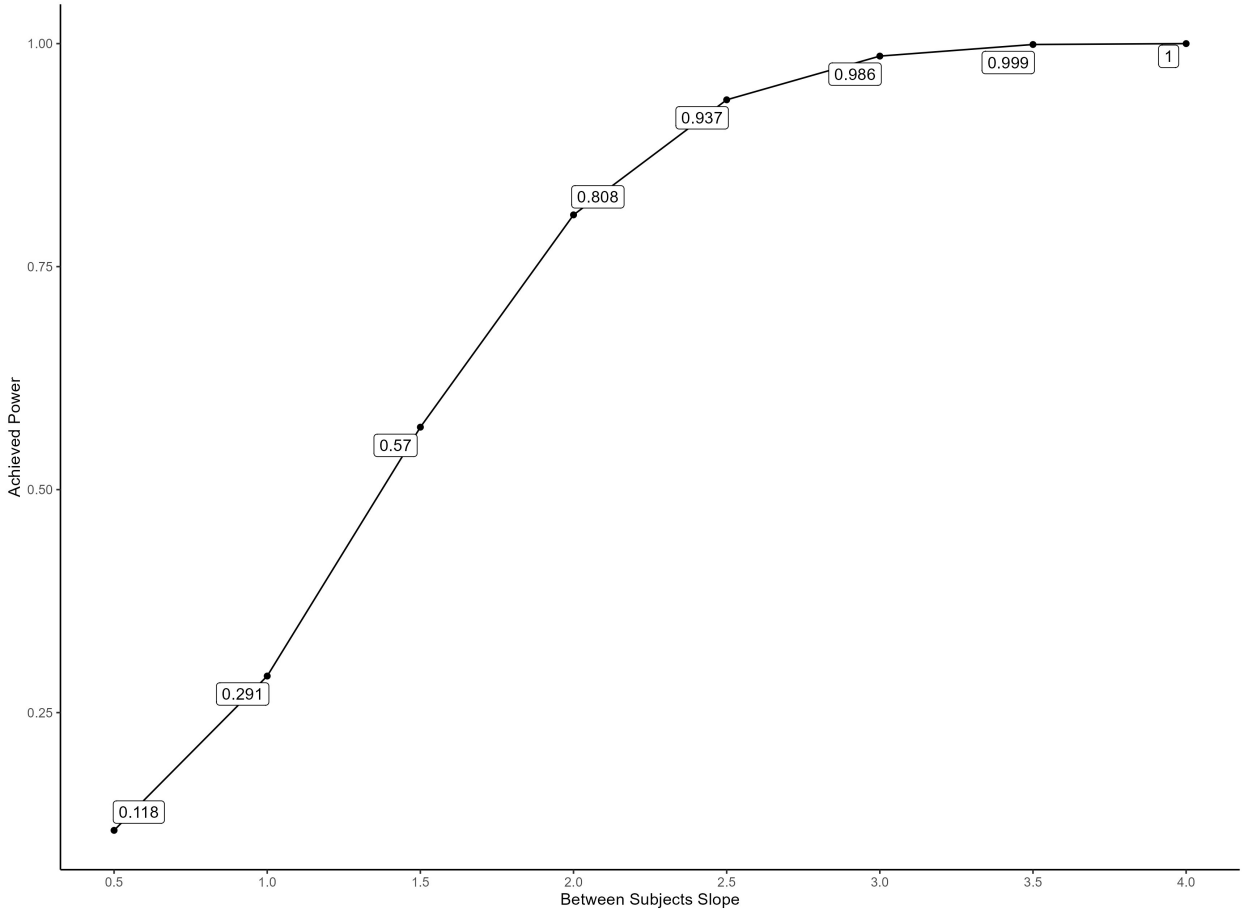


Figure S1. Power curve for between-subjects slope of social anxiety predicting alcohol problems.

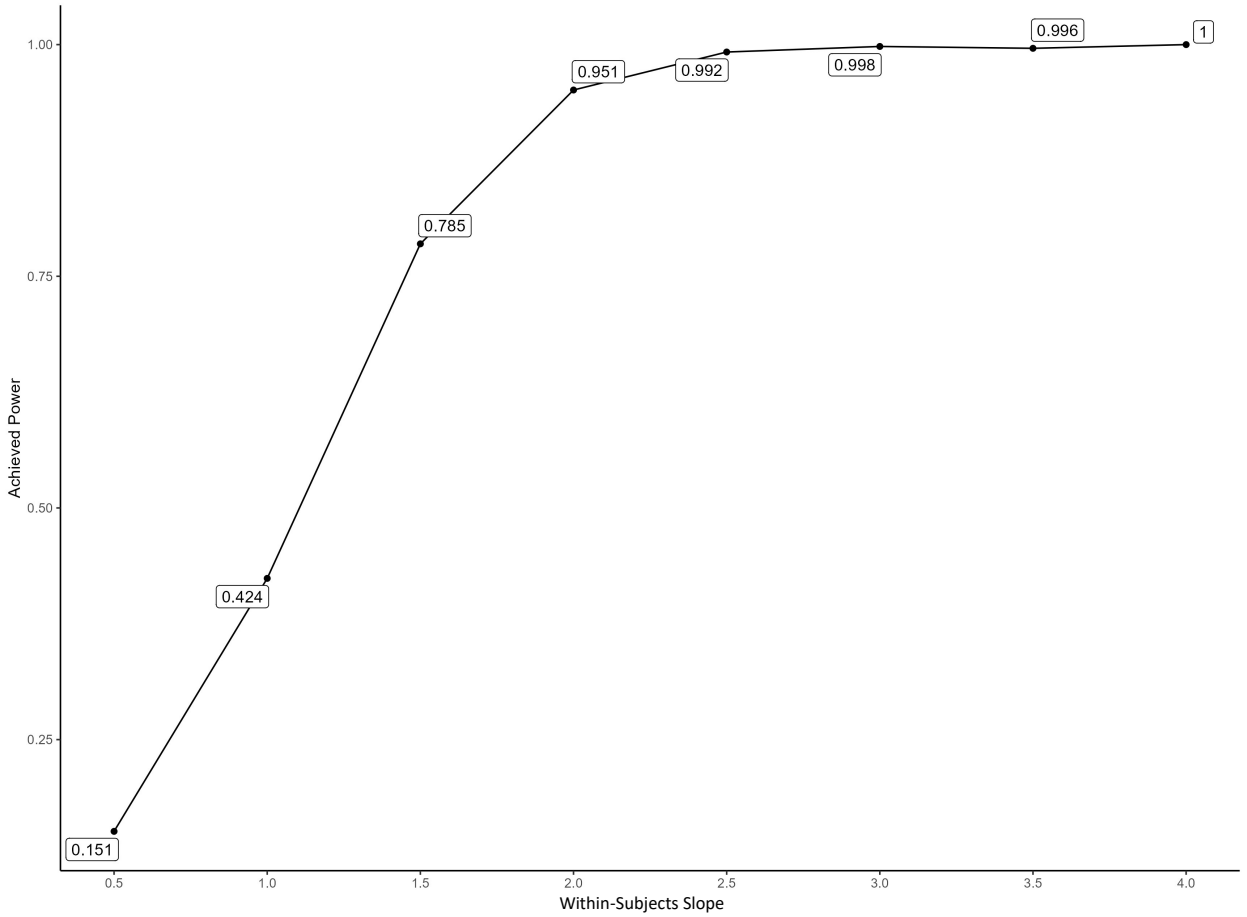


Figure S2. Power curve for within-subjects slope of social anxiety predicting alcohol problems.

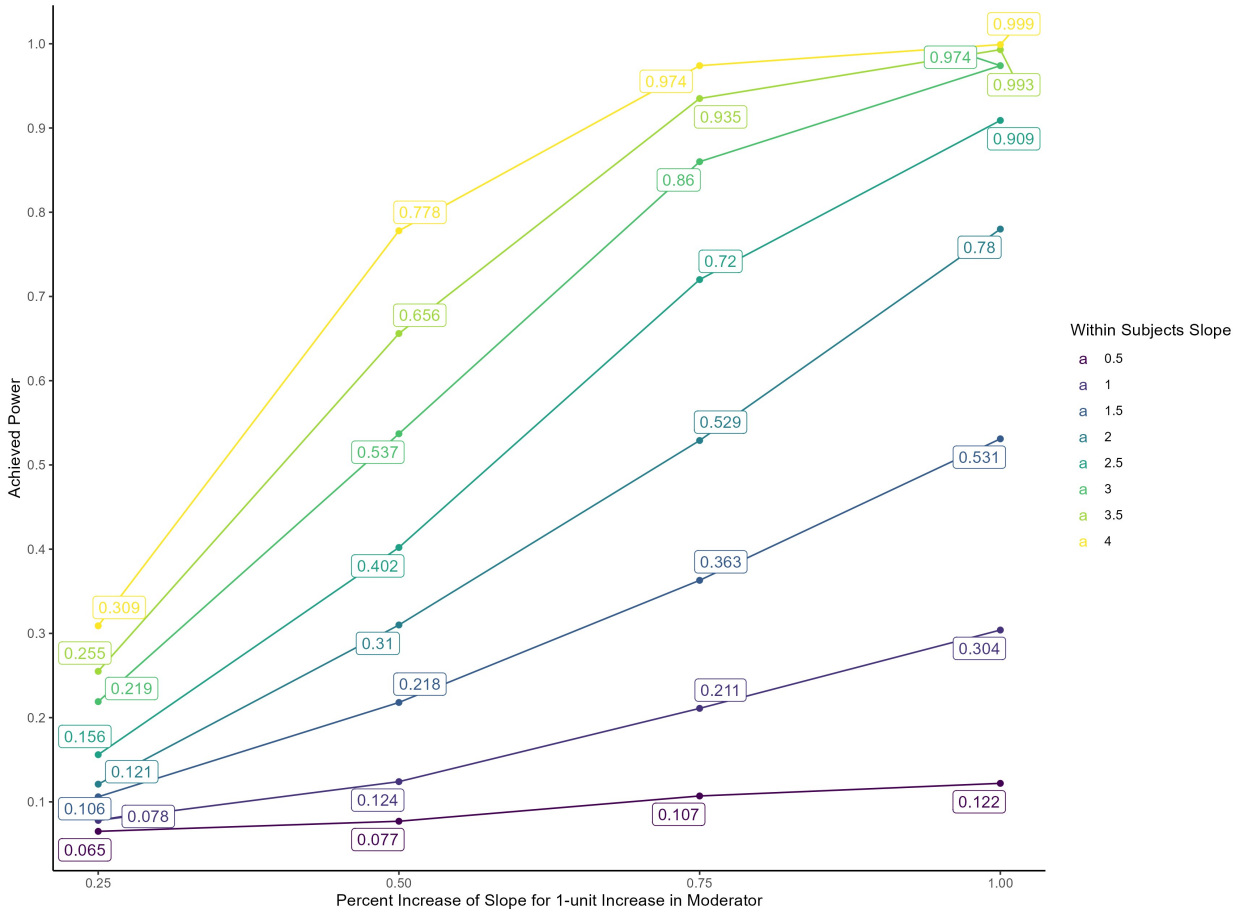


Figure S3. Power curves for cross-level interaction effects with social anxiety predicting alcohol problems (within-subjects slope) mapped to color and effect size for the interaction effect on the x-axis.