Alcohol and Common Ground: The Effects of Intoxication on Linguistic Markers of Shared Understanding during Social Exchange

Anna C. S. Garrison[1], Si On Yoon[2], Sarah Brown-Schmidt[3], Talia Ariss[1], and Catharine E. Fairbairn[1]

[1]Department of Psychology, University of Illinois at Urbana-Champaign

[2]Department of Communication Sciences and Disorders, University of Iowa

[3]Department of Psychology, Vanderbilt University

Author Note

We have no known conflict of interest to disclose.

This research was supported by NIH grants R01AA025969 and R01AA028488 to Catharine Fairbairn. Our thanks to the students and staff of the Alcohol Research Laboratory for their support in conducting this research.

All data and analytic code have been made publicly available at the Open Science Framework (OSF) and can be accessed at https://osf.io/ug3n7/.

Correspondence concerning this article should be addressed either to Anna Garrison, B.A., Department of Psychology, University of Illinois—Urbana-Champaign, 603 East Daniel St., Champaign, Illinois, USA, 61820, electronic mail: annacsg@illinois.edu, or to Catharine Fairbairn, Ph.D., Department of Psychology, University of Illinois—Urbana-Champaign, 603 East Daniel St., Champaign, Illinois, 61820, electronic mail: cfairbai@illinois.edu.

Abstract

Objective: Most alcohol consumption takes place in social contexts, and the belief that alcohol enhances social interactions has been identified as among the more robust predictors of alcohol use disorder (AUD) development. Yet we know little of how alcohol affects mental representations of others—what we share and do not share—nor the extent to which intoxication might impact the development of shared understanding (i.e., common ground) between interaction partners. Employing a randomized experimental design and objective linguistic outcome measures, we present two studies examining the impact of alcohol consumption on the development and use of common ground. **Methods:** In Study 1, groups of strangers or friends were administered either alcohol (target BAC=.08%) or a control beverage, following which they completed a task requiring them to develop a shared language to describe ambiguous images and then describe those images to either a knowledgeable or a naïve partner. The same procedures were completed in Study 2 using a within-subjects alcohol-administration design and all-stranger groups. **Results:** Study 1 findings did not reach significance but suggested that alcohol may facilitate common ground development selectively among stranger groups. This effect emerged as significant in the context of the within-subjects design of Study 2, b=-0.19, p=.007, with participants demonstrating greater facility in establishing common ground during Alcohol vs. Control sessions. **Conclusion:** Results suggest that alcohol facilitates the development of shared linguistic understanding in novel social spaces, indicating common ground as one potential mechanism to consider in our broader examination of alcohol reinforcement and AUD etiology.

Keywords: alcohol use, social context, common ground, social communication

Public Health Significance Statement

Understanding alcohol's effects on social behavior and communication patterns can help provide insight into factors reinforcing heavy drinking and the development of Alcohol Use Disorder. This study indicates that alcohol enhances individuals' ability to utilize linguistic common ground, contributing to alcohol's social lubricating effects and thus potentially our understanding of context-based vulnerability for heavy drinking.

Introduction

Most alcohol is consumed in social contexts. It is more common to drink in the presence of others—at bars or nightclubs, at parties or gatherings, socializing under the influence of “liquid courage”—than to drink alone (Creswell, 2021; Fairbairn & Sayette, 2014). Alcohol can have a variety of social effects with important implications, one of the most prominent being the enhancement of feelings of social connection. When alcohol is consumed in the presence of others, it has been shown to increase positive mood and decrease negative mood to a greater extent than drinking alone (Armeli et al. 2003; Doty & de Wit, 1995; Kirkpatrick & de Wit, 2013; Pliner & Cappell, 1974). In addition, the expectation that alcohol will improve social interactions is a commonly endorsed motive for drinking and a robust predictor of Alcohol Use Disorder (AUD) development (Fairbairn & Sayette, 2014; Jones et al., 2001). The degree of social cohesion associated with drinking can be altered by the nature of the social interaction taking place, and evidence is accruing to suggest that rewards from alcohol emerge as particularly pronounced when alcohol is consumed in the context of relatively novel social settings featuring strangers—settings that have also been linked to particularly hazardous consumption patterns (Fairbairn et al., 2018; Fairbairn & Sayette, 2014; Fairbairn, 2017; Fairbairn & Bresin, 2017). A more precise understanding of the mechanisms underlying alcohol’s social effects could help refine our understanding of susceptibility to AUD as well as social and contextual factors driving individual differences in AUD risk (Fairbairn & Sayette, 2014). Increased understanding of these mechanisms subsequently carries implications for potential prevention and intervention methods aimed at decreasing heavy drinking and AUD development.

Numerous theories have been proposed indicating that cognition represents the primary mechanism underlying alcohol’s impact on behavior and performance across contexts, including in social settings. Alcohol Myopia theory, among the more prominent of such models, posits that alcohol’s effects can be explained by its tendency to restrict the range of cues that can be processed simultaneously by the drinker, resulting in a “myopic” focus on the present moment. Alcohol Myopia thus explains alcohol’s ability to sometimes *enhance* experience and even performance through its tendency to diminish attentional resources the drinker has available to devote to distracting stimuli such as anxiety-inducing thoughts (Steele & Josephs, 1990). Subsequent theoretical frameworks have drawn on tenets of both Alcohol Myopia as well as related cognitive models such as Self-Awareness theory (Hull, 1981) to explain alcohol's effects on mood and performance specifically in the social realm.

In particular, the Social-Attributional model predicts that alcohol enhances feelings of connectedness during interpersonal interaction by diminishing our preoccupation with potential sources of stress, thus reallocating attentional resources for the formation of social bonds (Fairbairn & Sayette, 2014; Fairbairn et al., 2018; Guerrieri et al., 2021). In other words, the model posits that alcohol can free individuals from self-consciousness and social rejection concerns and so allow individuals to fully engage in social context and form connections with others. The Social-Attributional model predicts that alcohol's social-cohesive effects will be particularly pronounced in unfamiliar social context (e.g., interactions with strangers), where feelings of self-consciousness and social rejection concerns may be particularly pronounced. In light of the narrowed cognitive focus yielded by alcohol consumption, one potential prediction indicated by the Social-Attributional model is that alcohol enhances social interactions in part by permitting more accurate cognitive representations of interaction partners. Such models present the possibility that alcohol might not universally impair perception. Instead, consuming alcohol in specific contexts might help individuals peer through the fog of social anxiety and in fact see and understand those around them more effectively (Fairbairn & Sayette, 2014; Steele & Josephs, 1990; Giancola et al., 2010).

How does alcohol consumption impact internal cognitive representations of the people we interact with—i.e., how does drinking shape our understanding of what we share and do not share with those around us? Although some research has explored the effects of alcohol on such social perception using hypothetical and/or asocial paradigms (Bartholow et al., 2003; Francis et al., 2019, Eastwood, 2020), research exploring the effect of alcohol on the development of mutual understanding during in-vivo social interaction using validated social-cognitive measures is limited. It is possible studies exploring the impact of alcohol on social cognition—e.g., the drinkers' internal representation of how much mutual understanding or overlapping knowledge is shared with an interaction partner—are limited because measuring such processes in real-time during social interaction represents a methodological challenge.

Some previous studies have attempted to capture the social effects of alcohol by employing manufactured social interactions between a confederate and the participant (Monahan & Lannutti, 2000; Bègue et al., 2009; Larsen et al., 2010; Robinson et al., 2016). This methodology carries the advantage of a higher degree of control over the nature and reliability of the social interaction, but research suggests such scripted confederate interactions may fail to capture effects of alcohol observed in naturalistic exchange (Fairbairn & Sayette, 2014), and use of confederates may change conversational interactions in theoretically relevant ways (Kuhlen & Brennan, 2013). Other studies have relied on entirely asocial paradigms to evaluate the social effects of alcohol, such as measurements of participants' reactions to images or videos of various scenarios involving other people (Bartholow et al., 2003; Francis et al., 2019, Eastwood, 2020). While it can be challenging to employ continuous, objective assessments of cognitive processes during naturalistic social exchanges, doing so by evaluating real life interactions between participants should allow for more accurate insights into how alcohol can affect social cognition.

Language, Social Relationships, and Common Ground

One continuous and objective index that offers myriad clues to cognitive processes is language. The nature and number of words we choose as we interact with others in our daily lives capture a host of psychological processes, including the internal mental representations we have formed of mutual understanding shared with others, perceived barriers that might divide us, and the similarity of knowledge structures we perceive with interaction partners. For example, in chatting about baseball with an outsider, a Texas resident might refer to the "Houston Astronauts" whereas, in conversations with a local friend, this same person might simply reference the "Stros" (Isaacs & Clark, 1987). This shared knowledge, and the vocabulary we develop within relationships to capture such understanding, has been studied extensively in the field of psycholinguistics, in which field these perceptions of overlapping knowledge structures are referred to by the term "common ground."

In conversation, healthy adults form mental representations of what information they and a conversation partner mutually know. An understanding of common ground is necessary to evaluate whether a conversation partner is likely to have adequately understood what the speaker is trying to express, and divergent mental representations of common ground can lead to highly variable language choice across social relationships and contexts (Clark, 1996; Wilkes-Gibbs & Clark, 1992; Fussell & Krauss, 1989). Put differently, humans naturally use language in a way that is sensitive to their relationships and often becomes more nuanced as the relationships deepen and shared understanding grows.

Although relationship-specific use of language can be particularly noticeable in the context of long-time relationships, common ground is not specific to close social bonds but rather can be developed during relatively brief social interactions between any two individuals. When conversation partners describe a specific image or item to each other multiple times, they collaboratively develop shortened labels for the image, establishing common ground for what to call it. This common ground is partner-specific, allowing speakers to tailor their language choices based on the common ground shared with their intended addressee (Wilkes-Gibbs & Clark, 1992; Schober & Clark, 1989; Yoon & Brown-Schmidt, 2018). For example, speakers will describe something using a shortened label for a knowledgeable conversation partner who knows the label, but will provide more detailed, longer descriptions for a partner who is naïve to the short label and does not share that common ground. This type of partner-specific language use based on common ground is observed even in conversations involving multiple parties where each conversation partner possesses different background knowledge and perspectives, and is key to efficient and successful communication (Yoon & Brown-Schmidt, 2014; 2018; 2019; Yoon & Stine-Morrow, 2019).

Partner-specific language use can emerge as particularly pronounced with already established social connections. For example, when interacting with a friend, versus a stranger, speakers will produce more lexical alignment—using the same words that their partner used—and incorporate more expressions that reflect past discourse with that person (Unger, 2010; Yoon et al., 2021). Additionally, young adults who interact with friends establish shared labels more efficiently and show lower levels of stress while communicating compared with those who interact with strangers (Rodriguez et al., 2021). The difficulties of communicating with strangers, relative to friends, may provide an opening for alcohol consumption to ease social performance during stranger interactions. Previous research has also shown that alcohol consumption may improve communication in a foreign language (Renner et al., 2017), suggesting that alcohol can enhance social performance. Although alcohol's impact on common ground emerges as a promising potential mechanism promoting alcohol's social-enhancing effects, including in unfamiliar social contexts, no previous studies have examined the effects of alcohol consumption on common ground during social interactions.

The Current Study

Here we present a series of studies representing the first to examine the effects of alcohol on the development and use of common ground. To capture common ground, we employ a referential communication task (Krauss & Weinheimer, 1964) during which one participant repeatedly describes a set of novel images to a partner who arranges them in a separate workspace. Across repeated descriptions, partners typically develop collaboratively established labels for the images. We then ask one of the partners to describe the images to either a new partner who is naïve to the labels or to their original partner who has knowledge of the labels, to evaluate the use of common ground. Study 1 employs a between-subjects design to evaluate the effects of alcohol (Alcohol or Control) and social relationship (Friends or Strangers) on the development and use of common ground, when describing images in the referential communication task. Study 2 employs a within-subjects design to evaluate the effects of alcohol (Alcohol or Control counterbalanced across two sessions) on common ground among groups of Strangers. While previous studies have evaluated social outcomes by using self-report measures or by testing participants in isolation, the randomized design and objective outcome measure employed in these studies allow us to evaluate how alcohol impacts social cognition and performance with greater precision and with a paradigm capable of informing causal inferences.

Contrary to widely-held conceptions that alcohol universally diminishes performance on cognitively-demanding tasks, yet in line with prominent cognitive models of alcohol's effects (Steele & Josephs, 1990; Fairbairn & Sayette, 2014), here we predict that alcohol will *enhance* performance on a social referential communication task. Specifically, we predict that individuals consuming alcohol will demonstrate enhanced production and implementation of common ground during social interaction compared with those consuming a non-alcoholic beverage. Since more preexisting common ground is shared between Friends than between Strangers (Yoon et al., 2021), and the effects of alcohol on social outcomes are more pronounced among groups of Strangers (Fairbairn et al., 2018; Fairbairn & Sayette, 2014), we make the additional prediction that alcohol will have a stronger effect on the development and usage of common ground among groups of Strangers, whereas we predict this effect will be comparatively weak among groups of Friends.

Study 1

Participants

Participants consisted of 144 regular drinkers aged 21-28, $M_{age} = 22.17$, $SD = 1.78$, recruited from the local community. Fifty percent of participants were female. Among participants, 44% were White, 8% Black, 30% Asian, 6% Hispanic, and 12% Other/Multiracial. Exclusions included pregnancy in women, having medical conditions for which alcohol consumption was contraindicated, taking medications that might potentially interact with alcohol, or especially light or heavy drinking practices (see recommendations for the administration of alcohol in humans; National Advisory Council on Alcohol Abuse and

Alcoholism, 1989). All participants were required to refer at least two same-gender friends to the study in order to participate. Participants' average number of days consuming alcohol in the past month was 10.58, *SD* = 6.13, range = 0-30, and their average number of standard drinks, i.e. 14g of pure alcohol, per drinking occasion was 5.30, *SD* = 2.55, range = 1-13. A power analysis indicated that the current sample offered >80% power to detect a moderate sized effect of Beverage condition, *Cohen's d* = 0.5, assuming $\alpha = .05$.

Procedure

APA ethical standards were followed in the conduct of the study, and approval was received from the University of Illinois Urbana-Champaign institutional review board (protocol #16263). The study featured a Beverage Condition (Alcohol vs. Control) by Relationship Condition (Friends vs. Strangers) between-subjects factorial design (see also Fairbairn, Creswell, et al., 2022for full procedures). Following the completion of a phone screening, eligible participants were invited to the laboratory for experimental sessions in three-person groups. Participants attended sessions together with either two same-gender Friends (individuals with whom they had been acquainted for at least 6 months prior to study participation) or two same-gender Strangers (individuals with whom they were unacquainted prior to the laboratory session). Participants were randomized to same-gender Stranger or Friend conditions at the time of study screening.

Participants were instructed to refrain from consuming alcohol for 12 hours before their sessions and to refrain from eating for three hours. They were required to complete a breathalyzer test and register a Breath Alcohol Content (BrAC) value of 0.00% at the start of the session, and they consumed a light, weight-adjusted meal before being administered the study beverages. Following standard baseline procedures, e.g. anthropometric measurements and administration of baseline questionnaires, groups either consumed an alcoholic beverage or they consumed a non-alcoholic control beverage. Alcoholic beverages took the form of Sprite-vodka cocktails and were consumed in three equal portions over a 36-minute period, wherein subjects consumed each drink in 12 minutes. Alcohol dosing procedures were based on individualized body water calculations (Watson et al., 1981) intended to achieve a target peak BrAC of 0.08%. This dose was chosen for its demonstrated ability to elicit social effects in prior research (Sayette et al., 2012; Fairbairn at al., 2018), as well as in line with widely employed criteria for determining a binge episode (National Institute on Alcohol Abuse and Alcoholism, 2021). During no-alcohol control sessions, subjects received a weight and gender-adjusted quantity of Sprite (Fairbairn, Creswell et al., 2022; Fairbairn et al., 2018). Participants were informed of their beverage assignment prior to beverage consumption. Our choice to omit the placebo condition was driven by a variety of considerations, including research suggesting that placebo manipulations can lead to unanticipated compensatory effects (Fairbairn, Sayette, Amole, et al., 2015; Testa et al., 2006).

Following beverage administration, participants' BrACs were again assessed, and they engaged in tasks unrelated to the current study (see Fairbairn, Creswell et al., 2022). After a beverage absorption period lasting approximately 1.33 hours, M = 81.2 minutes, SD = 12.0, and within 25 minutes of reaching peak BrAC on average, M = 25.3, SD = 6.6, participants engaged in a referential communication task (Wilkes-Gibbs & Clark, 1992; Yoon et al., 2017; Yoon & Stine-Morrow, 2019; Rodrigues et al., 2021). During the task, participants were randomly assigned to the role of Director, Matcher 1, and Matcher 2, and completed two phases: *image-sorting* and *test*. During *sorting*, Directors and Matcher 1 sat facing each other and were given a booklet showing a set of abstract images (Figure 1) and separate cards of each image, respectively. Directors described a series of 16 images for Matcher 1 who rearranged them into the same order. The images were adapted from previous studies (Arnold et al., 2007; Brown-Schmidt, 2009a; Yoon & Brown-Schmidt, 2018; 2019). The task was interactive, and Matcher 1 was encouraged to ask any questions if needed.

Previous studies have shown that when speakers repeatedly describe the same images for the same partner, they develop short labels across repetitions (Clark & Wilkes-Gibbs, 1986; Krauss & Weinheimer, 1964, 1966; Schober & Clark, 1989; Yoon & Brown-Schmidt, 2014; 2018; 2019). For example, the Director might have initially described the first image on the page (see Figure 1) as "*a bench, or a chair that has two thick legs, it looks like 3D…*" but ultimately acquired the shorter label of "*the 3D chair*" as they repeatedly worked with Matcher 1 to sort the images. The sorting was repeated 3 times, while Matcher 2 waited in another room. Thus, Matcher 1 (who had established "common ground" and learned novel image-label mappings as described by the Director) but not Matcher 2 (who had been out of the room during *sorting*) would be familiar with the shortened image labels; e.g., "*the 3D chair.*"

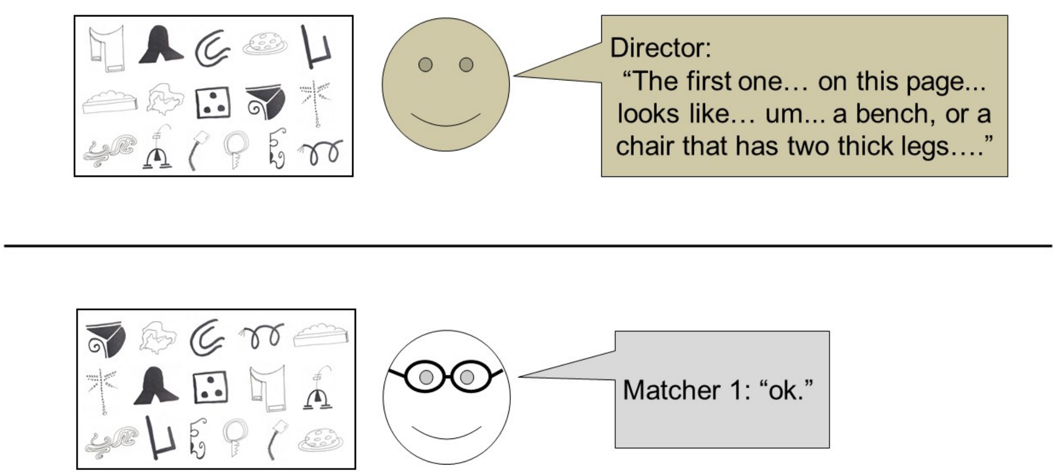

Figure 1. Example sorting display in Studies 1-2.

After the sorting task, Matcher 2, who was naïve to the image labels that were developed during *sorting*, joined the Director and Matcher 1. On each *test* trial, Director, Matcher 1 and Matcher 2 saw 4 pictures on separate booklets (Figure 2). The Director's booklet indicated the target and identified the intended addressee. Matcher 1 and Matcher 2 were each the addressee on half of the trials, randomly alternating. When they were the intended addressee, they marked the target on their booklet and the other Matcher proceeded to the next trial. In 24 trials of *test*, 16 target trials referred to old images that the Director and Matcher 1 had seen during *sorting*, and the other 8 filler trials referred to new images. Only target images that were included in both *sorting* and *test* phases were used for analysis of *test* trials.

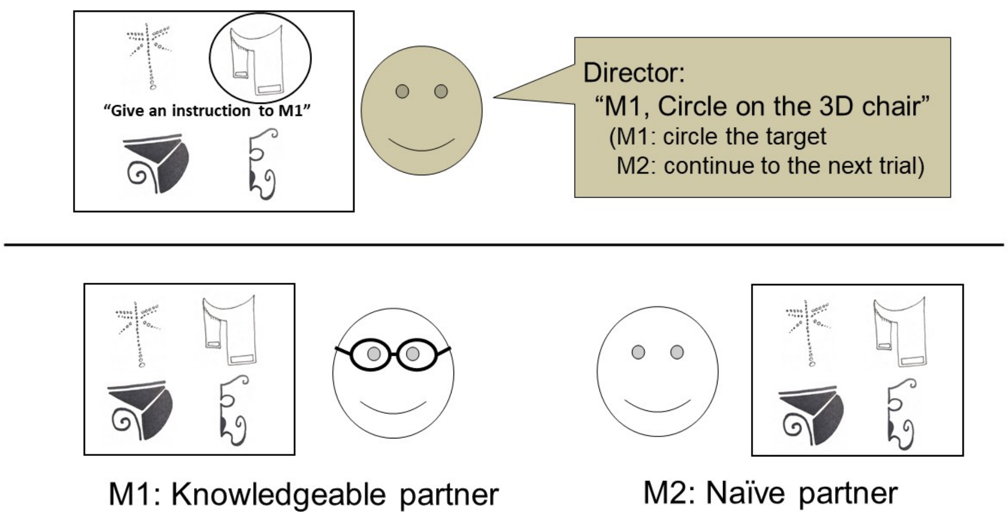

Figure 2. Example test display in Studies 1-2 (M1: Matcher 1; M2: Matcher 2).

Data Coding

The analysis focused on the number of words Directors used to describe each image during *test*. Expression length is commonly used as the primary outcome of the referential communication task (Krauss & Weinheimer, 1966; Wilkes-Gibbs & Clark, 1992). This measure has been consistent across previous studies and correlates with both the rate of disfluency (i.e.

filler utterances such as "um") and the rate of using referential expressions (using pre-established expressions from sorting trials). Additionally, disfluency rates have been shown to be low for this task, making expression length a more stable outcome variable (Yoon & Brown-Schmidt, 2018; Yoon & Stine-Morrow, 2019). To minimize the effect of the partner's feedback, we only analyzed the initiating descriptions that were produced before any feedback was given from the partner (Yoon et al., 2017). Following prior work (Yoon & Brown-Schmidt, 2018; 2019), both function (e.g., the) and content words (e.g., chair) were counted. Filler words (e.g., um, uh) and non-descriptive expressions (e.g., the top left one) were excluded from the analysis. For example, the Director's description of "*The first one… on this page… looks like… um… a bench, or a chair that has two thick legs*," has an expression length of 12 words (counted words underlined), excluding the non-descriptive expression of location and the filler word "um", while the shortened image label of "*the 3D chair*" has an expression length of 3 words. Transcripts from which expression length was calculated underwent quality control checks before analyses. We analyzed expression length during both *sorting* and *test* to examine how quickly participants establish shared labels during *sorting* and whether they modulate their language accordingly depending on the current partner's knowledge on *test*.

Data Analysis Plan

The aim of data analysis was to explore the effects of alcohol on the facility with which common ground was established between conversation partners with varying levels of acquaintance. Data from two groups (out of 48 groups total) were excluded from Study 1 analyses due to equipment issues resulting in missing video of the referential communication task, and data from one group was excluded from analyses because a participant did not consent to use of their video recording. The final data set comprised 1071 trials, excluding 9 trials during which participants did not follow instructions. Sample size was determined before any analyses were conducted. First of all, a manipulation check was completed based on conversational patterns observed during the *sorting* phase in order to establish that the length of expressions did indeed decrease as the conversational partners established common ground across repetitions of the same task, which is a well-established phenomenon in previous studies (Wilkes-Gibbs & Clark, 1992; Yoon & Brown-Schmidt, 2014; 2018; 2019). Then, tests of primary study aims were conducted in the *test* phase during which the Director communicated with both conversation partners simultaneously—a design permitting the direct comparison of expression length employed with both Naïve and Knowledgeable Matchers.

For the *sorting* phase (manipulation check) analyses, a Poisson-link mixed effects model was used to examine the rate at which participants established shared labels. Round, Beverage (Alcohol vs. Control), and Relationship (Friends vs. Strangers) were included as fixed effects. The dependent measure was the number of words used to describe each image (i.e., expression length). For the *test* phase (tests of primary study aims) analyses, a Poisson-link mixed effects model included Beverage (Alcohol (-0.53) vs. Control (0.47)), Relationship (Friends (-0.47) vs. Stranger (0.53)), and Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)) as mean-centered fixed effects, and the dependent measure was expression length. To evaluate the generalizability of effects across relationship type, we examined effects separately within Friend and Stranger conditions. In light of the clustering of observations within items and individuals, as well as the non-normal distribution of the outcome variable, analyses were performed using hierarchical generalized linear modeling including either a log-link function (for a binary measure of accuracy during *test*) or Poisson-link function (for expression length during *sorting* and *test*) (Raudenbush & Bryk, 2002). In all analyses, models were fit using the LMER package in RStudio version 2021.09.0+351 (R Core Team, 2021), with the maximal random effects structure for participants and items. In cases where the maximal model did not converge, a backwards-fitting procedure was used to identify the model with the largest random effects structure that would converge (see Barr et al., 2013).

Transparency and Openness

This study's design and its analysis were not pre-registered.[1] The data reported in this manuscript were collected as part of a larger data collection effort. For a complete listing of all manipulations and measures used in this study, see Fairbairn, Creswell et al. (2022). Prior manuscripts utilizing other measures from the complete dataset have examined the effects of alcohol on ostracism (Fairbairn, Creswell, et al., 2022), the effects of alcohol on the startle eyeblink reflex (Kang et al., 2018), the relationship between alcohol rewards and longitudinal drinking behaviors (Venerable & Fairbairn, 2020), as well as the relationship between social context and alcohol rewards (Fairbairn et al., 2018). No prior manuscript has reported the results of the referential communication task evaluating the effects of alcohol on common ground. All data and analysis code have been made publicly available at the Open Science Framework (OSF) and can be accessed at https://osf.io/ug3n7/. Trial protocols are available upon request. We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study.

Results

Manipulation Check

Beverage Administration:

[1] Data collection for this project spanned multiple years. Guidelines for open practice in clinical psychology have evolved considerably since this project was first launched. Although hypotheses for this study were formulated prior to analysis, they were not formally pre-registered.

Participants in the Alcohol condition registered an average BrAC value of 0.077%, *SD* = 0.017, immediately following beverage administration. The peak BrAC value for these sessions averaged 0.078%, *SD* = 0.012, with participants registering a BrAC value of 0.071%, *SD* = 0.012 immediately prior to the referential communication task. Participants also self-rated their level of subjective intoxication on a scale from 0 (entirely sober) to 100 (the most intoxicated I have ever been in my life). Subjective intoxication ratings immediately prior to the referential communication task averaged 29.8, *SD* = 17.2.

Sorting:

Directors completed three rounds of *sorting* with one other participant (the Knowledgeable partner for upcoming *test* trials) and developed short labels across repetitions (Table 1). The mixed effects model included Round, Beverage (Alcohol vs. Control), and Relationship (Friends vs. Strangers) as fixed effects, and the dependent measure was expression length. The model included intercepts by participants and items, and by-participants slope for the Round effect and by-items slope for the Round, Beverage, and Relationship effects and three two-way interactions between them. The model revealed a significant main effect of Round, b = -0.89, *EventRateRatio (ERR)* = 0.41, z = -12.72, 95% CI = [-1.03, -0.75], $p < .0001$, showing that participants established common ground across rounds. Intoxicated (vs sober) participants tended to use slightly more words to describe images, particularly at task onset, although the main effect of Beverage did not reach significance, b = -0.37, *ERR* = 0.69, z = -1.78, 95% CI = [-0.76, 0.003], p = .08. Partner Relationship did not affect expression length during *sorting*, b = -0.10, *ERR* = 0.90, z = -0.45, 95% CI = [-0.49, 0.32], p = .65. See Supplementary Materials (Table S1) for full list of effects, accessible on the study's OSF page (https://osf.io/ug3n7/). Taken together, results of this manipulation check indicate that Directors in all conditions successfully developed shared labels (i.e., decreased expression length) after three repeated rounds, consistent with previous findings, with little influence of Beverage and Partner Relationship.

Table 1. Study 1: Average number of words (standard deviation) used to describe each image on *sorting* trials.

		Round 1	Round 2	Round3
Alcohol	Friends	23.30 (23.66)	6.14 (8.29)	3.49 (2.57)
	Strangers	23.68 (24.62)	6.75 (6.50)	4.91 (6.40)
Control	Friends	18.44 (17.10)	6.18 (5.30)	3.84 (2.84)
	Strangers	19.50 (18.54)	7.24 (5.63)	4.66 (3.47)

Analysis of Primary Study Aims

The mixed effects model included Beverage (Alcohol (-0.53) vs. Control (0.47)), Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)), and Relationship (Friends (-0.47) vs. Strangers (0.53)) as mean-centered fixed effects, and the dependent measure was expression length. The model also included intercepts by participants and items, and by-participants slope for the Relationship effect and by-items slope for the Beverage and Relationship effects and their interaction. During *test* trials, Directors produced significantly longer expressions when speaking to a Naïve partner compared to the Knowledgeable partner, $b = 0.74$, $ERR = 2.10$, $z = 12.32$, 95% CI = [0.62, 0.86], $p < .0001$ (Table 2), reflecting partner-specific language use in both Friend and Stranger conditions (Figure 3). The model also revealed a significant main effect of Relationship; Directors in all conditions provided more detail (more words) when speaking to Strangers vs. Friends, $b = 0.21$, $ERR = 1.23$, $z = 2.14$, 95% CI = [0.02, 0.41], $p = .03$. However, the main effect of Beverage and all interactions were not significant, including the three-way interaction between Beverage, Partner Knowledge, and Relationship, $b = -0.27$, ERR= 0.76, $z = -1.14$, 95% CI = [-0.73, 0.19], $p = .26$ (Table 2).

Given the relatively low power of this study to detect a 3-way interaction, the authors proceeded with planned follow-up analyses based on a priori hypotheses regarding differential effects among Strangers versus Friends. To explore the generalizability of effects across familiarity level, planned analyses tested for the effects of Partner Knowledge in the Friend and Stranger conditions separately. Directors in the Friends condition provided more detail when speaking to a Naïve addressee unfamiliar with the images and used significantly shorter expressions with the Knowledgeable addressee, indicating the presence of common ground, b = 0.81, *ERR* = 2.25, z = 8.30, 95% CI = [0.62, 1.00], $p < .0001$. However, there was no significant interaction between Beverage Condition and Partner Knowledge in predicting the length of expressions, b = -0.11, *ERR* = 0.90, z = -0.94, 95% CI = [-0.37, 0.38], p = 0.35 (Table 3). In other words, among groups of Friends, differences in expression length for Naïve vs. Knowledgeable Matchers were similar across intoxicated and sober groups.

When the mixed effects model was run only on data derived from participants assigned to the Stranger condition, expression length was significantly shorter for Knowledgeable partners vs. Naïve partners, b = 0.65, *ERR* = 1.92, z = 9.12, 95% CI = [0.51, 0.79], $p < .0001$, confirming the presence of common ground. In addition, the interaction between Beverage and Partner was larger, albeit shy of significance, b = -0.27, *ERR* = 0.76, z = -1.897, 95% CI = [-0.55, 0.01], p = .0578 (Table 4). For groups of Strangers in the Alcohol condition, Directors used 7.26 fewer words for Knowledgeable partners than for Naïve partners, b = 0.82, *ERR* = 2.27, z = 8.31, 95% CI = [0.62, 1.01], $p < .0001$, on average. In contrast, for groups of Strangers in the Control condition, Directors only used 4.32 fewer words for Knowledgeable partners than for Naïve partners, b = 0.51, *ERR* = 1.67, z = 4.84, 95% CI = [0.31, 0.72], $p < .0001$ (Figure 3, Table S2). These findings imply that, among Stranger groups, Directors in the Alcohol condition may demonstrate more sensitivity in establishing and responding to the common ground shared with their addressees.

To further understand this effect , we parsed the interaction according to partner knowledge level. When interactions with Naïve partners were examined, the main effect of Beverage was non-significant and negative, *b* = -0.21, *ERR* = 0.16, *z* = -1.34, 95% CI = [-0.53, 0.10], *p* = 0.18. For interactions with Knowledgeable partners only, the main effect of Beverage on expression length also did not reach significance, although the effect tended in the opposite direction *b* = 0.07, *ERR* = 0.18, *z* = 0.40, 95% CI = [-0.28, 0.42], *p* = 0.69.

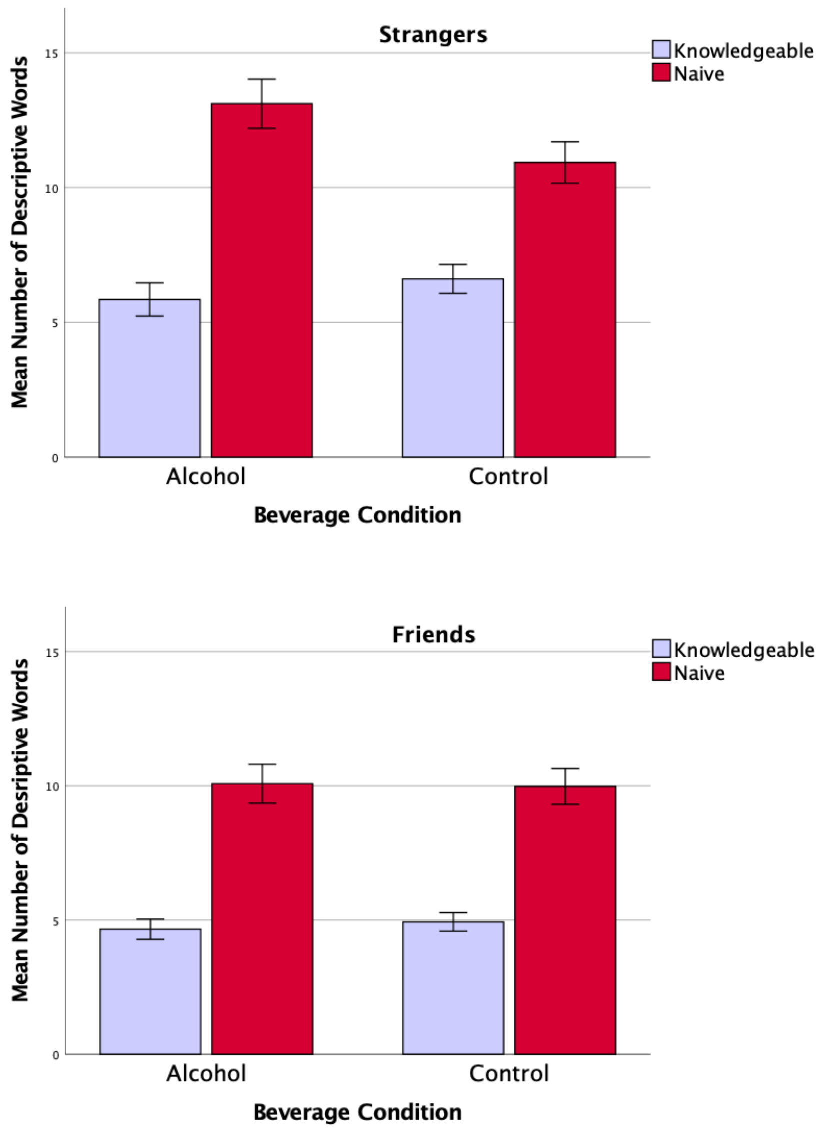

Figure 3. Study 1: Average number of descriptive words by beverage condition and partner type for Stranger (top panel) and Friend (bottom panel) groups. Error bars indicate +/- 1 standard error on the item level data.

Table 2. Study 1 test trials (Strangers and Friends combined): Mixed effect model with Beverage (Alcohol (-0.53) vs. Control (0.47)), Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)), and Relationship (Friends (-0.47) vs. Strangers (0.53)) as mean-centered fixed effects. The dependent measure is the number of words in the referring expressions at *test*.

	Estimate	SE	*z*-value	*p*-value			Variance	Std.Dev.
Fixed					*Random*			
(intercept)	1.94	0.08	23.77	<.0001	*Subject*	(Intercept)	0.09	0.30
Partner (P)	**0.74**	**0.06**	**12.32**	**<.0001**		P	0.11	0.34
Beverage (B)	-0.04	0.10	-0.40	0.69	*Item*	(Intercept)	0.07	0.27
Relationship (R)	**0.21**	**0.10**	**2.14**	**0.03**		B	0.01	0.11
P*B	-0.11	0.12	-0.93	0.35		R	0.18	0.13
P*R	-0.15	0.12	-1.26	0.21		B*R	0.14	0.38
B*R	-0.04	0.21	-0.17	0.87				
P*B*R	-0.27	0.24	-1.14	0.26				

Table 3. Study 1 Friends only test trials: Mixed effect model with Beverage (Alcohol (-0.54) vs. Control (0.46)) and Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)) as mean-centered fixed effects. The dependent measure is the number of words in the referring expressions at *test*.

	Estimate	SE	*z*-value	*p*-value			Variance	Std.Dev.
Fixed					*Random*			
(intercept)	1.83	0.09	19.60	<.0001	*Subject*	(Intercept)	0.08	0.28
Partner (P)	**0.81**	**0.10**	**8.30**	**<.0001**		P	0.16	0.40
Beverage (B)	-0.02	0.13	-0.17	0.86	*Item*	(Intercept)	0.08	0.28
P*B	0.00	0.19	0.02	0.99		B	0.03	0.18

Table 4. Study 1 Strangers only test trials: Mixed effect model with Beverage (Alcohol (-0.52) vs. Control (0.48)) and Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)) as mean-centered fixed effects. The dependent measure is the number of words in the referring expressions at *test*.

	Estimate	SE	*z*-value	*p*-value			Variance	Std.Dev.
Fixed					*Random*			
(intercept)	2.05	0.10	20.93	<.0001	*Subject*	(Intercept)	0.10	0.31
Partner (P)	**0.65**	**0.07**	**9.12**	**<.0001**		P	0.07	0.26
Beverage (B)	-0.06	0.16	-0.37	0.71	*Item*	(Intercept)	0.07	0.27
P*B	-0.27	0.14	-1.90	0.058		B	0.07	0.26

Finally, we conducted supplemental analyses aimed at exploring whether effects reported above might potentially be driven by a hastier and less careful approach to the image identifying task among Alcohol participants that also resulted in degradation in response accuracy. To address this question, we repeated all models substituting accuracy in identifying the target image (vs expression length) as the outcome variable. Overall, participants were overwhelmingly able to accurately identify the target image given descriptions — across all trials, only 0.7% resulted in errors. There was no main effect of Beverage, $b = 0.38$, $z = 0.002$, $p = 0.998$, or interactions with Beverage, $b = -1.57$, $z = -0.01$, $p = 0.991$, and thus it did not appear that shorter expression length among intoxicated participants resulted in a larger number of errors.

Study 1 Discussion

These findings replicate previous research indicating that speakers adjust their referential expressions (such as expression length when describing an image) according to their conversation partners' knowledge(Yoon & Brown-Schmidt, 2018; Rodrigues et al., 2021). Contrary to our prediction, alcohol did not affect speakers' language use, and initial analyses indicated that Beverage type did not modulate the effect of Partner Knowledge or Relationship especially when participants were interacting with Friends. However, when participants interacted with Strangers, a non-significant effect emerged suggesting that Directors in the Alcohol condition may have demonstrated more sensitivity to their partners' level of common ground compared to Directors in the Control condition.

Although the interaction between Beverage and Partner did not reach significance in this study, the effect was larger when expression length was examined only in the Stranger condition. These results indicate that the effect of alcohol on sensitivity to common ground may have been diminished when subjects were completing *test* trials among Friends with whom they had a pre-existing relationship while alcohol may have enhanced the use of common ground when subjects were completing trials with Strangers. This is consistent with previous findings that the social effects of alcohol are stronger when drinking with Strangers as opposed to Friends (Fairbairn, et al. 2018).

A power analysis indicated >80% power to detect a moderate sized effect of Beverage condition, *Cohen's d* = 0.5, assuming α = .05. However, in this first study exploring the effect of alcohol on the formation and use of common ground, our power was relatively low, with adequate power only to detect medium sized effects within Stranger groups. Results of underpowered studies can also at times produce unreliable results (Button et al., 2013). The 95% Confidence Interval for expression length in our main finding of interest, the Beverage by Partner interaction among Stranger-only participants, was between -0.55 and 0.01. To address this lack of power and wide interval of potential effect sizes, we conducted a second study in which groups of previously unacquainted individuals (Strangers) attended both Alcohol and Control sessions, thus leveraging the enhanced power of a within-subjects design. We chose to focus only on groups of Strangers due to the lack of evidence in Study 1 that alcohol affects common ground within groups of Friends, and due to previous research indicating that the social effects of alcohol are enhanced when among unfamiliar individuals (Fairbairn et al., 2018; Fairbairn & Sayette, 2014; Fairbairn, 2017; Fairbairn & Bresin, 2017).

Study 2

Participants

Participants consisted of 60 social drinkers aged 21-28, M_{age} = 22.5, *SD* = 1.88, recruited via advertisements in the local community. Fifty percent of participants were female. Among participants, 55% were White, 12% Black, 20% Asian, 5% Hispanic, and 8% Other/Multiracial. Exclusions were the same as in Study 1. Subjects consumed alcoholic beverages an average of 10.30 days out of the past month, *SD* = 5.48, range = 2-26, and consumed an average of 4.03 standard drinks per occasion, *SD* = 1.96, range = 1-9+. In light of the within-subjects study design, a power analysis indicated this sample size afforded >95% power to detect a moderate sized effect of Beverage condition, *Cohen's d* = 0.5 assuming $\alpha = .05$.

Procedure

The experiment featured a Beverage Condition (Alcohol vs. Control) within-subjects study design (see also Fairbairn et al., 2018 for full procedures). All participants attended two extended laboratory sessions in groups of three same-gender strangers who were unacquainted prior to the first laboratory session. Laboratory sessions were scheduled three days apart. On one of these sessions, groups consumed an alcoholic beverage, and on the other session, they consumed a non-alcoholic control beverage. The order of beverage condition was counterbalanced across groups, such that half received the alcoholic beverage first and half received the control beverage first. For this study, beverages took the form of cranberry juice-vodka cocktails for the Alcohol condition and weight and gender-adjusted doses of cranberry juice for the Control condition. Alcohol dosing was adjusted for weight and gender with the intention of reaching a peak BrAC of about 0.08% (0.82 g/kg for males; 0.74 g/kg for females; Sayette et al., 2001). Otherwise, beverage administration procedures, and the structure of sessions pre-beverage administration, mirrored those employed in Study 1.

Following a beverage absorption period of 1.25 hours, M = 74.4 minutes, SD = 13.3 (see Kang et al., 2018), and directly following measurement of peak BrAC, participants engaged in the referential communication task. In each session, participants were randomly assigned to the role of Director, Matcher 1, and Matcher 2, and completed the *sorting* and *test* phases of the task. Methods for this referential communication task were the same as in Study 1.

Data from two sessions (Control condition for two different groups) were excluded from the Study 2 analyses due to equipment issues resulting in missing video of the referential communication task. The final data set was comprised of 910 trials, excluding 2 trials during which participants did not follow instructions. Sample size was determined before any analyses were conducted. Expression length on *test* trials was analyzed using a Poisson-link mixed effects model that included Beverage (Alcohol vs. Control), Partner Knowledge (Knowledgeable vs. Naïve partner), and Session (First vs. Second session) as fixed effects. Session was included as a fixed effect to control order effect as participants may quickly become familiar with the task and develop strategies. We did not complete a manipulation check on the *sorting* trials for Study 2 because we had already established that Directors in all conditions successfully developed shared labels (i.e., decreased expression length) with Matcher 1 after three repeated rounds of *sorting*.

Results

Manipulation Check

Beverage Administration:

During the Alcohol session, participants registered an average BrAC value of 0.064%, *SD* = 0.012, immediately following beverage administration. Participants produced an average BrAC value of 0.073%, *SD* = 0.010, immediately prior to the referential communication task, a value that also reflected the peak average BrAC value for the sessions. Subjective intoxication ratings immediately prior to the referential communication task averaged 28.9, *SD* = 17.1.

Analysis of Primary Study Aims

During *test* trials, Directors in both conditions provided more detail (more words) when speaking to a Naïve addressee unfamiliar with the images and used shorter expressions with the Knowledgeable addressee, indicating the presence of common ground (Figure 4).

The mixed effects model included Beverage (Alcohol (-0.47) vs. Control (0.53)), Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)), and Session (First (-0.50) vs. Second

(0.50)) as mean-centered fixed effects and the dependent measure was the number of words in the referring expressions at *test*. The model also included intercepts by participants and items, a by-participants slope for the Beverage, Partner Knowledge, and Session effects and a by-items slope for the Beverage and Session effects and their interaction. The model revealed a significant main effect of Partner Knowledge, $b = 0.61$, $ERR = 1.84$, $z = 12.03$, 95% CI = [0.51, 0.71], $p < .0001$, replicating previous findings (Wilkes-Gibbs, 1986; Schober & Clark, 1989; Yoon & Brown-Schmidt, 2018). In addition, the interaction between Partner Knowledge and Session emerged as non-significant, $b = 0.19$, $ERR = 1.21$, $z = 1.77$, 95% CI = [-0.02, 0.40], $p = .08$ (Table 5).

Regarding tests of key study hypotheses, there was a significant interaction between Beverage and Partner in predicting expression length, $b = -0.19$, $ERR = 0.83$, $z = -2.70$, 95% CI = [-0.34, -0.05], $p = .007$ (Table 5). In particular, participants demonstrated significantly higher sensitivity to common ground during Alcohol sessions vs. Control sessions. During Alcohol sessions, Directors used 6.53 fewer words, on average, for Knowledgeable partners than for Naïve partners, $b = 0.71$, $ERR = 2.03$, $z = 10.05$, 95% CI = [0.57, 0.85], $p < .0001$. In contrast, during Control sessions, Directors used only 4.25 fewer words for Knowledgeable partners than for Naïve partners, $b = 0.54$, $ERR = 1.72$, $z = 8.12$, 95% CI = [0.41, 0.68], $p < .0001$ (Figure 4, Table S3). In other words, when Directors were intoxicated, the difference in expression length for Knowledgeable vs Naïve partners was significantly larger than when Directors were sober, indicating that common ground between conversation partners may have been established with greater alacrity under the intoxicated conditions.

To further understand this effect, we parsed the interaction according to partner knowledge level. When interactions with Naïve partners were examined, the main effect of

Beverage was significant, *b* = -0.14, *ERR* = 0.87, *z* = -2.41, 95% CI = [-0.25, -0.03], *p* = 0.016, indicating that Directors who consumed alcohol used significantly more words when describing items to Naïve partners than sober Directors did. For interactions with Knowledgeable partners only, the main effect of Beverage on expression length was opposite in its direction but did not reach significance, *b* = 0.05, *ERR* = 1.05, *z* = 0.59, 95% CI = [-0.11, 0.21], *p* = 0.56. Taken together, these results indicate that Alcohol exerts a differential effect on how individuals communicate with Naïve partners, lengthening utterances to accommodate lack of shared experience.

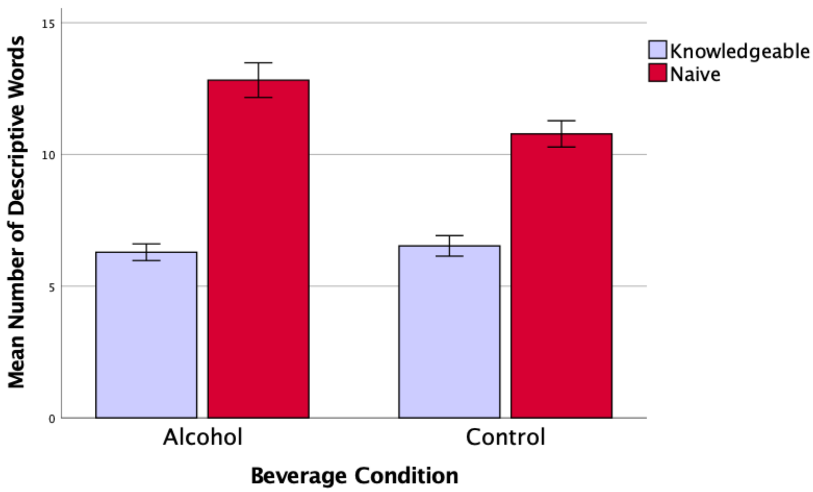

Figure 4. Study 2: Average number of descriptive words by Beverage condition and Partner Knowledge across both sessions. Error bars indicate +/- 1 standard error on the item level data.

Table 5. Experiment 2 test trials on all sessions: Mixed effect model with Beverage (Alcohol (-0.47) vs. Control (0.53)), Partner Knowledge (Knowledgeable (-0.50) vs. Naïve (0.50)), and Session (First (-0.50) vs. Second (0.50)) as mean-centered fixed effects. The dependent measure is the number of words in the referring expressions at *test*.

	Estimate	SE	*z*-value	*p*-value			Variance	Std.Dev.
Fixed					*Random*			
(intercept)	2.09	0.08	27.27	<.0001	*Subject*	(Intercept)	0.07	0.28
Beverage (B)	-0.01	0.06	-0.20	0.84		Beverage	0.004	0.07
Partner (P)	**0.61**	**0.05**	**12.03**	**<.0001**		Partner	0.02	0.13
Session (S)	-0.06	0.06	-1.05	0.30		Session	0.02	0.13
B*P	**-0.19**	**0.07**	**-2.70**	**0.007**	*Item*	(Intercept)	0.06	0.24
B*S	-0.40	0.26	-1.52	0.13		Beverage	0.04	0.19
P*S	0.19	0.11	1.77	0.08		Session	0.04	0.20

B*P*S	-0.11	0.21	-0.54	0.59	B*S	0.06	0.24

As in Study 1, participants were overwhelmingly able to accurately identify the target image given descriptions —across all trials, only 0.5% resulted in errors. There was no main effect of Beverage, $b = 9.83$, $z = 0.022$, $p = 0.98$, or interactions with Beverage, $b = 19.24$, $z = 0.037$, $p = 0.97$, and thus it did not appear that participants were less accurate at identifying images when they were intoxicated vs. sober.

Discussion

With most alcohol consumption taking place in social settings, it is vital that we understand the mechanisms through which alcohol alters social behavior and produces social rewards. Untangling the cognitive origins of alcohol's effects during novel social interactions can increase our ability to predict who may be at risk for developing AUD, and under what circumstances that risk may increase. The current research was the first to measure the development and use of common ground to better understand the effects of alcohol on social cognition. While this research did not yield evidence that alcohol facilitates the development of common ground among groups of previously acquainted individuals, we did see an alcohol effect when focusing only on groups of strangers. Specifically, in the context of the within-subjects design of Study 2, we found a significant interaction between beverage condition and partner knowledge wherein strangers in the alcohol condition used longer expression lengths to describe ambiguous images to naïve partners when compared to strangers in the control condition. In other words, participants in the alcohol condition demonstrated more facility in establishing and responding to the common ground shared with their addressees, preferentially reacting to the lack of shared knowledge with naïve conversation partners.

Results of this study indicate that alcohol can under certain conditions enhance elements of social cognition, increasing our ability to respond to shared knowledge (or more specifically, a lack thereof) with interaction partners. In light of research establishing alcohol's tendency to reduce cognitive capacity (MacDonald et al., 1995; Weissenborn & Duka, 2003; Van Skike et al., 2019), this finding might be considered counterintuitive at first glance. The Alcohol Myopia model was among the first to present a framework for understanding such counterintuitive effects, predicting that alcohol's tendency to narrow attentional focus can lead to enhanced outcomes under certain circumstances (Steele & Josephs, 1990). The Social-Attributional theory builds on the tenets of Alcohol Myopia, asserting that alcohol eases many of the stressful aspects of social interaction, thereby allowing more focus to be allocated to effective communication and formation of social bonds (Fairbairn & Sayette, 2014). Our finding that alcohol enhances the use of common ground during social interactions is also in line with previous research indicating that alcohol can increase emotional rewards and facilitate social communication when consumed with other people (Armeli et al., 2003; Doty & de Wit, 1995; Kirkpatrick & de Wit, 2013; Pliner & Cappell, 1974; Clarisse et al., 2004; Samp & Monahan, 2007). Enhanced use of common ground might present one potential mechanism by which alcohol enhances social interaction—in other words, alcohol might induce feelings of social connection in part by increasing the capacity to establish shared understanding with one's conversation partner.

One notable element to the findings of this study is that evidence of increased sensitivity to common ground emerged specifically among groups of strangers. In light of a burgeoning body of research suggesting the effects of alcohol on social outcomes can emerge as more pronounced among groups of strangers, this finding was not entirely unexpected (Fairbairn et al., 2018; Fairbairn & Sayette, 2014; Fairbairn, 2017; Fairbairn & Bresin, 2017). The Social-

Attributional model proposes that alcohol has the potential to free individuals from the self-consciousness and fear of social rejection that can often haunt stranger interactions (Fairbairn & Sayette, 2014; Fairbairn et al., 2018; Guerrieri et al., 2021). Prior research indicates that communicating with strangers rather than friends can cause increased levels of stress (Rodriguez et al., 2021). Many can relate to the uncomfortable moment upon meeting a new acquaintance—the mental scramble for a topic on which you can both relate, some shared experience or knowledge over which to bond. With alcohol relieving the self-awareness that causes stress during these interactions, we can more easily develop common ground with a new conversation partner, facilitating the development of mutual understanding and connection. However, the current studies do not directly measure social memory or cognition, and so the exact mechanism through which alcohol enhances the use of linguistic common ground is not clear. Additionally, it should be noted that while both studies included in this project shed light on the effects of alcohol among groups of strangers, due to the lack of power in Study 1, we cannot definitively speak to whether strangers and friends produce different results.

In light of research linking habitual drinking in unfamiliar social contexts to subsequent heavy drinking behaviors (Casswell & Zhang, 1997; Venerable & Fairbairn, 2020), these findings might help inform our understanding of factors underlying social-contextual risk for problem drinking patterns, in turn having implications for potential prevention and intervention methods. Increased risk of drinking in unfamiliar social contexts might indicate a promising path towards interventions directed at contextually considered alcohol consumption. Considerations of settings that carry a higher risk for heavy drinking can inform prevention methods aimed at restructuring the drinker's life to decrease reinforcement gained from alcohol and instead focus on activities that maximize rewards unrelated to drinking. For those recovering from AUD, these findings could increase understanding of contexts that carry higher risk for relapse and contribute to the conception of appropriate coping methods. Even the simple method of educating individuals about the increased risks of using alcohol in unfamiliar contexts to ease social interaction could prove effective in reducing heavy drinking and eventual development of AUD. Of course, further research is needed to conceptualize and validate any potential interventions informed by these findings.

Strengths of this study include the use of an in vivo, naïve participant interaction to evaluate common ground in a naturalistic setting, integration of a within-subjects design (Study 2), and an assessment of alcohol’s effects in both familiar and unfamiliar contexts. This study also included limitations. Study 1 may have been underpowered to effectively examine the effects of alcohol among groups of friends. A larger sample size would have been better suited to capturing effects in familiar social context that were smaller in magnitude. Given our focus on exploring risk factors for the development of later AUD, this study focused on a young adult population of drinkers (ages 21-30, $M = 22.3$). Future research should attempt to replicate these findings among a wider sample of differing ages and backgrounds. Additionally, the current research examined effects of a moderate alcohol dose on the descending limb of the BAC curve—slightly after participants reached peak BrAC. Future studies should evaluate common ground on the ascending limb of the BrAC curve and might also explore the effects of higher and lower alcohol doses. It would also be interesting to look at the effects of alcohol on common ground amid mixed groups of sober and intoxicated individuals. Although we chose to omit a placebo condition in order to avoid unanticipated compensatory effects (Fairbairn, Sayette, Amole, et al., 2015; Testa at al., 2006), we cannot rule out the possibility of an alcohol expectancy effect influencing our results. Lastly, future studies could consider the effects of participants' baseline linguistic complexity in moderating the relationship between alcohol and common ground.

In sum, our results indicate that alcohol can facilitate the use of common ground during interactions with strangers. Results suggest alcohol may eliminate some of the mental sludge that can impede the formation of a shared understanding (i.e., common ground) with conversation partners, so helping drinkers enjoy the company of not only friends but also unfamiliar people. Thus, findings of this study may offer one additional piece of the puzzle when it comes to understanding mechanisms driving alcohol's socially reinforcing effects, potentially increasing our understanding of pathways underlying AUD development.

References

Armeli, S., Tennen, H., Todd, M., Carney, M. A., Mohr, C., Affleck, G., & Hromi, A. (2003). A Daily Process Examination of the Stress-Response Dampening Effects of Alcohol Consumption. *Psychology of Addictive Behaviors, 17*(4), 266-276. http://doi.org/10.1037/0893-164X.17.4.266

Arnold, J. E., Kam, C. L. H., & Tanenhaus, M. K. (2007). If you say *thee uh* you are describing something hard: The on-line attribution of disfluency during reference comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*(5), 914–930. https://doi.org/10.1037/0278-7393.33.5.914

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, *68*(3), 255–278. https://doi.org/10.1016/j.jml.2012.11.001

Bartholow, B. D., Pearson, M., Gratton, G., & Fabiani, M. (2003). Effects of Alcohol on Person Perception: A Social Cognitive Neuroscience Approach. *Journal of Personality and Social Psychology, 85*(4), 627-638. https://doi.org/10.1037/0022-3514.85.4.627

Bègue, L., Subra, B., Arvers, P., Muller, D., Bricout, V., & Zorman, M. (2009). A message in a bottle: Extrapharmacological effects of alcohol on aggression. *Journal of Experimental Social Psychology, 45*(1), 137-142. https://doi.org/10.1016/j.jesp.2008.07.018

Brown, S. A. (1985). Context of drinking and reinforcement from alcohol: Alcoholic patterns. *Addictive Behaviors, 10*(2), 191-195. https://doi.org/10.1016/0306-4603(85)90027-9

Brown-Schmidt, S. (2009). The role of executive function in perspective taking during online language comprehension. *Psychonomic Bulletin & Review, 16*, 893–900. https://doi.org/10.3758/PBR.16.5.893

Brown-Schmidt, S. (2009). Partner-specific interpretation of maintained referential precedents during interactive dialog. *Journal of Memory and Language, 61*(2), 171-190. https://doi.org/10.1016/j.jml.2009.04.003

Button, K., Ioannidis, J., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafò, M. R. (2013). Power failure: why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience, 14*, 365–376. https://doi.org/10.1038/nrn3475

Casswell, S. & Zhang, J. F. (1997). Access to alcohol from licensed premises during adolescence: a longitudinal study. *Addiction, 92*(6), 737-745.

Clark, H. H. (1996). *Using language*. Cambridge University Press.

Clark, H. H. & Wilkes-Gibbs, D. (1986). Referring as a collaborative process. *Cognition, 22*(1), 1-39. https://doi.org/10.1016/0010-0277(86)90010-7

Clarisse, E., Testu, F., & Reinberg, A. (2004). Effects of Alcohol on Psycho-Technical Tests and Social Communication in a Festive Situation: A Chronopsychological Approach. *Chronobiology International*, *21*(4-5), 721-738. https://doi.org/10.1081/CBI-200026461

Creswell, K. G. (2021). Drinking together and drinking alone: A social-contextual framework for examining risk for alcohol use disorder. *Current Directions in Psychological Science, 30*(1), 19-25. https://doi.org/10.1177/0963721420969406

Doty, P. & de Wit, H. (1995). Effect of setting on the reinforcing and subjective effects of ethanol in social drinkers. *Psychopharmacology*, *118*, 19-27. https://doi.org/10.1007/BF02245245

Eastwood, A. P. R., Penton-Voak, I. S., Munafò, M. R., & Attwood, A. S. (2020). Effects of acute alcohol consumption on emotion recognition in high and low trait aggressive drinkers. *Journal of Psychopharmacology, 34*(11), 1226-1236. https://doi.org/10.1177/0269881120922951

Fairbairn, C. E. (2017). Drinking among strangers: A meta-analysis examining familiarity as a moderator of alcohol's rewarding effects. *Psychology of Addictive Behaviors, 31*(3), 255-264. https://doi.org/10.1037/adb0000264

Fairbairn, C. E. & Bresin, K. (2017). The effects of contextual familiarity on alcohol expectancies. *Experimental and Clinical Psychopharmacology, 25*(1), 13– 23. https://doi.org/10.1037/pha0000103

Fairbairn, C. E., Bresin, K., Kang. D., Rosen, I. G., Ariss, T., Luczak, S. E., Barnett, N. P., & Eckland, N. S. (2018). A Multimodal Investigation of Contextual Effects on Alcohol's Emotional Rewards. *Journal of Abnormal Psychology, 127*(4), 359-373. https://dx.doi.org/10.1037/abn0000346

Fairbairn, C. E., Creswell, K. G., Hales, A. H., Williams, K. D., & Wilkins, K. V. (2022). Mixing Misery and Gin: The Effect of Alcohol Administration on Ostracism Response. *Personality and Social Psychology Bulletin.* https://doi.org/10.1177/01461672211038450

Fairbairn, C. E. & Sayette, M. A. (2014). A Social-Attributional Analysis of Alcohol Response. *Psychological Bulletin, 140*(5), 1361-1382. http://dx.doi.org/10.1037/a0037563

Fairbairn, C. E., Sayette, M. A., Amole, M. C., Dimoff, J. D., Cohn, J. F., & Girard, J. M. (2015). Speech Vol. indexes sex differences in the social-emotional effects of alcohol. *Experimental and Clinical Psychopharmacology*, *23*(4), 255–264. https://doi.org/10.1037/pha0000021

Francis, K. B., Gummerum, M., Ganis, G., Howard, I. S., & Terbeck, S. (2019). Alcohol, empathy, and morality: acute effects of alcohol consumption on affective empathy and moral decision-making. *Psychopharmacology*, *236*, 3477-3496. https://doi.org/10.1007/s00213-019-05314-z

Fussell, S. R., & Krauss, R. M. (1989b). Understanding friends and strangers: The effect of audience design on message comprehension. *European Journal of Social Psychology, 19,* 509-525. https://doi.org/10.1002/ejsp.2420190603Giancola, P. R., Josephs, R. A., Parrott, D. J., & Duke, A. A. (2010). Alcohol Myopia Revisited: Clarifying Aggression and Other Acts of Disinhibition Through a Distorted Lens. *Perspectives on Psychological Science, 5*(3), 265-278. https://doi.org/10.1177/1745691610369467

Garrison, A. C. S., Yoon, S. O., Ariss, T., Brown-Schmidt, S., & Fairbairn, C. (2022, November 14). Alcohol and Common Ground: The Effects of Intoxication on Linguistic Markers of Shared Understanding during Social Exchange. Retrieved from osf.io/ug3n7

Guerrieri, L., Fairbairn, C. E., Sayette, M. A., & Bosch, N. (2021). Alcohol narrows physical distance between strangers. *PNAS, 118*(20), Article e2101937118. https://doi.org/10.1073/pnas.2101937118

Hull, J. G. (1981). A Self-Awareness Model of the Causes and Effects of Alcohol Consumption. *Journal of Abnormal Psychology*, *90*(6), 586-600. https://doi.org/10.1037/0021-843X.90.6.586

Isaacs, E., & Clark, H. H. (1987). References in conversation between experts and novices. *Journal of Experimental Psychology: General*, *116*, 26-37. https://doi.org/10.1037/0096-3445.116.1.26

Jones, B. T., Corbin, W., & Fromme, K. (2001). A review of expectancy theory and alcohol consumption. *Addiction*, *96*(1), 57-72. https://doi.org/10.1046/j.13600443.2001.961575.x

Kang, D., Bresin, K., & Fairbairn, C. E. (2018). The Impact of Alcohol and Social Context on the Startle Eyeblink Reflex. *Alcoholism Clinical & Experimental Research*, *42*(10), 1951-1960. https://doi.org/10.1111/acer.13838

Kirkpatrick, M. G. & de Wit, H. (2013). In the company of others: social factors alter acute alcohol effects. *Psychopharmacology*, *230*(2), 215-226. https://doi.org/10.1007/s00213-013-3147-0

Krauss, R. M. & Weinheimer, S. (1964). Changes in reference phrases as a function of frequency of usage in social interaction: a preliminary study. *Psychonomic Science, 1*, 113–114. https://doi.org/10.3758/BF03342817

Krauss, R. M. & Weinheimer, S. (1966). Concurrent feedback, confirmation, and the encoding of referents in verbal communication. *Journal of Personality and Social Psychology*, *4*(3), 343–346. https://doi.org/10.1037/h0023705

Kuhlen, A. K. & Brennan, S. E. (2013). Language in dialogue: when confederates might be hazardous to your data. *Psychonomic Bulletin & Review*, *20*, 54-72. https://doi.org/10.3758/s13423-012-0341-8

Larsen, H., Overbeek, G., Vermulst, A. A., Granic, I., & Engels, R. C. M. E. (2010). Initiation and continuation of best friends and adolescents' alcohol consumption: Do self-esteem and self-control function as moderators? *International Journal of Behavioral Development*, *34*(5), 406–416. https://doi.org/10.1177/0165025409350363

MacDonald, T. K., Zanna, M. P., & Fong, G. T. (1995). Decision making in altered states: Effects of alcohol on attitudes toward drinking and driving. *Journal of Personality and Social Psychology*, *68*(6), 973–985. https://doi.org/10.1037/0022-3514.68.6.973

Monahan, J. L., & Lannutti, P. J. (2000). Alcohol as social lubricant: Alcohol myopia theory, social self-esteem, and social interaction. *Human Communication Research*, *26*(2), 175–202. https://doi.org/10.1093/hcr/26.2.175

National Institute on Alcohol Abuse and Alcoholism. (2021, December). *Understanding Binge Drinking*. U.S. Department of Health and Human Services, National Institutes of Health. https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/binge-drinking

Pliner, P. & Cappell, H. (1974). Modification of affective consequences of alcohol: A comparison of social and solitary drinking. *Journal of Abnormal Psychology*, *83*(4), 418-425. https://doi.org/10.1037/h0036884

R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL: https://www.R-project.org/.

Raudenbush, S. W. & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods* (2nd ed.). Sage Publications.

Renner, F., Kersbergen, I., Field, M., & Werthmann, J. (2017). Dutch courage? Effects of acute alcohol consumption on self-ratings and observer ratings of foreign language skills. *Journal of Psychopharmacology, 32*(1), 116-122. https://doi.org/10.1177/0269881117735687

Robinson, E., Oldham, M., Sharps, M., Cunliffe, A., Scott, J., Clark, E., Piercy, K., & Field, M. (2016). Social imitation of alcohol consumption and ingratiation motives in young adults. *Psychology of Addictive Behaviors, 30*(4), 442-449. http://dx.doi.org/10.1037/adb0000150

Rodrigues, M. A., Yoon, S. O., Clancy, K. B. H., & Stine-Morrow, E. A. L. (2021). What are friends for? The impact of friendship on communicative efficiency and cortisol response during collaborative problem solving among younger and older women. *Journal of Women & Aging, 33*(4), 411-427. https://doi.org/10.1080/08952841.2021.1915686

Samp, J. A. & Monahan, J. L. (2007). Expressing Under the Influence: Alcohol Consumption, Nonverbal Behavior, and Performance. *Communication Research Reports, 24*(1), 79-86. https://doi.org/10.1080/08824090601128349

Sayette, M. A., Creswell, K. G., Dimoff, J. D., Fairbairn, C. E., Cohn, J. F., Heckman, B. W., Kirchner, T. R., Levine, J. M., & Moreland, R. L. (2012). Alcohol and Group Formation: A Multimodal Investigation of the Effects of Alcohol on Emotion and Social Bonding. *Psychological Science, 23*(8), 869-878. https://doi.org/10.1177/0956797611435134

Sayette, M. A., Martin, C. S., Perrott, M. A., Wertz, J. M., & Hufford, M. R. (2001). A test of the appraisal-disruption model of alcohol and stress. *Journal of Studies on Alcohol, 62*(2), 247-256. https://doi.org/10.15288/jsa.2001.62.247

Schober, M. F. & Clark, H. H. (1989). Understanding by addressees and overhearers. *Cognitive Psychology, 21*(2), 211-232. https://doi.org/10.1016/0010-0285(89)90008-X

Scribner, R., Mason, K., Theall, K., Simonsen, N., Kessel Schneider, S., Gomberg Towvim, L., & DeJong, W. (2008). The Contextual Role of Alcohol Outlet Density in College Drinking. *Journal of Studies on Alcohol and Drugs 69*(1), 112-120. https://doi.org/10.15288/jsad.2008.69.112

Senchak, M., Leonard, K. E., & Greene, B. W. (1998). Alcohol use among college students as a function of their typical social drinking context. *Psychology of Addictive Behaviors, 12*(1), 62–70. https://doi.org/10.1037/0893-164X.12.1.62

Steele, C. M. & Josephs, R. A. (1990). Alcohol Myopia: Its Prized and Dangerous Effects. *American Psychologist*, *45*(8), 921-933. https://doi.org/10.1037/0003-066X.45.8.921

Testa, M., Fillmore, M. T., Norris, J., Abbey, A., Curtin, J. J., Leonard, K. E., Mariano, K. A., Thomas, M. C., Nomensen, K. J., George, W. H., VanZile-Tamsen, C., Livingston, J. A., Saenz, C., Buck, P. O., Zawacki, T., Parkhill, M. R., Jacques, A. J., & Hayman Jr., L. W. (2006). Understanding Alcohol Expectancy Effects: Revisiting the Placebo Condition. *Alcoholism: Clinical and Experiments Research*, *30*(2), 339-348. https://doi.org/10.1111/j.1530-0277.2006.00039.x

Unger, L. (2010). *The Social Role of Linguistic Alignment with In-Group and Out-Group Members* (Exam No. 1896547) [Masters dissertation, The University of Edinburgh]. Edinburgh Research Archive.

Van Skike, C. E., Goodlett, C., & Matthews, D. B. (2019). Acute alcohol and cognition: Remembering what it causes us to forget. *Alcohol*, *79*, 105-125. https://doi.org/10.1016/j.alcohol.2019.03.006

Venerable, W. J. & Fairbairn, C. E. (2020). A multimodal, longitudinal investigation of alcohol's emotional rewards and drinking over time in young adults. *Psychology of Addictive Behaviors*, *34*(5), 601–612. https://doi.org/10.1037/adb0000567

Watson, P. E., Watson, I. D., & Batt, R. D. (1981). Prediction of blood alcohol concentrations in human subjects. Updating the Widmark Equation. Journal of Studies on Alcohol, *42*(7), 547–556.

Weissenborn, R. & Duka, T. (2003). Acute alcohol effects on cognitive function in social drinkers: their relationship to drinking habits. *Psychopharmacology*, *165*, 306–312. https://doi.org/10.1007/s00213-002-1281-1

Wilkes-Gibbs, D. (1986). *Collaborative Processes of Language Use in Conversation (Speech Arts, Comprehension, Completions, Interaction)* (Publication No. 8700834) [Doctoral dissertation, Stanford University]. ProQuest Dissertations Publishing.

Wilkes-Gibbs, D. & Clark, H. H. (1992). Coordinating Beliefs in Conversation. *Journal of Memory and Language*, *31*, 183-194. https://doi.org/10.1016/0749-596X(92)90010-U

Yoon, S. O. & Brown-Schmidt, S. (2014). Adjusting conceptual pacts in three-party conversation. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(4), 919-937.

Yoon, S. O. & Brown-Schmidt, S. (2018). Aim Low: Mechanisms of Audience Design in Multiparty Conversation. *Discourse Processes, 55*(7), 566-592. https://doi.org/10.1080/0163853X.2017.1286225

Yoon, S. O. & Brown-Schmidt, S. (2019). Audience Design in Multiparty Conversation. *Cognitive Science*, *43*(8), Article e12774. https://doi.org/10.1111/cogs.12774

Yoon, S. O. & Brown-Schmidt, S. (2019). Contextual Integration in Multiparty Audience Design. *Cognitive Science*, *43*(12), Article e12807. https://doi.org/10.1111/cogs.12807

Yoon, S. O., Duff, M. C., & Brown-Schmidt, S. (2017). Learning and using knowledge about what other people do and don't know despite amnesia. *Cortex*, 94, 164-175. http://dx.doi.org/10.1016/j.cortex.2017.06.020

Yoon, S. O., Pratley, B. B., & Heller, D. (2021). The identity of the partner matters even when naming everyday objects. *Proceedings of the Annual Meeting of the Cognitive Science Society*, 43.

Yoon, S. O., & Stine-Morrow, E. A. L. (2019). Evidence of preserved audience design with aging in interactive conversation. *Psychology and Aging*, *34*(4), 613–623. https://doi.org/10.1037/pag0000341