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## A Social-Attributional Analysis of Alcohol Response

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### Abstract

Conventional wisdom and survey data indicate that alcohol is a social lubricant and is consumed for its social effects. In contrast, the experimental literature examining alcohol's effects within a social context reveals that alcohol does not consistently enhance social-emotional experience. We identify a methodological factor that might explain inconsistent alcohol-administration findings, distinguishing between studies featuring unscripted interactions among naïve participants ( $k = 18$ ) and those featuring scripted social interactions with individuals identified as study confederates ( $k = 18$ ). While 89% of naïve-participant studies find positive effects of alcohol on mood ( $d = 0.5$ ), only 11% of confederate studies find evidence of significant alcohol-related mood enhancement ( $d = -0.01$ ). The naïve-participant versus confederate distinction remains robust after controlling for various moderators including stress manipulations, gender, group size, anxiety outcome measure, and within-group consistency of beverage assignment. Based on the findings of our review, we propose a multidimensional, social-attributional framework for understanding alcohol-related reward. Borrowing organizing principles from attribution theory, the social-attributional approach predicts that alcohol will enhance mood when negative outcomes are perceived to be *unstable* and/or *self-relevant*. Our framework proposes that alcohol's effects within a social context are largely explained by its tendency to free individuals from preoccupation with social rejection, allowing them to access social rewards. The social-attributional approach represents a novel framework for integrating distinct, well-validated concepts derived from several theories of alcohol's effects. It further presents promising lines of inquiry for future research examining the role of social factors in alcohol reward and addiction susceptibility.

### Keywords

Alcohol; social interaction; emotion; social rejection; study confederate

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In ancient Greece, members of the elite classes consumed large quantities of wine in the company of friends and acquaintances during parties known as symposia—a word that translates from the Greek as “to drink together.” During these symposia, guests drank and conversed on couches, occasionally debating philosophical issues and enjoying musical and theatrical entertainment provided by their hosts (Garnsey, 1999). Many centuries later in a remote portion of eastern Bolivia, members of the indigenous Camba group consumed

alcohol in the company of fellow villagers during social drinking rituals (Heath, 1958). Seated in chairs placed in a circle, the Camba drank to the health of each villager, offering a series of toasts as they consumed a potent liquor derived from sugar cane. In 21st century United States, advertising executives at Anheuser-Busch paid tribute to the common practice of drinking beer in the company of friends. The corporation launched an advertising campaign, sponsoring billboards and television ads picturing people socializing together with the slogan “Grab Some Buds.” The ancient Greeks, the Camba people, and the Budweiser campaign provide three examples of a phenomenon that researchers have documented extensively—across history (Heath, 1995), culture (MacAndrew & Edgerton, 1969), religion (Bales, 1945), and social class (Single & Wortley, 1993) alcohol has been consumed in the company of other people.

Notwithstanding the ubiquity of drinking in social contexts, researchers examining alcohol use and misuse have tended to neglect social environments in favor of intrapersonal factors (Beck, Summons, & Thombs, 1991; Sayette, 1993a; Stritzke, Lang, & Patrick, 1996). Despite compelling evidence suggesting that subjective response to alcohol varies depending on whether alcohol is consumed alone versus with other individuals (del Porto & Masur, 1984; Doty & de Wit, 1995a; Kirkpatrick & de Wit, 2013; Pliner & Cappell, 1974), theories of alcohol-related reward have relied almost exclusively on studies in which subjects drink in isolation (Hull, Levenson, Young, & Sher, 1983; Josephs & Steele, 1990; Sayette, 1993a). Further, studies have devoted little attention to understanding how elements of drinking context might confer risk for developing alcohol-related problems (Beck, Thombs, & Summons, 1993). This absence of social context is reflected in the studies included in key reviews of the literature. In an examination of eight alcohol reviews published in *Psychological Bulletin* since 1980, we found that studies featuring social settings represented less than 5% of all studies reviewed (Bushman & Cooper, 1990; Crowe & George, 1989; Hull & Bond, 1986; Ito, Miller, & Pollock, 1996; Moss & Albery, 2009; Newlin & Thomson, 1990; Sayette, 1993a; Stritzke et al., 1996). It appears that a consideration of social context is largely absent from the literature examining alcohol’s reinforcing properties and addictive potential.

The general disregard for social environment among alcohol researchers is likely partially attributable to the widespread belief that drinking alone is a reliable indicator of alcohol abuse or dependence, whereas drinking in social contexts is comparatively “healthy.” Jellinek (1946) observed that the majority of individuals in Alcoholics Anonymous reported drinking alcohol alone on at least one occasion, and concluded that such a practice might serve as an early sign of problematic drinking. In contrast, social drinking enjoys virtual impunity from public condemnation, and within research settings the term “social drinker” is synonymous with a non-problem drinker or an infrequent drinker (e.g., Vuchinich & Simpson, 1998).

Although studies of the solitary drinker have produced valuable insights about factors that might motivate drinking, evidence has accumulated to suggest that the examination of social drinking also deserves a place at the research table. Importantly, despite its popularity, the assumption that drinking alone is maladaptive whereas social drinking is relatively “healthy” has not withstood empirical scrutiny. Research suggests that drinking alone does not predict

alcohol-related problems—problem drinkers and non-problem drinkers sometimes being equally likely to drink alone—and that drinking excessively in either social or solitary settings is a robust predictor of alcohol-related problems (Bourgault & Demers, 1997). Among both problem drinkers (Bourgault & Demers, 1997; Cahalan, Cisin, & Crossley, 1969) and light drinkers (Cahalan et al., 1969; Demers et al., 2002; Single & Wortley, 1993), the overwhelming majority of drinking episodes take place in social environments. Social drinking is particularly common during drinking initiation episodes (Warner & White, 2003) and drinking experiences in the “formative” years of adolescence and young adulthood (Bachman, Johnston, O’Malley, & Schulenberg, 2006; Beck et al., 1991; Demers et al., 2002; Kahler, Read, Wood, & Palfai, 2003). Laboratory and field research further suggest that individuals consistently consume more alcohol when drinking in the company of other people compared to when drinking alone (Caudill & Marlatt, 1975; Sommer, 1969) and that this increased alcohol consumption is not attributable solely to imitation (Hendricks, Sobell, & Cooper, 1978). Drinking in social environments such as bars, clubs, and parties is associated with serious negative drinking outcomes including alcohol induced violence, binge drinking, and driving while intoxicated (Casswell, Zhang, & Wyllie, 1993; M. Christiansen, Vik, & Jarchow, 2002; Stockwell, Somerford, & Lang, 1991; Wells, Graham, Speechley, & Koval, 2005).

Social drinking environments also likely play an important role in the etiology of alcohol abuse and dependence. The formation and maintenance of social relationships is a primary motivation among humans (Baumeister & Leary, 1995; Leary, 2010), and substances that are perceived to enhance social interactions are likely to be experienced as highly reinforcing. In line with this supposition, research suggests that expectancies for social enhancement are among the most robust correlates of adverse drinking outcomes, predicting transition to problem drinking and also maintenance of alcohol dependence (S. A. Brown, Goldman, & Christiansen, 1985; B. A. Christiansen, Smith, Roehling, & Goldman, 1989; Connors, O’Farrell, Cutter, & Thompson, 1986; G. T. Smith, Goldman, Greenbaum, & Christiansen, 1995). Some longitudinal research examining self-reported drinking motives produces similar results to these alcohol expectancy findings. Patrick and colleagues (2011) found that social/recreational reasons for drinking at age 18 predicted symptoms of alcohol use disorders (AUDs) at age 35, and Beseler and colleagues (2008) found that high-risk adults who drank for social facilitation or to reduce negative affect at baseline showed the highest rates of alcohol dependence 10 years later.

In sum, given the vast quantity of alcohol consumed in social environments, the widespread disorder attributable to public drunkenness, and the robust relationship between social alcohol expectancies and problematic drinking outcomes, much would be gained from a psychological focus on the social context in which drinking occurs.

## Alcohol and Social-Emotional Reward

The notion that alcohol enhances social interactions is one of the most long-standing and widespread beliefs concerning alcohol’s effects. Alcohol has been held to ease feelings of social discomfort, promote feelings of intimacy, and enhance perceived outcomes during social interaction. "Without wine there is no love," wrote Euripides in the fourth century

B.C., a sentiment to which George Jean Nathan added a sly twentieth-century twist: "I drink to make other people more interesting."

Survey research offers support to these observations, indicating that alcohol consumption in social settings may yield emotional rewards. Research examining alcohol expectancies indicates that individuals believe that alcohol will relieve stress and facilitate bonding in social settings (Goldman, Brown, & Christiansen, 1987; B. T. Jones, Corbin, & Fromme, 2002). Young people report drinking in order to enhance their emotional experience in social settings, and these social motives are the most strongly endorsed reason for drinking alcohol (Cooper, Russell, Skinner, & Windle, 1992; Cooper, 1994). Recently, studies employing event-contingent recording confirm that everyday social interactions involving alcohol consumption are associated with positive mood and social affiliation and the alleviation of negative emotions (Aan Het Rot, Russell, Moskowitz, & Young, 2008; Armeli et al., 2003).

Unlike these survey studies, laboratory-based alcohol administration studies have found only equivocal support for alcohol's socially enhancing effects. Alcohol administration studies deliver a dose of alcohol or no-alcohol in a laboratory environment and compare outcomes across study groups. These studies represent an important tool to researchers seeking to understand factors motivating drinking; they allow for precision and control in the examination of alcohol's effects and have laid the foundation of theories that have ultimately proved to be powerful predictors of problematic drinking in naturalistic settings (e.g., Steele & Josephs, 1990). Importantly, laboratory studies investigating the effect of alcohol on mood in social settings have yielded strikingly inconsistent outcomes. While some alcohol-administration studies have found that alcohol reduces anxiety, enhances positive emotions, and increases perceived bonding in social settings (Kirchner, Sayette, Cohn, Moreland, & Levine, 2006; Lindfors & Lindman, 1987; Pliner & Cappell, 1974; Sayette et al., 2012; R. C. Smith, Parker, & Noble, 1975a) other studies have found no relationship between alcohol and affective experience during social exchanges (Balodis, Wynne-Edwards, & Olmstead, 2011; Himle et al., 1999; Keane & Lisman, 1980; Schippers, de Boer, Van Der Staak, & Cox, 1997; Wilson, Abrams, & Lipscomb, 1980). A handful of laboratory studies have even found significant increases in anxiety and decreases in friendliness with alcohol consumption (Childs, O'Connor, & de Wit, 2011; Söderpalm & de Wit, 2002). As noted by Sher in his investigation of alcohol's subjective effects across drinking settings, the literature is "riddled by a mass of contradictory findings" (1985, p. 146).

In summary, across a broad range of measures, the impact of alcohol in group settings has been highly variable. Clearly, some of this variability can be attributed to methodological problems. Perhaps most importantly, nearly all studies examining the effects of alcohol in a social context have lacked adequate statistical power to conduct group-level analyses that account for the interdependence of group members and the coordination of behavior (see Sayette et al., 2012). When the number of groups in a study is fairly low, several within-study differences can disproportionately and arbitrarily affect the results, in some cases creating too much noise for the hypothesized signal to emerge. For instance, studies often have arbitrarily varied group size within the study and done so without sufficient power to examine the impact of this variation. Studies also have failed to indicate whether

investigators ascertained the degree to which participants might be acquainted prior to entering the experiment. When the assumption is that participants are strangers at the outset, for example, it may require inviting extra participants to each session and taking measures to ensure that the final grouping meets these assumptions (see Kirchner et al., 2006). Small samples also mean that differences in gender composition can affect the outcome, as women tend to bond more readily than do men (Sayette et al., 2012). Power also means that the reliability of measures is crucial, and many studies have used observational (behavior-expressive) affect measures of unknown reliability (Sayette et al., 2012).

Despite the need for greater methodological rigor, the variability in findings among alcohol-administration studies is unlikely to be entirely accounted for by these methodological concerns. In this review, we offer a theoretically-driven examination of alcohol's social enhancing properties, identifying specific elements of social interaction responsible for alcohol's sometime social rewards and integrating a seemingly contradictory research literature. In the first portion of the paper we aim to identify and integrate the alcohol-administration literature examining alcohol's subjective effects observed in the context of social exchange. In the next portion of the paper we organize prominent theories of alcohol's effects using an integrative framework of alcohol's social rewards and test three propositions derived from this approach. In the final portion of the paper we explore predictions and implications of this analysis for understanding individual differences in alcohol response and addiction susceptibility.

## Alcohol and Stress

Alcohol's ability to mitigate emotional reactions to stressful stimuli has received considerable research attention. As far back as Masserman and Yum (1946) and Conger (1951; 1956), the premise that alcohol can reduce stress-responses has been addressed by almost every major theory of alcohol-based reinforcement (Hull et al., 1983; Levenson, Sher, Grossman, Newman, & Newlin, 1980; Sayette, 1993a; Steele & Josephs, 1990; Stritzke et al., 1996). Research has demonstrated that alcohol consumption has a powerful ability to reduce negative affect and increase positive affect across a broad range of stressor intensities extending from social stimuli that induce a mild sense of discomfort (Bartholow, Henry, Lust, Sauls, & Wood, 2012) to severe electric shock threat intended to induce extreme anxiety (Vogel-Sprott, 1967). Sayette (1993a) proposed that the elaboration of negative information may place particularly heavy demands on cognitive resources and that alcohol-related cognitive disruptions may therefore selectively disable the appraisal of negative stimuli while leaving the ability to process "benign/positive" information relatively intact (Conger, 1956; Kuiper & Derry, 1982; Sayette, 1994).

Since Conger's (1956) tension reduction hypothesis was originally proposed, research has accumulated to indicate that alcohol does not mitigate stress responses consistently across all situations. Instead, research and theory indicate that alcohol will relieve stress selectively depending on specific characteristics of the stressful stimulus and the drinking environment. A variety of perspectives have arisen to explain alcohol's (inconsistent) stress-relieving properties, many focusing on alcohol's tendency to impair various forms of cognition as the underlying mechanisms explaining alcohol's effects on mood (see Table 1).

Among the first of these perspectives to gain prominence, Hull's (1981, 1987) self-awareness model proposes that alcohol acts to disable the higher-order cognitive processes involved in the perception of self. The self-awareness model predicts that alcohol would be expected to reduce stress when stress is attributable to negative self-evaluation. Steele and Josephs (1990) later proposed an alternative to self-awareness in their attention-allocation model, an extension of alcohol myopia theory that offers predictions concerning alcohol's effects on mood. The authors theorize that alcohol reduces stress by limiting attention to elements of the immediate environment, predicting that alcohol will reduce awareness of stress in the presence of immediate pleasant distracting stimuli (see also Taylor & Leonard, 1983).

In appraisal-disruption, Sayette (1993a) proposes that alcohol reduces stress by constraining the spread of activation of information in memory during encoding of new information. Sayette predicts that alcohol will decrease stress under conditions in which the stressor is not elaborately encoded (e.g., when appraisal follows drinking or when stress requires elaborate encoding). Finally, recent research by Curtin and colleagues (Moberg & Curtin, 2009) suggests that alcohol's effects on stress may vary depending on the predictability of the stressor. Specifically, Curtin's research suggests that alcohol will disrupt negative emotions associated with uncertain but not certain negative outcomes.

In sum, a variety of theories have emerged to explain the relationship between alcohol and stress. While their specific predictions sometimes diverge, all would predict that alcohol's effects on emotion vary depending on the circumstances.

## Social Rejection

One highly salient source of stress in humans is the threat of social rejection. A recent surge in research on the need to belong suggests that, contrary to popular belief, the tendency to readily perceive and anxiously anticipate social rejection is not confined to job interviews or to socially anxious individuals (Leary, 2010). Instead, researchers have found that across a variety of seemingly mundane social interactions throughout everyday life, a substantial portion of our cognitive resources are likely engaged in the detection of social rejection and the elaboration of rejection cues (Baumeister, Twenge, & Nuss, 2002; Dandeneau, Baldwin, Baccus, Sakellaropoulo, & Pruessner, 2007; Richeson & Shelton, 2007; Williams & Zadro, 2005). Individuals feel rejected when excluded from an impromptu game of ball toss in a laboratory waiting room (Williams & Sommer, 1997), when a fellow research participant fails to respond to a text message (A. Smith & Williams, 2004), when a stranger on the street avoids eye contact (Wesselmann, Cardoso, Slater, & Williams, 2012), and when conversational pauses last longer than expected (Pearson et al., 2008). An event contingent daily diary study found that "healthy" participants reported experiencing social exclusion approximately twice a day (Nezlek, Wesselmann, Wheeler, & Williams, 2012). Further, research and theory suggest that, when not actively feeling rejected, we are likely to be anxiously scanning our environment for evidence of potential future rejection (Leary & Baumeister, 2000; Richeson & Shelton, 2007). This preoccupation with social rejection carries emotional costs, with rejection concern being linked not only to increases in negative emotions (Gerber & Wheeler, 2009) but also to decreases in positive emotion and social

connectedness (Blackhart, Nelson, Knowles, & Baumeister, 2009; Vorauer & Turpie, 2004). Although multiple motives are thought to govern human social experience, research and theory suggest that belongingness motives take precedence in many social interactions (Fiske, 2004), and that rejection concern governs emotional experience even when deliberately set in conflict with other important motives (Gonsalkorale & Williams, 2006; van Beest & Williams, 2006).

Alcohol researchers have long been interested in the notion that alcohol enhances mood in the face of social rejection (see Hull, 1981; Marlatt, 1976; Yankofsky, Wilson, Adler, Hay, & Vrana, 1986). Research suggests that alcohol can enhance mood during situations involving social evaluation concern (Sayette & Wilson, 1991) and that social rejection threat increases drinking (Higgins & Marlatt, 1975). Thus, given the prevalence of rejection concerns and the importance of these concerns in determining mood, changes in rejection perception may explain alcohol's mood-enhancing properties in social settings.

## Social Paradigms and the Alcohol Administration Literature

The experimental alcohol-administration literature features drinking paradigms almost as diverse as the natural social drinking environments they seek to model. Like natural drinking contexts, laboratory-based drinking settings differ along a variety of dimensions. Researchers have examined both mixed gender (D. B. Abrams & Wilson, 1979) and same gender (Kirchner et al., 2006) interactions, groups ranging in size from 2 (Keane & Lisman, 1980) to 7 individuals (Naftolowitz, Vaughn, Ranc, & Tancer, 1994), and interactions ranging in length from 3 minutes (e.g., Wilson & Abrams, 1977) to several hours (e.g., Sher, 1985).

A feature that is unique to laboratory-based drinking paradigms, however, is the presence of hired research personnel within interactive drinking contexts. While in some alcohol-administration studies participants interact with other naïve participants, in many they interact primarily with hired study personnel. In these studies participants converse with individuals who are identified as confederates of the experimenter and who often follow behavioral scripts (e.g., D. B. Abrams & Wilson, 1979). Confederates are employed for a variety of reasons and appear within diverse experimental paradigms. They are employed within social stress-manipulations in order to create an aversive social environment. Confederates also are employed in studies involving no socio-evaluative stress manipulation in order to promote uniformity across experimental conditions and to avoid data analytic and procedural complications associated with testing subjects in groups. Although behavioral patterns exhibited by confederates across many of these studies might seem more formalized than behavior observed in social environments in which alcohol is typically consumed (Heath, 2000), the authors of many of these studies nonetheless use the term "social interaction" to describe the experimental procedure (e.g., Sher & Walitzer, 1986), and many draw inferences about alcohol's influence on subjective experience in social settings based on their results (e.g., Keane & Lisman, 1980; see Yankofsky et al., 1986). While confederate interactions differ in some respects from interactions in natural drinking contexts, an examination of studies employing confederates may provide a unique opportunity to test

whether the hypotheses derived from theories of alcohol and stress can predict mood outcomes within a social context.

Importantly, several of the theories reviewed above would predict that alcohol-related mood enhancement would be less likely to manifest within studies featuring social interactions with confederates. More specifically, confederate interactions lack features that, according to these theories, are central to harnessing alcohol's mood-enhancing properties. For example, confederates often followed strict behavioral scripts during interactions with participants. While hypothetically an experimenter might pre-determine (script) an intricate, constantly changing pattern of behaviors for confederates to follow, the difficulties inherent in implementing such a script preclude its application. The speech and nonverbal behaviors of confederates in these studies are thus largely uniform, as predetermined by the experimenter—e.g., no speech or speech after a fixed interval, continually neutral or “friendly” facial expression. Work by Curtin and colleagues suggests that alcohol selectively impairs awareness of future events that are uncertain or unpredictable and has little effect on emotions experienced in response to highly probable negative events (Bradford, Shapiro, & Curtin, 2013; Hefner, Moberg, Hachiya, & Curtin, 2013; Hefner & Curtin, 2012; Moberg & Curtin, 2009). This work suggests that alcohol would be relatively unlikely to impact mood in the presence of scripted, invariant social behaviors exhibited in confederate interactions. In addition to work by Curtin, other theories might predict attenuated response to alcohol in scripted interactions. While appraisal-disruption offers no explicit predictions about the impact of stimulus variability on alcohol response, the construct of encoding difficulty addressed within the model may be relevant. Stimuli involving uncertainty may be more difficult to appraise than invariant stimuli (Sayette, 1993a). Thus, to the extent that unscripted interactions among naïve-participants would be viewed as relatively uncertain, the appraisal-disruption model predicts that such interactions would be more likely to induce a mood-enhancing effect of alcohol than scripted interactions.

Further, in most alcohol-administration confederate studies, participants were aware that they were interacting with an employee of the experimenter, and, in many cases, participants were informed explicitly that this individual would be acting according to the experimenter's instructions. Under such circumstances, participants might be less likely to view confederates' behavior as self-relevant—or, for example, to attribute curt replies or lack of eye contact to their own personal failures—but rather might assume that the confederate was acting in the interest of receiving a paycheck from the experimenter (Crocker, Voelkl, Testa, & Major, 1991; E. E. Jones, Davis, & Gergen, 1961; Weiner & Handel, 1985). If, as Hull and others have suggested, alcohol relieves stress specifically by interfering with self-perception (Hull, 1981), alcohol might be less likely to improve mood among participants in confederate studies who are unlikely to be “taking things personally” and making negative self-attributions to begin with (Hull et al., 1983).

In contrast to these other perspectives, the attention-allocation model (Giancola, Josephs, Dewart, & Gunn, 2009; Steele & Josephs, 1990) does not explicitly predict that stimulus self-relevance or stimulus variability carry implications for alcohol's impact on stress. Rather, it is the salience of the stressor relative to other more pleasant distracting stimuli in the environment that impacts alcohol's rewards. Thus, attention-allocation would not



necessarily predict that confederate interactions are poorly suited to harness alcohol's mood-enhancing properties. Instead, this model predicts that alcohol's impact on stress response would be determined by the nature of the immediate environment (e.g., stressful versus pleasantly distracting).

## The Current Research

This review aims to offer a more precise understanding of those social settings likely to engender alcohol-related reward. Pliner and Cappell (1974) conducted one of the first systematic laboratory examinations of alcohol's impact on mood in a social setting. In their seminal study, the authors justified their use of a social paradigm by simply noting that a factor known to be highly salient to humans is "the sheer presence of other individuals" (Pliner & Cappell, 1974, p. 419). In the nearly four decades since the publication of this study, alcohol researchers have conducted dozens of experiments examining the impact of alcohol on mood during social interactions. Also during this period, theorists have developed models of alcohol reward indicating that alcohol's effects on mood vary depending on the situation, and researchers in other subdisciplines of psychology have suggested that the "sheer presence of others" is not sufficiently precise to explain the influence of other individuals on responding in many social situations. Nonetheless, alcohol researchers have moved no closer to identifying the circumstances in which, or the mechanisms through which, alcohol engenders social reward (Sayette et al., 2012).

In the next portion of the paper we examine the extent to which mere "social interaction" is sufficient to induce a mood enhancing effect of alcohol. We organize the alcohol-administration literature employing social experimental paradigms—a literature spanning fields ranging from endocrinology to clinical psychology to communication science. We hypothesize that alcohol will be more likely to enhance social-emotional experience in naïve participant studies than in scripted confederate studies.

## Review of Alcohol Administration Studies

### Method

Alcohol administration studies were reviewed to determine whether alcohol influences subjective experience across social situations. Studies were identified by searching electronic databases including PsycINFO, Medline, and Google Scholar (search terms: [alcohol or ethanol] and [social interaction, social groups, social stress, or social anxiety]). In order to discover relevant studies not identified by formal searches the reference sections of several studies and review articles were also scanned (e.g., Bushman & Cooper, 1990; Crowe & George, 1989; Hull & Bond, 1986; Hull, 1981; Ito et al., 1996; Moss & Albery, 2009; Newlin & Thomson, 1990; Sayette, 1993a; Steele & Southwick, 1985; Stritzke et al., 1996). Further, where articles were identified that met inclusion criteria, all other articles published by that same author or authors were also read for potential inclusion. Finally, solicitations for unpublished articles were sent out to individual authors of papers identified in this review as well as to the 1800 members of the Research Society on Alcoholism.

The present paper reviews articles published prior to December 2013 that meet the following inclusion criteria: 1) The study involved an alcohol-administration paradigm in which participants were randomly assigned to drink conditions. To avoid mixing randomized and quasi-experimental designs within the same review and to ensure that any causal inferences derived from this review were supported (Borenstein, Hedges, Higgins, & Rothstein, 2009), studies were required to deliver a fixed dose (or several fixed doses) of alcohol in the alcohol group and examine at least one no-alcohol comparison group. Studies employing “choice paradigms” in which participants could choose to receive additional doses of alcohol were only included if self-report measures were administered separately after the initial fixed dose of alcohol. 2) The study featured a discrete period during which the participant was placed in a room together with at least one other individual. 3) During this social interval, participants were prompted to talk to other individuals in the social setting. Such prompts might have been either explicit (e.g., direct instruction) or implicit (e.g., proximity to other individuals or a collaborative study task). 4) Studies were required to measure and report findings relevant to self-reported affect during or immediately following this social interval. Where studies examined multiple discrete social interactions, we examine the results pertaining to the first social interaction since intervals between social interactions were often protracted (Babor, Berglas, Mendelson, Ellingboe, & Miller, 1983) and sometimes involved other manipulations that might themselves have affected alcohol response (Sher, 1985).

In this portion of the paper we review studies in which participants interact either with: 1) other naïve participants; or 2) an identified confederate whose behavior was scripted. Interactions were considered scripted if the content, timing, or quantity of the confederates’ speech in conversation was determined by the experimenter. Confederates were considered “identified” if no means of deception were employed to lead the participants to believe that the confederate was also a participant.

Confederate studies included in this review fall into four general categories: 1) Studies in which participants are encouraged to speak to a still-faced confederate who “listens attentively,” occasionally prompting the participant to continue after a fixed interval of silence (e.g., D. B. Abrams & Wilson, 1979). These interactions sometimes contain other explicitly scripted content provided to the confederate—some beginning with the confederate introducing him/herself (e.g., Keane & Lisman, 1980) or ending with the confederate asking several questions provided by the experimenter (e.g., de Boer, Schippers, & van der Staak, 1993). 2) Studies in which confederates ask participants a series of questions within the framework of an “interview” (e.g., de Boer, Schippers, & van der Staak, 1994). Questions are uniform across participants and asked at fixed intervals of time, the confederate occasionally prompting the participant to continue if responses end prematurely. 3) Studies in which participants perform speeches or challenging mental arithmetic in front of a “panel of judges” (e.g., Trier Social Stress Test; Childs et al., 2011) or an “audience” of research personnel (e.g., Naftolowitz et al., 1994). In these studies confederates generally maintain neutral expressions throughout the task and occasionally prompt the participant when the task requires it. 4) “Friendly” interactions in which confederates maintain positive or affiliative behaviors throughout. In such interactions, aspects of confederates’ speech are scripted (e.g., Ham, Casner, Bacon, & Shaver, 2011).

Naïve-participant studies differ with respect to the structure of the social interaction examined. Many studies examine interactions in which no tasks or conversation topics are provided to participants, and subjects are permitted to converse freely (e.g., Sayette et al., 2012). Other studies require participants to engage in tasks ranging from composing cartoon captions (Pliner & Cappell, 1974) to competing in timed tasks for monetary rewards (Babor et al., 1983) to delivering a speech to a group of other naïve participants (K. Abrams, Kushner, Lisdahl Medina, & Voight, 2001). Naïve-participant studies also differ with respect to whether intoxicated participants interact with other intoxicated individuals (e.g., Kirchner et al., 2006), or instead with sober participants (e.g., Monahan & Samp, 2007; see Kirkpatrick & de Wit, 2013). Both naïve participant and confederate studies featured a mixture of same gender and mixed gender interactions and examined groups ranging in size from 2 to 7 individuals.

Study characteristics were coded independently by the first author and two research assistants. Inter-rater agreement was high for all factors, including confederate versus naïve-participant distinction (100%), whether the confederate was identified (98%), and whether the interaction was scripted (91%). Studies were also coded with respect to whether social interactions involved cues or manipulations likely to engender anxiety (e.g., instructions intended to trigger social-evaluative concern, video cameras monitoring performance during interaction, timed tasks for monetary rewards) and inter-rater agreement here was also high (93%). Disagreements between coders were resolved by discussion.

Outcomes examined in this review include self-reported measures of mood, sociability and perceived social outcomes. Indexes of perceived social outcomes measured participants' evaluations of the social interaction and social experience (e.g., "this individual would be interested in a friendship with me" or "that interaction went well"), and were chosen as measures thought to be indicative of the level of reinforcement an individual derived from the exchange (Baumeister & Leary, 1995). We do not examine psychophysiological measures such as heart rate since such measures index affective arousal without specifying valence, and alcohol may have direct pharmacological effects on some of these physiological measures independent of its effects on mood (Sayette, 1993b).

## Results

We first briefly present results in narrative fashion and then proceed to a quantitative analysis of key study hypotheses. A total of 36 studies (18 confederate, 18 naïve-participant) were identified as meeting the aforementioned inclusion criteria. Studies in which participants interacted with identified confederates are listed in Table 2. Out of 18 confederate studies identified in this review, 15 found no significant effects of alcohol on positive mood, negative mood, or indexes of sociability. One of the three remaining studies found a negative influence of alcohol on mood and sociability (Childs et al., 2011)—increases in anxiety and decreases in friendliness—one study reports significant positive effects of alcohol on two mood measures but indicates that no significant effects emerged on three other measures (Sher, Bylund, Walitzer, Hartmann, & Ray-Prenger, 1994), and the final study found that alcohol produced a mixture of positive and negative effects on mood and sociability (Söderpalm & de Wit, 2002).

Studies in which participants interact with other naïve participants are listed in Table 3. In stark contrast to studies listed in Table 2, of 18 naïve-participant studies, 16 found alcohol to significantly increase positive mood, sociability, and/or decrease anxiety. Two studies found no significant effects of alcohol (Doty, Zacny, & de Wit, 1994; R. C. Smith et al., 1975a). Pertinent to the present analysis, five naïve-participant studies featured factorial designs in which participants were tested both in isolation and in the company of other naïve participants (del Porto & Masur, 1984; Doty & de Wit, 1995a; Kirkpatrick & de Wit, 2013; Pliner & Cappell, 1974; Sher, 1985). Of these five studies, four found greater mood-enhancing effects of alcohol among participants tested in the company of other naïve participants compared to those tested in isolation. Thus, in contrast to confederate studies, naïve-participant studies find a significant positive effect of alcohol on indexes of positive and negative affective state, and those studies employing factorial designs present the intriguing possibility that naturalistic social settings offer unique opportunities for alcohol-related reward.

**Quantitative Analysis**—Effect sizes were estimated as Cohen’s *d*, and then adjusted for bias according to recommendations by Hedges (1981). When studies featured nested designs, procedures were used to calculate effect sizes that accounted for this clustering (Hedges, 2009). We were able to compute precise effect sizes for 25 (71%) studies on the basis of information in the report or correspondence with authors. For the remaining 11 studies, we estimated some or all values based on summary statistics or the significance levels reported. For example, if authors did not provide information required for the calculation of effect sizes with respect to any relevant outcome measure but simply noted that all effects were non-significant, we assumed zero difference ( $d = 0.00$ )<sup>1</sup>, and where authors simply noted that the effect was significant at  $p < .05$  we used the smallest value of the effect size that was significant at this level of alpha (Lipsey & Wilson, 2001). Results from studies reporting on the same sample of participants were aggregated and treated as a single study (e.g., Fairbairn & Sayette, 2013; Sayette et al., 2012), and where exact effect sizes could be calculated from more than one self-reported outcome within the same study these effect sizes were averaged. The heterogeneity of effect sizes was tested with the *Q* statistic (Cochran, 1954). Random effects models were used across all analyses (Raudenbush, 1994), and meta-regression with maximum likelihood estimation was used to examine the effects of continuous covariates and multiple variables simultaneously.

When all studies were examined together, we found the overall effect of alcohol on mood and sociability was .26, with a 95% confidence interval ranging from 0.15 to 0.38. Significant heterogeneity was observed across the studies, suggesting that the effect of alcohol on mood and sociability differed significantly depending on the study in question,  $Q(34) = 66.21, p = .001$ . Importantly, moderation analyses suggested that the effect of alcohol on mood and sociability differed significantly between studies involving naïve participant interactions and those in which participants interacted with confederates,  $Q(1) = 39.42, p < .0001$ . When studies featured social interactions with scripted confederates, there was no evidence that alcohol significantly enhanced mood and sociability,  $d = -0.01, 95\%$ ,

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<sup>1</sup>Estimates of overall effects, level of variance, and moderation coefficients remain identical in significance level and direction when studies with only partially reported data are omitted from the analysis.

CI =  $-.13$  to  $0.11$ . In contrast, when social interactions involved naïve participants, alcohol exerted a significant positive effect on mood and sociability,  $d = 0.50$ , 95% CI =  $.39$  to  $0.60$ . Rosenthal's fail-safe  $N$  was calculated to determine whether publication bias might have influenced the size of the effect among naïve-participant studies (Rosenthal, 1979), and it was determined that 339 unpublished null results would be required to offset the significant finding. This figure greatly exceeds Rosenthal's criteria of  $5 * (\text{number of studies}) + 10$ , indicating that publication bias was unlikely to have influenced results in this analysis. No significant variability in effect sizes remained after accounting for the confederate/naïve participant distinction,  $Q(33) = 26.79$ ,  $p = .77$ .

Next, we examined whether the naïve-participant/confederate distinction remained robust after controlling for other potential sources of effect size variation. Using meta-regression models we examined the effect of confederate interaction while controlling for: 1) whether manipulations or cues were implemented that might have enhanced stress among participants; 2) whether all individuals within a group were assigned to the same drink condition; 3) whether the social interaction featured a dyad or a larger group; 4) the percentage of women included in the study; and 5) whether the self-reported outcome measure specifically targeted negative mood/anxiety, or rather indexed other facets of mood/sociability. The naïve-participant/confederate distinction remained highly significant after controlling for all of these other potential sources of variation,  $\beta = .56$ ,  $p = .0003$  (see Table 4). No other variable reached significance after accounting for the confederate/naïve-participant distinction, and, of particular note, stress manipulations did not emerge as a significant predictor of alcohol's effects on mood and sociability,  $\beta = .15$ ,  $p = .33$ . Two studies included in the review inverted the order of drink administration procedures (Childs et al., 2011; Söderpalm & de Wit, 2002). Although the effect of drink order appeared to have a marginally significant effect on results ( $p = .07$ ) the naïve-participant confederate distinction remained highly significant even after controlling for this effect.

Taken together, studies reviewed here suggest that alcohol does not enhance mood, sociability, and perceived social experience during social interaction, but rather specifically produces social-emotional rewards in the relatively naturalistic social exchanges observed in naïve-participant studies. Results of this review do not support the notion that alcohol enhanced mood and social experience among participants interacting with an individual who identified as a study confederate and followed a behavioral script. Further, differences in results between naïve-participant and confederate studies did not appear to be easily explained by various other methodological factors including whether stress manipulations were implemented within the study. A more comprehensive framework may be required to fully understand the results of this review.

## A Social-Attributional Analysis of Alcohol Reward

The social-attributional approach represents an integrative framework for understanding alcohol's emotional rewards as they manifest within a social context. We propose that alcohol's effects in social settings are explained by alcohol's impact on perceptions surrounding social rejection. Specifically, we propose that alcohol enhances social experiences by disabling cognitive processes engaged in the anticipation and elaboration of

social threat—freeing us from our preoccupation with rejection and enabling us to access social rewards.

Similar to other accounts of alcohol's emotional rewards, the social-attributional framework focuses on alcohol's impact on stress reactivity. Unlike these theories, however, we argue that alcohol's mood-enhancing properties are best understood as multidimensional or as impairments across several discrete domains (see also Lang, Patrick, & Stritzke, 1999; Taylor & Leonard, 1983). Over the past several decades numerous theories have identified mechanisms responsible for alcohol's emotional rewards. Based on the results of controlled laboratory procedures involving discrete mood manipulations administered to participants drinking in isolation, theorists have identified specific processes by which alcohol consumption might elevate mood. In identifying these individual mechanisms, researchers have sometimes neglected to account for results observed in the larger research literature or to acknowledge mechanisms identified within other well-validated theories. As evidence accumulates suggesting that diverse experimental paradigms can reliably induce a mood-enhancing effect of alcohol, multidimensional explanations for alcohol's mood-enhancing effects become increasingly credible (Hefner et al., 2013). Arguably the most parsimonious conclusion that might be reached based on this impressive body of work is that the effects of the powerful drug alcohol are attributable to the impairment of more than one discrete process. Indeed, a precise understanding of emotional responses in the comparatively "messy" environments in which alcohol is typically consumed may demand a more comprehensive framework.

The social-attributional account aims to explain alcohol's mood enhancing properties within naturalistic social interaction by integrating models of alcohol reward into a unified theoretical framework. In order to provide structure to predictions derived from models of alcohol reward, we borrow the organizing principles of "stability" and "(internal/external) locus" from attribution theory (Heider, 1958; Rotter, 1966; Weiner, 1985; Weiner et al., 1971). The social-attributional approach proposes that alcohol enhances social interactions by interfering with both: 1) the anticipation of future social rejection when rejection is perceived as unstable; and 2) the perception of social rejection as self-relevant. Thus, the social-attributional framework predicts that alcohol will enhance social interaction to the extent to which social rejection in such settings is attributed to unstable and/or internal causes. Stated differently, this framework predicts that when social rejection is seen to be both stable and non self-relevant—e.g., as in the confederate studies evaluated above—alcohol would be unlikely to enhance mood.

Below we further develop this framework, reviewing relevant findings in social psychology and human alcohol research to examine three propositions derived from the social-attributional approach. Within the first two propositions, we examine the properties of stability and locus separately to explore the extent to which these properties might be considered independent in determining social-emotional response to alcohol. In the final proposition, we explore the implications of the framework for predicting behavioral responding in social settings.

**Proposition 1: Alcohol will enhance mood in social settings where behavior is perceived to be unstable**

The anticipation of future social rejection is common during social interactions and can exert a powerful effect on mood. Research indicates that individuals exist in a state of constant readiness for and anticipation of social rejection (Leary & Baumeister, 2000). Concern about future rejection has pervasive effects on emotion and behavior that are well documented by social psychologists. To offer one of many examples, anticipation of social rejection led participants in Asch's conformity studies to offer blatantly incorrect opinions about the relative length of lines—judgments offered freely in the absence of any coercion or persuasion (Asch, 1951). Fearful anticipation of future social rejection may not intrude on consciousness and has been associated with a state of numbness and joylessness rather than any more extreme negative emotion (DeWall & Baumeister, 2006; Twenge, Catanese, & Baumeister, 2003). Thus, like breakfast on the morning of an important exam, social interactions in the shadow of potential rejection may not be noticeably distasteful, but simply lacking in flavor.

The tendency to disrupt awareness of future events is one of alcohol's most widely studied properties (Giancola, Josephs, Parrott, & Duke, 2010). In many settings alcohol is thought to limit attentional focus to elements of the immediate environment, restricting the extent to which intoxicated individuals are cognizant of past and future happenings (Fairbairn & Sayette, 2013; Steele & Josephs, 1990). Importantly, research suggests that alcohol does not disrupt awareness of all future events. Instead, alcohol reliably disrupts awareness of unstable or variable negative future events. As noted earlier, work by Curtin and colleagues suggests that alcohol decreases awareness of future events that vary unpredictably (Moberg & Curtin, 2009). This research indicates that alcohol selectively impairs awareness of uncertain, but not certain or invariant, negative future outcomes. To offer an example, an individual commencing his drive home following an evening of heavy drinking may experience few qualms, since the perceived probability that he will cause an accident or encounter a patrol car during any one episode of intoxicated driving is low. In addition, work exploring alcohol's effects on behavioral disinhibition also points to instability as an important determinant of alcohol response. This research suggests that alcohol may selectively impair awareness of future events when these events vary contingently upon the subject's own behavior and create a state of conflict with the individual's primary behavioral drives (Sevincer & Oettingen, 2009; Steele & Josephs, 1990; Steele & Southwick, 1985; Zeichner & Pihl, 1979). In sum, research across several domains suggests that alcohol decreases awareness of negative future events when these events are unstable, varying randomly or varying contingent on the subject's own behavior.

Researchers have suggested that behavioral instability, including unpredictability and response contingency, is a defining element of casual social discourse (Gudykunst & Nishida, 2001; Gudykunst, 2005; Watzlawick, Bevelas, & Jackson, 1967). In most social interactions we are not quite sure of what another person will say or do at any given moment—never certain whether or when their actions might be hurtful. We also elicit behaviors from our interaction partners that are contingent on our own responses. Social psychological research suggests that the desire to make social connections often conflicts with the fear of

encountering rejection during social interactions, and that individuals fear that their efforts to connect will elicit contingent rejection from interaction partners (MacDonald & Leary, 2005; Murray, Holmes, & Collins, 2006). Thus, it appears that casual naturally-occurring social interactions feature elements of ambiguity, uncertainty, and conflict that are ideally suited to highlight areas of alcohol-induced cognitive impairment.

Importantly, the sense of uncertainty and dissonance that haunts our everyday social interaction may be absent from the confederate studies included in this review. Confederates exhibited behavioral patterns that were generally uniform and non-contingent on the behavior of the participant. Thus, as discussed earlier, alcohol's tendency to selectively disrupt awareness of unstable (but not stable) negative future outcomes may explain the differential effects of alcohol observed in Tables 2 and 3.

While behavioral instability represents one compelling explanation for the results of our review, behavioral scripts are not the only factor that might explain alcohol's differential effects on mood presented to this point. Confederates in this review not only evinced distinct invariant patterns of behavior, but their identity as employees of the experimenter was communicated to participants, a circumstance that likely impacted the attributional style of participants during interactions (expanded upon in the next section). In order to isolate the effects of behavioral scripts from any potential effects of confederates being identified, we examined findings of *unscripted* identified confederate research and compared results to findings of the *scripted* identified studies reviewed previously. In the *unscripted* research, participants interact with an individual they know to be an employee of the experimenter who exhibits unscripted behavior that follows the variable, contingent behavioral patterns characteristic of much natural social discourse. An examination of *unscripted* identified confederate research permits consideration of the effects of behavioral instability while holding constant an important determinant of self-attributions (confederate is identified).

Although alcohol researchers have typically favored studies employing *scripted* confederate interactions, we located one study examining alcohol's effects on subjective experience among participants interacting with an *unscripted* confederate (Lindman, 1980). In this study, features of the confederate's gaze behavior were scripted, but no other specific aspects of nonverbal or verbal behavior were predetermined by the experimenters. In stark contrast to the 18 scripted confederate studies reviewed earlier, only two of which produced any evidence of a positive effect of alcohol on mood, alcohol exerted a significant positive effect on elation, talkativeness, and sociability in Lindman's study (average  $d = 0.78$ ). The dramatic distinction between Lindman's findings and those observed in *scripted* confederate studies reviewed earlier was sufficient to yield a significant effect in meta-analytic moderation analysis,  $Q(1) = 4.74, p = .03$ . Thus, the effect of alcohol observed in this *unscripted* identified confederate study is significantly larger than that observed in *scripted* identified confederate studies reviewed earlier.

In sum, alcohol consumption appears to reduce awareness of unstable negative future events. Studies reviewed in this section suggest that alcohol enhances mood during unscripted social interactions. Alcohol may enhance mood in social settings by reducing the anticipation of negative social outcomes when behavior is perceived to be unstable.



**Proposition 2: Alcohol will enhance mood in social settings where behavior is perceived to be self-relevant**

Self-esteem is among the more powerful known contributors to emotional state in humans (J. D. Brown & Marshall, 2001; James, 1890). How we feel about ourselves is an integral part of how we feel in general. Social psychologists believe that self-perceptions play a particularly active role in the perception of social rejection, noting links between social rejection and decreases in self-esteem (Leary & Baumeister, 2000; Twenge et al., 2003; Williams, 2009; Wright, Gronfein, & Owens, 2000). Research suggests that self-concepts and self-awareness play an important role in the initial perception of rejection (“that man is frowning specifically at me”) as well as the subsequent elaboration of rejection (“I always fail in social situations...I’m a loser”) (Boivin & Hymel, 1997; Fejfar & Hoyle, 2000; Hull & Levy, 1979; Zadro, Williams, & Richardson, 2004). Thus, while the pain of social rejection is likely attributable to a number of factors and rejection may therefore be painful even when not perceived as self-relevant (see Williams, 2007 for a review), most social psychologists agree that diminished self-perceptions play an important role in rejection’s emotional costs.

Similarly, perceptions of the self are a central concept of interest to alcohol researchers. Hull and colleagues first identified an important role for altered self-perceptions in alcohol response. Their work demonstrates that alcohol reduces the use of self-focused pronouns in speech (Hull et al., 1983), that studies employing paradigms in which participants receive negative self-relevant information consistently demonstrate mood-enhancing effects of alcohol (Hull, 1981), and that high levels of trait self-consciousness together with negative self-relevant life events predict drinking (Hull, Young, & Jouriles, 1986; Hull & Young, 1983). Building on this initial work, researchers have continued to identify self-perceptions as an important factor in understanding alcohol response (Giancola et al., 2010). For example, in the appraisal-disruption model, Sayette (1993a) suggests that alcohol may selectively reduce awareness of negative, but not positive, self-related information (see also Aramakis, Khamba, MacLeod, Poulos, & Zack, 2012; Sayette, 1994), and Steele and Josephs (1990) when addressing the impact of alcohol on “ego inflation,” propose that alcohol inhibits awareness of negative self-relevant information in areas important to self-concept. Further, recent research suggests that individuals in an induced state of self-awareness may gain particularly pronounced emotional rewards from alcohol consumption (Fairbairn, Sayette, Levine, Cohn, & Creswell, 2013).

While past research has identified self-perceptions as an important factor in alcohol-related reward, it has ignored important moderators such as attributional style that could dramatically alter how alcohol-related reward manifests in social settings. Research suggests that social roles and behaviorally-contingent rewards have a powerful effect on attributions (Bem, 1967; E. E. Jones et al., 1961; Tang & Hall, 1995). Individuals who are perceived to be acting within the framework of a social role and/or individuals who are known to receive rewards for their behavior are likely to be perceived by others as motivated by extrinsic factors, and their actions are less likely to be perceived as self-relevant. These altered attributions could have important implications for response to rejection, since individuals who perceive social rejection to be attributable to non-self-relevant factors have less intense

or extreme responses to social rejection (Crocker & Major, 1989; Crocker et al., 1991, 1991; Mendes, Major, McCoy, & Blascovich, 2008). Applying this research to the studies examined in this review, participants in confederate studies would be likely to view their interaction partner's behavior as motivated by rewards and role expectations and would be less likely to view confederates' actions as self-relevant. Thus alcohol may be less likely to enhance mood in studies employing confederates as a result of an altered attributional framework.

In an attempt to disentangle the effects of self-attributions from the effects of behavioral scripts (discussed above), we examined alcohol-administration studies in which participants interact with study confederates who identify as naïve-participants but secretly follow behavioral scripts. We identified four studies examining alcohol's effects on subjective experience among participants interacting with these scripted *unidentified* confederates (Battista, MacDonald, & Stewart, 2012; Connors & Sobell, 1986; Monahan & Lannutti, 2000; Yankofsky et al., 1986). Participants in the study conducted by Connors and Sobell (1986) interacted with a confederate who followed a behavioral script intended to portray either intoxicated or sober behaviors. While the main effect of alcohol was not emphasized by the authors in their summary, alcohol did significantly enhance self-reported elation, friendliness, and euphoria across all drink conditions in this study. Monahan and Lannutti (2000) found a main effect of alcohol in enhancing perceived social outcomes across all participants and an effect of alcohol in decreasing anxiety selectively among participants with low self-esteem. Finally, Battista and colleagues (2012) found that alcohol decreased subjective feelings of anxiety among socially anxious participants after an interaction with an individual of the opposite gender. Nonetheless, because scripts adopted in these three studies offered confederates some leeway to respond spontaneously within the context of the social exchange, they may not provide an ideal point of comparison in our examination of self-attributions.

In contrast, the paradigm used by Yankofsky and colleagues (1986) seems ideally suited to induce a self-focused attributional style while holding constant many features of behavioral scripts observed in identified confederate studies. Confederates in this study showed a nearly identical pattern of non-responsive behaviors as that observed in some identified confederate studies reviewed earlier, but in this study participants were led to attribute the confederate's lack of responsiveness to themselves. Participants in Yankofsky's study engaged in two interactions with the same female confederate whom they were led to believe was another participant. During the first interaction, the confederate behaved in a natural and unconstrained manner whereas in the second interaction the confederate was almost entirely non-responsive—a change participants were tacitly induced to believe was attributable to their own failure to make a positive impression. Participants in the alcohol condition were significantly less likely to engage in negative self-evaluations following this second interaction and were significantly more likely to want to engage in more interactions with the confederate.

Finally, we explored whether effects observed in these scripted *unidentified* confederate studies were significantly stronger than those observed in the scripted *identified* confederate studies reviewed in the first portion of the paper. We found that the effect of alcohol was

significantly larger among the *unidentified* confederate studies,  $d = 0.56$ , 95% CI = .32 to 0.80. This distinction remained significant regardless of whether all three unidentified studies were included in the analysis,  $Q(1) = 17.60$ ,  $p < .001$ , or whether the Yankofsky study alone was examined,  $Q(1) = 6.18$ ,  $p = .01$ .

In sum, perceptions of the self comprise a central part of our emotional responses in social situations, particularly when we perceive social rejection. This section presented evidence consistent with the notion that alcohol enhances mood in some social situations specifically through disabling processes engaged in self-referent thought.

**Proposition 3: Alcohol will facilitate the expression of behaviors otherwise constrained by fear of rejection during social interactions perceived as self-relevant and unstable**

Researchers have suggested that alcohol's tendency to alleviate anxiety explains alcohol's effect on behavioral disinhibition (Ito et al., 1996). An understanding of situations in which alcohol impacts anxiety could not only further our understanding of its addictive potential, but also help identify situations in which alcohol might promote behaviors ranging from interpersonal aggression to affiliative expressions (Wilson, 1988). Social rejection concerns appear to have pervasive effects on our social functioning (Clark & Lemay, 2010), with research linking fear of rejection to decreased speech (Natale, Entin, & Jaffe, 1979), decreased self-disclosure (Cozby, 1973), and decreased expressions of both affiliation and aggression in social settings (Berkowitz, 1962; Vorauer & Turpie, 2004). Thus, fear of social rejection and social censure not only constrains the expression of aggression and negativity in social settings, but also limits our willingness to reach out to others and form connections (Murray et al., 2006). Importantly, the social-attributional account predicts that alcohol will disinhibit social behaviors that increase one's vulnerability to experience social rejection only during interactions perceived to be self-relevant and unstable or, in operational terms, in naïve-participant but not confederate studies.

Studies in which participants interact with a scripted identified confederate produced no evidence that alcohol facilitates behavioral expression during social interaction (see top portion Table 5). Of 9 confederate studies to examine behavioral outcomes in social settings, none found evidence that alcohol increases expressions of positive affect, expressions of negative affect, total speech initiation or duration, or depth or amount of self-disclosure. In contrast to confederate studies, results of naïve participant studies provide evidence that alcohol facilitates behavioral expression during social interaction (see bottom portion Table 5). Of 16 naïve participant studies to examine behavioral outcomes, 14 found that alcohol increased the expression of social behaviors that could enhance the likelihood of social rejection, with the specific nature of these behaviors varying depending on the nature of the interaction examined. The valence of the response in these studies was moderated by the particular experimental manipulations used. Findings from studies employing paradigms that tended to be either provocative or competitive, for example, found that alcohol facilitated the expression of negative affect and aggression (e.g., Babor et al., 1983). In contrast, findings from studies employing paradigms that tended to be either cooperative or unstructured revealed that alcohol increased the expression of positive emotions and affiliative behaviors, increased depth of self-disclosure and/or increased overall verbal and

nonverbal expressiveness (e.g., Sayette et al., 2012). Interestingly, studies finding increases in the behavioral expression of negative affect among participants consuming alcohol found that these same participants reported decreases in negative affect and increases in positive affect (Babor et al., 1983; Lindfors & Lindman, 1987; Samp & Monahan, 2007), suggesting that effects of alcohol on affective displays were explained by behavioral disinhibition rather than by increases in “felt” negative affect (Bartholow et al., 2012). Indeed, the only study we found to employ behavioral measures of affect derived from a well-validated system of implicit affective measurement (i.e., validated behavioral measures of “felt” affect using Ekman, Friesen, and Hager’s (2002) Facial Action Coding System) was also the only naïve participant study to find a decrease in negative affective expression with alcohol (Sayette et al., 2012).

Using procedures outlined previously we examined the naïve-participant/confederate distinction within a meta-analytic framework. Across all studies, we found the overall effect of alcohol on behavioral expression was .34, 95% CI = .19 to 0.49, and some heterogeneity was observed across studies,  $Q(20) = 29.96$ ,  $p = .07$ . Importantly, moderation analyses suggested that the effect of alcohol on behavior differed significantly between studies involving naïve participant interactions and those in which participants interacted with confederates,  $Q(1) = 8.71$ ,  $p = .003$ . When studies featured social interactions with scripted confederates, there was no evidence that alcohol disinhibited behavioral expression,  $d = -.03$ , 95% CI =  $-.34$  to  $0.29$ . In contrast, when social interactions involved naïve participants, behavioral expression significantly increased with alcohol consumption,  $d = 0.49$ , 95% CI =  $.35$  to  $0.62$ . Among these naïve-participant studies Rosenthal’s fail-safe  $N$  was calculated as 155, indicating that publication bias was unlikely to be a major concern. When the direction of effects were adjusted to reflect the valence of behavior, we found that the nature of the naïve-participant interaction moderated the type of behavior that was facilitated,  $Q(1) = 5.38$ ,  $p = .02$ , with competitive/provocative interactions yielding negative expressions,  $d = -0.31$ , 95% CI =  $-0.89$  to  $0.26$ , and cooperative/unstructured interactions yielding positive expressions,  $d = 0.41$ , 95% CI =  $0.20$  to  $0.62$ .

In sum, naïve participant studies found significant effects of alcohol in increasing behavioral expression, while scripted identified confederate studies consistently found no significant effects of alcohol on any behavioral display. Taken as a whole, results suggest that the properties of perceived self-relevance and behavioral stability hold promise in predicting alcohol’s effects on not only mood but also on behavioral expression.

**Summary of Framework**—Recent research in social psychology suggests that humans are preoccupied with social rejection concerns during many everyday social encounters and that this preoccupation carries negative consequences for mood. The social-attributional framework suggests that alcohol enhances mood in social settings by disabling cognitive processes involved in the anticipation, detection, and elaboration of social rejection. Specifically, this account suggests that alcohol enhances social interactions by interfering with the anticipation of future social rejection that is unstable— an argument supported through an examination of an *unscripted*, identified confederate study—and the encoding of social rejection cues in terms of their self-relevance— supported through an examination of scripted, *unidentified* confederate studies. The findings reviewed provide support for both of

these proposed mechanisms. Nonetheless, future research using methods specifically designed to test the independent contributions of stability and self-relevance within a single study is clearly indicated. Further, we suggest that the framework has implications for behavior, with alcohol increasing behavioral expressions that might otherwise be constrained by fear of social rejection selectively during social interactions perceived as self-relevant and/or unstable.

## Discussion

Conventional wisdom suggests that alcohol enhances mood and relieves stress in social situations. Hosts serve alcohol across a variety of social events in the hopes of lifting the spirits of their guests. Scientists incorporate social interactions into experimental paradigms in an effort to capture alcohol's emotionally "reinforcing" effects. As many researchers and even some hosts can attest, these attempts to harness the mood enhancing effects of alcohol do not meet with unadulterated success.

The studies reviewed here do not support the notion that alcohol unequivocally enhances social interaction. Instead, findings suggest that the unscripted social encounters in which alcohol is often consumed contain elements ideally suited to elicit alcohol's mood-enhancing properties. The first portion of this paper identifies and organizes the literature that examines emotional response to alcohol in a social environment. Results of the review indicate no effect of alcohol on positive or negative mood among individuals engaging in scripted interactions with identified confederates, and, in contrast, consistent mood-enhancing effects of alcohol in studies examining unscripted interactions between naïve-participants. The second portion of this paper proposes a social-attributional account for understanding these findings. This analysis suggests that alcohol will enhance social interactions by interfering with the anticipation and elaboration of social rejection. Specifically, the analysis indicates that alcohol enhances social situations by limiting awareness of unstable negative social outcomes and interfering with self-referent thought. Finally, the paper addresses how the social-attributional approach could be used to identify situations in which alcohol might disinhibit behavioral expression.

The social-attributional approach provides an integrative framework for understanding alcohol's mood-enhancing properties. It bids to explain alcohol-related mood enhancement in terms of more than one discrete impairment. The interactive research paradigms employed in the studies that form the foundation for this account directly inform and facilitate this multi-dimensional perspective. Unlike discrete mood-induction procedures used in many alcohol studies (e.g., electric shock threat), social interactions place diffuse and heavy psychological demands, recruiting higher-order cognitive resources (Lieberman, 2007) and evoking a mixture of powerful emotional reactions that may simultaneously inhibit and provoke the same behavioral response (Murray et al., 2006). Thus, interactive paradigms not only allow for an examination of alcohol reward in social settings, but also permit the development of a multi-faceted framework for understanding alcohol's reinforcing properties.

Although the analysis proposed here shares certain elements with existing alcohol theories (see Table 1), it does not entirely overlap with any of them. More importantly, it appears to yield new predictions that were not obvious based on these prior models. For instance, Steele and Joseph's (1988) attention-allocation model predicts that elements within the immediate environment will determine alcohol's effects on mood. Attention-allocation would not necessarily attach significance to the naïve-participant/confederate distinction, but might instead predict that studies incorporating stress cues into the experimental environment (without concurrent pleasant distraction) would be less likely to induce a mood-enhancing effect of alcohol. In our analysis we did not find that presence of stress cues in a study influenced the magnitude or direction of alcohol's effect on mood once the naïve-participant/confederate distinction had been accounted for. While the appraisal-disruption model (Sayette, 1993a) proposes that alcohol is more likely to impact mood in the presence of stressors that are difficult to appraise, the translation of this general observation into specific predictions concerning environments likely to yield a mood-enhancing effect of alcohol is not straightforward. Moreover, the social-attributional framework identifies specific characteristics of social environments likely to moderate alcohol's effect on mood that are not obviously derived from the appraisal-disruption model. Finally, models proposed by Hull (1987) and Curtin and colleagues (2009) form an integral part of the conceptual foundation of our analysis, each distinctly mapping onto constructs addressed within the social-attributional framework. Nevertheless, neither model alone accounts for the findings reviewed in this paper. Research outlined in proposition one appears to be outside the scope of the former model and findings reviewed in proposition two seem less relevant to current formulations of the latter.

### Implications and Applications

Considerable research attention has been devoted to identifying individual difference factors that might denote sensitivity to alcohol reward and susceptibility to alcohol use disorders. Psychologists have identified personality traits (Sher & Levenson, 1982), gender (Kandel, Chen, Warner, Kessler, & Grant, 1997), family history (Chassin, Mann, & Sher, 1988), comorbid psychiatric illness (Grant & Harford, 1995), genetic profiles (Creswell et al., 2012), and a variety of other factors as markers of AUD vulnerability. At the same time, alcohol-administration studies find that in many drinking contexts individuals experience no reinforcing effects of alcohol, regardless of whether they possess individual difference criteria presumed to denote risk (Sayette, 1993a). To date, theorizing surrounding individual difference criteria tends to neglect that a number of factors (e.g., culture, gender, age group, etc.) constrain the range of drinking environments an individual will encounter, and that these drinking environments vary dramatically in the extent to which they confer alcohol-related reward. Such psychological research fails to account for substantial sources of variation in AUD susceptibility including variation according to cultural group membership—variation that is observed both internationally and within the United States and is independent of genetic factors and per capita rates of consumption (Heath, 1995; Snyder, 1958).

An approach that considers the context in which individuals were acculturated to drink alcohol—in which they learned about its (potentially) reinforcing properties—could expand

understanding of AUD susceptibility. Since the vast majority of drinking occurs in social settings, particularly early drinking episodes, the approach presented in this review offers a promising framework for understanding potential differences in alcohol sensitivity and AUD susceptibility attributable to drinking environment. Although little research has examined drinking settings as a potential causal factor in onset of AUDs, well-established associations documented by anthropologists and sociologists hint at important explanatory implications for the framework presented within this review.

**Social Ritual**—Drinking environments in many cultures feature unstructured social exchange in which people interact spontaneously without recourse to a behavioral script (Heath, 2000). However, in some cultures—for example, in Judaism and among some indigenous groups—much alcohol consumption takes place within the context of religious, spiritual, or secular drinking rituals (Chrzan, 2013; MacAndrew & Edgerton, 1969; Snyder, 1958). During these drinking rituals, both verbal and nonverbal behavior often follow a strictly pre-determined, largely uniform pattern with little room left for behavioral spontaneity (Heath, 1958). Rituals are likely to minimize perceived behavioral instability and—since drinkers in such settings are aware that behaviors are guided by a script—also limit the extent to which behaviors are perceived to be self-relevant. Thus, the social-attributional framework predicts that alcohol’s emotionally reinforcing properties would be diminished when alcohol is consumed within the context of social ritual.

Robust associations between drinking rituals and low rates of alcohol dependence have led scholars to list “ritual drinking cultures” as among a few core cultural categories intended to reflect variation in AUDs (Bales, 1945; Room & Makela, 2000). Anthropologists and sociologists have noted relatively subdued emotional responses to alcohol during drinking rituals among a variety of non-western cultural groups (Heath, 1958) and, importantly, a far more dramatic affective response to alcohol among members of these same groups when they are introduced to Western drinking practices through colonialism (Colson & Scudder, 1988; Hellmann, 1948; Joseph, Spicer, & Chesky, 1949; Levy, 1966). Accounts of drinking practices among indigenous groups in the United States (Joseph et al., 1949), Africa (Colson & Scudder, 1988; Hellmann, 1948), and Australia (Collmann, 1979) indicate that populations that had previously consumed alcohol within the context of social ritual experienced sharp increases in rates of AUDs when, with colonization, young people were introduced to alcohol within informal Western social drinking settings such as taverns (MacAndrew & Edgerton, 1969). Within Jewish communities, degree of engagement with drinking ritual has been inversely correlated with drinking problems (Snyder, 1958), and researchers have indicated that Jewish ritualistic drinking practices may serve to “inoculate” Jews against drinking problems (Bales, 1945; Heath, 2000). These observations have led researchers to suggest that exposure to alcohol within the context of social ritual may act as a protective factor for the development of alcohol-related problems (Bales, 1945; Heath, 2000; Partanen, 1991). The social-attributional framework offers one explanation for the relationship between social drinking ritual and protection from AUDs.

**Close Acquaintance**—Research suggests that the behavior of close acquaintances is perceived to be more predictable than the behavior of individuals with whom we are less

familiar (Duronto, Nishida, & Nakayama, 2005; Gudykunst & Shapiro, 1997; Gudykunst, 1985). Slowly, as we observe other individuals across a variety of situations we are likely to *perceive* their behavior to be less unstable and more predictable (Berger & Calabrese, 2006; Gudykunst, 1993). Further, as our acquaintance level with other individuals increases, our attributional framework for determining the causes of their behavior is likely to become more complex (Duronto et al., 2005; Heider, 1944). Research suggests that both dispositional (Monson, Tanke, & Lund, 1980) and also situational attributions (B. T. Jones et al., 2002) increase with level of acquaintance.

Our tendency to overdetect social rejection, perceiving social cues as self-relevant when the causes are ambiguous (Wesselmann et al., 2012), must be buffered by some of the alternative attributional frameworks we gain as we become more familiar with others. For example, as we observe that our friend consistently fails to respond to text messages, regardless of the sender, we are less likely to interpret these behaviors as self-relevant or caused by our own social failures.

Thus, given the effect of close acquaintance on perceived behavioral instability and self-attributions, the social-attributional framework would predict that the effects of alcohol on positive emotional experience would be less pronounced when alcohol is consumed in the company of close acquaintances. Importantly, given the variability of human behavior across situations (Mischel, 1977), repeated exposure to other individuals in a variety of settings may be necessary for familiarity to attenuate alcohol's positive subjective effects. Thus, we predict that only close acquaintance such as that observed within the context of a family, a very close friendship, or a small community would limit socio-emotional response to alcohol.

Psychological and sociological research provides some support for the notion that drinking among close acquaintances protects against problem drinking whereas drinking among strangers confers risk. Extensive cross-cultural research has documented associations between high integration of drinking into family life and low population rates of AUDs (Ahlström-Laakso, 1976; Gual & Colom, 2006; Heath, 1995; Room & Makela, 2000). Surveys suggest that, independent of the quantity of alcohol consumed, drinking among friends and acquaintances is associated with emotional rewards whereas drinking with family predicts little additional emotional enjoyment (e.g., Beck et al., 1993). A number of longitudinal and cross-sectional studies examining drinking settings within cultures have linked parental supervision of drinking and drinking in a family setting to decreased problematic drinking outcomes (Chen et al., 2008; Foley, Altman, Durant, & Wolfson, 2004; Kelly, Chan, & O'Flaherty, 2012; Korte, Pieterse, Postel, & Van Hoof, 2012; Strunin et al., 2010; Warner & White, 2003; Wells et al., 2005). In contrast to family drinking settings, bars and other public drinking establishments provide unique opportunities for interacting with strangers, and researchers have described bars as "open regions" in which structural elements of the internal environment encourage patrons to initiate conversation with unknown others (Cavan, 1966; Cloyd, 1976). Drinking in public establishments has been associated with higher overall rates of alcohol problems compared to drinking in other social and solitary settings (Casswell et al., 1993; Single & Wortley, 1993) and longitudinal



studies have established temporal precedence in this relationship (Casswell, Pledger, & Pratap, 2002; Casswell & Zhang, 1997; Curran, Harford, & Muthen, 1996).

These findings are consistent with the social attributional analysis offered here. We stop short of arguing, however, that the sole, or even the definitive, reason why so much problem drinking occurs in public establishments is because of the high concentration of strangers. Folks itching to engage in antisocial behaviors on a Saturday night likely gravitate to the saloon rather than the café for multiple reasons. Nevertheless, the breadth of research reviewed here does support the notion that alcohol may have enhanced effects in social settings characterized by individuals who are not closely acquainted, and in our view makes a compelling case for further research to test this possibility more stringently. The social-attributional approach provides a novel platform for integrating sociological and anthropological perspectives on AUD variation with psychological reinforcement models of addiction.

### Limitations and Future Directions

In the social-attributional framework, we propose that reduction in rejection concern represents an important mechanism by which alcohol can enhance social interaction. However, at present it is unknown whether social rejection is the only or even the primary mechanism explaining alcohol's social rewards. (Indeed, we recognize that there likely exist amotivational cognitive factors—e.g., concurrent pleasant distraction: (Steele & Josephs, 1988); temporal sequencing of stress appraisal and intoxication (Sayette 1993a)—that may influence the effects of alcohol in social interactions). While rejection concerns appear to be prominent in many social settings, other important needs such as physical protection/survival motives may take precedence in some social situations (Bushman & Cooper, 1990; Giancola et al., 2010; Ito et al., 1996), and in other situations individuals may be more concerned about their own evaluations of others than about others' evaluations of them. A challenge for future research will be to directly measure alcohol's impact on rejection concerns in social settings that vary along several dimensions including level of predictability and self-relevance. Importantly, since concerns about social rejection may not enter conscious awareness, implicit measures of rejection concern would likely be required. For instance, measures of facial expression (Ekman & Rosenberg, 2005)—which allow researchers to track automatic emotional experience in real time (Fairbairn & Sayette, 2013) and enable measurement of negative social evaluative concern (Keltner, 1995)—hold promise in tests of the social-attributional framework.

Second, most studies examined in this review focus on alcohol response during the ascending limb of the BAC curve, with the assumption that social drinking contexts outside the laboratory feature individuals who are actively consuming alcohol (Sayette et al., 2012). Future research should examine whether the effects reported here generalize to all portions of the BAC curve (Babor et al., 1983), and at alcohol doses beyond those typically administered in laboratory experiments. Third, in our meta-analysis we examined the effects of various study characteristics on alcohol-related social mood-enhancement. While these analyses were effective in establishing the robustness of the naïve-participant/confederate distinction, variation across studies along many of these moderators was insufficient to

represent a fair, independent test of their potential power in predicting alcohol's effect in social settings. Further, the bulk of our review focused on self-report measures of mood and social outcomes—measures that index only those emotional states that have reached conscious awareness (Schooler, 2002). Where behaviors were examined analyses tended to be relatively superficial, often simply reporting “mean” levels of behavioral expression and neglecting to consider important potential correlates of social reward such as behavioral coordination between subjects (Fairbairn, Sayette, Aalen, & Frigessi, under review) and fluctuations in emotional experience within the same subject over time (Fairbairn & Sayette, 2013). Future research should explore whether factors such as participants' gender, the intoxication level of drinking companions (Connors & Sobell, 1986; Kirkpatrick & de Wit, 2013), and participants' level of acquaintance (Leonard & Roberts, 1998) moderate alcohol-related social reward using not only self-report measures of reward but also a sophisticated analyses of behavioral expression and social coordination. Fourth, while in the current review we emphasize the impact of scriptedness on the part of confederates, it is important to acknowledge that the extent to which participants themselves feel they have a script for their own behavior may have important implications for social interactions. Research on shyness and social anxiety, for example, reveals that unstructured social interactions impede social functioning more than do structured interactions (Alden, 1987; Buss, 1980; Zimbardo, 1977). Future research therefore should explore the impact of not only interaction partner scriptedness, but also of the participant's own scriptedness on alcohol's mood enhancing properties. Finally, the studies reviewed here did not facilitate the independent examination of “random” and “contingent” behavioral instability as contributors to alcohol-related reward. While theories informing our hypotheses would indicate that each form of instability holds important implications for alcohol's effects (Moberg & Curtin, 2009; Steele & Josephs, 1990), we were not able to explicitly test this prediction using the present sample of studies or examine whether one form of behavioral instability might primarily drive results observed here.

## Conclusion

The social-attributional analysis outlined here builds on research by Hull and by Curtin and their respective colleagues to suggest crucial factors moderating the impact of alcohol on social and emotional responding. Many existing social-cognitive theories of alcohol (e.g., attention-allocation model, self-awareness model, appraisal-disruption model) have a high degree of overlap (see Sayette, 1993a). Accordingly, it is unsurprising that the chief predictions underlying the present review (that the mood enhancing effects of alcohol will be manifest when social outcomes are thought to be unstable or self-relevant) are not necessarily incompatible with these theories. We view the principal contribution of this review and analysis as being twofold: 1) the specific predictions emanating from our social-attributional framework are not merely obvious extensions of these prior models; and 2) by themselves these existing models have not identified specific factors and conditions that can organize what to date has been an exceedingly inconsistent and contradictory literature examining the impact of alcohol on emotional experience in social context. Moreover, we believe that group drinking is not simply another context to consider when trying to understand drinking and the development of alcoholism. Rather, we view efforts to understand the effects of alcohol in social context to be particularly important given

alcohol's pre-eminent status as a social drug. The social-attributional framework proposed here offers such an organizing framework and provides directions for new research that highlight the importance of self-relevance and stability in a social context.

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**Table 1**

Extant models of alcohol-related stress response dampening (SRD)

<b>Model</b>	<b>Alcohol's SRD Mechanism</b>	<b>Predictions</b>
self-awareness (Hull, 1981, 1987)	Interferes with higher-order cognitive processes involved in self-awareness	Alcohol relieves stress when stress is attributable to negative self-evaluations
attention-allocation (Steele & Josephs, 1990)	Limits attentional capacity to stimuli in the immediate environment	Alcohol relieves stress in the presence of pleasant distraction
appraisal-disruption (Sayette, 1993a)	Constrains the spreading activation of associated information in memory	Alcohol relieves stress under conditions in which the stressor is not elaborately encoded (e.g., when appraisal follows drinking or when stress requires elaborate encoding).
threat-predictability (Moberg & Curtin, 2009)	Affects the neurobiological pathways associated with the experience of anxiety	Alcohol relieves stress associated with uncertain, but not certain, stressors

Table 2

## Mood Outcomes in Confederate Studies

Study	N	Interaction	Outcome Measures	Results	Hedges's g [95% CI]
D. B. Abrams & Wilson, 1979	32	Interaction minimally responsive confederate	STAI, SUDS	NS	0.00 [-0.68, 0.68]
Balodis et al., 2011	87	Trier Social Stress Test	POMS, VAS	NS <sup>1</sup>	0.39 [-0.15, 0.94]
Childs et al., 2011*	25	Trier Social Stress Test	POMS, VAS	Increase anxiety: Decrease friendliness	-0.40 [-0.80, -0.01]
de Boer et al., 1993	64	Interaction minimally responsive confederate	STAI	NS on STAI. Decrease anxiety "trait" anxiety measure	0.19 [-0.30, 0.67]
de Boer et al., 1994	72	Interview minimally responsive confederate	STAI, VAS	NS	0.08 [-0.38, 0.53]
de Wit et al. 2003	37	Trier Social Stress Test	VAS	NS	0.00 [-0.64, 0.64]
Ham et al., 2011	62	Interaction friendly, minimally responsive confederate	SUDS	NS	-0.36 [-0.87, 0.16]
Himle et al., 1999	40	Deliver speech to group of 2 confederates	SUDS, Social Interaction Self Statements Scale	NS	0.20 [-0.41, 0.81]
Keane & Lisman, 1980 study 1	32	Interaction minimally responsive confederate	MAACL	NS	0.00 [-0.68, 0.68]
Keane & Lisman, 1980 study 2	36	Interaction minimally responsive confederate	MAACL	NS	0.00 [-0.68, 0.68]
Naftolowitz et al., 1994	18	Deliver speech to audience 6-7 confederates	VAS	NS	-0.16 [-0.61, 0.28]
Schippers et al., 1997	64	Interview minimally responsive confederate	STAI, VAS	NS	-0.02 [-0.51, 0.46]
Sher et al., 1994	55	Interaction minimally responsive confederate	Multi-item mood inventory	Decrease social anxiety and increase dominance	0.69 [0.15, 1.23]
Sher & Walitzer, 1986	96	Interaction minimally responsive confederate	Multi-item mood inventory	NS <sup>1</sup>	-0.23 [-0.65, 0.20]
Söderpalm & de Wit, 2002*	20	Trier Social Stress Test	VAS	Increase anxiety, talkative, down mood and inactive	0.06 [-0.79, 0.90]
Wilson & Abrams, 1977	32	Interaction minimally responsive confederate	STAI, SUDS	NS	0.00 [-0.68, 0.68]
Wilson et al., 1980	48	Interaction minimally responsive confederate	SUDS, STAI	NS	0.00 [-0.59, 0.59]
Zimmermann et al., 2004	52	Trier Social Stress Test	VAS	NS	0.00 [-0.27, 0.27]



NS = No significant effects; SUDS = Subjective Units of Discomfort Scale; STAI = State Trait Anxiety Inventory; POMS = Profile of Mood States; VAS = Visual Analogue (mood) Scale; MAACL = Mood Affect Adjective Check List.

\* Social interaction occurred before drink period in this study.

<sup>1</sup>The authors also report results of self-report measures administered immediately prior to the social interaction. Findings included in this review reflect the results of self-report measure administered during or immediately following the social interaction

Table 3

## Mood Outcomes in Naïve-Participant Studies

Study	N	Interaction	Outcome Measures	Results	Hedges's g [95% CI]
K. Abrams et al., 2001	61	Groups 6 delivered speeches	VAS, AAS, Positive thoughts inventory	Decrease anxiety: Increase positive thoughts	0.45 [-0.08, 0.99]
Babor et al., 1983	16	Dyads performed competitive tasks	POMS	Increase elation and friendliness	0.51 [0.01, 1.01]
Del Porto & Masur, 1984 <sup>†</sup>	40	Groups 4 unstructured interaction	Structured mood interview	Increase euphoria and emotionality	0.75 [0.12, 1.38]
De Wit & Doty, 1994	27	Groups 2-4 unstructured interaction	POMS	Increase elation, friendliness and positive mood	0.42 [0.04, 0.81]
Doty & De Wit, 1995a <sup>†</sup>	41	Groups 3-4 unstructured interaction	POMS	Increase elation, positive mood and friendliness.	0.51 [0.19, 0.83]
Doty & De Wit, 1995b	13	Groups 3-4 unstructured interaction	POMS	Decrease anxiety: Increase friendliness	0.84 [0.24, 1.44]
Doty et al., 1997	25	Groups 3-4 unstructured interaction	VAS	Increased lighthearted mood	0.48 [0.08, 0.89]
Doty et al., 1994	19	Dyads unstructured interaction	POMS	NS	0.00 [-0.51, 0.51]
Fairbairn & Sayette, 2013 <sup>a</sup>	720	Groups 3 unstructured interaction	Multi-item mood inventory	Increase positive mood: Decrease negative mood	0.59 [0.32, 0.86]
Holdstock & De Wit, 1999	27	Groups 3-4 unstructured interaction	POMS	Increase friendliness, elation and positive mood	0.39 [0.01, 0.77]
Kirchner et al., 2006	54	Groups 3 unstructured interaction	Perceived social bonding	Increase bonding	0.54 [-0.06, 1.14]
Kirkpatrick & de Wit, 2013 <sup>†</sup>	44	Dyads unstructured interaction	Multi-item mood inventory	Decrease dysphoria, increase sociability	0.54 [0.22, 0.86]
Lindfors & Lindman, 1987	16	Groups 4 watch video then discuss	Multi-item mood inventory	Increase positive mood: Decrease negative mood	0.99 [-0.15, 2.14]
Monahan & Samp, 2007	42	Dyads perform cooperative tasks	STAI	Decrease anxiety	0.62 [0.01, 1.23]
Pliner & Cappell, 1974 <sup>†</sup>	120	Groups 3 cooperative task	Multi-item mood inventory	Increase friendly and elation: Decrease unhappy and bored.	0.77 [0.20, 1.35]
Sayette et al., 2012 <sup>a</sup>	720	Groups 3 unstructured interaction	Perceived social bonding	Increase bonding	0.59 [0.32, 0.86]
Sher, 1985 <sup>†</sup>	98	Groups 3-5 unstructured interaction	Multi-item mood inventory	Increase Pleasure. No setting by alcohol interaction.	0.43 [0.04, 0.83]
Smith et al., 1975a	36	Acquainted dyads unstructured interaction	Multi-item mood inventory	NS	0.20 [-0.28, 0.68]

NS = No significant effects; AAS = Audience Anxiousness Scale; STAI = State Trait Anxiety Inventory; POMS = Profile of Mood States; VAS = Visual Analogue (mood) Scale.

In the column headed “results” we aimed to reflect all findings identified as significant by study authors. In our own effect size calculations, we adjust for the effects of nesting and average effects across all outcomes for which sufficient information was provided to inform these calculations.

<sup>†</sup> Study featured factorial design in which subjects were tested both in a social setting and in isolation

<sup>a</sup> Results drawn from same sample of participants

**Table 4**

## Results of Meta-Regression Models

	All Variables Examined Together in a Single Model				Each Variable Examined Independently in a Separate Model			
	Coefficient	Standard Error	Z-value	p-value	Coefficient	Standard Error	Z-value	p-value
Intercept	0.3734	0.1115	3.3494	0.0008	-	-	-	-
Naïve-Participant Interaction	0.5557	0.1544	-3.5989	0.0003	0.5113	0.0819	-6.2392	<.0001
Stress Manipulations	0.152	0.1575	0.9651	0.3345	-0.3604	0.0956	-3.769	0.0002
All Group Members Intoxicated	0.1295	0.1262	1.0262	0.3048	0.4216	0.1577	2.6732	0.0075
% Female	0.127	0.1568	0.8096	0.4182	0.1084	0.2007	0.5401	0.5892
Group size larger than 2	0.0383	0.087	0.4406	0.6595	0.1891	0.1171	1.6141	0.1065
Outcome Indexes Anxiety	-0.0383	0.1208	-0.3174	0.7509	-0.314	0.1094	-2.8694	0.0041

Naïve-Participant Interaction: 1 = Interaction involves only naïve participants, 0 = Participants interact with a scripted/identified confederate.

Covariates examined in models above were created for the purposes of disentangling the effects of the naïve-participant vs. confederate distinction from the effects of other potentially confounding factors that varied (to some extent) across studies. These results do not represent powerful independent tests of the effects of many of the covariates listed above (see discussion section).

With the exception of % female, all covariates are binary

Table 5

## Behavioral outcomes in naïve participant and confederate studies

Study	N	Interaction	Behavioral Outcome Measure	Alcohol's Impact Interpersonal Behavior	Hedges's g [95% CI]
<b>Confederate Studies</b>					
D. B. Abrams & Wilson, 1979 <sup>b</sup>	32	Interaction minimally responsive confederate	Naïve observers rated verbal and nonverbal affective expression	NS	0.16 [-0.52, 0.84]
Caudill, Wilson, & Abrams, 1987 Study 1 <sup>c</sup>	48	Interaction minimally responsive confederate	Amount and depth of self-disclosure	NS	0.45 [-0.15, 1.04]
Caudill et al., 1987 Study 3 <sup>b</sup>	32	Interaction minimally responsive confederate	Amount and depth of self-disclosure	NS	0.16 [-0.52, 0.84]
de Boer et al., 1994	72	Interview minimally responsive confederate	Amount and depth of self-disclosure	NS	0.29 [-0.18, 0.75]
Keane & Lisman, 1980 study 1	32	Interaction minimally responsive confederate	Speech timing and content	Increase pauses	-0.73 [-1.43, -0.03]
Keane & Lisman, 1980 study 2	36	Interaction minimally responsive confederate	Speech timing and content	Increase pauses	-0.63 [-1.32, 0.06]
Schippers et al., 1997	64	Interview minimally responsive confederate	Amount and depth of self-disclosure	NS	0.01 [-0.47, 0.50]
Wilson & Abrams, 1977	32	Interaction minimally responsive confederate	Content-free speech.	NS	0.00 [-0.68, 0.68]
Wilson et al., 1980 <sup>c</sup>	48	Interaction minimally responsive confederate	Naïve observers rated verbal and nonverbal affective expression	NS	0.45 [-0.15, 1.04]
<b>Naïve-Participant Studies</b> (Or unscripted/unidentified confederate studies)					
Babor et al., 1983	16	Dyads performed competitive tasks	Bales Interaction Process Analysis	Increase expression hostility and profanity	0.82 [0.27, 1.36]
Battista et al., 2012	88	Interaction unresponsive identified confederate	Speech and gaze "safety" behaviors	Increase speech	0.42 [0.01, .84]
Frankenstein, Hay, & Nathan, 1985	16	Couples discuss relationship problem	Marital Interaction Coding System	Increase speech & positive expression	0.57 [0.06, 1.07]
Kirchner et al., 2006	54	Groups 3 unstructured interaction.	Facial Action Coding System and content-free speech	Increase speech initiation and smiling initiation	0.68 [-0.08, 1.44]
Leonard & Roberts, 1998	270	Couples discuss relationship problem	Marital Interaction Coding System	Increase negative expression and attempts at problem solving	0.42 [0.06, 0.78]
Lindfors & Lindman, 1987	16	Groups 4 watch video then discuss	Bales Interaction Process Analysis	Increase total speech,	1.22 [-0.48, 2.91]

Study	N	Interaction	Behavioral Outcome Measure	Alcohol's Impact Interpersonal Behavior	Hedges's g [95% CI]
				assertive speech and negative responses	
Lindman, 1980	32	Interview responsive confederate	Eye gaze duration and number gaze aversions.	NS	0.00 [-0.68, 0.68]
Murdoch & Pihl, 1985	44	Groups 6 cooperative task (2 unidentified confederates)	Behavioral coding system	Increase positive expression	0.63 [0.03, 1.23]
Pliner & Cappell, 1974	120	Groups 3 cooperative task	Schachter & Wheeler amusement index	NS	0.78 [-0.09, 1.65]
Rohrberg & Sousa-Poza, 1976	32	Dyads cooperative task	Amount and depth of self-disclosure	Increase depth of self-disclosure	0.51 [-0.40, 1.41]
Samp & Monahan, 2007	42	Dyads competitive task	Coders rated vocal, facial, and body expression	Increase facial expressivity and negative expression	0.62 [0.01, 1.23]
Samp & Monahan, 2009	44	Couples discuss infidelity	Coders rated vocal, facial, and body expression	Increase gestures and speech rate	0.31 [-0.30, 0.93]
Sayette et al., 2012	720	Groups 3 unstructured interaction	Facial Action Coding System and content-free speech	Increase speech and smiling, decrease negative facial expressions	0.43 [0.15, 0.71]
Smith et al., 1975a <sup>a</sup>	36	Couples unstructured interaction	Gottschalk-Gleser Hostility Scale, units laughter, qualitative affect coding	Increased laughter and expressed giddiness and happiness.	0.47 [0.01, 0.93]
Smith et al., 1975b <sup>a</sup>	36	Couples unstructured interaction	Content-free speech coding according to Mishler & Waxier	Increase speech initiation and speech overlap	0.47 [0.01, 0.93]
Stitzer et al., 1981	18	Dyads unstructured interaction	Automated content-free speech.	Increase speech duration	N/A

Studies have overlapping alphabetical superscripts if results were drawn from same sample of participants

NS = No significant effects