

# A Participant Walks Into a Bar...

## Subjective Intoxication Buffers Ostracism's Negative Effects

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**Abstract.** Alcohol is commonly used to cope with social pain, but its effectiveness remains unknown. Existing theories offer diverging predictions. Pain overlap theory predicts that because alcohol numbs physical pain it should also numb people to the negative effects of ostracism. Alcohol myopia predicts that because alcohol intensifies salient emotions it should enhance the negative effects of ostracism. We conducted a field experiment in a bar, exposing individuals to ostracism or inclusion using Cyberball on an iPad. Subjective intoxication, but not blood alcohol concentration, was associated with less distress for participants who were ostracized, and more distress in participants who were included. We conclude that alcohol reduces both the pain of ostracism and the pleasure of inclusion.

**Keywords:** ostracism, alcohol, subjective intoxication, blood alcohol concentration, pain overlap theory

“To the poor man liquor is the chloroform that allows him to endure the painful operation of living.”  
(George Bernard Shaw, 1930)

Anecdotal evidence abounds attesting to the tendency to use alcohol as a means to dull the impact of emotional distress. Common expressions such as “liquid courage,” “drowning sorrows,” “drinking the pain away,” and “feeling no pain,” articulate the tendency to use alcohol in the face of emotional distress. Indeed, there is a large body of research identifying negative affect and interpersonal stressors as proximate causes of drinking (e.g., Cooper, Frone, Russell, & Mudar, 1995; Creswell, Chung, Clark, & Martin, 2013; Mohr et al., 2001; Todd, Armeli, & Tennen, 2009). Given this, it is not surprising that ostracism, a particularly negative interpersonal stressor, has been observed to lead to greater drinking behavior (Rabinovitz, 2013). Even flies turn to alcohol after being rejected (Shohat-Ophir, Kaun, Azanchi, & Mohammed, 2012; Zars, 2012). However, no empirical research has tested the immediate effectiveness of this strategy. Does feeling intoxicated reduce or amplify the pain of social rejection? The present research addresses this question with a field experiment examining the effects of ostracism on individuals varying in their levels of subjective intoxication.

### Temporal Need-Threat Model of Ostracism

Ostracism – being ignored and excluded – is a powerfully aversive interpersonal experience resulting in negative

affect and threat to four fundamental human needs: belonging, self-esteem, control, and meaningful existence (Williams, 2009). According to Williams's (2009) temporal need-threat model, ostracism is experienced in three stages. First, in the *reflexive stage* individuals detect ostracism and respond with immediate feelings of pain, negative affect, and threat to basic needs. Immediate responses to ostracism are powerful and resistant to moderation by many individual differences and situational factors, but have been shown to be blunted by interventions that reduce physical pain (see research reviewed below). People quickly begin to recover from ostracism in the *reflective stage*, in which they consider the event and make attributions for why it occurred. The speed of recovery in the reflective stage depends on individual differences, such as social anxiety (Zadro, Boland, & Richardson, 2006). Finally, if individuals are chronically ostracized they may enter the *resignation stage*, in which they are vulnerable to negative mental and physical health outcomes (Baumeister & Leary, 1995). The present research is concerned with the first two stages. We predict that one's level of subjective alcohol intoxication will moderate the effect of ostracism on threatened needs satisfaction and affect during an acute ostracism episode.

Two theories make competing predictions relevant to the effect of alcohol on the experience of being ostracized. Pain overlap theory (Eisenberger & Lieberman, 2005; MacDonald & Leary, 2005) predicts that intoxication will numb the painful experience of ostracism, just as it numbs physical pain. Alternatively, the alcohol myopia model (Steele & Josephs, 1990) predicts that subjective intoxication will intensify negative responses to ostracism in the absence of cognitive distraction.

## Pain Overlap Theory

Evidence from cognitive and affective neuroscience has led theorists to propose that a social pain detection system evolved as an extension of a physical pain detection system in the brain that had evolved earlier in human history (Eisenberger & Lieberman, 2005; MacDonald & Leary, 2005). These theorists argue that given the survival importance of social connections, a highly sensitive social-exclusion detection system would have been adaptive for ancestral human beings. Such a system is believed to have piggybacked on existing neural architecture for detecting physical pain.

In support of this proposition, fMRI research has demonstrated that experiences of ostracism activate the dorsal anterior cingulate cortex (dACC), a brain region associated with pain processing, and the right ventrolateral prefrontal cortex (rVLPFC), an area associated with pain regulation (Eisenberger, Lieberman, & Williams, 2003). Further, when social pain of a recent break-up was made salient, Kross, Berman, Mischel, Smith, and Wager (2011) found that the pain sensory regions, specifically the secondary somatosensory cortex and the dorsal posterior insula, were also activated. It seems that neural and emotional responses to social pain are similar to neural and emotional responses to physical pain.

An important implication of this conclusion is that interventions that reduce physical pain should also reduce emotional pain. Evidence for this comes from research showing that over a 3-week period, participants randomly assigned to take daily 1,000 mg doses of acetaminophen reported less social pain each day, and, in a second study, participants who took 2,000 mg doses exhibited less dACC activation in response to an ostracism experience (DeWall et al., 2010). Similarly, moderate marijuana use is associated with more resilient reactions to social exclusion (Deckman, DeWall, Way, Gilman, & Richman, 2013). Further, when the rVLPFC is deactivated during ostracism (using transcranial direct current stimulation) individuals report experiencing greater unpleasantness, and greater hurt feelings (Riva, Romero Lauro, DeWall, & Bushman, 2012).

Given that agents that reduce physical pain also reduce social pain, it follows that if alcohol reduces physical pain, it should also reduce social pain resulting from ostracism. Accounts of people using alcohol to numb the pain of surgical procedures reportedly date as far back as the 16th century (Brown & Cutter, 1977). Today people still use alcohol to cope with physical pain (Brennan, Schutte, & Moos, 2005). For example, people report using alcohol to help cope with pains associated with aging (Riley & King, 2009). Indeed, there is ample laboratory evidence demonstrating the strong analgesic properties of alcohol across a variety of pain-inducing procedures including pin pricks, extreme heat, electric shocks, pressure, and cold exposure (Brown & Cutter, 1977; Mullin & Luckhardt, 1934; Perrino et al., 2008; Wolff, Hardy, & Goodell, 1942). Given the pain-reducing effects of alcohol coupled with evidence of the overlap between physical and social pain, it is plausible that objective intoxication reduces the negative effects of ostracism.

It is also possible that numbed responses to ostracism when highly intoxicated are due to an individual's expectation that such events will hurt less, rather than the pharmacological effects of alcohol. A long tradition of research attests to people's strong expectations regarding the effects of alcohol (see Testa et al., 2006 for a review). The widespread belief that alcohol numbs social pain could itself be sufficient for people to report numbed responses to ostracism. In this case, subjectively reported intoxication, rather than blood alcohol concentration would moderate responses to ostracism.

## Alcohol Myopia

In contrast to the predictions of pain overlap theory, according to the alcohol myopia model, subjective intoxication should magnify the effects of ostracism, provided that people are not distracted (Steele & Josephs, 1990). The alcohol myopia model holds that alcohol intoxication limits effortfully controlled cognitive processing, resulting in attention being restricted to only the most salient features of the environment. According to this reasoning, alcohol does not necessarily lead to more positive or negative feelings. Rather, it leads to more intense positive or negative feelings, depending on what is most immediately salient. In support of this proposition, intoxicated participants who are informed that they will be performing a demanding activity respond with less stress than sober participants, but only when they are able to engage in a distracting task (Josephs & Steele, 1990). Likewise, alcohol can lead to greater positive affect within a group interaction, and appears to do so by decreasing the moment-to-moment stability in affective experience (Fairbairn & Sayette, 2013; Sayette et al., 2012). Based on this perspective, one would expect ostracism to be experienced more intensely as intoxication increases in a normal situation where distraction is not immediately available.

## Subjective Intoxication

This research examines the effects of both objective and subjective intoxication on immediate and delayed reactions to ostracism. Experimental research systematically manipulating blood alcohol concentration and measuring subjective intoxication has shown that there are individual differences in subjective intoxication, across similar levels of blood alcohol concentration (Cromer, Cromer, Maruff, & Snyder, 2010; Morzorati, Ramchandani, Flury, Li, & O'Connor, 2002). Subjective intoxication is influenced by temporary factors, such as caffeine consumption (Alford, Hamilton-Morris, & Verster, 2012), as well as stable factors such as family history of drinking (Morzorati et al., 2002). These differences are consequential, with subjective intoxication uniquely predicting illicit drug use, unsafe sex, aggression, property crime, and drunk driving (Quinn & Fromme, 2011; Quinn & Fromme, 2012). In accordance with theory and research in this area (e.g., Sayette, 1993; Walter et al., 2011), it is plausible that the phenomenological sensation of drunkenness provides a protective buffer

Table 1. Descriptive statistics and correlations for alcohol consumption variables

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Blood alcohol concentration	0.066	0.05	–	.49***	.48***	.23 <sup>†</sup>	–.30*	.17
2. Subjective intoxication	2.30	0.98		–	.51***	.23 <sup>†</sup>	–.17	.01
3. Drinks	4.01	1.75			–	.48***	–.18	.18
4. Drinks per week	7.92	6.16				–	–.06	.17
5. Exhaustion	2.18	1.14					–	–.02
6. Party size	5.90	3.23						–

Notes. Subjective intoxication and exhaustion were reported on a scale from 1 (= *strongly disagree*) to 5 (= *strongly agree*). \* $p \leq .05$ . \*\*\* $p \leq .001$ . <sup>†</sup> $p = .06$ .

against the pain of ostracism, even controlling for blood alcohol concentration. Further, this may be the result of a general numbing process that also reduces any benefit individuals would have received from inclusion.

## Prior Research

Researchers have yet to examine how alcohol and associated feelings of intoxication affect responses to ostracism. Related research has explored the question of whether ostracism increases desire to drink. In a laboratory experiment, Rabinovitz (2013) found that participants who were randomly assigned to be ostracized rather than included consumed more of a beverage that they believed contained alcohol. Rabinovitz (2013) treated alcohol consumption as a *consequence* of ostracism and demonstrates that being excluded can motivate drinking. In the current study we extend this research by treating alcohol as a *moderator* of ostracism's effects on other outcomes and ask whether being intoxicated can help regulate the pain of being ostracized. In other words, exclusion leads people to drink, but does it help?

Other related research compared the brain activity of alcoholics and nonalcoholics as they were being ostracized (Maurage et al., 2012), finding that alcoholics showed patterns of brain activation suggesting reduced ability to inhibit feelings of pain following ostracism. This research suggests that alcohol *dependence* may play a role in altering the brain's response to ostracism, however, it did not observe the immediate effects of alcohol intoxication itself. It remains to be tested whether alcohol intoxication is associated with enhanced or reduced reactions to ostracism.

## The Current Research

The current research was designed with the predictions of both pain overlap theory and alcohol myopia in mind. To test whether either subjective or objective intoxication dulls the pain and distress brought about by ostracism, we conducted a field experiment in which patrons at a bar, naturally varying in levels of intoxication, were either

ostracized or included in a Cyberball game played on an iPad. They then reported their immediate and delayed reactions to the game, their subjective feelings of intoxication, and through the use of a Breathalyzer, their blood alcohol concentration. Importantly, participants were not given any opportunity for distraction before reporting their immediate reactions to the ostracism experience, so alcohol myopia would predict responses to be more negative as subjective intoxication increases. Because prior research has shown that ostracism increases hostility toward the sources of ostracism (Warburton, Williams, & Cairns, 2006), as well as responses similar to feelings of physical pain (Eisenberger et al., 2003), we collected self-reports of both as dependent variables possibly moderated by ostracism. Finally, because we did not randomly assign participants to their intoxication levels, we measured personality and individual differences that may covary with intoxication to test whether intoxication is associated with better or worse outcomes after accounting for these factors.

## Method

### Participants and Design

One hundred sixteen patrons<sup>1</sup> at a local bar were approached by a female experimenter and invited to participate in a short study of mental visualization on an iPad. As an incentive, patrons were told that they would learn their blood alcohol concentration. Of those that were invited, 81 (69.8%) agreed to participate (27 female; 62 Caucasian;  $M_{\text{age}} = 24.36$ ,  $SD_{\text{age}} = 3.38$ ). On average participants reported having a total of 4.01 drinks and blew an average Blood alcohol concentration of .066 (see Table 1 for descriptive statistics and correlations of alcohol consumption variables). We did not administer the alcohol; rather, we assess blood alcohol concentration and feelings of intoxication in bar patrons who were already drinking.

Prior to beginning the experiment, all participants passed a modified version of the Evaluation to Sign Consent procedure (Resnick et al., 2007) in which they were allowed to complete the study only if (1) they

<sup>1</sup> Data were collected on back-to-back nights on the same weekend. A stopping rule was not formally stated. We did not analyze the data between the first and second nights.

appeared alert and able to communicate with the experimenter, and (2) they were able to answer three basic questions about the nature of participation (“What will you be asked to do during the study?”, “What will you do if you no longer want to participate in the study?”, “What will you do if you experience distress or discomfort during the study?”). This ensured not only that participants were able to provide consent, but also that participants would be alert enough to follow directions in the study. Ten individuals were excluded from analysis (six were familiar with the ostracism manipulation, and four did not follow directions),<sup>2</sup> leaving 71 in the final sample. All participants were randomly assigned to either an ostracism or inclusion condition.

## Procedure

Participants were escorted to a separate section of the bar. Up to two participants were run at the same time. They were positioned so that they were not facing each other, and were instructed to complete the experiment individually, to minimize communication. It was made clear that participants were playing “other players hooked up through our network” rather than each other. Participants began by playing Cyberball, an online ball tossing game used to manipulate whether the participant is ostracized or included (Williams, Cheung, & Choi, 2000).<sup>3</sup> Ostensibly, the purpose of the game was to exercise mental visualization skills by imagining a ball tossing game played online with two other players. In reality, the players were computer generated and were programmed to either include the participant equally (inclusion condition), or throw the ball to the participant twice in the beginning of the game, but exclude them thereafter (ostracism condition). There were a total of 21 throws in the game, which took about 2-min to complete.

Immediately following the game participants responded to questions assessing *immediate* levels of their basic needs satisfaction, positive affect, pain, and hostility toward the other players as experienced during the game (e.g., “How did you feel during the game?”). Then participants responded to questions assessing relevant individual differences (e.g., personality traits). After this delay from their immediate responses (approximately 5-min), they responded to the same questions measuring needs satisfaction, positive affect, pain, and hostility toward the other players, as experienced at that moment (i.e., “How do you feel right now?”). Finally, participants reported demographic variables and completed an ostracism manipulation check by indicating the percentage of throws they received during the game.

After responding to survey questions, participants were asked to blow into a calibrated BACtrack Element Professional Breathalyzer<sup>®</sup> for approximately 5 s. The experimenter recorded the blood alcohol concentration

reading and shared it with the participant. Mouthpieces were replaced between participants. After being breathalyzed each participant was thoroughly debriefed, thanked, and asked not to talk about the experiment when they returned to their table. The full study took approximately 15 min to complete.

## Measures

### Responses to Ostracism

We assessed basic needs satisfaction using eight items taken from the standard ostracism post-experimental questionnaire (Williams, 2009), with two items assessing each need. Items were averaged to form a composite measure of needs satisfaction, with reverse coding where necessary (e.g., “I felt/feel good about myself”; immediate  $\alpha = .86$ , delayed  $\alpha = .83$ ). Positive affect was measured with the single item, “I felt/feel like I was/am in a good mood.” Physical pain was measured using the faces pain scale, in which participants are shown an array of drawn faces that express different levels of pain (Bieri, Reeve, Champion, Addicoat, & Ziegler, 1990) with responses ranging from 1 (no hurt; represented by a neutral face) to 6 (worst hurt possible; represented by a highly distressed face). Hostility toward the other players was measured with three face valid items (e.g., “I want/wanted to hurt the other players”; immediate  $\alpha = .71$ , delayed  $\alpha = .70$ ). Responses to the needs, mood, and hostility measure were made on a scale from 1 (= *not at all*) to 5 (= *completely*). As a manipulation check, participants responded to the question “Assuming the ball should be thrown to each person equally (33% of throws to each player), what percentage of throws did you receive?” and rated their agreement with the statements “During the game I was ignored” and “During the game I was excluded.” These two items were averaged together ( $r = .92$ ).

### Individual Differences

Our general aim in selecting individual difference variables was to control for factors that may be related to drinking behavior, and could thus confound the effect of alcohol which we are trying to examine. To this end we assessed personality and life satisfaction, which have each been linked to drinking behavior (Littlefield, Sher, & Wood, 2009; Murphy, McDevitt-Murphy, & Barnett, 2005). Using eight items from the Ten Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003), we measured extraversion (e.g., “I see myself as extraverted and enthusiastic”), conscientiousness (e.g., “I see myself as dependable and self-disciplined”), agreeableness (e.g., “I see myself as sympathetic and warm”), and neuroticism (e.g., “I see myself as anxious and easily upset”). To save time,

<sup>2</sup> Including these participants does not appreciably alter the pattern of results with regard to blood alcohol concentration and subjective intoxication moderating responses to ostracism.

<sup>3</sup> Cyberball 4.0, which is compatible with iPads and other mobile devices, can be freely downloaded at: <https://cyberball.wikispaces.com>.

Table 2. Means and standard deviations for ostracism outcomes in the reflexive and reflective stages

	Included		Ostracized		<i>t</i> (66–69)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
<i>Reflexive stage</i>							
Needs satisfaction	3.52	0.68	2.47	0.70	–6.44	< .001	–1.52
Positive affect	3.83	0.94	3.24	1.10	–2.45	.02	–0.58
Pain	1.57	0.98	2.18	1.17	2.34	.02	0.57
Hostility	1.41	0.81	1.75	0.87	1.73	.09	0.40
<i>Reflective stage</i>							
Needs satisfaction	4.02	0.62	3.92	0.58	–0.70	.49	–0.17
Positive affect	4.17	0.94	4.09	0.70	–0.41	.68	–0.10
Pain	1.26	0.79	1.29	0.52	0.18	.86	0.04
Hostility	1.18	0.41	1.50	0.71	2.33	.02	0.55

Note. *N* varies due to three cases of participant nonresponse.

the openness to new experience items were omitted. We measured life satisfaction using two items taken from the Satisfaction with Life Scale (“In most ways my life is close to ideal,” and “The conditions of my life are excellent,” Diener, Emmons, Larsen, & Griffin, 1985). Additionally, because we were also interested in when alcohol potentially moderates ostracism-induced hostility, we also measured dispositional anger and aggression as control variables. Dispositional anger was measured with the single item “I am easily angered,” and dispositional aggression was measured with one item from the Buss-Perry Aggression Questionnaire, “I have trouble controlling my temper” (Buss & Perry, 1992). Participants also indicated the number of drinks they have in an average week.

Because participants who were contacted later in the night would have had more time to be drinking, we decided to also control for their level of exhaustion. Participants indicated their agreement with the statement “I feel tired/exhausted.” Additionally, we thought it might be possible that people who were out with larger groups of friends might be drinking more. Because they would have had a wider social network to return to (which might have altered the ostracism experience), we asked participants to report the number of people in their party, so we could control for this factor.

Finally, participants reported their subjective intoxication by rating their agreement with the statement “I feel drunk” on a scale from 1 (= *strongly disagree*) to 5 (= *strongly agree*). None of these variables were affected by the ostracism manipulation, largest  $t(69) = .71, p = .48$ .

## Results

### Manipulation Checks

Demonstrating the success of the manipulation, included participants reported receiving 35.09% of the tosses,

whereas ostracized participants reported receiving only 12.47% of the tosses,  $t(64) = 7.38, p = .003$ .<sup>4</sup> Also, ostracized participants ( $M = 3.52, SD = 1.84$ ) correctly reported being more ignored and excluded than included participants ( $M = 1.85, SD = .98$ ),  $t(69) = 6.85, p < .001$ .

### Responses to Ostracism

Before testing subjective and objective intoxication as moderators, we examined the effect of ostracism on needs satisfaction, positive affect, pain, and hostility. Given that we had four separate constructs as outcome variables, we performed a multivariate analysis of variance (MANOVA) for each stage. First, we tested the effect of ostracism on reflexive outcomes. Overall, ostracism had a significant multivariate effect on reflexive needs satisfaction, affect, aggression, and pain  $F(4, 63) = 12.94, p < .001, \eta_p^2 = .45$ . The same analysis performed on these variables in the reflective stage, revealed no significant effect  $F(4, 63) = 1.26, p = .30, \eta_p^2 = .07$ , suggesting that participants had recovered. These multivariate effects are deconstructed next with a series of 2 (inclusion status: included vs. ostracized)  $\times$  2 (stage: reflexive vs. reflective) mixed univariate analyses of variance (ANOVAs; see Table 2 for means and standard deviations).

### Needs Satisfaction

Replicating prior research, we detected significant main effects for both ostracism,  $F(1, 69) = 21.65, p < .001, \eta_p^2 = .24$ , and stage,  $F(1, 69) = 114.60, p < .001, \eta_p^2 = .62$ . These effects were qualified by a significant interaction,  $F(1, 69) = 27.39, p < .001, \eta_p^2 = .28$ . Follow-up simple effects tests showed that ostracized participants reported lower needs satisfaction in the reflexive stage, but not the reflective stage (see Table 2 for simple effect test statistics).

<sup>4</sup> Degrees of freedom vary throughout because of occasional participant nonresponse.

## Positive Affect

Ostracism had a similar effect on positive affect. There was a marginally significant main effect for inclusion status,  $F(1, 68) = 3.64, p = .06, \eta_p^2 = .05$ , as well as a significant main effect of stage,  $F(1, 68) = 18.96, p < .001, \eta_p^2 = .22$ . The interaction between these factors was marginally significant,  $F(1, 68) = 3.64, p = .06, \eta_p^2 = .05$ . Ostracized participants reported less positive affect in the reflexive, but not reflective stage.

## Pain

The main effect of inclusion status on pain ratings was not significant,  $F(1, 66) = 2.70, p = .11, \eta_p^2 = .05$ , but the main effect of stage was significant,  $F(1, 66) = 29.68, p < .001, \eta_p^2 = .31$ . This effect was qualified by a significant interaction,  $F(1, 66) = 6.37, p = .01, \eta_p^2 = .09$ . Ostracized participants reported significant more reflexive, but not reflective pain.

## Hostility

We detected significant main effects for both inclusion status,  $F(1, 69) = 4.63, p = .04, \eta_p^2 = .06$ , and stage,  $F(1, 69) = 10.79, p = .002, \eta_p^2 = .14$ , such that hostility ratings were greater in ostracized participants and in the reflective stage. Unlike the other outcome measures, the effect of ostracism on hostility did not depend on stage, as indicated by a nonsignificant interaction,  $F(1, 69) = 0.3, p = .86, \eta_p^2 < .01$ .

## Subjective Intoxication and Blood Alcohol Concentration

Subjective intoxication and blood alcohol concentration were moderately correlated,  $r(70) = .49, p < .001$ . Subjective intoxication and blood alcohol concentration were each tested as moderators of the effects of ostracism in a series of regression analyses performed both on reflexive measures, and on reflective measures. In each analysis the dependent variable (immediate or delayed need satisfaction, affect, pain, or hostility) was predicted from inclusion status (coded as 0 = included, 1 = ostracized) and either subjective intoxication or blood alcohol concentration, as well as an interaction term (the product of inclusion status and subjective intoxication or blood alcohol concentration).

Subjective intoxication moderated the effect of ostracism on needs satisfaction,  $b = .43, t(67) = 2.63, p = .01$ , and positive affect,  $b = .64, t(66) = 2.62, p = .01$  (see Table 3). In ostracized participants, subjective intoxication predicted greater needs satisfaction,  $b = .22, t(33) = 1.92, p = .06$  and positive affect  $b = .36, t(33) = 2.10, p = .04$ . However, in included participants' subjective intoxication trended toward an association with reduced needs satisfaction  $b = -.21, t(34) = -1.80, p = .08$  and reduced positive affect  $b = -.28, t(34) = -1.61, p = .11$  (see Figures 1 and 2).

These interactions remained significant controlling for gender, age, exhaustion, party size, blood alcohol concentration, extraversion, agreeableness, neuroticism, conscientiousness, life satisfaction, dispositional anger, dispositional aggression, and drinks per week,  $b = .38, t(54) = 2.11, p = .04$ , and  $b = .78, t(53) = 2.91, p = .005$ . Subjective intoxication did not moderate the effect of ostracism on physical pain,  $b = -.39, t(65) = -1.44, p = .15$ , or hostility,  $b = -.10, t(67) = -.49, p = .49$ .

There were no significant main effects of blood alcohol concentration on responses to ostracism, largest  $b = -3.23, t(67) = -1.01, p = .32$ . Likewise, blood alcohol concentration did not significantly interact with ostracism condition in predicting ostracism outcomes, largest  $b = 5.54, t(67) = 1.57, p = .12$ .

## Reflective Measures

By the time of the reflective measure, ostracized participants appeared to have recovered needs satisfaction,  $b = -.14, t(67) = -.38, p = .70$ , and positive affect,  $b = -.11, t(67) = -.22, p = .83$ . Similarly, those who were ostracized did not report greater feelings of reflective physical pain,  $b = .67, t(64) = 1.64, p = .11$ , or hostility toward the other players,  $b = .44, t(67) = 1.23, p = .22$ . None of these effects were qualified by interactions with subjective intoxication, largest  $b = -.28, t(64) = -1.69, p = .09$ .

## Discussion

The present research is an initial investigation into the effectiveness of alcohol intoxication in reducing the negative consequences of being ostracized. The findings are consistent with our hypothesis that alcohol intoxication changes how ostracism is experienced. Subjective intoxication was associated with greater needs satisfaction and positive affect in ostracized, but not included participants, suggesting that alcohol can provide a buffer against the pain of ostracism. Framed in another way, the effect of ostracism was significantly reduced in participants who were high in subjective intoxication. Moreover, the reduced effect of ostracism was not explained by individual differences in personality, life satisfaction, anger, dispositional aggression, or average drinks consumed per week. They were also not explained by situational factors, such as party size, or feeling exhausted.

The moderating effect of alcohol on responses to ostracism was not universal. While apparently effective in buffering against threats to needs satisfaction and positive affect, subjective intoxication failed to moderate ostracism's effects on ratings of pain and ratings of hostility toward the other players.

The fact that subjective intoxication, rather than blood alcohol concentration, moderated the some effects of ostracism is not easily explained by pain overlap theory. Rather than being due to the pharmacological effects of alcohol, the benefits of intoxication could likely be the result of people's expectations that alcohol reduces social pain.

Table 3. Effects of ostracism and subjective intoxication on reflexive and reflective needs satisfaction, positive affect, physical pain, and hostility

Model	Dependent variable	Predictor variables	<i>b</i>	<i>SE</i>	$\Delta R^2$
Reflexive responses					
1	Reflexive needs satisfaction	Inclusion status	-2.03***	.41	.06
		Subjective intoxication	-0.21	.12	
		Interaction	0.43**	.16	
2	Reflexive positive affect	Inclusion status	-2.05***	.60	.09
		Subjective intoxication	-0.28	.17	
		Interaction	0.64**	.24	
3	Reflexive physical pain	Inclusion status	1.49*	.67	.03
		Subjective intoxication	0.28	.20	
		Interaction	-0.39	.27	
4	Reflexive hostility	Inclusion status	0.57	.51	.00
		Subjective intoxication	-0.02	.15	
		Interaction	-0.10	.20	
Reflective responses					
5	Reflective needs satisfaction	Inclusion status	-0.14	.37	.00
		Subjective intoxication	-0.08	.11	
		Interaction	0.02	.15	
6	Reflective positive affect	Inclusion status	-0.11	.51	.00
		Subjective intoxication	-0.06	.15	
		Interaction	0.01	.21	
7	Reflective physical pain	Inclusion status	0.67	.41	.04
		Subjective intoxication	0.29*	.12	
		Interaction	-0.28	.16	
8	Reflective hostility	Inclusion status	0.44	.36	.00
		Subjective intoxication	0.04	.10	
		Interaction	-0.05	.14	

Notes. \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ . *b* = Unstandardized regression coefficients.

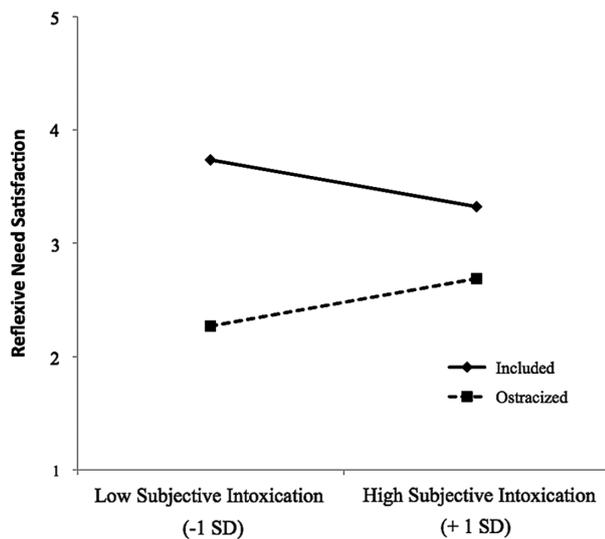


Figure 1. The relationship between subjective intoxication and needs satisfaction in included and ostracized participants.

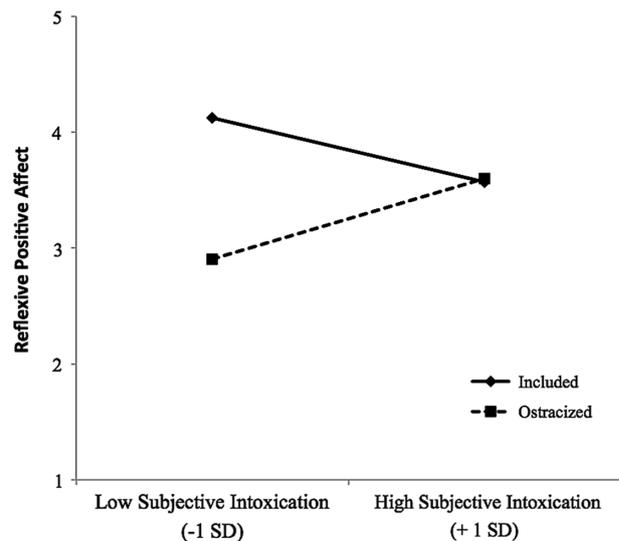


Figure 2. The relationship between subjective intoxication and positive affect in included and ostracized participants.

Greater subjective intoxication trended toward reduced needs satisfaction and positive affect in included participants. These effects were marginal, and should be interpreted with caution. However, they do suggest the benefits of alcohol in helping ostracism hurt less come at the cost of inclusion not feeling as good. Alcohol may not just decrease the negative effects of ostracism; it may also decrease the benefits of inclusion. A second possible explanation for the negative effects of alcohol in the inclusion condition is that people who were drinking more were experiencing more positive affect and social connection prior to playing Cyberball. Even though the virtual players included them, Cyberball may have been viewed as an interruption from their prior social connections, which may have been perceived as greater for those who were drinking more (Sayette et al., 2012).

## Implications

This research demonstrates the apparent usefulness of alcohol in coping with an acute rejection experience. Though alcohol is associated with better outcomes following ostracism, it should not be recommended as an intervention for three reasons (in addition to the general negative health consequences of alcohol). First, the pain of ostracism is considered to be an adaptive signaling mechanism that alerts people to the need to correct their behavior or seek affiliation with a new group (Williams, 2009). By numbing people to the experience of being ostracized, alcohol disrupts this process and may lead to maladaptive behaviors that interfere with future attempts at inclusion. Second, intoxication directly impairs neural networks involved in social perception (Gorka, Fitzgerald, King, & Phan, 2013), again interfering with attempts at reinclusion. Third, using alcohol to cope with ostracism may lead to adverse long-term consequences. When the effects of alcohol wear off there may be potential rebound effects. Similarly, fMRI research has found that people who are addicted to alcohol display reduced activation of brain areas that inhibit dACC activation following ostracism (Maurage et al., 2012). Though alcohol reduces the short-term pain of ostracism it may lead to greater problems, especially over time.

According to the need-threat model of ostracism and supporting research (Williams, 2009; Zadro, Williams, & Richardson, 2004) the immediate effects of ostracism are highly resistant to moderation. The current findings testify to the power of alcohol intoxication by showing that it is a sufficiently strong psychological state to disrupt a sensitive pain detection system. These findings also inform the need-threat model of ostracism by adding further evidence that responses in the reflexive stage can be moderated, albeit by a very strong agent.

Although the current findings appear inconsistent with the alcohol myopia model, they can be reconciled. None of the participants in this study were distracted, and given that people tend to naturally ruminate following an ostracism experience (Wesselmann, Ren, Swim, & Williams, 2013), it was reasonable to expect intoxicated participants in this experiment to behave similarly to intoxicated

participants in non-distraction conditions in other alcohol myopia research (Steele & Josephs, 1990). Contrary to this expectation, alcohol reduced some of the negative effects of ostracism. A likely explanation for the failure of alcohol to magnify the effects of ostracism is that the environment (a noisy bar) was sufficiently distracting to reduce, rather than enhance, the negative consequences of ostracism.

This study adds further support to a growing body of evidence that interventions known to reduce physical pain also reduce social pain (e.g., Deckman et al., 2013; DeWall et al., 2010; Riva et al., 2012). However, unlike marijuana, which is illegal in most states, and transcranial direct current stimulation, which is impractical for use in daily life, alcohol provides a buffer that is socially acceptable in many contexts. In fact, alcohol itself may be an avenue that people use to secure inclusion in groups. This proposition is indirectly supported by the finding that alcohol can enhance social bonding in small group contexts (Sayette et al., 2012). The possible dual role of alcohol as (1) a buffer against the negative effects of ostracism, and (2) an apparent pathway back to social inclusion may be partially responsible for its addictive properties. This is an intriguing direction for future research.

Interestingly, and contrary to what one would predict based on pain overlap theory, subjective intoxication was not associated with immediate physical pain ratings. This could be due to floor effects; the mean response on the scale (1–6) was below the second response option ( $M_{\text{pain}} = 1.87$ ,  $SD_{\text{pain}} = 1.11$ ). It is possible that different measurement strategies that allow for more variability would be sensitive to the possible influence of subjective intoxication. Additionally, ratings of hostility toward the other players were not related to subjective intoxication. It seems that alcohol is sufficient to buffer threats to needs satisfaction and affect following ostracism, but not influence other responses, such as hostility or aggression.

In addition to being the first study to demonstrate an association between intoxication and responses to ostracism, this study is also the first we know of to employ mobile devices to examine the effects of ostracism on populations outside of the laboratory. Future researchers may use the same method to answer research questions about other similarly elusive populations. Participants had largely recovered from the ostracism experience before the study had even ended, suggesting that the lasting impact is minimal.

## Limitations

As a field experiment the current research has a number of limitations. First, our time with each participant was limited, requiring us to keep measures quite short, which could have affected measurement reliability. Also, conducting the research in a naturalistic setting precluded controlling the administration of the alcohol in a standardized fashion that would allow us to assess other important factors, such as whether participants were on the ascending or descending limb in the intoxication experience (e.g., Giancola & Zeichner, 1997).

Another limitation of this research is that participants were not randomly assigned to consume different amounts of alcohol. It is possible that other correlated variables account for the relationship between subjective intoxication and need and mood levels. However, we regard this as unlikely because (1) the effects of subjective intoxication differed based on the ostracism condition, to which participants were randomly assigned, and (2) the analysis controlled for a wide range of variables that could plausibly explain relationships between alcohol consumption and general well-being. We do acknowledge, however, that any list of control variables will necessarily be non-exhaustive. For example, this research did not control for social anxiety or need to belong: Two individual differences that are plausibly related to drinking behavior and are strongly implicated in the experience of rejection.

Finally, based on the current research, it is unclear whether the reported numbing effects of alcohol are due to beliefs about alcohol having social-pain reducing properties, or instead due to some other aspect of subjective intoxication (i.e., the feeling of being drunk above and beyond blood alcohol concentration). Future experimental work including placebo control conditions will shed light on whether the benefits of alcohol are due to expectations, or the more direct result of the sensation of being intoxicated.

## Conclusion

Given these results it is understandable that alcohol is commonly used to cope with social exclusion. The present research suggests that people who do so will enjoy short-term benefits as the negative effects of ostracism are blunted. However, this may come at the cost of enjoying inclusion less if it is eventually achieved.

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