



Excluded, then inebriated: A preliminary investigation into the role of ostracism on alcohol consumption

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ABSTRACT

Introduction: Ostracism has only recently been investigated as a relevant social stressor that might precede college student alcohol use. The present study continues initial efforts to examine the effects of ostracism on subsequent alcohol consumption in the laboratory. A 2 (sex: male, female) × 2 (condition: ostracism, control) between-subjects experimental design was conducted to examine the effects of these variables on alcohol consumption in the laboratory.

Methods: Social drinking college students ($N = 40$; 43% female) were randomly assigned to one of two social interaction tasks: either an in-person conversation from which the participant was excluded by two confederates, or independently rating neutrally valenced photographs alongside confederates. Participants then consumed a priming drink (targeted dose = 0.03 BrAC) before completing a mock taste test of up to 710 ml of light beer. Amount consumed (in ml) during the mock taste test served as the primary dependent variable.

Results: The ostracism condition was effective at decreasing mood and psychological need variables (i.e., control, belonging) compared to the control condition. After removing from analyses those who identified the confederates as part of the study ($n = 7$; 3 control, 4 ostracism), results indicated that males consumed more beer than females, and that ostracized participants trended toward consuming more beer than control participants.

Conclusions: Findings contribute important methodological additions to a burgeoning literature on the effects of ostracism on drinking, and suggest that ostracism may be a valuable addition to studies examining drinking to cope behaviors.

1. Introduction

Among the many possible malleable precursors for heavy drinking among college students, stress-induced drinking behaviors may be especially concerning. Negative affect and stressful events increase the likelihood of drinking in the short term (Armeli, Conner, Cullum, and Tennen, 2010), and drinking to cope with negative mood predicts greater alcohol use problems and dependence symptoms in longitudinal designs (Beck, Caldeira, Vincent, and Arria, 2013; Littlefield, Sher, and Wood, 2010). Yet, while some experimental studies find that stress increases alcohol consumption in the laboratory among social drinking college students (Higgins and Marlatt, 1975; Kidorf and Lang, 1999; Nescic and Duka, 2006; Tucker, Vuchinich, Sobell, and Maisto, 1980), others find null or contrasting effects (Hull and Young, 1983; Larsen, Engels, Granic, and Huizink, 2013; McNair, 1996). This status suggests that some (but not all) kinds of stress may lead to increased drinking in some (but not all) people. Identifying for whom and under what conditions stress may increase drinking offers the possibility of improved

and targeted intervention and prevention efforts.

The transition to college includes many social stressors: the increased influence of peers, a decrease in regular parental influence, and a focus on interpersonal and romantic relationships. This coincides with a cultural expectation that heavy drinking at this age and in this environment is socially permissible (Schulenberg and Maggs, 2002). Alcohol is often used to facilitate social connectedness (Mohr et al., 2005), and most college drinking situations involve the presence of others (Single and Wortley, 1993), with the result that alcohol may be reasonably perceived as a valid method of regaining connectedness or coping with distress when ostracism occurs. Limited work has been conducted to link ostracism to alcohol use (Bacon, Cranford, and Blumenthal, 2015; Laws, Ellerbeck, Rodrigues, Simmons, and Ansell, 2017; Rabinovitz, 2014). However, with evidence that ostracism results in increased engagement in less healthy behaviors (i.e., eating more cookies) and more financially risky behaviors (Baumeister, DeWall, Ciarocco, & Twenge, 2005; Oaten, Williams, Jones, and Zadro, 2008), alcohol use may fall under the umbrella of similar unhealthy and risky

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Table 1
Demographics, alcohol use variables, and psychological assessment by ostracism condition.

		Ostracized (n = 20)*	Control (n = 20)	Difference
Demographics	Sex (% female)	45% (n = 9)	40% (n = 8)	$\chi^2(1) = 0.10, p = .75$
	Age [21–26 years]	22.5 (2.43)	21.85 (0.99)	$F(1, 37) = 1.21, p = .28$
	Ethnicity (% Caucasian)	72% (n = 13)	65% (n = 13)	$\chi^2(1) = 0.23, p = .63$
	Yr. in school (% 4th yr.)	56% (n = 10)	70% (n = 14)	$\chi^2(1) = 0.85, p = .36$
	Housing (% on campus)	22% (n = 4)	25% (n = 5)	$\chi^2(1) = 0.04, p = .84$
Alcohol variables, M (SD)	Problematic alc. Consumption AUDIT-C [0–12]	5.35 (2.23)	5.50 (2.65)	$F(1,39) < 1, p = .85$
	Coping motives DMQ-R [2–25]	9.50 (3.13)	11.00 (4.30)	$F(1,39) = 1.48, p = .24$
	Alcohol use problems RAPI-23 [0–69]	28.06 (6.02)	29.40 (6.67)	$F(1, 37) < 1, p = .52$
	Pos. expect B-CEOA [1–4]	2.87 (0.46)	2.88 (0.60)	$F(1, 37) < 1, p = .94$
	Neg. expect B-CEOA [1–4]	2.47 (0.51)	2.39 (0.42)	$F(1, 37) < 1, p = .62$
	Pos. valuations B-CEOA [1–5]	3.82 (0.66)	3.64 (0.89)	$F(1, 37) < 1, p = .50$
	Neg. valuations B-CEOA [1–5]	1.72 (0.45)	1.94 (0.47)	$F(1, 37) = 2.02, p = .16$
Psychological variables, M (SD)	Social anxiety LSAS [0–144]	36.72 (21.07)	39.15 (19.15)	$F(1, 37) < 1, p = .71$
	Perceived stress PSS-10 [10–50]	17.80 (5.82)	20.75 (7.46)	$F(1, 37) < 1, p = .36$
	Emotion. Dysregulation DERS [36–180]	66.89 (16.25)	64.25 (14.20)	$F(1, 37) < 1, p = .60$
	Depression CES-D [0–60]	10.56 (6.65)	8.10 (5.43)	$F(1, 37) = 1.57, p = .22$
	Anx. sensitivity ASI-3 [0–72]	15.28 (10.03)	14.55 (9.40)	$F(1, 37) < 1, p = .82$

Note: * = Some data from two participants in the ostracism condition is missing due to computer error.

behaviors influenced by ostracism.

Increased drinking in the context of an unsociable, ostracizing confederate was observed in a study examining the roles of social status and rapport on modeling the drinking behavior of male college students (Collins, Parks, and Marlatt, 1985). Recently, Laws et al. (2017) conducted an ecological momentary assessment study as community members self-reported their social interactions and alcohol use in real time over the course of two weeks. These researchers found no overall relationship between ostracism and alcohol use, but did find that ostracism specifically by close others was associated with increased alcohol consumption, with no effect from ostracism by strangers or acquaintances. Studies examining the inverse relationship—the effect of alcohol on the experience of ostracism—have similarly yielded mixed results (Buckingham et al., 2016; Hales, Williams, and Eckhardt, 2015).

Only two studies have directly examined the effects of ostracism on alcohol consumption in the laboratory. Rabinovitz (2014) found that social drinking college students ($N = 60$) receiving false personality feedback forecasting a “future alone” consumed more of an alcohol placebo beverage during an ad-lib drinking period, compared those receiving feedback predicting “future belonging.” In Bacon et al. (2015), social drinking college student participants ($N = 40$) played a game of Cyberball, a computer-based ball-toss game between the participant and two other “players,” who were actually pre-programmed responses (Williams, Cheung, and Choi, 2000). Participants were randomly assigned to be either included or excluded during the five-minute virtual ball toss game, and were then served from two pitchers of beer (710 ml total), and invited to consume as much as necessary to rate their taste profile. Unlike Rabinovitz (2014), Bacon et al. (2015) found that ostracism resulted in a decrease in alcohol consumption during the beer taste-test among female participants, with no effect of condition on males. In sum, the limited evidence available regarding the effect of ostracism on alcohol consumption is inconclusive, and likely moderated by individual and contextual variables.

The present study adds to this nascent literature by examining three important variations to previous work. First, the present study marks the first use of an in-person exclusion task among investigations into the effects of ostracism on alcohol consumption. Alcohol use in college occurs primarily in in-person social settings (e.g., parties; Clapp et al., 2003), and a face-to-face exclusion paradigm would enhance ecological validity compared to previous methods. Secondly, Bacon et al. (2015) and Rabinovitz (2014)—along with the majority of ostracism studies—compared the results of their ostracism manipulations to an inclusion condition. However, just as an increase in drinking is predicted following exclusion, alcohol use might also be expected to increase following inclusion. Alcohol use facilitates greater social bonding

(Sayette et al., 2012) and quantity of alcohol consumed is greater among participants reporting social motives for drinking (i.e., drinking because “it makes social gatherings more fun”) compared to those with coping motives (O’Hara, Armeli, and Tennen, 2015). The neutral comparison group used in the present study will establish a baseline from which to make claims regarding the effect of ostracism (or inclusion) on drinking behaviors. Finally, a priming drink (target BrAC: 0.03) was added to further encourage drinking behavior in the laboratory environment (Thomas, Bacon, Randall, Brady, and See, 2011).

We predict that participants excluded from an in-person conversation with confederates will drink more in a mock taste test than participants engaging in a neutral control task. Participant sex was included as subject variable, consistent with earlier findings (Bacon et al., 2015).

2. Method

2.1. Participants

Forty participants (43% female) from a medium-sized, Midwestern university completed the full study protocol. Participants were predominantly Caucasian (65%) undergraduate students, ages 21–30 ($M = 22.2, SD = 1.8$). See Table 1 for full demographic description.

AUDIT = Alcohol Use Disorder Identification Test; AUDIT-C = Alcohol Use Disorder Identification Test-Consumption scale; DMQ-R = Drinking Motives Questionnaire-Revised; RAPI = Rutgers Alcohol Problems Index-23 item; B-CEOA = Brief-Comprehensive Effects of Alcohol; LSAS = Liebowitz Social Anxiety Scale, total score; PSS-10 = Perceived Stress Scale-10 item; DERS = Difficulties in Emotion Regulation Scale; CES-D = Center for Epidemiological Studies-Depression; ASI = Anxiety Sensitivity Index-3.

2.1.1. Recruitment

Individuals responding to campus-wide advertising for the study completed a telephone-screening interview to assess eligibility for participation. Initial eligibility requirements included: (a) age 21 or older, (b) alcohol consumption within the previous month, (c) no history of problematic reactions to alcoholic beverages, (d) no medical conditions, medical use, or illegal drug use for which alcohol is contraindicated, including pregnancy or breastfeeding, and (e) an ability to forego any medication use (aside from contraceptives) for 24 h prior to the study (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2005). Beer consumption within the previous three months was an additional eligibility requirement. Eligible participants were scheduled for a laboratory appointment and instructed to abstain from alcohol and other medications (excluding contraceptives) for 24 h prior

to the study, and to fast for four hours prior to their appointment. Participants were scheduled for individual appointments to reduce potential effects of social modeling on alcohol use (Larsen et al., 2013).

2.1.2. Informed consent and initial assessment

Written and oral informed consent was collected upon arrival to the laboratory appointment. In order to reduce demand effects, the informed consent accurately described an interaction with other “participants” (actually confederates) and the taste tests, but with deception as to their true purpose. An in-person interview then reviewed eligibility requirements from the telephone screening and additionally assessed current intoxication, recent history of problematic alcohol use, and (for females) pregnancy. Participants with a BrAC > 0.000 or those scoring ≥ 15 on the Alcohol Use Disorder Inventory Test (AUDIT; Babor, Higgins-Biddle, Saunders, and Monteiro, 2001) were dismissed from further participation. For females, a negative result from a urine pregnancy test was required to participate.

2.2. Laboratory tasks

2.2.1. Social interaction tasks

Participants were randomly assigned to one of two conditions: ostracism ($n = 20$) or control ($n = 20$). Both conditions took place in the “bar-laboratory” – a space decorated to look like a bar in order to increase the likelihood of alcohol consumption (Ham, Casner, Bacon, and Shaver, 2011). Both interaction conditions took place at a circular pub table in the lab, where two female confederates were seated prior to the arrival of the participant.

Ostracism was manipulated via a conversation task with the confederates. The experimenter provided a list of introductory questions (e.g., “What is your favorite season?”), and instructed the participants to engage in a conversation using these questions, ostensibly to form the basis for a later peer assessment of personality. The conversation lasted seven minutes, with the first two minutes consisting of equal participation in the conversation by all parties. Confederates were instructed to look at the participant when directing a question to them or when the participant was speaking, with smiles, nods, and agreement, when appropriate. A cue at the two-minute mark prompted the confederates to talk among themselves, turn their bodies away from the participant, and dismiss participant responses with minimal acknowledgement (both verbal and eye-contact) when they tried to re-enter the conversation. By comparison, the confederates interacted with each other in a friendly, interested, and lively manner, with smiles, laughs, and indications of agreement.

The control condition was designed to occur in the same physical and social environment for the same duration of time, while eliciting neither feelings of social exclusion nor inclusion. The experimenter provided the group a stack of neutrally-valenced color photographs (Lang, Bradley, and Cuthbert, 2008), with instructions to rank and rate the photographs under the guise that these ratings would be used to evaluate their personality. Only one of each photograph was provided to the table, requiring minor discussion and coordination to share photos. Confederates were instructed to avoid conversation beyond that required to share photos, and to politely and gently limit conversation attempts by the participant, if they occurred.

2.2.2. Priming drink and taste rating task

The priming drink was provided following the social interaction, and was designed to dose participants to a BrAC of 0.03, which has been demonstrated to facilitate later alcohol consumption in a bar-laboratory (Thomas et al., 2011). Participants selected their choice of either red or white wine or a vodka/juice mixture upon arrival to the laboratory. The participant's weight, height, and sex were used to calculate the dose necessary to reach 0.03, based on tables by Watson, Clark, and Tellegen (1989). Participants were given 10 min to consume the drink.

The taste-rating task is a common way to assess voluntary alcohol

consumption under controlled conditions while reducing demand and observation effects (Mackillop and Murphy, 2013) and is significantly associated with measures of typical consumption (Jones et al., 2016). Participants were presented with two pitchers of light beer, which were poured into two 12-oz mugs (710 ml total). Each pitcher contained equal parts of Budweiser (5.0% ABV) and Bush NA (nonalcoholic) beer (0.5% ABV), to reduce total time in the laboratory and minimize taste familiarity. Participants were instructed to drink as much as needed to provide ratings of the various taste descriptors on a taste rating form. To increase motivation and focus, participants were also told that there was a 50% chance that the two mugs contained the same kind of beer, rather than different beers, and that a correct identification would result in a monetary bonus to their study compensation (all participants received the bonus regardless of their response; Thomas et al., 2011). Participants were given 15 min to complete this task.

2.3. Procedure

Upon arrival to the laboratory, participants completed the informed consent and eligibility assessment described above. Participants also provided measures of height, weight, and drink preference to use for dosing purposes. Upon determination of study eligibility, participants were seated at a computer to complete initial study questionnaires assessing mood and drinking-related variables. Upon completion, the participant was led to the “bar-laboratory,” to begin the social interaction task. When the social interaction was complete, the participant was asked to remain in the bar-lab, and the confederates were escorted from the room under the pretense that they would complete questionnaires elsewhere. The participant then completed measures related to the mood and psychological need response to the interaction (Affective Impact Index [AII]; Oaten et al., 2008; Williams et al., 2000), while the experimenter poured and provided instructions for the priming drink. The experimenter left the room during the absorption period for the priming drink, and returned to the room to pour the beer for the taste-test task, provide instructions, and to collect a BrAC measurement before leaving again for the duration of the taste test. After 15 min, the participant completed a final series of questionnaires in a separate interview room. Participants were debriefed verbally, coinciding with another BrAC reading taken 20 min after the conclusion of the beer taste-test. BrAC assessments required two consecutive readings of < 0.04 in order to safely leave the laboratory. Once the participant reached this threshold, they were compensated for their time and their “bonus” from the taste test (\$30–\$50 total, depending on time in the lab) and contacted a friend to escort them home. The total duration of the study was approximately two to three hours.

2.4. Measures

2.4.1. Demographics

A demographic form assessed age, sex, year in school, relationship status, and living arrangements.

2.4.2. Problematic alcohol use

The Alcohol Use Disorders Inventory Test (AUDIT; Babor et al., 2001) is a 10-item self-report measure that assesses problematic alcohol use (e.g., being advised to cut back by a family member, friend, or doctor). Each item is scored on a 0–4 scale, and summed to produce a total score ranging from 0 to 40. The consumption factor (AUDIT-C) comprising the first three questions (frequency of drinking, amount per event, and frequency of binge use) has been shown to demonstrate greater internal consistency in college student samples ($\alpha = 0.81$; Shields, Guttmanova, and Caruso, 2004), though the internal reliability in the present sample for both the AUDIT-C ($\alpha = 0.49$) and the total AUDIT ($\alpha = 0.55$) were poor. The total AUDIT score was used to determine study eligibility; the AUDIT-C ($M = 5.43$, $SD = 2.46$) was used as a potential covariate in the present study.

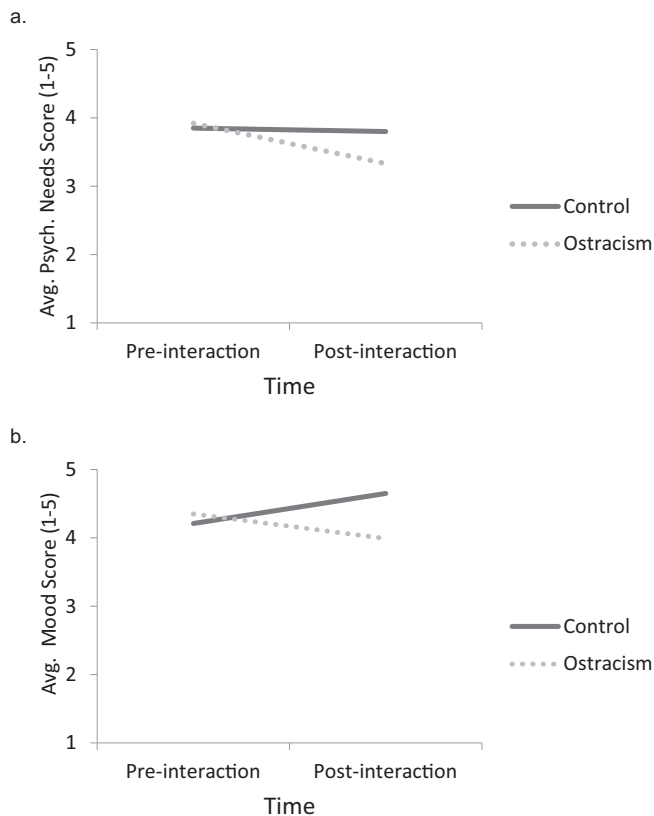


Fig. 1. Results from the Aversive Impact Index [AII] assessing (a) psychological needs and (b) mood from pre- and post-social interaction between control and ostracism conditions. Neither psychological needs nor mood differed between conditions prior to the social interaction. Following the social interaction, (a) psychological needs decreased significantly in the ostracism condition ($p = .001$). (b) Mood significantly increased from pre- to post- in the control condition ($p = .03$), and marginally significantly decreased in the ostracism condition ($p = .08$).

2.4.3. Psychological needs and mood

The Aversive Impact Index (AII; Oaten et al., 2008; Williams et al., 2000) is a self-report measure assessing “psychological needs”: belonging (“I felt like I belonged to the group”), self-esteem (“I felt good about myself”), meaningful existence (“I felt important”), and control (“I felt that I had control over the course of the conversation”). Each construct is assessed with five questions, rated by participants on a scale from 1 (*not at all*) to 5 (*extremely*). Each psychological need construct can be assessed separately or averaged for a total psychological needs score. Eight affect prompts (i.e., “happy,” “angry”) assess current mood on the same scale. Negative affect items were reverse scored and the items averaged to produce an overall mood score, with higher numbers indicating greater positive mood. The measure was administered both prior to and following the social interaction tasks. Internal reliability was good to excellent in both the pre-interaction (needs: $\alpha = .82$; mood: $\alpha = 0.87$) and post-interaction (needs: $\alpha = .92$; mood: $\alpha = 0.91$) administrations.

2.4.4. Assessment of suspicion

The verbal debriefing interview was initiated with an open-ended question—“What do you think this study was about?”—in order to assess suspicion of study deception (Blackhart, Brown, Clark, Pierce, and Shell, 2012). Experimenters were trained to follow brief answers (e.g., “college student drinking”) or answers that simply repeated the reported study rationale without further elaboration (e.g., “Personality and alcohol taste preferences”) with, “Can you make any more specific guesses?” The questions were designed to provide participants the

opportunity to voice any suspicion, without explicitly indicating that any deception was present or guiding participants to a particular component of the study. The experimenter wrote down a brief summary of the participant’s response, along with coding one of three options: (0) no suspicion, (1) suspicion, but not accurate in belief about purpose of the study, or (2) suspicion, accurate in belief about purpose of the study. Borderline or unclear cases were discussed with the principal investigator, who also reviewed all responses for accuracy prior to analyses.

2.4.5. Potential covariates

Additional measures were included to assess known influences on alcohol consumption, and were examined as potential covariates in analyses. The measures assessed *trait mood and anxiety variables* (Liebowitz Social Anxiety Scale [LSAS], Baker, Heinrichs, Kim, and Hofmann, 2002; Center for Epidemiological Studies-Depression [CES-D], Radloff, 1977; Anxiety Sensitivity Index-3 [ASI-3], Taylor et al., 2007), *emotion regulation* (Difficulties in Emotion Regulation Scale [DERS], Gratz and Roemer, 2004), *alcohol use variables* (Rutgers Alcohol Problems Inventory [RAPI-23], White and Labouvie, 1989; Drinking Motives Questionnaire-Revised [DMQ-R], Cooper, 1994; Brief-Comprehensive Effects of Alcohol [B-CEOA], Ham, Stewart, Norton, and Hope, 2005), and *recent stress* (Perceived Stress Scale [PSS-10], Cohen and Williamson, 1988).

3. Results

3.1. Participants

Randomization was successful at creating groups equivalent across demographic, alcohol-related, and psychological variables (Table 1). A computer error resulted in the failure to collect initial study questionnaires (demographics and covariate measures) for two participants in the ostracism condition.

3.1.1. Suspicious participants

During debriefing, participants were verbally queried about their beliefs regarding the purpose of the study. Seven participants (18% of total) were coded as “suspicion, but not accurate.” All expressed a belief that the two other “participants” were working with or instructed by the researcher in some way, though none were able to correctly identify the task of the confederates. Suspiciousness was split evenly between the ostracism ($n = 4$) and control ($n = 3$) conditions. Suspicious participants did not differ significantly from the larger sample in terms of demographic, psychological, or alcohol use variables, nor in responses to the ostracism manipulation or subsequent alcohol consumption. Analyses were conducted with and without these participants; data from the full sample are presented below, except where noted.

3.2. Effects of ostracism manipulation

3.2.1. Effects on psychological needs

A repeated-measures ANOVA evaluated change across pre- and post-interaction administrations (time) for the two conditions (ostracism; control) on the total psychological needs score (see Fig. 1a). A significant time \times condition interaction ($F(1, 36) = 5.38, p = .03$, partial $\eta^2 = 0.13$) was followed with simple effects test with a Bonferroni correction, which indicated no initial difference between the conditions prior to the interaction ($p = .64, d = 0.15, 95\% \text{ CI}_d [-0.49, 0.79]$). The difference in psychological needs at post-interaction was the result of a significant decrease from pre-interaction ($M = 3.92, SD = 0.40$) to post-interaction ($M = 3.33, SD = 0.82$) for those in the ostracism condition ($p = .008, d = 1.00, 95\% \text{ CI}_d [0.26, 1.72]$), but no difference from pre- to post- in the control condition (pre: $M = 3.85, SD = 0.82$; post: $M = 3.80, SD = 0.50; p = .73, d = 0.11, 95\% \text{ CI}_d [-0.51, 0.73]$).

3.2.2. Effects on mood

A repeated-measures ANOVA on pre- and post-interaction mood yielded a significant time x condition interaction, $F(1, 36) = 8.48$, $p = .006$, partial $\eta^2 = 0.19$ (see Fig. 1b). Simple effects tests with a Bonferroni correction indicate no initial difference in mood between conditions ($p = .53$, $d = 0.21$, 95% $CI_d [-0.43, 0.84]$). The difference between conditions following the interaction task ($F(1, 38) = 12.07$, $p = .001$, $\eta^2 = 0.24$) is the result of a marginally significant decrease in mood in the ostracism condition (pre: $M = 4.35$, $SD = 0.62$; post: $M = 3.99$, $SD = 0.82$; $p = .08$, $d = 0.51$, 95% $CI_d [-0.17, 1.18]$), and a significant increase in mood in the control condition (pre: $M = 4.21$, $SD = 0.74$; post: $M = 4.65$, $SD = 0.31$; $p = .03$, $d = 0.90$, 95% $CI_d [0.21, 1.58]$).

3.3. Priming drink manipulation

The priming drink was successful in dosing participants to the intended target BrAC of 0.03, assessed prior to the beer taste-test ($M = 0.027$, $SD = 0.012$). The mean did not differ significantly from the 0.03 target, $t(39) = 1.55$, $p = .13$.

3.4. Effects of ostracism on beer consumption

Only problematic alcohol consumption (AUDIT-C; $r = 0.32$, $p = .05$), and the positive expectancies ($r = 0.50$, $p = .002$) and positive valuations of alcohol ($r = 0.49$, $p = .002$) subscales of the B-CEOA yielded significant correlations with beer consumed in the taste test (see Table 2). These variables were included in analyses as covariates, but removed if they did not account for a significant portion of the variance in the final model.

An ANCOVA using problematic alcohol consumption (AUDIT-C), and positive expectancies and valuations of alcohol (B-CEOA) scales indicated that none of the covariates accounted for a significant portion of the variance, and their inclusion or exclusion did not alter outcomes. A 2 (sex) x 2 (condition) between-subjects ANOVA was conducted on the full sample ($N = 40$) of participants (see Fig. 2a). Results indicated a main effect of sex, such that men ($M = 450$ ml, $SD = 222$ ml) consumed more beer than women ($M = 224$ ml, $SD = 172$ ml), $F(1, 36) = 11.77$, $p = .002$, partial $\eta^2 = 0.25$. Neither condition ($F(1,$

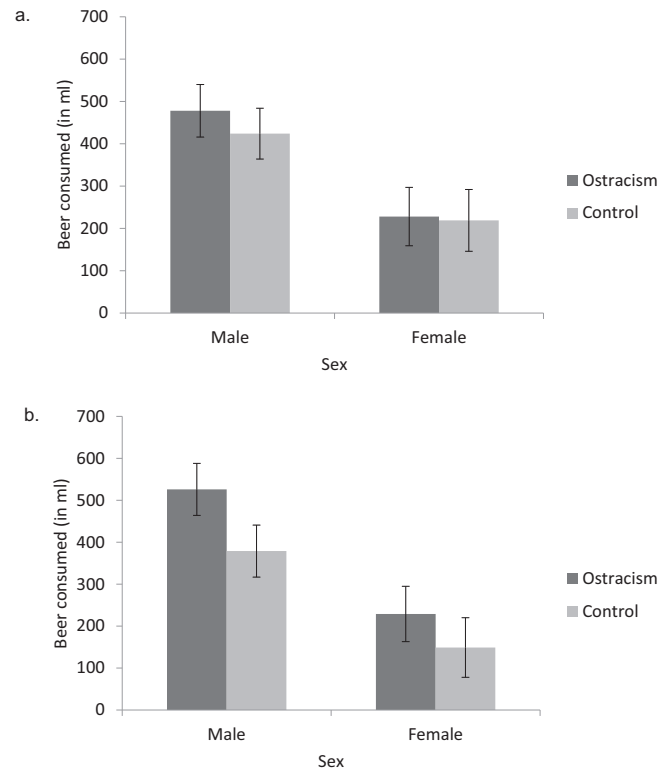


Fig. 2. Beer consumed (in ml) following the social interaction task, by sex and condition. (a) Represents analysis of the full sample ($N = 40$), which yields only a significant main effect of sex, $F(1, 36) = 11.77$, $p = .002$, partial $\eta^2 = 0.25$. (b) Represents analysis of those participants who did not report suspiciousness of study protocols ($n = 33$), which yields a significant main effect of sex $F(1, 28) = 14.18$, $p = .001$, partial $\eta^2 = 0.34$, and a marginally significant main effect for condition, $F(1, 28) = 3.96$, $p = .06$, partial $\eta^2 = 0.12$. Raw data (no covariates) are depicted; error bars indicate standard error.

Table 2

Correlations of Alcohol Use, Psychological, and Post-Interaction Measures with Beer Consumption (in ml) during taste test.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Beer consumed	-	0.32*	0.25	0.30	0.50**	0.01	0.49**	-0.11	0.05	0.02	0.24	0.13	0.23	0.07	-0.24	-0.26
Alcohol use measures																
2. Problematic alc. Cons. (AUDIT-C)		-	0.22	0.54**	0.33*	0.19	0.33*	0.05	0.12	-0.08	0.27	-0.02	0.04	-0.001	-0.39*	-0.19
3. Coping motives for drinking (DMQ-R)			-	0.44**	0.46**	0.33*	0.27	0.07	0.52**	0.56**	0.44**	0.36*	0.61*	0.20	-0.15	0.05
4. Alcohol problems (RAPI-23)				-	0.44**	0.36*	0.43**	0.23	0.26	0.23	0.63**	0.31	0.34*	-0.02	-0.45**	-0.30
5. Pos. expectancies (B-CEOA)					-	0.13	0.54**	0.12	0.23	0.34	0.26	0.20	0.36*	-0.02	-0.19	0.02
6. Neg. expectancies (B-CEOA)						-	0.004	0.20	0.20	0.50*	0.40*	0.24	0.32	0.14	-0.38*	-0.35
7. Pos. valuations (B-CEOA)							-	0.21	0.12	-0.24	0.26	0.05	0.32	0.19	-0.27	-0.25
8. Neg. valuations (B-CEOA)								-	-0.05	0.19	0.15	-0.12	0.06	-0.19	0.15	0.20
Psychological & demographic measures																
9. Social anx. (LSAS)									-	0.63**	0.63**	0.63**	0.76**	0.13	-0.41*	-0.22
10. Stress (PSS-10)										-	0.55*	0.75**	0.54*	-0.12	-0.23	0.04
11. Emo. dysregulation. (DERS)											-	0.67**	0.59**	0.11	-0.63**	-0.45**
12. Depress. (CES-D)												-	0.41*	-0.004	-0.53**	-0.31
13. Anx. sens. (ASI-3)													-	0.21	-0.30	-0.30
14. Age														-	-0.16	-0.05
Post-interaction variables																
15. Psych needs. (AII)															-	-0.66**
16. Mood (AII)																-

Note. * = $p < .05$, ** $p < .01$; AUDIT-C = Alcohol Use Disorder Identification Test-Consumption scale; DMQ-R = Drinking Motives Questionnaire-Revised; RAPI = Rutgers Alcohol Problems Index-23 item; B-CEOA = Brief-Comprehensive Effects of Alcohol; LSAS = Liebowitz Social Anxiety Scale, total score; PSS-10 = Perceived Stress Scale-10 item version; DERS = Difficulties in Emotion Regulation Scale; CES-D = Center for Epidemiological Studies- Depression; ASI = Anxiety Sensitivity Index-3; AII = Aversive Interaction Index.

36) < 1, $p = .64$, partial $\eta^2 = 0.006$) nor the sex \times condition interaction ($F(1, 36) < 1$, $p = .73$, partial $\eta^2 = 0.003$) were significant.

Analyses were also conducted excluding the seven participants suspicious of the study's methodology. Amount of beer consumed did not differ between suspicious ($M = 447$ ml, $SD = 220$ ml) and non-suspicious ($M = 334$ ml, $SD = 230$ ml) participants, $F(1, 38) = 1.41$, $p = .24$, $\eta = 0.04$. The non-suspicious participants ($n = 33$) were subjected to the same 2 (sex) \times 2 (condition) ANCOVA above. Only AUDIT-C as a covariate accounted for a significant portion of the variance ($F(1, 28) = 4.71$, $p = .04$, partial $\eta^2 = 0.14$), and remained in the final model, though results are similar when AUDIT-C is removed (see Fig. 2b). Results indicated a main effect of sex, such that men ($M_{adj} = 440$ ml, $SE_{adj} = 42$ ml) consumed more beer than women ($M_{adj} = 203$ ml, $SE_{adj} = 46$ ml), $F(1, 28) = 14.18$, $p = .001$, partial $\eta^2 = 0.34$. There was a marginally significant main effect of condition, such that ostracized participants ($M_{adj} = 383$ ml, $SE_{adj} = 43$ ml) consumed more beer than control participants ($M_{adj} = 260$ ml, $SE_{adj} = 44$ ml) with a medium to large effect size, $F(1, 28) = 3.96$, $p = .06$, partial $\eta^2 = 0.12$. The sex \times condition interaction remained non-significant, $F(1, 28) < 1$, $p = .89$, partial $\eta^2 = 0.001$.

4. Discussion

The present study continues preliminary investigations into the effects of ostracism on alcohol use in the laboratory. In-person ostracism by two study confederates was successful at decreasing mood and psychological need variables (i.e., belonging, control). With some notable caveats discussed below, it appears that ostracism may increase subsequent alcohol consumption in both male and female college students. Together with recent findings across multiple research teams (Bacon et al., 2015; Hales et al., 2015; Laws et al., 2017; Rabinovitz, 2014), these results validate the potential of ostracism as a tool to better understand drinking to cope behaviors linked with problematic alcohol use outcomes.

This study primarily differs from previous work in the use of an in-person ostracism manipulation, in which two female confederates initially included, then excluded, a participant from a conversation. Excluded participants showed a more negative mood state, and endorsed less control, self-esteem, and belonging compared to a neutral control. Our self-report results mirror that of a similar paradigm, the Yale Interpersonal Stressors (YIPS; Stroud, Tanofsky-Kraff, Wilfley, and Salovey, 2000), which additionally found evidence for a physiological stress response to in-person exclusion. A benefit of the in-person exclusion manipulation lies in its similarity to the types of interpersonal stressors that occur in the drinking environments of college students. The types of psychological stress induction techniques that have been typically employed in laboratory studies are unlikely to be encountered in most situations where alcohol is available and acceptable to use—a speech to a real or imaginary audience (e.g. McNair, 1996), a speech to an audience in lab coats followed by a mental arithmetic task (Trier Social Stress Test [TSST]; e.g., De Wit, Söderpalm, Nikolayev, and Young, 2003), or false feedback regarding social skills (Holroyd, 1978) or intellectual ability (e.g., Hull and Young, 1983). Stroud et al. (2000) found that participants endorsed a description of an exclusionary conversation as more similar to distressing social situations that they have encountered compared to a description of a TSST-like situation. The recent results of Laws et al. (2017), who find an association between experiencing ostracism from close others and later alcohol consumption also support the ecological validity of the ostracism paradigm in exploring drinking to cope in the laboratory. The use of ostracism as a stressor, and especially the in-person ostracism manipulation, appears uniquely successful at reliably replicating in the lab the kinds of stressors likely to be present in drinking environments.

Despite the ecological validity of the use of in-person ostracism, the “noise” created by variations in conversation, confederate behaviors and identity, and different interactions between participants and

confederates has the potential to muddy the effects of ostracism, compared to a more consistent and standardized method, like Cyberball. Indeed, while the magnitude of the effect of ostracism on psychological needs in the current study was statistically significant with a large effect size ($\eta_p^2 = 0.13$), it is smaller in comparison to that of similar studies employing Cyberball as the ostracism induction method (e.g., Bacon et al., 2015, $\eta_p^2 = 0.34$; Buckingham et al., 2016, $\eta_p^2 = 0.79$; Hales et al., 2015, $d = 1.52$). The current study also employed a neutral control comparison group, which is likely to yield smaller differences with ostracism conditions than the inclusion comparison group used by Cyberball and other methods of ostracism induction (e.g., false personality feedback, Rabinovitz, 2014). These two variations from typical ostracism studies involving alcohol consumption continue to demonstrate that ostracism—across various methods of induction and comparison groups—has a strong effect on mood and psychological feelings of belonging, self-esteem, and control and can serve as a mechanism for inducing social stress in the laboratory.

Among those who were convinced that they were interacting with other participants (the majority of our sample), we found that those excluded from a conversation trended toward consuming more alcohol compared to those who completed a neutrally-valenced photograph evaluation task. Rabinovitz (2014) similarly found an increase in drinking after social exclusion compared to a social inclusion group in an experimental design. Ecological momentary assessment data from Laws et al. (2017) also found an association between ostracism by close others and increased drinking. The use of a social inclusion group by Rabinovitz (2014) likely yielded greater differences in mood and subsequent behavioral impact compared to the more neutral comparison group employed in the current study. As a result, the observed difference between ostracized and neutral control conditions in alcohol consumption did not meet the traditional threshold of statistical significance. Nevertheless, the finding of a medium effect size between conditions suggests that a more adequate sample size may have produced more conclusive results.

Our results are at odds with previous work (Bacon et al., 2015), which found a decrease in drinking among ostracized women, but no effect of condition on drinking in men. Different modalities of inducing ostracism may vary in severity (Bernstein and Claypool, 2012) or in the types of psychological needs affected (Williams, 2009), which may result in different behavioral strategies accounting for the differences between Bacon et al. (2015) and the current results. Another difference may be in the perpetrators of ostracism across the three studies. The perpetrators of ostracism were apparent to participants in the present study; in Rabinovitz (2014), a future alone was the presumed result of internal causes. Cyberball (used in Bacon et al., 2015) consists of exclusion from two cartoon, ungendered figures described as representing study participants playing elsewhere. Young women report that unknown and intoxicated others are a commonly perceived risk when drinking (Armstrong, Watling, Davey, and Darvell, 2014), and women are more likely to employ protective drinking strategies, such as drinking with familiar people (Benton et al., 2004), which may have yielded the protective drinking pattern employed by women in Bacon et al. (2015). Severity of ostracism, an assessment of the psychological needs impacted, and manipulation of the perpetrators of ostracism are all potential avenues of future exploration.

Though aspects of the current study design warrant replication (i.e., the small sample size), the robustness of an effect for ostracism across different modalities of induction and across laboratories lend support to the veracity of an impact of ostracism on alcohol use. The next stages of this line of research are tasked with determining *why* participants choose to drink more or less under conditions where they are excluded, as well as *who* might be most likely to drink in response to ostracism. A number of existing alcohol-related (i.e., alcohol expectancy theory, stress-response dampening) and social theories (i.e., needs-fortification, Williams, 2009: self-regulation, Oaten et al., 2008) offer potential mechanisms of action in understanding the ostracism-alcohol use

relationship and provide testable hypotheses for future studies.

As a preliminary study, some aspects of the research design were less than optimal. A potential confound was our reliance on only female confederates as perpetrators of ostracism, which was driven by availability rather than ideal study design. Other studies employing in-person interactions either used sex-matched confederates (Stroud et al., 2000) or a male and female confederate together (Werner, Kerschreiter, Kindermann, & Duschek, 2013). Though our study finds no sex differences in mood or psychological needs following ostracism, nor an interaction between study condition and sex, it is possible that exclusion results in different affective and/or behavioral responses depending on if the excluding parties are of the same or opposite sex. An additional challenge to the current study design was the believability of the manipulation. Some participants in the study suspected that their social interaction partners were involved in the study in some way, with suspicion equally divided between ostracism and control conditions. Clever staging of the study (e.g., having one confederate arrive later, Stroud et al., 2000) may increase believability. It also appears that whether or not participants articulated suspicion to researchers has a notable effect on the interpretability of the results of the current study. Research has demonstrated the participants are overall reluctant to report suspicions of deception to researchers, though offering a reward for correctly stating the purpose of the study and using computerized post-experimental assessments of deception (as opposed to in-person interviews), may result in small increases in admission of suspicion (Blackhart et al., 2012). Future studies employing deception and/or an in-person ostracism manipulation should consider these issues in order to reduce unnecessary confounds and loss of statistical power.

Most notably, our conclusions are tempered by a small sample size, which was further reduced with the need to exclude from analyses those suspicious about the motives of the research team and confederates. Though the ultimate results yielded a medium effect size between our ostracism and control groups in the amount of alcohol consumed, and produced findings similar to those using a larger sample size (Rabinovitz, 2014), our results must be replicated in a larger sample in order to establish more firm conclusions. Finally, though the use of an in-person ostracism manipulation was an attempt to increase the ecological validity of previous work, our alcohol consumption protocol remains unlike typical drinking experiences (Sayette et al., 2012). How ostracism may influence drinking in groups, drink selection, and quantities consumed over longer periods of time remain important questions to assess in future studies.

5. Conclusions

The present study adds to a promising new literature assessing the role of ostracism on alcohol use. We find tentative support that in-person ostracism by female confederates increased alcohol consumption compared to a neutrally-valenced control, consistent with results from a study with a larger sample and a different methodology (Rabinovitz, 2014), and a daily diary study (Laws et al., 2017). Ostracism research may provide a target for prevention and intervention strategies, especially when directed at vulnerable populations, such as those with social anxiety or incoming freshmen who may be especially motivated to “fit in” and sensitive to cues indicating otherwise. Our results, along with other recent work (Bacon et al., 2015; Hales et al., 2015; Laws et al., 2017; Rabinovitz, 2014), support continued exploration of the role of ostracism on alcohol consumption.

Declarations of interest

None.

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