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Change and Stability in Active and Passive Social Influence Dynamics during Natural Drinking Events: A Longitudinal Measurement-Burst Study

Jerry Cullum,
University of Connecticut Health Center

Megan O'Grady,
University of Connecticut Health Center

Stephen Armeli, and
Fairleigh Dickinson University

Howard Tennen
University of Connecticut Health Center

Abstract

We examined the link between social norms and active social influences occurring during natural social drinking contexts. Across 4 yearly measurement-bursts, college students ($N = 523$) reported daily for 30-day periods on drinking norms, drinking offers, how many drinks they accepted, and personal drinking levels during social drinking events. In contexts where drinking norms were higher, students were more likely to both receive and comply with drinking offers. These acute social influences were highly stable throughout college, but affected men and women differently across time: Women received more drinking offers than men, especially at the beginning of college and when norms were higher, but men complied with more drinking offers per occasion. These effects were not attributable to between-person differences in social drinking motives or drinking levels, nor to within-person patterns of situation-selection. The present work suggests that context-specific drinking norms catalyze active social influence attempts, and further promote compliance drinking.

Keywords

social influence dynamics; drinking behavior; norms; group processes; advanced quantitative
Author Notes

Social norms are the real or imagined behaviors of others (Sherif, 1936), which people gain awareness of through observation of collective behavior and by communicating with others about their attitudes and behavioral preferences (Cullum & Harton, 2007; Prentice & Miller, 1993). The influence of social norms on individual behavior is pervasive, with studies in myriad domains demonstrating how social norms predict behaviors such as energy use (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008), stereotype expression (Crandall, Eshleman, & O'Brien, 2006), littering (Kallgren, Reno, & Cialdini, 2000), and voting (Gerber, Green, & Larimer, 2008); but perhaps social norms have been linked to no other behavior quite so extensively as that of drinking alcohol (see Borsari & Carey, 2001;

2003 for reviews). Although the link between norms and personal behavior seems fairly well-established, the specific influence processes involved remain relatively unclear. Much of the social norms research to date demonstrates or presumes a passive influence process, whereby merely perceiving a focal norm (Cialdini, Reno, & Kallgren, 1990; Joly, Stapel, & Lindenberg, 2008), via exposure to the behaviors of close friends or proximal others (Capone, Wood, Borsari & Laird, 2007; Cullum, Armeli, & Tennen, 2010; Goldstein, Cialdini, & Griskevicius, 2008) is enough to guide a person's own subsequent behavior. That is, the influence of the social norm on personal behavior in these instances requires no direct pressure upon a person to change his or her behavior, and makes no attempt to persuade or request a person's compliance with a norm; however, in many social settings, norms may also be enforced or actively promoted by other people present in the environment.

For instance, in many small and informal group settings distinct social norms can emerge quickly through mutual and reciprocal exposure to proximal others' behaviors and preferences (Cullum & Harton, 2007; Sherif, 1936), and once a group norm forms, members often begin making direct persuasion attempts to bring and to keep other members in line with the norm (Schachter, 1951). Furthermore, people are motivated to actively derogate or ostracize norm-violators in an effort to demonstrate the sincerity of their own commitment to group norms (Willer, Kuwabara, & Macy, 2009). In many social settings, however, norms may be promoted by less punitive and more mundane measures, such as making a simple request. And once a request is made, people may look to the normative behavior pattern of others immediately around them as a guide when making compliance decisions (Cialdini & Goldstein, 2004; Festinger, 1954). In this way, social norms and active influence processes are likely to have a dynamic relationship to one another in many social settings, with social norms both catalyzing more active social influence processes, and serving as a form of social proof that increases compliance with active influence attempts.

Studies of social norms conventionally assess perceptions of norms retrospectively by asking participants to recall their past social experiences and to estimate the general social norm from these cumulative experiences. Additionally some prospective studies using these general retrospective measures of social influence suggest that both passive and active social influence processes contribute to long-term changes in drinking behavior (Capone et al., 2007; Graham, Marks, & Hansen, 1991), and that these processes may be especially influential when people have less experience with alcohol consumption (Donaldson, Graham, Piccinin, & Hansen, 1995; Pomery, Gibbons, Reis-Bergan, & Gerrard, 2009). However, these studies did not capture social influence processes as they occur during specific drinking contexts, making it difficult to determine the extent to which group norms may catalyze active social influence processes. In this study, we examine the link between social norms and active social influence processes occurring during natural social drinking contexts. Furthermore, we track the long-term stability and change in these acute social influence dynamics over the course of acquiring 4 years of college drinking experiences.

Drinking and Social Influence Processes

Passive Social Influence

Students' perceptions of their college student peers' typical drinking and their perception of their close friends' drinking are two types of descriptive norms shown to predict personal drinking behavior (Graham et al., 1991). These drinking norms represent passive influences on behavior because they do not directly exert pressure on a person to behave accordingly, but rather consist of beliefs or observations a person acquires through social exposure regarding typical or approved behavior. Students' perceptions of social norms have been shown to be one of the best predictors of college drinking behavior, relative to a host of

other social cognitive predictors (e.g., motives, expectancies, etc.; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007), and meta-analyses have shown the association between social norms and personal drinking to be a robust and moderate to large effect (Borsari & Carey, 2003).

Although the vast majority of this research is cross-sectional in nature, more recent prospective analyses also suggest that social norms predict changes in drinking behavior over time. For instance, students' perceptions of social drinking norms amongst their close friends have been linked to increases in drinking across yearly intervals in several prospective studies (Cullum et al., 2010; Reifman, Watson, & McCourt, 2006) that controlled for other causal processes that may also contribute to prospective associations between social norms and personal drinking behavior, such as selective affiliation, whereby heavier drinkers selectively befriend other heavier drinkers over time. Furthermore, a prospective study by Read, Wood, and Capone, (2005) found that perception of the drinking norms of close friends, rather than more general norms (e.g., typical college student), was related to drinking over time. They also found that close friend social norms predicted long-term change in the number of alcohol-related problems students experienced.

Active Social Influence

Unlike social norms, offering another person a drink is a common form of active social influence that impinges directly upon a person, requesting of him or her an immediate response: To comply or not (Borsari & Carey, 2001; Graham et al., 1991). Drinking offers may vary in their intensity from polite gestures to more forceful prompts to drink (e.g., enforcing a drinking game rule); polite or not, drinking offers represent an active form of social influence because they involve a direct attempt to change a person's behavior toward a particular course of action. That is, these active influence attempts seek a particular response from their targets, namely compliance or acquiescence to the request, and require a prompt behavioral response on the part of the person to the situation. Relative to social norms, far fewer studies have investigated the effects of drinking offers on alcohol consumption. Nevertheless, the available research shows that drinking offers are positively associated with both drinking levels and drinking problems in cross-sectional studies (Turrise, Mastroleo, Mallett, Larimer, & Kilmer, 2007; Wood, Read, Palfai, & Stevenson, 2001), and several prospective studies found that receiving drinking offers increased overall drinking levels over time, independent from the effects of drinking norms (Graham et al., 1991; Read et al., 2005).

In addition to there being little research on the link between active social influence and drinking, little is known about whether situational factors affect the receipt of and compliance with drinking offers. Most research on situational factors that affect drinking offers has focused on relatively stable situational factors of membership in groups (e.g., Greek organizations and college athletic teams) that typically have higher levels of passive and active influences on drinking (Capone et al., 2007; Klein, 1992; Turrise et al., 2007). Although these findings do not directly look at how the social norms of these groups contributed to the rate of drinking offers received, they do suggest a link between these groups' drinking norms and receiving drinking offers that may contribute to their increased risk for binge drinking and alcohol related problems.

Context-specific Social Influence

There are several reasons to examine acute social influence processes that occur during social drinking contexts, in addition to more general group affiliations. First, according to the Focus Theory of Norms (Cialdini et al., 1990), descriptive norms will influence behavior especially well in the context in which they are observed, and often these passive influence

effects do not generalize well across different contexts (Reno, Cialdini, & Kallgren, 1993) nor across longer temporal intervals (Nolan et al., 2008). Furthermore, the normative behavior of spatially and temporally proximal others are most likely to influence behavior (Cullum & Harton, 2007; Latané, 1981), even more so than the norms for relevant reference groups a person may identify with (e.g., gender, fraternities, etc.; Goldstein et al., 2008). Second, active social influences, by their very nature are acute and time sensitive. Although some norms may to some extent generalize and inform a person's behavior across settings (i.e., injunctive norms), active social influences such as drinking offers are time sensitive, and require an immediate response to the request. As such, generalizations regarding how often a person receives drinking offers may not adequately reflect the effect of such influences upon a person's behavior. And because both passive and active social influence processes are likely to be more temporally acute and context-specific, the ability to detect potential associations between social drinking norms and active social influence processes requires more sensitive measurement than is available from extant research.

The Norms-Offers Link

One prospective study did find a direct link between social drinking norms and drinking offers. After controlling for overall drinking level, Read et al. (2005) found that the normative drinking behavior of close friends predicted change in the number of drinking offers students' received over a 9-month period. The reverse causal order was not supported, and this effect was specific to the norms of a student's close friends; students' perceptions of the drinking norms of their typical college peers did not predict change in the number of drinking offers students received. This pattern of results suggests that the normative behavior of proximal others rather than the general perceptions of norms can influence the rate at which students receive more active influence attempts from others, and this is consistent with the hypothesis that actual norms can catalyze more active forms of social influence by increasing efforts by group members to promote or enforce the norm.

Limitations of Current Social Influence and Drinking Research

Although informative, current research on social influence and drinking suffers from three general limitations. First, of the already limited research available on drinking offers, few studies directly measure students' compliance with these offers, making it difficult to assess the effectiveness of these active social influences on drinking. Instead, researchers have relied on an association between drinking offers received and overall drinking levels to show support for these active forms of social influence. These findings might be attributable to other factors, such as heavier drinkers evoking more offers from others (Buss, 1987). Secondly, social norms may also affect the extent to which students comply with drinking offers, upon receiving them. When an offer is made, people may rely on the social norm as a source of information for a guide in deciding how to appropriately respond (Festinger, 1954). In this respect, norms may serve not only as a catalyst that encourages others to make drinking offers, but also as social validation for complying with them. The normative behavior of others has been shown to increase compliance with a request for a variety of other behaviors (Cialdini & Goldstein, 2004), but the effect of drinking norms on compliance drinking has not yet been directly investigated.

A third limitation of the social influence research on drinking is the strong tendency to examine abstractions of general or typical social norms amongst typical college students or close friends, as well as having participants assess their personal drinking behavior over an extended period of time (i.e., the last month, 3 months, year, or entire drinking history). These large windows of time require people to retrospect about their own behavior and social drinking experiences across a number of instances across time, and then abstract from these their typical pattern of behavior and typical observations of the normative behaviors of

others (cf. Tennen, Affleck, Armeli, & Carney, 2000). The generalizations people come to regarding their typical behavior or their typical social experiences may not accurately reflect their more acute behavior and social drinking experiences (Oishi, 2002; Robinson, Johnson, & Shields, 1998). These generalizations drawn over larger units of retrospective time are prone to heuristic biases, in both assessing their own behavior (e.g., availability, recency heuristics) and the collective behavior of others (the false consensus or social projection effect; Marks, Graham, & Hansen, 1992). More acute recall that draws upon episodic memory is far less subject to such biases during recall than conventional retrospective measures (Robinson & Clure, 2002).

As such, even prospective studies of social influences that assess these general perceptions of behavioral patterns may not adequately capture acute social influence dynamics as they occur in specific social drinking contexts. Individuals' drinking levels and the actual drinking norms they encounter may vary widely across drinking events within each wave of a prospective study (cf. Sliwinski, 2008), and many of the risks associated with drinking are often specific to acute episodes of heavy drinking (Neighbors, Oster-Aaland, & Bergstrom, 2006; Weitzman, Nelson, & Wechsler, 2003). Therefore, some important research questions remain unaddressed by past longitudinal studies on social influence and drinking: namely, what effect does context-specific influence dynamics have on a person's drinking behavior relative to how that person typically behaves and to what extent does such an effect change or remain stable across years of college experience?

Individual Differences & Context-Specific Social Influence

There may also be some important individual differences that affect acute influence dynamics during social drinking contexts. For instance, women in early adolescence report receiving more drinking offers than do men (Graham et al., 1991). Further, men may be more sensitive to drinking norms because they perceive more permissive alcohol norms for their gender than women do (Borsari & Carey, 2001) and might be more susceptible to influence because they feel more social pressure to drink and are more afraid of embarrassment and negative social consequences if they voice concerns about drinking (Suls & Green, 2003). As such, men may comply with drinking offers at a higher rate than women. Further, men shift their attitudes and behaviors more over time in the direction of what they believe the norm is, whereas women's drinking responses remain more stable across time (Borsari & Carey, 2003; Prentice & Miller, 1993).

Individual differences in social drinking motives may also predict rates of receiving and complying with drinking offers. Social drinking motives consist of affiliation motives—desires to drink in order to build rapport with others—and conformity motives—desires to drink to avoid social disapproval or teasing. Affiliation and conformity drinking motives are common predictors of overall and context-specific drinking behaviors (Cooper, 1994; Mohr, Armeli, Tennen, Todd, Clark, & Carney, 2005). With respect to receiving drinking offers, those with higher affiliation and conformity drinking motives may be more likely to evoke drinking offers from others during social drinking contexts, perhaps by emitting cues to others of their greater receptivity to alcohol in social settings (Buss, 1987). Further, past research on drinking norms demonstrate that people who are motivated to drink for social reasons are more sensitive to the effects of drinking norms on their behavior (Lee, Geisner, Lewis, Neighbors, & Larimer, 2007). This suggests that people with high affiliation and conformity drinking motives may defer more to context-specific drinking norms in deciding whether or not to comply with a drinking offer.

The Current Study

In the current study we examine the passive and active social influence dynamics of college social drinking in close proximity to the drinking event. We also investigate the effect of these acute processes on students' compliance drinking. Secondly, because experience with drinking may reduce susceptibility to social influence over time (Donaldson et al., 1995; Pomery et al., 2009) we investigate the stability and change of these acute influence dynamics across years of college. And lastly, we examine the role of gender and social drinking motives in accounting for between-person differences in sensitivity to these acute influences. To accomplish these objectives, we employed a longitudinal measurement-burst design (Sliwinski, 2008), which is a hybrid design of longitudinal and event-specific experience sampling techniques. In the present study, we collected multiple bursts of daily sampling of students' social interactions and drinking behavior, separated by long term intervals between bursts of data collection. Specifically, we conducted a series of daily diary intervals or "bursts" in which students report daily for a 30-day period once a year, for 4 years.

Hypotheses

We hypothesized that drinking offers would be more likely to occur when the context-specific drinking norms were greater. We also hypothesized that in contexts in which students received drinking offers, they would comply more with drinking offers when the context-specific drinking norm was higher. With respect to long-term changes in these associations, we hypothesized that the effect of context-specific norms on compliance drinking would decrease with time. However, we made no specific predictions as to how the context-specific association between drinking norms and drinking offers might vary across years of drinking experiences. We also expected that women would receive more drinking offers than men (Graham et al., 1991), but that in drinking contexts where offers were made, men would comply more (Klein, 1992). Finally, we predicted that students high in affiliation and conformity drinking motives would comply with more drinking offers, and that this relationship would be greater as context-specific drinking norms increased.

Method

Participants

We initially recruited 560 regularly drinking college students (51% Men) from a New England University participant pool for a longitudinal measurement-burst study on health and social behavior. Interested students attended an informational session about the study, during which they reviewed informed consent information and completed a pre-screening measure regarding alcohol use. Students who reported drinking at least twice in the past month during a pre-screening, but who reported no prior history of substance abuse (based on self-report of participation in substance abuse treatment) were eligible. From this original sample, 37 were removed for high degrees of missing data, either for failing to respond to personality and demographics items across all years (3), or for failing to respond to at least half of the dairy reporting days for even a single year of the study (34), leaving a final sample of 523. At the start of the study, 57% of participants were Freshmen, 34% were Sophomores, and 9 % were Juniors or Seniors. For all analyses, we excluded yearly responses from participants once they graduated from college, although these responses were few and their inclusion did not change the pattern of results. The mean age of participants at the start of the study was 18.8 years ($SD = 1.1$), and the majority of participants were Caucasian (86%), with the remaining participants being either Asian (6%), African American (4%), Hispanic (3%), or did not indicate their ethnicity (1%). There were no differences between the excluded participants and the final sample in age, class, full/part-

time status, ethnicity, average daily drinking, or in affiliation and conformity drinking motives. The two groups did differ somewhat in their gender composition ($\chi^2(1) = 4.73, p = .03$), such that the excluded group contained a higher portion of men (65% vs. 51%). Participants received \$20 for completing the initial questionnaire each year, and received \$1–5 per day of participation in the daily diary surveys, depending on the day of the week. In total, participants could earn up to \$130 per year of the study.

Procedure

As part of a broader study on health and social behaviors (e.g., Cullum et al., 2010), each year for four years participants responded initially to a baseline phase of the study, which included demographics, and personality measures, such as measures of affiliation and conformity drinking motives. For each year, data were collected approximately 1 month into the start of either the fall (61% of respondents) or spring semester (39% of respondents) and each subsequent year's data was collected during the same school-year semester for which participants responded at the beginning of the study. There were no differences in drinking behavior and norms based on semester of participation (fall vs. spring). All measures were administered online using a secure website and participants had roughly one week to respond during this phase of the study. Each year, participants updated their email, phone, and permanent address, which were used to contact them for each subsequent year of the study.

Two weeks after the initial baseline phase, participants began the daily diary phase of the study, which lasted for an interval of 30 days. Each day participants responded online to a variety of questions regarding their health behaviors and the social-contexts they encountered from the previous evening, logging on between the hours of 2:30 – 7:00 PM. This reporting time frame helped to ensure that participants were routinely recalling their behavior and social settings from the previous evening under similar conditions, which dramatically reduces the potential bias of reporting while under the influence of alcohol that would result from an immediate post-event sampling strategy. Participants received daily emails during the diary phase of the study, and received an update each week regarding the number of weeks remaining in the diary phase. Participants who missed 3 days in a row received a phone call reminder from a research assistant.

Consistent with past standards for completeness in daily sampling studies, we excluded responses in a given year if the participant responded to < 15 days of each 30-day diary phase, (Cullum et al., 2010; Mohr, Brannan, Mohr, Armeli, & Tennen, 2008). Of the final sample ($N = 523$), this procedure resulted in adequate responses from 59% of participants for all 4 yearly bursts of data collection, from 77% for 3 or more yearly bursts of data collection, and from 89% for 2 or more yearly bursts of data collection. Inclusion of all participants, regardless of the number of years of data they provided, is consistent with recent guidelines for computing accurate parameter estimates using maximum likelihood estimation procedures (e.g., Singer & Willet, 2003). The daily response rate average during the diary phase across all four years of the study was 88%.

Measures

Social Drinking Motives—In the baseline survey each year participants completed the affiliation and conformity drinking motives subscales from the Motivations for Alcohol Use scale (Cooper, 1994). Specifically, we examined affiliation motives, which are the extent to which participants were motivated to drink alcohol to enhance the affiliation processes (i.e., a positive reinforcement from the social environment), and conformity motives, which encompass a desire to avoid social censure or rejection (i.e., a negative reinforcement from the social environment). Each social drinking subscale contained 5 items. Affiliation

drinking motives consisted of items such as “I drink because it makes social gatherings more fun”; conformity drinking motives consisted of items such as “I drink so that others won’t kid me about not drinking.” Participants responded to each item using a 5-point scale (1 = *almost never/never* to 5 = *almost always/always*). Internal consistency estimates across the multiple years were high; Cronbach α s ranged from .84 to .86 for affiliation motives, and .86 to .90 for conformity motives. Year to year test retest correlations were also high, ranging from .58 to .61 for affiliation motives and .50 to .68 for conformity motives. For each social drinking motive, we calculated a within-person mean score across all years by averaging together each participant’s scale score across all years in which they responded (Armeli, Cullum, Conner, & Tennen, 2010). This procedure creates a more reliable estimate of individual differences in social drinking motives (Epstein, 1983).

Context-Specific Social Influence—Each day participants were asked “Were you with other people who were drinking last night?” and indicated yes or no by checking the appropriate box; If participants answered yes, they were then asked “How many drinks did others have on average” and responded using a drop-down menu, consisting of response options in single serving increments ranging from 0 to 15 alcoholic drinks and > 15 (Cullum et al., 2010). This question was accompanied by a standard definition for a serving of alcohol each day (e.g., a bottle of beer, a glass of wine, a straight or mixed shot of liquor; Wechsler & Nelson, 2001). This served as our measure of the context-specific drinking norm. Next, participants were asked “Last night, did others offer you any alcoholic drinks?” and indicated yes or no by checking the appropriate box; If participants answered yes, they were then asked “How many drinks did you accept?” and responded using a drop-down menu, consisting of the same alcohol serving response scale as used to report context-specific drinking norms (i.e., 0 to 15 alcoholic drinks and > 15). These last two items served as our outcome measures of the likelihood of receiving an alcoholic drink, and compliance drinking behavior, respectively.

Contextual Covariates—Three potential confounds we address are (a) the availability of alcohol and the time to consume larger quantities of it, and (b) students’ ability to self-select their social drinking contexts, and (c) the tendency to project one’s own behaviors onto others (i.e., the false consensus effect). Time spent interacting with others is a corollary of availability to drink alcohol, which greatly increases the rate of binge drinking in college student populations (Weitzman et al., 2003). Each day, participants were asked “How many hours did you spend interacting with friends or acquaintances last night?” and responded using a drop-down menu, consisting of response options in hourly increments ranging from 0 to 12 hours, and > 12 hours. Day of the week is also related to the availability of alcohol and time spent in social drinking contexts, with most drinking occurring toward the end of the week and peaking over the weekend (Rabow & Duncan-Schill, 1995). As such, we also added six dummy coded variables for each day of the week in which participants drank (i.e., 0 = Saturday; Mohr et al., 2005).

Furthermore, in many cases, the degree to which students drink in a particular setting may be pre-planned, to celebrate particular occasions, or to socialize around academic schedules (e.g., after an exam, before finals week; Rabow & Duncan-Schill, 1995). In such events/cases, the students may be self-selecting their degree of exposure to active drinking influences, where they may intend to comply at higher levels with drinking offers from others (Ajzen, 1985). Past work discerning selective affiliation processes from that of social influence have relied on measures of a person’s overall drinking behavior (Cullum et al., 2010; Popp, Laursen, Kerr, & Stattin, 2008; Reifman et al., 2006). Similarly, past work on the false consensus effect have used a person’s overall drinking behavior to predict their perceptions of norms (Gerrard, Gibbons, Benthin, & Hessling, 1996; Marks, Graham, & Hansen, 1992). As such we asked participants “How many alcoholic drinks did you have

last night?” and they responded using the same alcohol serving scale as used above (i.e., 0 to 15 alcoholic drinks and > 15). Along with this measure, participants received the same definition of what constituted a single serving of alcohol as used above (Cullum et al., 2010; Mohr et al., 2008; Wechsler & Nelson, 2001). By using a student’s overall evening drinking and other control variables for availability, we should have a more pristine measure of the effects of the active and passive social influences on drinking occurring within social drinking contexts, independent from any setting selection effects.

Results

Descriptive Results

Participants reported interacting with one or more people who were drinking on 26% of the total days sampled. All subsequent analyses will involve data from these days in which participants interacted with others who were drinking. This resulted in 11,464 daily observations of social drinking contexts (*Mean per person* = 19.8, *SD* = 13.3), which encompassed 72% of the days in which participants themselves reported drinking, and 7% of the days in which participants abstained. Participants also reported receiving a drinking offer during 67% of all social drinking contexts. As depicted in Table 1, participants typically spent nearly 6 hours socializing on nights in which social drinking occurred, typically consumed 4.59 alcoholic drinks while in a social drinking context, and when drinking offers were made, typically accepted 2.25 servings of alcohol. This information suggests that as a base rate for our sample, about 1/3 of all alcohol consumed in social drinking contexts is attributable to compliance behavior (i.e., 2.25 offers complied with multiplied by a rate of .67 for receiving offers divided by 4.59 total drinks consumed = 32.8%).

The average context-specific drinking norm, at least as perceived by participants, were typically high ($M = 5.38$ drinks), and above the commonly accepted threshold for binge drinking (Wechsler, & Nelson, 2001). Between-person associations (see Table 1) revealed that, during social drinking contexts, women spent somewhat more time socializing, but consumed less alcohol and complied less often with drinking offers than men. Women also attended social contexts with lower drinking norms on average than men, or at least typically perceived these context-specific norms as lower. Conformity drinking motives were somewhat positively related to context-specific drinking norms and compliance drinking. Women reported somewhat lower conformity motives for drinking than men. Affiliation drinking motives were positively related to all social drinking context variables, including compliance drinking. These relationships provide new insight into social drinking contexts and their prevalence, and some key individual differences in average compliance drinking; in order to further investigate how these dynamic influence processes affect compliance behavior, how these processes may change over the course of college, and how these processes may vary across people, we turn now to multilevel modeling analyses.

Multilevel Regression Analyses

Analytic Procedure—Using Hierarchical Linear Modeling software (HLM; v. 6.06; Raudenbush, Bryk, & Congdon, 2008) which uses maximum likelihood parameter estimation, we conducted multilevel modeling with daily social drinking observations (Level 1), nested within years 1 through 4 of college (Level 2), nested within people (Level 3). Specifically, we conducted 2 multilevel analyses; one multilevel logistic regression (using a Bernoulli distribution model) to predict the discrete event of receiving a drinking offer during each social drinking context; and one multilevel linear regression to predict the number of drinks accepted from others (i.e., compliance drinking) during each social drinking context. For the analysis of receiving a drinking offer, all social drinking context

observations were included ($N = 11,464$). For the analyses of compliance drinking, only observations of social drinking contexts in which participants received a drinking offer were included ($N = 7,654$). In both models affiliation and conformity drinking motives were treated as stable, person-level (i.e., level 3) predictors.

For both models, we used the following analytical strategy: Context-specific drinking norms were entered as a level 1, context-varying predictor, with time spent socializing and nightly alcohol consumption also entered as Level 1 covariates. Each of these level 1 predictors was modeled as random effects, and was person-mean centered (Enders & Tofighi, 2007). Additionally, the day of the week dummy coded variables were entered at Level 1 as a fixed effect (Mohr et al., 2008). At Level 2, year in school was entered as a fixed effect, and was centered at the first year in college (i.e., year 1 = 0 through year 4 = 3) in order to test for a linear growth curve model (Singer & Willett, 2003). We also modeled quadratic and cubed growth curves, but neither of these alternative change patterns were significant for receiving a drinking offer, nor for compliance drinking. At Level 3, gender, affiliation and conformity drinking motives were modeled as fixed between-person effects, with affiliation and conformity drinking motives grand-mean centered (Armeli et al., 2010; Mohr, et al., 2008). We also modeled cross-level interactions between context-specific drinking norms and year in school, between contexts-specific norms and each of the between-person variables, and between year in school and each of the between-person variables, and lastly a 3-level interaction between context-specific norms, year in school, and each of the between-person variables. Results of these models are depicted in Table 2.

Drinking Offers—Independent of hours spent socializing and personal alcohol consumption, context-specific norms increased the likelihood of receiving a drinking offer ($b = .24$, $SE = .02$, $p < .001$) with an Odds Ratio (OR) of 1.28—95% Confidence Interval (CI) = 1.20–1.36. Transforming this OR into a probability of receiving a drinking offer suggests that, for each additional drink of alcohol consumed on average by others in a social drinking environment (i.e., the context-specific drinking norm), participants were 28% more likely to receive a drinking offer. Affiliation and conformity drinking motives did not predict the likelihood of receiving a drinking offer ($ps > .37$). But, year in school ($b = -.14$, $p = .001$) and gender ($b = -.69$, $p < .001$), did predict receiving a drinking offer. However, these significant norm, gender, and year effects were qualified by two significant cross-level interactions.

First, we found evidence for a norm X gender interaction ($b = -.08$, $SE = .03$, $p = .041$, $OR = .94$, 95% $CI = .90-.99$). To interpret the nature of this interaction, we conducted simple slopes tests of gender at ± 1 SD around the person-centered mean of context-specific drinking norms. We then transformed the OR into the probability of receiving a drinking offer and depict these results in Figure 1. The gender difference in likelihood of receiving a drinking offer was smaller when context-specific drinking norms were low ($b = -.44$, $SE = .15$, $t(519) = 3.06$, $p = .003$), than when context-specific drinking norms were high ($b = -.59$, $SE = .16$, $t(519) = -3.70$, $p < .001$); nevertheless, women were consistently more likely to receive a drinking offer than men in contexts where drinking norms were low (44% vs. 36%, respectively), and in contexts where drinking norms were high (82% vs. 65%, respectively).

Second, we found evidence for a year X gender interaction, ($b = .16$, $SE = .05$, $p = .007$, $OR = 1.14$, 95% $CI = 1.04-1.26$). To interpret the nature of this interaction, we conducted simple growth curve tests of year in school for both men and women separately. We then transformed the OR into the probability of receiving a drinking offer and depict this result in Figure 2. The likelihood of receiving a drinking offer did not change over time for men ($b = .01$, $SE = .05$, $t(519) = .31$, $p = .76$), but the likelihood of receiving a drinking offer decreased significantly over time for women ($b = -.15$, $SE = .04$, $t(519) = -3.30$, $p = .001$).

In the first year of school, women received a drinking offer approximately 69% of the time they were in social drinking contexts, but by the fourth year in school, this rate dropped to approximately 55%; a rate more on par with the rate in which men received drinking offers throughout the study. No other cross-level interactions, including 3-level interactions, were significant.

Compliance Drinking—Unlike for receiving offers, the number of drinks people accepted from others—compliance drinking—was unaffected by time spent socializing. However, personal alcohol consumption strongly predicted compliance drinking. Independent from the effects of time spent socializing and personal alcohol consumption, context-specific drinking norms significantly predicted compliance drinking levels ($b = .05$, $p = .021$). In social drinking contexts in which a drinking offer was made, people complied with more drinking offers when the drinking norm of that context was high (*1 SD above person-means*), than when the drinking norm of that context was low (*1 SD below person-means*); accepting 1.9 vs. 1.5 offers, respectively). Levels of compliance drinking did not change over time ($p = .45$), nor did it differ across people as a function of conformity drinking motives ($p = .80$). Nevertheless, compliance behavior did differ across people on the basis of gender ($b = .68$, $p < .001$) and affiliation drinking motives ($b = .29$, $p = .011$). Despite the fact that women were more likely to receive a drinking offer, men had higher levels of compliance with drinking offers than women (2.4 vs. 1.7, respectively). Students high in affiliation drinking motives (*1 SD above grand mean*) complied with drinking offers more than students low in this motive (*1 SD below grand mean*; 2.0 vs. 1.5, respectively). No cross-level interactions, including 3-level interactions, were significant for compliance drinking.

Discussion

We found evidence that active social influence attempts and compliance with such attempts are both prevalent in naturally occurring social drinking contexts, and that both correspond with the specific drinking norm that emerges during each context. In contexts where drinking norms were higher, people were more likely to receive an active influence attempt from others, in the form of a drinking offer. And once an active influence attempt was made, people were more likely to comply—by accepting more drink offers—in contexts where the drinking norm was higher. Furthermore, these effects were independent of both the time people spent in a drinking context and the overall amount of alcohol people consumed each night.

These findings suggest a process by which context-specific norms may shape individual-level drinking behavior by first, increasing the likelihood that others in the contexts will make an active influence attempt, and second by informing people's compliance decisions in response to these influence attempts. Our findings related to active influence attempts are consistent with our hypothesis and past research that suggest that norms in a social setting often encourage others present to actively promote or enforce the norm using persuasive communications (Schachter, 1951) and other forms of active social pressure (Willer et al., 2009). With respect to context-specific drinking norms, the initiation of active social influence processes may serve as a feedback loop which further increases the overall drinking level during a particular drinking event. Further, findings related to the relationship between norms and compliance with offers are consistent with the notion that norms serve as social proofs and that people to some degree rely on this information when deciding to comply with overt requests (Cialdini & Goldstein, 2004; Festinger, 1954). Although past research illustrates a link between receiving drinking offers and heavier drinking and greater alcohol-related problems (e.g., Turrisi et al., 2007), the present work is the first of which we

are aware to examine how acute influence dynamics directly inform the rate at which drinking offers are made and at which people comply with such offers.

We also found that these two influence dynamics affected men and women differently. Women were more often the targets of active social influence attempts during social drinking events—especially in contexts with heavier drinking norms. This suggests that active influence efforts to enforce or promote a norm may be targeted towards those (e.g., women) who are perceived as deviating more from the norm (Schachter, 1951). Alternatively, women may be targeted more for active influence efforts as a part of a courtship or a resource display process on the part of men, but our data cannot speak to this account directly, as we did not assess the gender of the person doing the offering. Meanwhile, during social drinking events where men did receive active offers, they complied more as evidence by their acceptance of more drink offers. This pattern of findings supports and expands upon earlier cross-sectional work that suggested that women resist drinking offers more than men (Klein, 1992). Furthermore, men may be more concerned with adhering to drinking norms (Suls & Green, 2003), and therefore more likely to defer to norms when deciding whether or not to accept drinking offers. However, the elevated probability of receiving a drinking offer that women experienced in our study appeared to diminish over time, and by the 4th year in school, women were only slightly more likely to receive a drinking offer than men, while men's receipt of a drinking offer remained highly stable across the years. Whether this is the result of diminishing efforts to bring women in line with heavier drinking norms over time, or of women selecting drinking contexts with lower levels of active influence, remains unclear in the present study.

We found no support for the hypothesis that individual differences in conformity or affiliation drinking motives evoke different rates of active influence attempts from others during social drinking contexts, but we did find evidence that affiliation drinking motives—but not conformity motives—increase compliance drinking behavior when active influence attempts were made. Thus, people do not appear to strategically identify others as targets of influence attempts based on their affiliation and conformity drinking motives, but consistent with past research, much of college students' drinking is driven by affiliation motives, rather than conformity motives (Mohr et al., 2005; 2008). The present work extends these findings explicitly to compliance drinking in natural social drinking contexts. However, contrary to expectation, between-person affiliation and conformity drinking motives failed to interact with context-specific norms (cf. Lee et al., 2007); thus it appears that people who are motivated to drink for social reasons are no more likely to defer to the context-specific norm in making compliance decisions in response to drinking offers than people who are not motivated to drink to socialize.

Lastly, we found that contextual (norms) and between-person factors (gender, social drinking motives) in compliance drinking were both stable across the years, and appear to operate independently of one another, as indicated by no significant cross-level interaction effects. Although past cross-sectional research using vignettes implied that college students comply less with drinking offers over the years (Shore, Rivers, & Berman, 1983), the present work suggests that in naturally occurring drinking contexts, active influence attempts decrease with time—at least for women—but that compliance drinking remains steady. Past work identified maturational experience with drinking as a factor that might diminish the effects of social influence on drinking over time (Pomry et al., 2009), but when it comes to context-specific influence dynamics, this may not entirely be the case.

Implications

Passive and active social influences are thought to be greatest when they are acute, and specific to a given context, rather than as general context-independent representations

(Goldstein et al., 2008; Graham et al., 1991; Latané, 1981; Reno et al., 1993). Yet most studies investigating these social influence factors with respect to alcohol consumption rely on general levels of norms and offers that participants abstract retrospectively over extended periods of experience. The present work is the first to look at social influence dynamics as they unfold in close to real time. Furthermore, by using a longitudinal measurement-burst design (Sliwinski, 2008), we are the first to examine how these context-specific influence processes change over time. Such a design allows us to examine some types of hypotheses generated from basic influence research such as on the active enforcement of group norms (Schachter, 1951; Willer et al., 2009) and on normative information validating compliance decisions (Cialdini & Goldstein, 2004; Festinger, 1954), that were difficult to assess and measure in the field, using conventional survey and prospective methods. Additionally, measurement-burst designs may help to better determine potential critical periods for alcohol interventions, and what types of social influence processes remain stable over time, as students acquire years of experience in social drinking settings. Such information could be used to better design and target interventions to reduce heavy drinking and its various negative consequences and public health risks (cf. Donaldson et al., 1995).

Relatedly, our findings suggest that acute influence dynamics may be important for understanding and intervening in the risks from heavy drinking. Many of the health consequences linked to drinking are specific to heavy episodes of drinking (Neighbors et al., 2006). Binge drinking episodes in which women consume 4 or more drinks and men consume 5 or more dramatically increases the rates of drunk driving, getting into fights, rape, unprotected sex, and black-out periods (Wechsler, & Nelson, 2001). Norm-based interventions are beginning to recognize this and to specifically target heavy drinking norms during specific contexts (e.g., 21st birthday, tailgating; Neighbors, Lee, Lewis, Fossos, & Walter, 2009). These context-specific norms-based interventions may be further improved by adding a component of persuasion resistance that teaches skills or builds efficacy for refusing drinking offers (c.f., Donaldson et al., 1995). Generally, active social influence accounted for 1/3 of all alcohol participants consumed per drinking context, and as indicated in our study, would typically be enough to push individual drinking levels above this binge drinking threshold, at which point health risks are at their greatest. Therefore, interventions should be designed to directly address acute influence dynamics, and could reduce drinking levels to below risky and potentially harmful binge levels by targeting the rate at which offers are made in heavy drinking settings (enforcement of the norm), or at which people comply with the offers once made (compliance decisions).

Limitations

Despite its innovations, the present study had of several limitations. First, we assessed active social influence as a dichotomous variable, which was either present or absent during a particular drinking context. This meant that our analyses were limited to estimating likelihoods of receiving drinking offers as a function of context-specific norms, when a more continuous measure of drinking offers may have been more informative, as the number of drinking offers extended during a drinking context may also correspond to social drinking norms or other important factors. Furthermore, a continuous measure of drinking offers made in conjunction with our continuous measure of compliance drinking might provide a stronger test of the social proof hypotheses in compliance drinking, by ensuring that participants didn't just accept more drinking offers when the norms were higher because more offers were extended during such contexts. Secondly, a potentially important factor that may qualify the effects we observed is the availability of alcohol during a drinking setting. Although we controlled for corollaries of alcohol availability, such as day of the week (more available on the weekends) and time spent interacting (more available time to consume and receive alcohol), more alcohol being available in a particular setting may still

account for the associations we observed between norms and offers. However, we are confident in our conclusions for two reasons. First, we controlled for people's overall drinking levels during each context, which would likely also be higher in settings if more alcohol was available and should co-vary as a function of both person factors (intentions to drink more) and situational factors (more alcohol available). We found social influence effects independent of how much a person drank in each setting, making this alternative account seem less plausible. Second, past research which examined drinking offers found that these effects were independent of alcohol availability (Turrissi et al., 2007). Nevertheless, future work should develop alcohol availability measures that are appropriate for measurement-burst designs (Sliwinski, 2008; Tennen et al., 2000) and other event-specific experience sampling techniques (Reis & Gable, 2000).

Lastly, our study only assessed drinking offers being made and complied with at the context level. Although far more acute than the general and retrospective measures used in past research (e.g., Capone et al., 2007; Graham et al., 1991; Turrissi et al., 2007), there may be important interpersonal and social network effects within and across social drinking contexts that may qualify, or are distinct from, our findings. Kenny, Mohr, and Levesque, (2001) note that the social context may be partitioned into several types of effects. The type of relationship a person has with a network member may influence whether or not this network member makes an offer or the extent to which a person complies with his or her drinking offers. Likewise, it would be useful to know the characteristics of those making the offer and those receiving them (e.g., do men make more offers to women?) to determine compliance rates. Similarly, a reviewer suggested that the level of consensus around a group norm and number who decline offers may impact the extent of social influence on a person (e.g., Sloan, Berman, Zeigler-Hill, & Bullock, 2009). Group and dyadic dynamics such as these may be distinct from the relatively more diffuse effects of context-specific norms. For instance, a person may be more likely to comply with a drinking offer from a friend or date than from a stranger. Social network research has shown that drinking behavior, as well as other health behaviors, spread throughout and cluster within social networks over long periods of time (Christakis & Fowler, 2007; Rosenquist, Murabito, Fowler, & Christakis, 2010). Future work may be able to apply daily diary studies and measurement-burst designs (Sliwinski, 2008) to better understand the more acute influence dynamics involved in the social contagion and epidemiology of health behaviors.

Conclusion

Social norms affect a variety of behaviors, including alcohol consumption. Although these norms can influence behavior merely by making them focal (Cialdini et al., 1990), social norms may also affect behavior by catalyzing active social influences that further enforce or promote the norm (Willer et al., 2009). These influence dynamics are likely to be applicable to specific settings or social contexts, rather than domain general. The present work demonstrates that during social drinking contexts, the normative drinking behavior of proximal others increases the likelihood that a person will receive a drinking offer, and increases the rate at which a person complies with drinking offers. Additionally, these acute social influences affected men and women differently, with women receiving more drinking offers than men, especially when drinking norms were high, and men complying with more drinking offers overall. Furthermore, these acute social influences remain fairly stable over long periods of time, despite people maturing and gaining more experience with drinking and social pressure. These acute social influences may contribute to binge drinking episodes and may play an important role in the interpersonal transmission of health behaviors. Taking the influence dynamics that occur during natural social drinking settings into account could help to design more effective intervention strategies to reduce the number of binge drinking episodes that occur in college populations, and their negative public health consequences.

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Figure 1.
Likelihood of Receiving a Drinking Offer as a Function of Gender and Context-Specific Drinking Norm

Figure 2.
Change in the Likelihood of Receiving a Drinking Offer Over Time as a Function of Gender.

Table 1

Descriptive Statistics and Correlations

Context-Level Variables	1	2	3	4	5	6	7
1. Hours Spent Socializing	5.85 (3.10)						
2. Personal Alcohol Consumption	.37**	4.59 (4.18)					
3. Context-Specific Norms	.33**	.66**	5.38 (3.58)				
4. Compliance with Drinking Offers	.25**	.60**	.46**	2.25 (2.41)			
Person-Level Variables							
5. Gender	-.12**	.41**	.34**	.24**			
6. Conformity Drinking Motives	.04	.03	.08†	.09*	.10*	1.67 (.65)	
7. Affiliation Drinking Motives	.24**	.27**	.25**	.13**	.07	.42**	3.00 (.78)

Note:

† $p < .06$,

* $p < .05$,

** $p < .01$. Means and standard deviations (in parentheses) are presented on the diagonal. Summary information for variables 1–4 represent level 1 results based on disaggregated reports of social drinking events (N = 11,464). Summary information for variables 5–7 represent level 2 results, including person aggregated reports of social drinking events and affiliation and conformity drinking motives (N = 523). Gender is dummy coded as 0 = Female, 1 = Male.

Table 2

Multilevel Regression Results for Receiving a Drinking Offer and Compliance Drinking.

Predictors	Drinking Offer Received^a		Compliance Drinking	
	<i>b</i>	<i>t-value</i>	<i>b</i>	<i>t-value</i>
Hours Spent Socializing	.02 *	2.04	.01	.73
Personal Alcohol Consumption	.04 **	3.04	.33 ***	24.42
Context-Specific Norm	.24 ***	7.64	.05 *	2.42
Year	-.14 **	-3.07	-.04	-.96
Gender	-.69 ***	-4.89	.68 ***	3.79
Conformity Drinking Motive	.02	.17	.03	.19
Affiliation Drinking Motive	.11	1.07	.29 *	2.27
Context-Specific Norm X Year	.01	.14	-.01	-.51
Context-Specific Norm X Gender	-.08 *	-2.03	.04	1.22
Context-Specific Norm X Conformity Drinking Motive	.02	1.17	.03	1.02
Context-Specific Norm X Affiliation Drinking Motive	-.03	-1.55	-.02	-.78
Year X Gender	.16 **	2.57	.03	.82
Year X Conformity Drinking Motive	.02	.41	-.01	-.93
Year X Affiliation Drinking Motive	.01	.15	.01	.18
Context-Specific Norm X Year X Gender	.01	.95	.03	1.56
Context-Specific Norm X Year X Conformity Drinking Motive	.01	.77	.01	.66
Context-Specific Norm X Year X Affiliation Drinking Motive	.00	-.35	.00	.19

Note:

^aAs receiving a drinking offer was a dichotomous outcome variable, this analyses uses Multilevel Logistic Regression. Analyses also control for the day of the week. Coefficients are interpreted as unstandardized regression coefficients.

* $p < .05$,

** $p < .01$,

*** $p < .001$.