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Objectives: This project investigates how emerging adult college students' engagement with alcohol-related content online is associated with their frequency of alcohol use and heavy episodic drinking, using novel dyadic self-reported and peer-reported data. As youth use social media to post text and pictures about offline alcohol consumption to glorify and rehash drinking episodes, this may reshape youths' perceptions of the extent to which drinking is normative in their peer network, and thus increase alcohol use risk. The present study sought to elucidate the ways in which college students' engagement in online alcohol-facilitative communication is associated with their drinking (frequency of alcohol use and heavy episodic drinking) and a friend's drinking. **Methods:** Drinking college students and a friend were recruited in dyads at UNC Chapel Hill (analytic sample N = 1,124, nested in 526 dyads); they self-reported on their past year frequency of alcohol use and heavy episodic drinking, engagement in online alcohol-facilitative communication, and perception of their friend's past year frequency of drinking. Hybrid two-intercept actor-partner interdependence models tested intersections between the college student's and their friend's online alcohol-facilitative communication with their self-reported and peer-reported drinking frequency. **Results:** Consistent with hypotheses, college students who reported more online alcohol-facilitative communication endorsed a higher frequency of drinking and college students with a friend who reported more online alcohol-facilitative communication also reported a higher frequency of drinking. Contrary to my hypothesis, the interaction between the dyad members' alcohol-facilitative communication was not associated with the college student's frequency of drinking. Across all levels of the college student's alcohol-facilitative communication, their friend's perception of their drinking was

associated with the college student's self-reported drinking, but this association was strongest when college students engaged in lower levels of alcohol-facilitative communication, which was contrary to the hypothesized direction. **Conclusions:** Analyses from the current study add to a growing body of literature suggesting that one's own and their peer's online posting of alcohol-related content influence drinking outcomes. This study was the first to examine whether peer descriptive norms are being shaped by one's posting online of alcohol-related content, and it is evident that future research is needed to continue to understand how digital technology may play a role in reshaping peer descriptive norms.

DYADIC PERSPECTIVES AROUND ONLINE ALCOHOL-FACILITATIVE COMMUNICATION

by

Gregory E. Chase

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Approved by

Dr. Michaeline Jensen
Committee Chair

DEDICATION

To my godson, Bentley Cooper, I cannot imagine how different digital technology will be when you are an emerging adult, but my hope is that the field continues to equip youth and their caregivers with the tools to thrive in the digital age.

APPROVAL PAGE

This thesis written by Gregory E. Chase has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I: INTRODUCTION

Background

Emerging adulthood (often conceptualized as ages 18 – 25) is a critical developmental period between adolescence and adulthood (Arnett, 2000) marked by frequent alcohol use and increased risk for poor psychosocial adjustment (Ellickson et al., 2001). Alcohol misuse, including heavy episodic or binge drinking, is a major public health concern among emerging adults, especially those on college campuses, who see the highest prevalence rates of alcohol misuse in the United States (Grant et al., 2016). In comparison to emerging adults not attending college, college students consume higher quantities of alcohol on drinking occasions (SAMHSA, 2006), and nearly half of undergraduate students report at least one heavy episodic drinking day in the last two weeks (Wechsler et al., 2002). Previous research indicates that the developmental context of emerging adulthood is a period when there is a rapid transition in social contexts marked by greater freedom, less parental control, and more identity exploration (Osgood et al., 2004; Schulenberg & Maggs, 2002; Schulenberg et al., 2005), which warrants further exploration of health risk behaviors such as alcohol use (Arnett, 2005).

Drinking in emerging adulthood is multiply determined and influenced by several socio-ecological factors including, genetics, familial alcohol use, behavioral disinhibition, and peers (Brown & Tapert, 2004; Chassin et al., 2004, 2013; Steinberg, 2010). Peers are one of the most salient and consistent influences on emerging adult alcohol use (Leung et al., 2014; Steinberg & Monahan, 2007), especially in the digital age when peer interactions are always at youths' fingertips (Pew Research Center, 2018). This study seeks to investigate how college students' engagement with alcohol-related content online (both their own self-reported online engagement

and their friend's reported online engagement) is related to their frequency of alcohol use and heavy episodic drinking.

Engagement with Alcohol-Related Content Online as a Risk for Alcohol Use

Youth engagement with digital technology has skyrocketed in recent decades, with 96% of youth today indicating that they own a smartphone (Pew Research Center, 2021). Smartphones allow users to connect with others through text, photos, and videos, and may provide a context for health risk behaviors (Livingstone & Smith, 2014), specifically as youth are able to post and view others' alcohol-related content online (Moreno et al., 2015).

Youth use social media to post text and pictures about offline alcohol consumption (Moreno et al., 2015), to glorify and rehash drinking episodes (D'Angelo et al., 2014; Hebden et al., 2015; Hendriks et al., 2018; Jensen et al., 2018), and to receive positive peer feedback (Steers et al., 2021). Cross-sectional research has indicated that youth who post more alcohol-related content online tend to drink more than youth who post less (Glassman, 2012; Stoddard et al., 2012; Moreno & Whitehill, 2014; Roberson et al., 2018; Westgate et al., 2014; Westgate & Holliday, 2016), though these cross-sectional surveys cannot determine whether this association is due to heavier drinkers having more alcohol-related content to post, and/or if posting drives drinking patterns. In an illuminating longitudinal study, Erevik and colleagues (2017) found that youth who posted more alcohol-related content on their social media profiles at baseline were more likely to report higher alcohol use a year later, suggesting that online posting is not *only* a signal of current drinking risk. Further, in a six-week longitudinal study of self-generated alcohol posts, youth who posted alcohol-related content online were more likely to drink (and drink more heavily) the next day (Hendriks et al., 2021).

Youth may post about their alcohol use as a way to explore their identity as a drinker (Litt et al., 2018; Thompson & Romo, 2016; Westgate & Holiday, 2016) and use social media to seek out peers who display similar drinking patterns (Huang et al., 2014), both of which could account for escalations in offline drinking. Posts about alcohol use generally portray the social and positive aspects of drinking (e.g., partying with friends) and receive high amounts of positive feedback (i.e., likes, retweets, and comments), reinforcing peer approval for consuming alcohol (Beullens & Schepers, 2013; Hendriks et al., 2017; Vanherle et al., 2022). Research examining motivations for posting alcohol-related content posits that youth post online content to adhere to the social norms of their peer group (Thompson & Romo, 2016), which suggests that one's own alcohol-related posting may be an important determinant of drinking behaviors.

In addition to one's own posting, youth are exposed to the content that their peers put online around alcohol use. Indeed, there is a growing body of literature suggesting that exposure to peers' positive alcohol-related content online (e.g., through posts, reactions, and pictures; Moreno et al., 2013) may lead to increased drinking risk. For instance, results from recent longitudinal designs suggest that exposure to peers' alcohol-related content online predicts the likelihood of drinking initiation at both six months (Boyle et al., 2016) and a year later (Nesi et al., 2017). The influence of viewing alcohol-related content online has also been supported in experimental research, as youth who viewed alcohol Facebook profiles with alcohol-related content indicated higher levels of willingness to drink, more positive attitudes toward alcohol, and rated images of alcohol users to be more favorable in comparison to participants who viewed a profile with no alcohol-related content included (Litt & Stock, 2011).

Although there is strong evidence that *posting* alcohol-related content online is associated with self-reported alcohol use and heavy episodic drinking, and some evidence that *viewing*

peers' content online may also influence drinking patterns, there is a scarcity of current literature that examines both self- and peer-generated alcohol-related content simultaneously. Erevik and colleagues (2018) found that youth who posted more alcohol-related content also viewed more alcohol-related content online, but did not explore associations with offline drinking. A meta-analysis by Curtis and colleagues (2018) concluded that youth who view and post more alcohol-related content online are more likely to drink, but did not examine whether posting or viewing alcohol-related content was more strongly related to offline drinking. Finally, and most relevantly, recent work by Steers and colleagues (2021) indicates an interactive association between posting and viewing: Youth with low levels of alcohol-related postings drank more when their peers posted more alcohol-related content online. This finding suggests that peers are able to assert influence online through postings of alcohol-related content, though this process may not offer much incremental predictive validity when one's own posting is high (i.e., a ceiling effect). It is important that future research continues to parse between the effects of self- and peer-generated alcohol-related content online, as examining them in isolation ignores potential confounding of the other. Therefore, the current study seeks to build upon a growing body of literature to understand the independent, additive, and interactive associations of online alcohol-facilitative communication within peer dyads.

Alcohol-Related Content Online and Perceived Descriptive Norms

One way in which engagement with alcohol-related content online may present risks for offline drinking is by reshaping descriptive norms around peer alcohol use. Perceived descriptive norms, or one's perception of how much their peers are drinking (Baer & Carney, 1993) have been shown to be robust predictors of alcohol use (Cox et al., 2019; Cristello et al., 2023; Meisel & Coulder, 2020) above and beyond potential confounds like gender, Greek membership, and

alcohol attitudes (Neighbors et al., 2006; Perkins & Berkowitz, 1986; Perkins et al., 2005). That is, youth who believe their peers are drinking frequently are more likely to drink more frequently themselves. In the digital age, exposure to peers' alcohol-related content online may convey the impression that many youth are drinking (Nesi et al., 2018), and Super Peer Theory (Strasburger et al., 2013) asserts that social media may work as a "super peer" making alcohol use seem more normative than it would without this source of online information. This exposure to peers' alcohol-related content online has been linked to pro-alcohol attitudes and willingness to drink (Cabrera-Nguyen et al., 2016; Curtis et al., 2018; Litt et al., 2021).

In general, research has found that youth often over-estimate how much their peers are actually drinking (Baer, 2002; Borsari & Carey, 2001; Neighbors et al., 2006; Perkins & Berkowitz, 1986; Perkins et al., 2005) and that the youth who overestimate to the greatest extent tend to drink more often and more heavily (Borsari & Carey, 2003; Campo et al., 2003; Meisel et al., 2022). Since overestimation is a risk factor for alcohol misuse (Borsari & Carey, 2003; Campo et al., 2003; Meisel et al., 2022) and normative feedback interventions to reduce overestimating and increase accuracy of descriptive norms are successful in reducing problematic drinking (Neighbors et al., 2016), other ways to increase the accuracy of perceived norms are of interest. There is some evidence that youth may more accurately report on peers that are more socially proximal (McAlaney & McMahon, 2007; Kenney et al., 2017). A recent study by Cox and colleagues (2019) found that the majority (84.8%) of college students overestimated drinking among general peers; however, nearly half (42%) accurately estimated important peers' drinking, suggesting that students are better predictors of their close friends' drinking than of general peers.

The literature generally supports the idea that exposure to alcohol-related content online reshapes youth's perception of their peer network's alcohol use. Qualitative work with college students (Moreno et al., 2012) suggests that peers' posts of alcohol use on social media are indicative of their drinking offline, which may serve as an indicator to their peer network of how much they are actually drinking. A drawback of past studies is that they have often focused on postings of alcohol-related content online within a broad or vaguely defined peer network and have not been able to differentiate between general peers and socially proximal peers. It is not known if posting of alcohol-related content online is reshaping peer norms to be more aligned with their peer's actual alcohol use in peer dyads that are more socially proximal (i.e., friendships with people known in offline contexts). A key contribution of the present study is that it can elucidate the extent to which one's own facilitation of alcohol experiences online might by helping their friend (who they know in an offline college setting) to know more accurate information about their level of alcohol use.

Thus, the present study explores the ways in which online alcohol-facilitative communication might present *risks* for alcohol use and heavy episodic drinking (Research Question 1), but also ways in which online alcohol-facilitative communication might offer *protection* from drinking through reshaping of perceived descriptive norms towards accuracy (Research Question 2).

The Present Study

The current study sought to uncover how emerging adult college students' engagement with alcohol-related content is associated with their frequency of alcohol use and heavy episodic drinking, using novel dyadic self-reported and peer-reported data. In service of the larger

objective of the study, the present study sought to answer the following study questions and test the following specific hypotheses:

RQ1: Do those college students who report engaging in more online alcohol-facilitative communication drink more often or drink more heavily than those who engage in less online alcohol-facilitative communication? Do college students whose *friend* reports engaging in more online alcohol-facilitative communication drink more often or drink more heavily than those whose friend reports engaging in less online alcohol-facilitative communication? Does the *combination* of the college student and their friend's online alcohol-facilitative communication matter more than either one's engagement in online alcohol-facilitative communication alone?

Hypothesis 1a. Consistent with previous research indicating that one's own posting of alcohol-related content is associated with one's own increased alcohol use (Moreno & Whitehill, 2014; Roberson et al., 2018; Westgate & Holliday, 2016), I hypothesized that those college students who reported engaging in more online alcohol-facilitative communication would also report engaging in more frequent alcohol use and heavy episodic drinking.

Hypothesis 1b. Consistent with previous research indicating that youth may (inadvertently or more intentionally) influence their peer's drinking behavior through their own positive alcohol messaging (online and offline; Curtis et al., 2018; Litt et al., 2021), I hypothesized that college students whose friend engaged in more online alcohol-facilitative communication would report engaging in more frequent alcohol use and heavy episodic drinking.

Hypothesis 1c. Consistent with one study indicating that the relationship between alcohol use and viewing peers' alcohol-related content is stronger for those who post less alcohol-related content online themself (Steers et al., 2021), I hypothesized that the college student's friend's

online alcohol-facilitative communication would be more strongly linked to the college student's frequency of alcohol use and heavy episodic drinking when the college student's online alcohol-facilitative communication is *low*; when the college student's online alcohol-facilitative communication is high, it is likely a strong signal of drinking risk and thus the friend's online alcohol-facilitative communication would be less strongly tied to the college student's frequency of alcohol use and heavy episodic drinking.

RQ2: Do those college students who engage in more online alcohol-facilitative communication have a friend who perceives the college student's drinking in a way that is more similar to the college student's perception of their own drinking? That is, might the content that college students post online about their drinking shape peer perceptions of the college student's drinking to make them more "accurate"?

Hypothesis 2. Consistent with previous research indicating that proximally close peers are moderately accurate reporters on their peers' alcohol use (Cox et al., 2019; McAlaney & McMahon, 2007; Kenney et al., 2017) and that posting alcohol-related content online is associated with actual alcohol use (Glassman, 2012; Stoddard et al., 2012; Westgate et al., 2014), I hypothesized that college students who engaged in more online alcohol-facilitative communication would have a friend that perceived the college student's frequency of alcohol use and heavy episodic drinking more similarly to how the college student reports their own frequency of alcohol use and heavy episodic drinking (more "accurate"), relative to those college students who engaged in less online alcohol-facilitative communication.

CHAPTER II: METHOD

Method

Sample and Recruitment

The current study used an existing sample of college students (Hussong & Bauer, 2019), featuring peer dyadic survey data. As part of a larger study completed from 2016 to 2018 on novel data harmonization techniques to measure substance use and related disorders, study participants completed two lab-based visits, two weeks apart. Participants were recruited through e-mail invitations that were sent to 8,199 undergraduate students at the University of North Carolina at Chapel Hill (UNC-CH) whose contact information was obtained through the registrar's office or who participated in a similar study (REAL-U) by the research team. Invitees were randomly sampled from all enrolled students who were aged 18-26, with oversampling for males and ethnic minority students given their underrepresentation in the student body (as compared to the U.S. population of that age bracket). An additional 116 people contacted the study team directly asking to participate in the study after hearing about it from a friend, resulting in a recruitment pool of 8,315.

Randomly selected students were first sent a personalized email containing a brief description of the study, a link to the study's website, and a link to a Qualtrics-based pre-screen survey for eligibility. Inclusion criteria for the target participant included: (a) aged 18-26; (b) currently enrolled as a student at UNC-CH; and (c) reported alcohol use in the past year at the point of screening. In service to the larger goals of the study, alcohol using participants were required to evaluate new methodological techniques for harmonizing measures for substance use and related disorders, and to evaluate a series of hypotheses concerning the social and environmental factors that lead emerging adults towards or away from substance use behavior

(Hussong & Bauer, 2019). A total of 1,468 students (18% of recruitment pool) completed the pre-screen survey, of whom 1,270 (87%) screened eligible for participation in the study.

Qualifying participants were considered the "target participant" and were asked to nominate up to four friends to participant in a study with them as their "peer." The nominated first-choice friend was automatically sent a pre-screen survey of their own, which evaluated their eligibility (i.e., over the age of 18 and not having participated in the study previously). If the peer was determined to be eligible at the end of the pre-screen, both were provided sign up instructions through the study's research portal. The dyad was instructed to sign up for two testing sessions, exactly two weeks apart, that they were both available to attend together. Of eligible participants, 949 dyads scheduled research appointments (75% of eligible screenings); the final sample comprised 923 peer dyads (N = 1,846 individuals) as 26 pairs did not show up for their first scheduled study visit. Given the perturbations of study items to evaluate novel harmonization techniques included within the current study, the final analytic sample included 562 peer dyads (N = 1,124 individuals). More detail on perturbations and sample restrictions are provided in the Study Procedures below.

As seen in Table 1, the current sample was fairly representative of UNC-CH's student population more broadly (as measured here using data on the demographics of incoming students in 2016 (UNC-CH Admissions, 2016)). Like the population, the sample was predominantly female and predominantly White.

Table 1. First Year UNC Student Demographics Compared to the Current Sample

	First Year Students UNC in 2016	Current Sample
Total N	4,228	1,124
%		
Male Gender[a]	40.0	34.4
Race		
American Indian or Alaska Native	2.0	0.2
Asian	14.0	14.0
Pacific Islander	< 0.1	0.2
Black/African American[a]	11.0	9.8
White/Caucasian	71.0	68.8
Latino/Hispanic	7.0	7.6
Two or more races/ethnicities	9.0	4.1

Note. [a]Oversampled by design for current sample.

Study Procedures

At the first session, peer dyads completed consent procedures and a computerized survey battery. In service of the larger goals of developing new harmonization techniques, participants were randomly assigned to one of five conditions which determined what survey batteries (which included different variations of the same survey measures, with minor perturbations in either item stems or item response sets) would be completed in study sessions (i.e., targets completed batteries A or B and peers completed batteries C or D). Breakdown of this random assignment to survey batteries can be found in Table 2, with details on the nature of perturbations and techniques for either harmonizing measures across conditions (in the case of small perturbations that altered item stem wording but not meaning or response sets) or for dropping participants from analyses (in instances when perturbations were drastically different from original items) found in Tables 3 and 4. Procedures for Lab Visit 1 and Lab Visit 2 each took approximately 60 minutes to complete. Participants received a $20 incentive for completing of the first testing session, and an additional $25 incentive for completing the second testing session.

Table 2. Data Harmonization in Peer Dyads

Column Label	Target Batteries	Peer Batteries
Condition 1	Visit 1: A Visit 2: A	Visit 1: C Visit 2: C
Condition 2	Visit 1: B Visit 2: B	Visit 1: D Visit 2: D
Condition 3	Visit 1: A Visit 2: B	Visit 1: C Visit 2: D
Condition 4	Visit 1: A Visit 2: A	Visit 1: D Visit 2: D
Condition 5	Visit 1: B Visit 2: A	Visit 1: C Visit 2: D

Note. This table depicts the battery order by condition.

Measures

Demographic Covariates

Participants reported on their age (in years), sex (0 = *female*, 1 = *male*), and their parents' highest education attained (which serves as a proxy for socioeconomic status); the highest education attained by either parent was used. These variables were chosen as potential covariates because they often overlap with alcohol initiation and use (Chartier & Caetano, 2010; Labots et al., 2018; White, 2020) and could serve as potential confounds.

Frequency of Alcohol Use and Heavy Episodic Drinking

Both the target and the peer reported on their own, and their perceptions of their peer's frequency of alcohol use using items drawn from the Monitoring the Future National Survey (Johnston et al., 2013) at both Lab Visit 1 and Lab Visit 2, with varying versions randomly assigned for each survey battery (see Table 2). Here, I maximized the number of participants who received the same or very similarly worded item versions and selected either Lab Visit 1 or 2 responses according to procedures outlined below.

The Monitoring the Future items come from a long-term epidemiological study that surveys trends in legal and illicit drug use among American adolescents and adults (Johnston et al., 2013) and has been used frequently within the substance use literature (Krieger et al., 2018; Patrick et al., 2016; Skidmore et al., 2016) because of its exceptional quality and rigor (Johnston, 2014). It is difficult to obtain direct and completely objective valid measures of frequency of alcohol use; however, there is considerable evidence that suggests that this survey battery of self-report questionnaires can produce largely valid data (Johnston & O'Malley, 1997). As recommended by Johnston and colleagues (2013) as an additional step to assure validity, I checked for logical inconsistencies in respondent answering (e.g., past year frequency of alcohol use being less than past year frequency of heavy episodic drinking) and removed two responses from the dataset prior to analysis for inconsistencies.

Self-Reported Frequency of Alcohol Use. As seen in Table 3, target participants who were randomly assigned to Battery A received two questions regarding their *past year frequency of alcohol use*: 1) "On how many occasions have you had alcoholic beverages to drink – more than just a few sips – in the past year?" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*), and 2) "In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?" using a free response option. Participants in Battery A also reported on their *past year frequency of heavy episodic drinking* using two questions: 1) "How many times have you had five or more drinks in a row in the past year?" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*), and 2) "How many times have you had five or more drinks in a row in the past year" using a free response option. Participants randomly assigned to Battery B also received two questions regarding their *past year frequency of alcohol use*: 1) "In the past year, how often have

you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*), and 2) "In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?" using an 8-point Likert scale ranging from 0 (*zero*) to 7 (*everyday)*. Participants randomly assigned to Battery B also reported on their *past year frequency of heavy episodic drinking* using two questions: 1) "How many times have you had five or more drinks in a row in the past year? using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*), and 2) "In the past year, how often have you had 5 or more alcoholic drinks at one time?" using an 8-point Likert scale ranging from 0 (*zero*) to 7 (*everyday)*.

Peer participants randomly assigned to Battery C received one question on their *past year frequency of alcohol use* ("On how many occasions have you had alcoholic beverages to drink – more than just a few sips – in the past year?") and one question on their *past year frequency of heavy episodic drinking* ("How many times have you had five or more drinks in a row in the past year?"); both using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions)*. Peer participants in *Battery D* received one question on their *past year frequency of alcohol use* ("In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?") and one question on their *past year frequency of heavy episodic drinking* ("In the past year, how often have you had 5 or more alcoholic drinks at one time?"); both using an 8-point Likert scale ranging from 0 (*zero*) to 7 (*everyday)*.

To maximize the number of participants (both targets and peers) who received the same or similar item versions, I used participants' reports of *past year frequency of alcohol use and heavy episodic drinking* from Battery A and Battery C which used the same 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*), which are shaded in grey in Table

3. Battery A and Battery C were included (at either Lab Visit 1 or 2) in Conditions 1, 3, and 5 (N = 1,124, nested within 562 peer dyads). Conditions 2 and 4 (N = 726, nested within 363 peer dyads) were excluded from the current analysis as they received different Likert scales.

Table 3. Self-Reported Frequency of Alcohol Use and Heavy Episodic Drinking

Target Participant		Peer Participant	
Past Year Frequency of Alcohol Use			
Battery A	Battery B	Battery C	Battery D
On how many occasions have you had alcoholic beverages to drink – more than just a few sips – in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? 0 (*zero occasions*) to 6 (*40 or more occasions*)	On how many occasions have you had alcoholic beverages to drink – more than just a few sips – in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? 0 (*zero*) to 7 (*everyday*)
In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? *Number of Occasions:*	In the past year, how often have you had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? 0 (*zero*) to 7 (*everyday*)		
Past Year Frequency of Heavy Episodic Drinking			
How many times have you had five or more drinks in a row in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	How many times have you had five or more drinks in a row in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	How many times have you had five or more drinks in a row in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	In the past year, how often have you had 5 or more alcoholic drinks at one time? 0 (*zero*) to 7 (*everyday*)
How many times have you had five or more drinks in a row in the past year? *Number of Occasions:*	In the past year, how often have you had 5 or more alcoholic drinks at one time? 0 (*zero*) to 7 (*everyday*)		

Note. Items that are shaded in gray are those vary slightly in wording (but not in meaning) by battery type that will be utilized in the current study.

Peer-Report on their Friend's Frequency of Alcohol Use. As seen in Table 4, target participants who were randomly assigned to Battery A received one question regarding their *peer's frequency of past year alcohol use* ("On how many occasions has your friend had alcoholic beverages to drink – more than just a few sips – in the past year?") and one question regarding their *peer's frequency of past year heavy episodic drinking* ("How many times has your friend had five or more drinks in a row in the past year?"); both using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*). Target participants randomly assigned to Battery B also received one question regarding their *peer's frequency of past year alcohol use* ("In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?") and one question regarding their *peer's frequency of past year heavy episodic drinking* ("In the past year, how often has your friend had 5 or more alcoholic drinks at one time?"); both using an 8-point Likert scale ranging from 0 (*zero*) to 7 (*everyday)*.

Peer participants who were randomly assigned to Battery C received two questions regarding the *target's frequency of past year alcohol use*: 1) "On how many occasions has your friend had alcoholic beverages to drink – more than just a few sips – in the past year?" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions)* and 2) "In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?" using a free response option. Peer participants in Battery C also reported on the *target's frequency of past year heavy episodic drinking* using two questions: 1) "How many times has your friend had five or more drinks in a row in the past year?" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*) and 2) "How many times has your friend had five or more drinks in a row in the past year?" using a free

response option. Peer participants who were randomly assigned to Battery D received two questions regarding the *target's frequency of past year alcohol use*: 1) "In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*) and 2) "In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor?") using an 8-point Likert scale ranging from 0 (*zero*) to 7 (*everyday)*. Battery D also asked peer participants to report on the *target's frequency of past year heavy episodic drinking* using two questions: 1) "How many times has your friend had five or more drinks in a row in the past year?" using a 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*) and 2) "In the past year, how often has your friend had 5 or more alcoholic drinks at one time?" using an 8-point Likert scale ranging from 0 (*zero*) to 7 (*everyday)*.

I used target's report of their peer's frequency of past year alcohol use and heavy episodic drinking and peer's report of the target's frequency of past year alcohol use and heavy episodic drinking from Battery A, Battery C, and Battery D which used the same 7-point Likert scale ranging from 0 (*zero occasions*) to 6 (*40 or more occasions*); shaded in grey in Table 4. Batteries A, C, and D were included (at either Lab Visit 1 or 2) in Conditions 1, 3, 4, and 5 (N = 1,480, nested within 740 peer dyads). Given that participants in Condition 4 (N = 356, nested within 178 peer dyads) did not report on their own frequency of past year alcohol use in a similar way as Conditions 1, 3, and 5 (N = 1,124, nested within 562 peer dyads) they were excluded from the current analysis with Condition 2 (N = 370, nested within 185 peer dyads; total dropped = 726, nested within 363 peer dyads) due to the different Likert scales used.

Table 4. Peer-Reported Frequency of Alcohol Use and Heavy Episodic Drinking

Target Participant		Peer Participant	
Past Year Frequency of Alcohol Use			
Battery A	Battery B	Battery C	Battery D
On how many occasions has your friend had alcoholic beverages to drink - more than just a few sips – in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? 0 (*zero*) to 7 (*everyday*)	On how many occasions has your friend had alcoholic beverages to drink - more than just a few sips – in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? 0 (*zero occasions*) to 6 (*40 or more occasions*)
		In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? *Number of Occasions:*	In the past year, how often has your friend had a drink of beer, wine, wine cooler, or something containing alcohol or liquor? 0 (*zero*) to 7 (*everyday*)
Past Year Frequency of Heavy Episodic Drinking			
How many times has your friend had five or more drinks in a row in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	In the past year, how often has your friend had 5 or more alcoholic drinks at one time? 0 (*zero*) to 7 (*everyday*)	How many times has your friend had five or more drinks in a row in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)	How many times has your friend had five or more drinks in a row in the past year? 0 (*zero occasions*) to 6 (*40 or more occasions*)
		How many times has your friend had five or more drinks in a row in the past year? *Number of Occasions:*	In the past year, how often has your friend had 5 or more alcoholic drinks at one time? 0 (*zero*) to 7 (*everyday*)

Note. Items that are shaded in gray are those vary slightly in wording (but not in meaning) by battery type that will be utilized in the present study.

Alcohol-Facilitative Communication (AFC)

An 11-item scale (Table 5) was developed for this study to assess ways in which emerging adults use digital technology (e.g., text messaging or social media platforms such as Snapchat, Instagram, and Facebook) to facilitate drinking experiences. All participants (target and peer) across all conditions of the current study responded to these items without perturbations. These items were created by study staff and were based on questions targeting partying norms within college student samples. Each item asked participants to "Please indicate how true each reason is for you with regard to your text messaging or use of social media" with scores on a 5-point Likert scale ranging from 0 (*not true at all*) to 4 (*extremely true*). A similar measure was previously implemented by the study team in a different sample of college students from the same university (Jensen et al., 2018; however, private text messaging and social networking were reported on separately). The current study prompted participants by stating "The following are reasons why some people may use text messaging or social media platforms such as Snapchat, Instagram, and Facebook. Please indicate how true each reason is for you with regard to your text messaging or use of social media" to broadly measure how participants use technology to facilitate offline drinking experiences.

Table 5. Measure of Alcohol-Facilitative Communication (AFC)

Item Text	*M* (*SD*)	% Endorsed	Skew	Kurtosis
To find someone to walk me home after I party.	0.80 (1.16)	41.1	1.34	0.75
To figure out how to get drunk without consuming too many calories.	0.27 (0.68)	17.1	2.87	8.55
To find parties.	1.73 (1.32)	75.1	0.14	-1.14
To play online drinking games.	0.12 (0.44)	7.6	4.19	18.14
To watch my friends party.	0.88 (1.02)	52.8	1.02	0.29
To share with others that I party.	1.01 (1.16)	53.9	0.07	-0.13
To find a post-party when my friends go home.	0.40 (0.82)	24.2	2.12	3.92
To feel connected to friends even when drinking alone.	0.28 (0.74)	16.1	0.07	8.25
To find places where I can drink with others.	0.96 (1.19)	48.0	0.93	-0.37
To find the best ways to get drunk quickly.	0.25 (0.66)	16.5	0.07	11.06
To find rides home after I have been drinking or using drugs.	0.94 (1.21)	46.8	0.07	-0.08

Note. Items were administered identically within all survey batteries.

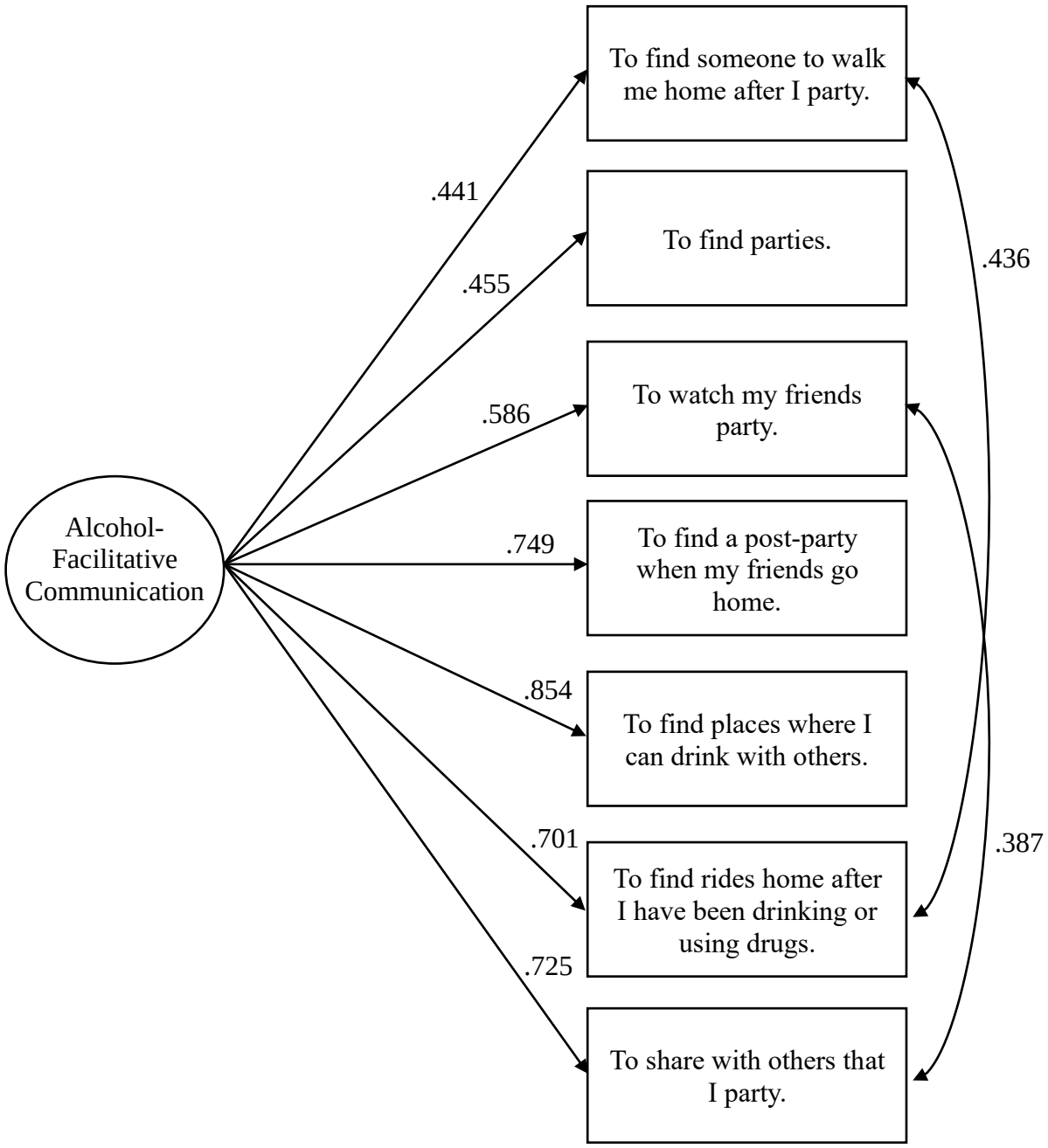
First, given the novelty of this measure, a confirmatory factor analysis (CFA) tested the hypothesized single latent factor structure of the alcohol-facilitative communication measure in Mplus version 8.6 (Muthén & Muthén, 1998-2021), using weighted least squares mean and variance adjusted (WLSMV) estimation for categorical indicators, consistent with previous research (Jensen et al., 2018) and the 4-level Likert response scale ranging from 0 (*not true at all*) to 4 (*extremely true*). A single-factor CFA of all 11-items had poor fit to the data ($\chi^2(55)$ = 2543.43, $p < .001$, RMSEA = .11 [CI .10 to .11], SRMR = .08, CFI = .79) for targets and peers who were combined using the TYPE=COMPLEX feature in Mplus to account for non-independence of peer dyads. Consistent with the only other study of this latent construct (Jensen et al., 2018), four items that were endorsed by less than 20% of the current sample were dropped

to improve model fit (e.g., “to figure out how to get drunk without consuming too many calories,” 17.1% endorsed; “to play online drinking games,” 7.6% endorsed; “to feel connected to friends even when drinking alone,” 16.1% endorsed; and “to find the best ways to get drunk quickly,” 16.5% endorsed”). Model fit improved when I allowed the residuals among several substantively related items to correlate: “to find someone to walk me home after I party” with “to find rides home after I have been drinking or using drugs, and “to watch my friends party” with “to share with others that I party.” The seven-item CFA with two correlated residuals had good fit to the data ($\chi^2(12) = 39.402$, $p < .001$, RMSEA = .05 [CI .03 to .06], SRMR = .02, CFI = 1.00). The standardized factor loadings for the seven-item alcohol-facilitative communication can be found in Figure 1; all factor loadings were significant at the $p < .001$ level.

Next, in order to assess the extent to which this seven-item measure of alcohol-facilitative communication functions similarly for males and females, I conducted measurement invariance testing based on assigned sex at birth. Using the Mplus measurement invariance convenience function, I tested invariance at three levels: configural (whether the basic factor structure is the same across groups), metric (whether factor loadings are the same across groups), and scalar (whether the item intercepts/thresholds are the same across groups) invariance (Brown, 2015; Millsap & Olivera-Aguilar, 2012). Unfortunately, invariance test results suggested that the seven-item measure of alcohol-facilitative communication failed to achieve invariance: (configural: $\chi^2(24) = 84.14$, $p < .001$; metric: $\chi^2(30) = 265.05$, $p < .001$; scalar: $\chi^2(30) = 247.52$, $p < .001$; metric against configural: $\chi^2(6) = 142.57$, $p < .001$; scalar against configural: $\chi^2(26) = 156.71$, $p < .001$; scalar against metric: $\chi^2(20) = 41.40$, $p = .003$). This suggests differences in both the item loadings and intercepts/thresholds across sex. In service of constructing a measure that functions similarly across males and females, I explored alternative

measurement strategies (e.g., dropping items that functioned most differently across males and females, “To find someone to walk me home after I party” and “To find rides home after I have been drinking or using drugs”). However, I was not successful in finding a common set of items that tapped the construct of alcohol-facilitative communication similarly across males and females. Thus, I have proceeded with the original seven-item alcohol-facilitative communication measure, for which I computed and exported factor scores to be used in subsequent analyses. All analyses controlled for sex and limitations of this approach are discussed.

Figure 1. Standardized Factor Loadings for Alcohol-Facilitative Communication



Note. Standardized coefficient paths depicted. All paths were significant at the $p < .001$ level.

CHAPTER III: ANALYSES

Analyses

Preliminary Descriptive Analyses

Descriptive statistics (means and standard deviations) and correlations between study variables were computed (see Table 6). Demographic variables of age, sex, and caregiver education (as a proxy for socioeconomic status) were chosen as covariates because of their correlations with predictor (i.e., alcohol-facilitative communication and peer perception of alcohol use and heavy episodic drinking) and outcome variables (i.e., frequency of alcohol use and heavy episodic drinking) in the current study. Previous studies (e.g., Chartier & Caetano, 2010; Labots et al., 2018; White, 2020) have also confirmed associations between these demographic variables and alcohol initiation and use.

Primary Analyses

All hypothesis testing was conducted in Mplus 8.6 (Muthén & Muthén, 1998-2021) using the robust maximum likelihood (MLR) estimator (which allows for non-normality of endogenous variables, which is important for often non-normal drinking outcomes) and controlling for relevant demographic covariates. Missing data were handled using full information maximum likelihood estimation (FIML), a method with fewer biases than other approaches to handling missing data (Enders & Bandalos, 2001). All predictor variables included in interaction terms were grand-mean centered to facilitate interpretation (Aiken & West, 1991) and significant interactions were probed using the Johnson-Neyman technique for visualizing regions of significance (Johnson & Neyman, 1936; Preacher et al., 2006).

Table 6. Correlations and Descriptive Statistics for Study Variables

Variable	1	2	3	4	5	6	7	8
1. Age	**.73****	.02	-.06	-.02	.20**	.15**	.27**	.19**
2. Male Sex	.04	**.54****	.04	-.06	.07	.04	.13**	.28**
3. Caregiver Education	-.04	.05	**.06**	.06	.07	.04	.13**	.07
4. Alcohol-Facilitative Communication (AFC)	-.05	.01	.10*	**.24****	.29**	.37**	.47**	.45**
5. Peer Perception of Alcohol Use	.18**	.04	.15**	.25**	**.51****	.81**	.59**	.51**
6. Peer Perception of Heavy Episodic Drinking	.10*	.17**	.14**	.37**	.73**	**.57****	.54**	.65**
7. Frequency of Alcohol Use	.21**	.10*	.10*	.39**	.56**	.53**	**.44****	.76**
8. Frequency of Heavy Episodic Drinking	.11*	.21**	.15**	.46**	.47**	.68**	.76**	**.48****
Target Participant's *Mean* (*Standard Deviation*)	20.46 (1.22)[a]	0.35 (0.48)[a]	4.74 (1.30)[a]	0.00 (0.39)[a]	4.09 (1.69)[a]	2.70 (1.96)[a]	4.25 (1.61)[a]	2.80 (1.99)[a]
Peer Participant's *Mean* (*Standard Deviation*)	20.47 (1.29)[a]	0.33 (0.47)[a]	4.78 (1.33)[a]	0.00 (0.40)[a]	4.34 (1.63)[b]	3.18 (2.03)[b]	4.21 (1.61)[a]	2.73 (1.99)[a]

Note. ***p* < .001. **p* < .05. Correlations among target participants are below the diagonal and peer participants are above the diagonal. The diagonal depicts the correlations between target participant and peer participant reports of the same construct. Means of target and peer participants in columns with different subscripts are significantly different at *p* < .05.

Dyadic Data Analysis Approach

Given the fact that target and peer participants are nested in dyads, I followed the procedures set forth by Wheeler and colleagues (2018) to assess the extent to which I should treat target and peer participants as distinguishable or indistinguishable members of the dyad. I did so through a series of nested structural equation models which were compared using chi-square difference tests to determine which model fit the data the best: (a) an unconstrained model in which all parameters were freely estimated across target and peer participants; (b) a hybrid two-intercept actor-partner interdependence model in which target and peer effects were constrained to equality; and (c) a fully constrained model with covariate paths, intercepts, and residual variances were constrained to equality across target and peer participants. Results from the unconstrained models (Kenny, 2006; Wheeler et al., 2018), in which all parameters were allowed to vary across target and peer participants, and the fully constrained models, in which all parameters of interest were constrained to equality across target and peer participants, indicated that the target and peer participants were empirically *non*distinguishable (i.e., no significant variation by target and peer participants). Chi-square difference tests that determined the model that fit the data best can be found in Table 7. The fully constrained model results (where target and peer participants are constrained to equality, which yields a single estimate) are thus presented below and we henceforth refer to "college students" and their "friend" to make it clear that these estimates no longer distinguish between target and peer participants.

Table 7. Chi-Square Difference Tests for Model Fit

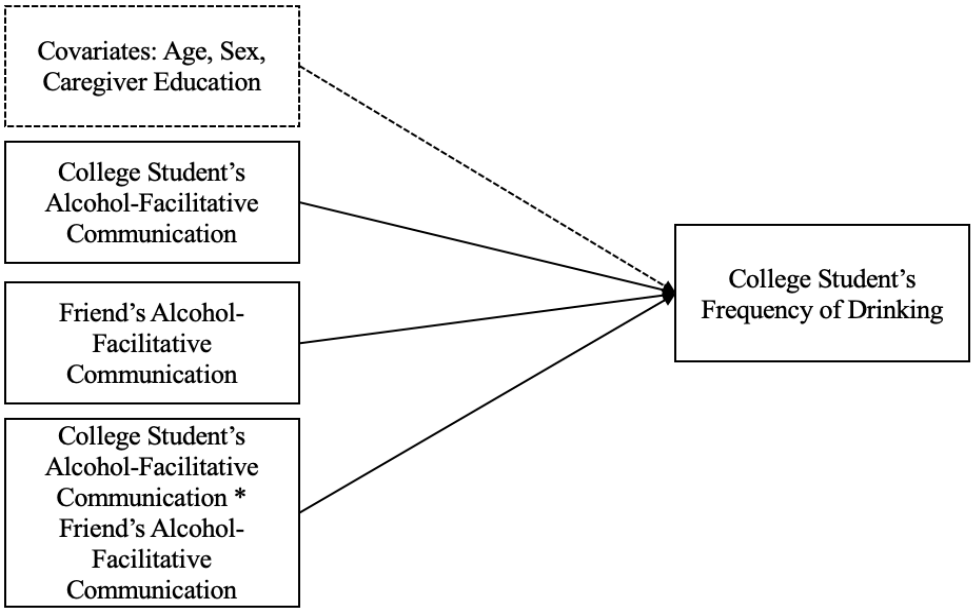
	Step 1: Unconstrained Model	Step 2: Hybrid Two-Intercept APIM	Step 3: Fully Constrained Model	Step 1 versus Step 3 Test Statistic
Past Year Frequency of Alcohol Use				
Research Question 1	RMSEA = .07 [.04 to .10] CFI = .96 SRMR = .02	RMSEA = .04 [.02 to .07] CFI = .97 SRMR = .02	RMSEA = .04 [.02 to .06] CFI = .95 SRMR = .08	$\chi^2(12) = 13.97$, $p = .303$
Research Question 2	RMSEA = .12 [.10 to .14] CFI = .89 SRMR = .04	RMSEA = .10 [.08 to .12] CFI = .88 SRMR = .04	RMSEA = .08 [.07 to .10] CFI = .87 SRMR = .08	$\chi^2(14) = 22.44$, $p = .070$
Past Year Frequency of Heavy Episodic Drinking				
Research Question 1	RMSEA = .03 [< .01 to .06] CFI = .99 SRMR = .01	RMSEA = .02 [< .01 to .05] CFI = .99 SRMR = .02	RMSEA = .03 [< .01 to .05] CFI = .98 SRMR = .08	$\chi^2(12) = 16.87$, $p = .154$
Research Question 2	RMSEA = .16 [.14 to .18] CFI = .82 SRMR = .04	RMSEA = .13 [.12 to .15] CFI = .81 SRMR = .04	RMSEA = .11 [.10 to .13] CFI = .80 SRMR = .08	$\chi^2(14) = 16.72$, $p = .271$

Note. Fully constrained model results indicated best model fit across all models in hypothesis testing and were retained for analyses. Non-significant chi-square differences indicate that target and peer participants are empirically nondistinguishable.

RQ1: Online Alcohol-Facilitative Communication

Research Question 1 was tested (as seen in Figure 2) in single-level structural equation models, with the dyad as the unit of analysis, in which each college student's past year frequency of alcohol use and heavy episodic drinking were regressed (in separate models) on the college student's self-report of their own online alcohol-facilitative communication, their friend's report of their own online alcohol-facilitative communication, alongside an interaction term between the college student and friend's online alcohol-facilitative communication. All models included covariates of age, sex, and caregiver education.

Figure 2. Model for Research Question 1

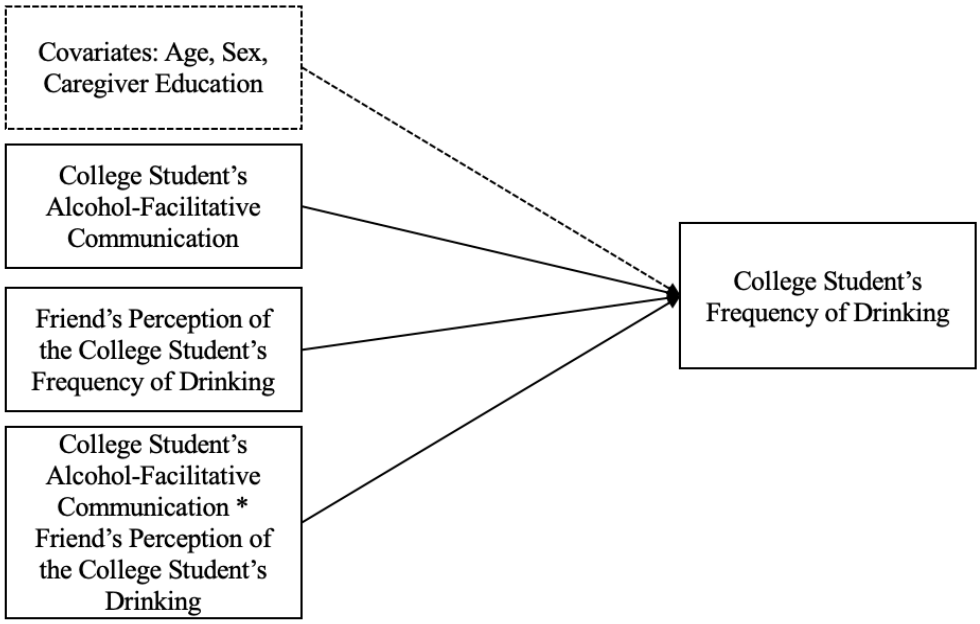


Note. College student's frequency of drinking (alcohol use or heavy episodic drinking) regressed (in separate models) on the college student's alcohol-facilitative communication, their friend's alcohol-facilitative communication, and their interaction alongside covariates of age, sex, and caregiver education.

RQ2: Peer Perception of Alcohol Use and Alcohol-Facilitative Communication

Research Question 2 was also tested in single-level structural equation models, with the dyad as the unit of analysis. As seen in Figure 3, college student's past year frequency of alcohol use and heavy episodic drinking were regressed on their friend's report of their perception of the college student's past year frequency of alcohol use and heavy episodic drinking (in separate models), the college student's online alcohol-facilitative communication, and an interaction term between the college student's online alcohol-facilitative communication and their friend's report of their perception of the college student's past year frequency alcohol use and heavy episodic drinking. All models included covariates of age, sex, and caregiver education.

Figure 3. Model for Research Question 2



Note. College student's frequency of drinking (alcohol use or heavy episodic drinking) regressed (in separate models) on the college student's alcohol-facilitative communication, their friend's perception of the college student's frequency of drinking, and their interaction alongside covariates of age, sex, and caregiver education.

CHAPTER IV: RESULTS

Results

Preliminary Results

As seen in Table 6, the magnitude and sign of zero-order correlations among study variables were similar for college student (below the diagonal) and friend (above the diagonal) participants (consistent with my decision to treat the two participants as indistinguishable dyad members). The only mean-level differences that emerged between the two participant types was that college student and friend participants differed on their report of their friend's frequency of alcohol use ($t(1086) = -2.44$, $p = .015$) and heavy episodic drinking ($t(1084) = -3.95$, $p < .001$) where the friend reports of college students' alcohol use and heavy episodic drinking were higher than the college student's reports of friend's frequency of alcohol use any heavy episodic drinking (consistent with the recruitment of target participants who were drinkers by design, and peer participants who were not required to be drinkers). The college student and friend participants' self-reported frequency of alcohol use and heavy episodic drinking were moderately correlated with each other ($r(1086) = .44$, $p < .001$ and $r(1086) = .48$, $p < .001$, respectively); whereas the correlation between the college student and their friend's alcohol-facilitative communication was somewhat weaker ($r(1086) = .24$, $p < .001$).

Overall, college student and friend self-reported fairly high amounts of alcohol use ($M_{\text{College Student}} = 4.24$, $SD_{\text{College Student}} = 1.61$, $M_{\text{Friend}} = 4.21$, $SD_{\text{Friend}} = 1.60$; where a 4 indicates 10-19 drinking occasions) and heavy episodic drinking ($M_{\text{College Student}} = 2.79$, $SD_{\text{College Student}} = 2.00$, $M_{\text{Friend}} = 2.71$, $SD_{\text{Friend}} = 1.97$; where a 2 indicates 3-5 and a 3 indicates 6-9 heavy episodic drinking occasions) in the past year. Self-reported and peer-reported frequency of alcohol use were not significantly different from each other for the college student ($t_{\text{College Student}}(535) = -1.45$,

p = .146); however, self-reported and peer-reported frequency of alcohol use were significantly different from each other for the friend ($t_{\text{Friend}}(531) = 2.14$, p = .028) where the college student's report of their friend's frequency of alcohol use was an underestimate of the friend's frequency of alcohol use. Self-reported and peer-reported frequency of heavy episodic drinking were significantly different from each other for the college student ($t_{\text{College Student}}(524) = -6.15$, $p <$ .001) where the friend's report of the college student's frequency of heavy episodic drinking was an overestimate of the college student's frequency of alcohol use. Self-reported and peer-reported frequency of heavy episodic drinking were not significantly different from each other for the friend ($t_{\text{Friend}}(519) = -0.48$, p = .631).

RQ1: Online Alcohol-Facilitative Communication

Research Question 1 queried whether college students who engage in more online alcohol-facilitative communication drank more or drank more heavily than those who engaged in less online alcohol-facilitative communication, if college students whose friend engages in more online alcohol-facilitative communication drank more or drank more heavily than those whose friend engaged in less online alcohol-facilitative communication, and if the combination of the college student and their friend's online alcohol-facilitative communication mattered more than either one's engagement in online alcohol-facilitative communication alone. Results related to Research Question 1 are summarized in Table 8. Consistent with hypothesis 1a, college students that engaged in more online alcohol-facilitative communication tended to endorse more frequent alcohol use and heavy episodic drinking. Consistent with hypothesis 1b, college students whose friend engaged in more online alcohol-facilitative communication also tended to report more frequent alcohol use and heavy episodic drinking. The effect sizes of the college student and their friend's online alcohol-facilitative communication were compared using a chi-square

difference test to determine if the coefficients capturing associations between the college student and their friend's online alcohol-facilitative communication with the college student's alcohol use and heavy episodic drinking differed significantly in magnitude. The college student's online alcohol-facilitative communication was a significantly stronger predictor of the college student's frequency of alcohol use ($\chi^2(1) = 40.05$, $p < .001$) and heavy episodic drinking ($\chi^2(1) = 30.45$, $p < .001$) than their friend's online alcohol-facilitative communication. Contrary to hypothesis 1c, the interaction term of the college student and friend's online alcohol-facilitative communication was not significantly associated with the college student's alcohol use nor heavy episodic drinking frequency, suggesting that associations between the college student's online alcohol-facilitative communication and their own frequency of alcohol use and heavy episodic drinking did not differ based on how much their friend reported engaging in online alcohol-facilitative communication.

Table 8. Results for Research Question 1

	Frequency of Past Year Drinking					
	Alcohol Use			Heavy Episodic Drinking		
	b (*SE*)	*p*	β	*b* (*SE*)	*p*	β
Age	**.28 (.04)**	**< .001**	**.22**	**.23 (.05)**	**< .001**	**.14**
Caregiver Education	**.10 (.04)**	**.005**	**.09**	**.11 (.04)**	**.015**	**.07**
Male Sex	**.33 (.10)**	**.001**	**.10**	**.95 (.12)**	**< .001**	**.23**
College Student's AFC	**1.62 (.11)**	**< .001**	**.40**	**2.11 (.13)**	**< .001**	**.42**
Friend's AFC	**.65 (.10)**	**< .001**	**.03**	**1.01 (.13)**	**< .001**	**.20**
College Student's AFC * Peer's AFC	-.44 (.33)	.179	-.04	-.42 (.43)	.330	-.03

Note. N = 1,124 nested within 562 peer dyads. Age, Caregiver Education, and Sex (1 = Male) included as covariates. Raw coefficients (*b*), standard errors (*SE*), standardized regression coefficients (β) reported. Significant values ($p < .05$) bolded. AFC = Alcohol-Facilitative Communication.

RQ2: Peer Perception of Alcohol Use and Alcohol-Facilitative Communication

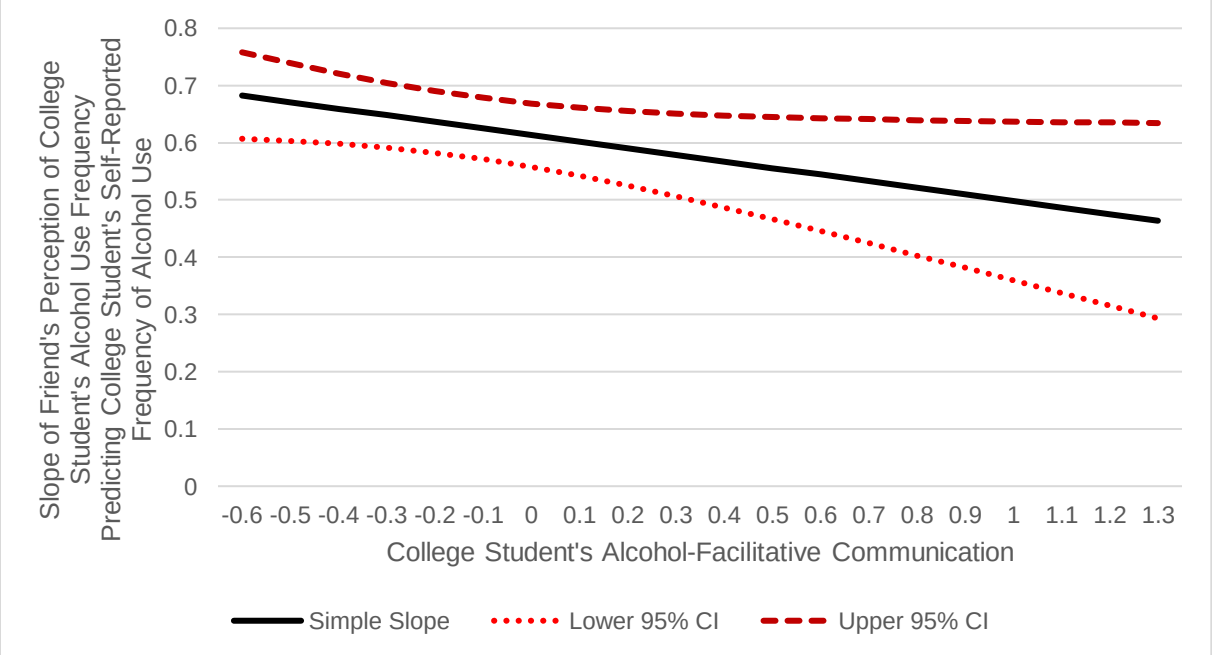
Research Question 2 queried whether college students who engage in more online alcohol-facilitative communication have a friend who perceives the college student's drinking in a way that is more similar to the college student's perception of their own drinking. As seen in Table 9, there were significant direct associations between the friend's perceptions of the college student's frequency of alcohol use and heavy episodic drinking and the college student's online alcohol-facilitative communication with the college student's self-reported frequency of alcohol use and heavy episodic drinking. Frequency of heavy episodic drinking was not significantly predicted by the interaction between the two, but there was as significant interaction between the friend's perception of the college student's frequency of alcohol use and the college student's online alcohol-facilitative communication in predicting the college student's frequency of alcohol use. Figure 4 plots the magnitude of the association between the friend's perception of the college student's alcohol use frequency and the college student's frequency of alcohol use across all levels of the college student's online alcohol-facilitative communication; friend perception of the college student's alcohol use frequency was always significantly associated with the student's frequency of alcohol use, but this association was stronger when the college student engaged in *lower* levels of online alcohol-facilitative communication, which is contrary to the hypothesized direction.

Table 9. Results for Research Question 2

	Frequency of Past Year Drinking					
	Alcohol Use			Heavy Episodic Drinking		
	b (*SE*)	*p*	β	*b* (*SE*)	*p*	β
Age	**.28 (.04)**	**< .001**	**.22**	**.23 (.05)**	**< .001**	**.14**
Caregiver Education	**.10 (.04)**	**.005**	**.09**	**.11 (.04)**	**.015**	**.07**
Male Sex	**.33 (.10)**	**.001**	**.10**	**.95 (.12)**	**< .001**	**.23**
Friend's Perception of Drinking	**.61 (.03)**	**< .001**	**.62**	**.65 (.03)**	**< .001**	**.63**
College Student's AFC	**.77 (.10)**	**< .001**	**.18**	**1.01 (.13)**	**< .001**	**.19**
Friend's Perception of Drinking * College Student's AFC	**-.12 (.06)**	**.047**	**-.05**	.07 (.05)	.120	.02

Note. N = 1,124 nested within 562 peer dyads. Age, Caregiver Education, and Sex (1 = Male) included as covariates. Raw coefficients (*b*), standard errors (*SE*), standardized regression coefficients (*β*) reported. Significant values ($p < .05$) bolded. AFC = Alcohol-Facilitative Communication.

Figure 4. Johnson-Neyman Regions of Significance Plot



Note. Plot of the slope of the friend's perception of the college student's frequency of alcohol use as a function of the college student's alcohol-facilitative communication predicting the college student's frequency of alcohol use. The range of alcohol-facilitative communication depicted here includes 1 SD above and below the mean.

CHAPTER V: DISCUSSION

Discussion

Posting of alcohol-related content online has been widely implicated as a risk for self-reported alcohol use and heavy episodic drinking, with some evidence that viewing peers' alcohol-related content online may also influence drinking patterns. Fewer studies, however, have examined both self-generated and peer-generated alcohol-related content simultaneously. Further, no previous study had examined whether engagement with alcohol-related content online may be reshaping peer descriptive norms to be more similar to one's own perception of their own drinking; that is, the content that an individual posts online about their drinking may give their peers an observational window into their drinking patterns, and shaping peer perceptions to make them more "accurate." This study built upon recent research (e.g., Cox et al., 2019; Litt et al., 2021; Steers et al., 2021) to better understand how college student's engagement with alcohol-related content online (both their own and their friend's) may be associated with their frequency of alcohol use and heavy episodic drinking.

I found (in line with my hypothesis) that those college students who used more online alcohol-facilitative communication, and who had a friend who reported using more online alcohol-facilitative communication tended to drink more often and more heavily. These direct (unmoderated) associations are consistent with previous research that has indicated that posting of alcohol-related content online is associated with self-reported drinking frequency, heavy episodic drinking, and likelihood of alcohol use disorder (Glassman, 2012; Moreno & Whitehill, 2014). The current study adds to a growing consensus that youth may (either inadvertently or more intentionally) influence their peers' drinking behavior through their own positive alcohol messaging (both online and offline; Curtis et al., 2018; Litt et al., 2021). Although it was found

that friends' use of online alcohol-facilitative communication was associated with the college student's frequency of alcohol use and heavy episodic drinking, it is important to note that the effect sizes of the friend's online alcohol-facilitative communication were significantly weaker than the college student's online alcohol-facilitative communication. This suggests that facilitating alcohol experiences online matters more when the college student is engaging in this behavior than when their friend is.

Interestingly, I did not find evidence that the combination of the college student and their friend's online alcohol-facilitative communication was associated with the college student's drinking, which is inconsistent with the only other study to test the interaction of both self-generated and peer-generated online alcohol-related content (Steers et al., 2021). It is possible that these divergent results could be attributed to methodological differences: Steers and colleagues (2021) asked their participants about how often they either posted or viewed alcohol-related content online, with items adapted from measures of daily drinking, whereas this study asked a college student and their friend how often they each engaged in alcohol-facilitative communication across technological mediums for various purposes. It is possible that differing conclusions could be due to a focus on perceived frequency of *viewing* alcohol-related content online from one's entire peer network (Steers et al., 2021) versus the friend's self-reported frequency of engaging in online alcohol-facilitative communication, which the college student may or may not have directly viewed every time. For instance, it is possible that the friend's online alcohol-facilitative communication occurred sometimes in public social media, sometimes in private text messages, and sometimes in semi-private (closed circle) social media, which the college student may have been exposed to in some forms but not in others. Irrespective of methodology, it is important that future research continue to look at both self-generated and

peer-generated online alcohol-related content in tandem to better understand the mutual influence these types of social media postings may have on drinking patterns and norms.

Further, consistent with my hypothesis, the friend's perception of the college student's past year frequency of alcohol use and heavy episodic drinking was significantly associated with the college student's report of past year frequency of alcohol use and heavy episodic drinking. These friend perceptions of alcohol use frequency were always strongly and significantly linked with the college student's report of their own alcohol use frequency, across all levels of the college student's online alcohol-facilitative communication, though this association was stronger when college students engaged in *lower* levels of online alcohol-facilitative communication, which was contrary to the hypothesized direction of this interaction. Possible explanations for the emergence of these findings and this counterintuitive pattern are explored below.

Consistent with some previous research (Cox et al., 2019; McAlaney & McMahon, 2007; Kenney et al., 2017) it was found that friends were moderately accurate reporters of the college student's frequency of alcohol use, though college students tended to underestimate their friend's frequency of alcohol use. Friends tended to overestimate the college student's frequency of heavy episodic drinking, though college students were moderately accurate reporters of their friend's frequency of heavy episodic drinking. This finding is somewhat consistent with other work indicating that college students' perceived peer norms are often overestimates (Baer, 2002; Borsari & Carey, 2001; Neighbors et al., 2006; Perkins & Berkowitz, 1986; Perkins et al., 2005). As college students were able to nominate a friend to participate in the study with them, it was likely that they selected a more proximal friend (rather than distal) who was a more similar reporter on their alcohol use. No previous work to date has focused on whether posting of alcohol-related content online is reshaping peer norms to more aligned with their peer's actual

alcohol use, thus the finding that the friend's perception of the college student's alcohol use was more strongly associated with the college student's alcohol use when the college student engaged in lower levels of online alcohol-facilitative communication is novel, irrespective of being contrary to the hypothesized direction. It is important to note that this interaction was significant across all levels of the college student's online alcohol-facilitative communication which makes it difficult to discern whether this represents a meaningful reshaping of peer descriptive norms in the context of digital technology. As noted above, it is possible that student's online alcohol-facilitative communication was not always accessible to the friend, therefore the friend's perception of the college student's drinking may not be meaningfully shaped by the college student's use of digital technology to facilitate drinking experiences. It is important that future research continue to disentangle how social media may serve as a window into actual drinking behaviors, and how peers are perceiving this content online to be associated with offline drinking behavior.

Limitations and Future Directions

This study had many strengths, including a large sample of college student drinkers, use of novel peer dyadic self-reported and peer-reported data, and use of a novel measure assessing ways in which college students are facilitating alcohol-related experiences online. However, several limitations merit consideration and help point to future directions. First, the measure of online alcohol-facilitative communication was noninvariant across males and females, suggesting that the construct of alcohol-facilitative communication may have a different meaning across sex and that meaningful results across males and females cannot be tested. The current sample was predominantly female (65.6% of the sample) and unequal cell sizes can lead to insufficient power and inaccurate estimates (Brown, 2015), thus the overrepresentation of

females in the current study may have contributed to measurement noninvariance in the measure of alcohol-facilitative communication. There is some literature to suggest the men post more alcohol-related content online than women (Hendriks et al., 2017; Moreno et al., 2010), which may have implications for reshaping peer descriptive norms. Aligned with potential gender differences, another limitation of the current study is that gender was expressed through sex rather than gender identity. Extant literature suggest that sexual and gender minority individuals may have different motivations for drinking (Kalb et al., 2018; Kidd et al., 2018), thus their engagement in digital media to facilitate drinking experiences may also differ in ways that could not be assessed through how sex was queried in the current study. Future research is warranted to better understand ways in which individuals facilitate alcohol experiences online and how this may differ by gender identity.

Third, this study relied on cross-sectional self-reports of frequency of alcohol use and heavy episodic drinking and alcohol-facilitative communication. A past meta-analysis of 19 studies focused on alcohol-related social media saw stronger associations in cross-sectional and self-report studies compared to longitudinal and observational studies (Curtis et al., 2018). Perhaps college students use of digital media to engage around alcohol experiences is a stronger indicator of *current* drinking patterns rather than *future* drinking plans, but this could not be tested here due to the cross-sectional design. Relatedly, future studies may consider gathering objective measures (e.g., through text messaging or access to social media platforms) of online alcohol-facilitative communication to determine how much content they generate and how much they actually see others' posting of alcohol-related content online (Ehrenreich et al., 2014; Jensen & Hussong, 2021). Future research using observational, experimental, and longitudinal methods is necessary for more objective assessment of how online alcohol-facilitative

communication evolves alongside frequency of alcohol use and heavy episodic drinking over time.

Fourth, the current study did not directly test online peer influence mechanisms (i.e., peer selection and socialization) that may impact drinking behaviors. One mechanism of peer socialization that may have important implications in the digital age is deviancy training (Dishion et al., 1996), a process in which moment to moment communication and interactions within youth dyads reinforce change toward antisocial behaviors. Whereas offline antisocial conversations are reinforced by laughter or encouragement (Pieheler & Dishion, 2007), the availability and quantifiability of reinforcement afforded by social media may therefore work to socialize youth with the click of a "like" or comment of "lol." Indeed, deviancy training does appear to be occurring outside face-to-face contexts: In a study of youth's text message exchanges, it was found that antisocial behaviors were often followed by peers' reinforcement of these behaviors (e.g., responding with "lol" or "haha;" Ehrenreich et al., 2014). In the current study, it was found that college student and their friend's online alcohol-facilitative communication is associated with the college student's drinking, but not how one's friends respond dynamically in the moment to the facilitation of alcohol experiences online (e.g., through reinforcement of drinking or partying). Future research should work to parse apart specific peer selection and socialization processes and digital media may be a well-suited platform to uncover how emerging adults discuss and facilitate alcohol experiences, as digital traces of selection and socialization can be obtained as they happen in real time.

Conclusions

This study leveraged novel dyadic self-reported and peer-reported data to examine associations between one's own and their friend's engagement in online alcohol-facilitative

communication with frequency of alcohol use and heavy episodic drinking. Analyses from the current study add to a growing body of literature suggesting that one's own and their peer's posting of alcohol-related content online influences drinking outcomes. This study was also the first to examine whether peer descriptive norms are being shaped by one's posting of alcohol-related content online, and it is evident that future research is needed to continue to understand how digital technology may play a role in reshaping peer descriptive norms. It is important that future studies continue to pull apart peer selection and socialization processes online, as digital media may be a well-suited platform to understand the association between these processes and antisocial behaviors as they happen in real time. Findings from the current study have implications for those invested in the development of college students (e.g., parents/caregivers, clinicians, higher education professionals) who may be wondering how youth use digital technology to facilitate drinking experiences. Results suggest that clinicians and higher education professionals may benefit from recognition that postings of alcohol-related content online may serve as a window into one's actual drinking behavior, and that these postings may reinforce drinking norms.

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