Is Shame a Proximal Trigger for Drinking? A Daily Process Study with a Community Sample

Jason B. Luoma, Paul M. Guinther

Portland Psychotherapy Clinic, Research, and Training Center

Nicole M. Lawless DesJardins

University of Oregon

Roger Vilardaga

Duke University

Author Note

Jason B. Luoma and Paul M. Guinther, Portland Psychotherapy Clinic, Research, and

Training Center; Nicole M. Lawless DesJardins, Department of Psychology, University of

Oregon; Roger Vilardaga, Psychiatry and Behavioral Sciences, Duke University

Disclosures and Acknowledgments

Citation

Abstract

Between-subjects studies show that people with higher levels of shame tend to experience more negative drinking-related consequences than people with lower levels of shame. However, within-subjects studies of the association between daily fluctuations in shame and subsequent drinking have yielded mixed findings. This study aimed to resolve these inconsistencies by examining the association between daily fluctuations in shame, between-subjects differences in shame, and subsequent evening alcohol consumption in a sample of 70 community-dwelling drinkers. Additionally, we examined whether the previous night's drinking predicted shame the next day based on the theory that shame may operate in a cyclical fashion in some people to maintain problematic drinking patterns. Multilevel model analyses showed a cross-level interaction in which individuals' average levels of ashamed mood moderated the effect of daily fluctuations in shame on solitary drinking. In contrast, previous day's drinking was only weakly related to shame the next day. This study contributes to existing literature by refining models of negative mood-related drinking and further elucidating the patterns by which shame serves as a trigger for drinking, particularly among high shame individuals. We interpret results in terms of self-control theory and demonstrate the importance of disaggregating between- and within-subjects variance when examining longitudinal data.

Keywords: shame, alcohol, daily diary, drinking

Public significance statement: This study suggests that shame experienced during the day tends to trigger solitary drinking that evening and therefore may be an important target for prevention and treatment efforts. In this study, people who tended to experience more shame drank alone more often and consumed more alcohol when they drank alone. Furthermore, on days when

shame was exacerbated, these individuals were less likely to drink alone, but tended to consume more alcohol when they did drink alone.

Is Shame a Proximal Trigger for Drinking? A Daily Process Study with a Community Sample

The tendency to use alcohol to escape or reduce negative affective states has been called *tension-reduction drinking* (Cooper, Frone, Russell, & Mudar, 1995). Studies of *between-subjects* effects show that people who report a higher motivation to drink alcohol to cope with negative affect, as well as those with more negative affect, tend to drink more alcohol and encounter more negative alcohol-related consequences (e.g., Cooper, et al., 1995; Kuntsche, Stewart, & Cooper, 2008). However, these studies do not capture the dynamic and cyclical interplay implied by tension-reduction models of drinking, wherein negative affect is thought to lead to drinking in a dynamic interplay between social context, emotional and cognitive responses, and subsequent drinking. Acquiring this type of information requires methodologies such as daily process designs or ecological momentary assessment designs that measure affect, social context, and behavior closer in time to the dependent variable of interest. These designs more adequately address questions such as, "Do people drink more on days they experience more negative affect?" Furthermore, combining daily process data with between-subject moderators can address questions such as, "Do certain types of people drink more on days with higher levels of negative affect?" Such contextually situated information is invaluable to researchers developing targeted interventions that can help problem drinkers or those at risk (Simons, Wills, & Neal, 2014).

A number of studies lead to the conclusion that different types of affect, not just valence or intensity, need to be considered when studying affect-drinking relationships. For example, differentiating between drinking to cope with anxiety versus depression improves fit for models examining mood-drinking relationships (e.g., Grant, Stewart, & Mohr, 2009) and motivation to cope with depression versus anxiety is related to different patterns of alcohol use and problems

(Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007). Additional studies have found that college students reporting higher motivation to use alcohol to cope had reduced alcohol use on days they reported sadness and increased alcohol use on days they reported fear and shyness (Hussong, Galloway, & Feagans, 2005), college students with less supportive friendships tended to drink more on days with elevated sadness and hostility (Husson, Hicks, Levy, & Curran, 2001), and sadness was the only affect of several measured to predict drinking among high school students (Gottfredson & Hussong, 2011). Furthermore, neurobiological studies show that alcohol use appears to selectively reduce anxiety but not fear (e.g., Moberg & Curtin, 2009). In sum, not all negative affective states will trigger drinking for all individuals; differentiating between types of affect and the inclusion of moderators are important design elements when examining affect-drinking relationships.

Shame and Problematic Drinking Behavior

Shame, an emotion that relates to a sense of a flawed self in the eyes of the self or others (Dearing, Stuewig, & Tangney, 2005), has been observed by researchers (e.g., Luoma, Guinther, Potter, & Cheslock, 2017) and clinicians (e.g., Potter-Efron, 2002; Wiechelt, 2007) to be associated with drinking-related problems. At a between-subjects level, shame is moderately correlated with alcohol/drug problems but weakly correlated with level of use (e.g., Dearing et al., 2005; Luoma et al., 2017; Treeby & Bruno, 2012);self-reported shame is higher in people with addictions than in non-addicted controls (Meehan et al., 1996; O'Connor, Berry, Inaba, Weiss, & Morrison, 1994). As such, shame may be a fruitful target of investigation when examining affect-drinking relationships.

Shame as an Antecedent of Drinking

A handful of longitudinal studies demonstrate that shame predicts subsequent drinking-related behavior. For example, shame proneness among fifth graders predicted an earlier onset of drinking in adolescence (Stuewig et al., 2015). A study of people attending alcoholics anonymous meetings found that shame, assessed in terms of nonverbal emotion displays while talking about a negative drinking experience, predicted occurrence of relapse and intensity of negative drinking-related outcomes over the next four months (Randles & Tracy, 2013). Finally, a study of college students showed that students who experienced shame after drinking more alcohol than they thought their peers typically drank were likely to increase their drinking over the subsequent week (Giguere, Lalonde, & Taylor, 2014). In sum, these studies reveal that a tendency toward shame is a risk factor for more intense drinking over subsequent periods of time (i.e., weeks to years), both among those with and without a history of alcohol-related problems.

While shame is a consistent *between-subjects* risk factor for problematic drinking, it is less clear whether shame is a proximal trigger for drinking at a *within-subjects* level. The studies reviewed above leave open the possibility that a trait-like tendency to experience higher levels of shame predicts problematic drinking due to third variables. For example, shame could signal a lack of self-efficacy to cope with other life problems (e.g. relationship conflicts), which could, in turn, trigger drinking. Alternately, shame could lead to social isolation and loneliness, which might then lead people to cope through drinking (Arpin, Mohr, & Brannan, 2015).

Two studies, to our knowledge, have examined within-person associations between shame and subsequent drinking over a more temporally constricted window (i.e., the next few hours). In a daily diary study of college students, daily reports of ashamed mood predicted drinking at home and away from home that evening better than other emotions (Mohr, Brannan, Mohr, Armeli, & Tennen, 2008). However, another study of community-dwelling adults

interested in reducing their drinking did not show a significant association between ashamed mood and drinking over the subsequent few hours (Mohr et al., 2010). Methodological weaknesses in these studies may account for some of the observed inconsistencies. First, both studies used a single-item measure of ashamed mood, potentially resulting in attenuated statistical power. Indeed, low power may be why the study with the smallest sample (Mohr et al., 2010) was the one that failed to find a significant shame-drinking association. Furthermore, the studies did not use statistical models that account for samples with a large number of non-drinking days (e.g., zero-inflated Poisson models; Atkins, Baldwin, Zheng, Gallop, & Neighbors, 2013), opening the possibility that model selection affected results. Additionally, significant associations between within-subjects variability in shame and drinking were found only with college students, not in the community sample, leaving open the possibility that sample characteristics, or moderators that differed between samples, could have influenced results. Finally, one of the studies (Mohr et al., 2010) was not thoroughly described (being only part of a chapter), making it difficult to fully understand the findings.

Shame as a Possible Consequence of Problematic Drinking

Other data indicate that shame may be a consequence of problematic patterns of drinking. When drinking results in failures to meet important role expectations or leads to violations of important standards of behavior or group norms, shame could plausibly follow (Giguere et al., 2014). For example, a person might get in a public argument with their spouse while drinking or miss work the day following a binge. Such events could result in shame, especially among people who are already prone to interpreting events in a manner that elicits shame. A qualitative study of students (Fjaer, 2015) supports this idea, finding that many people experience shame after violating social norms as a consequence of drinking.

A Cyclical Model of Shame and Alcohol Misuse

Shame may thus serve as both an antecedent for and a consequence of drinking, resulting in a cyclical relationship between shame and drinking, at least for certain individuals (Dearing et al., 2005; Weichelt, 2007). This is consistent with negative reinforcement models of addiction wherein escape or avoidance of negative affect is the principle motive for problematic substance use (Baker et al., 2004). For those prone to shame, negative reinforcement connected to escape from the painful self-awareness involved in shame could lead to increased drinking over time. As the intensity of drinking increases, the person is likely to develop tolerance, resulting in a need for increased amounts of alcohol to achieve the same effects. Increasing tolerance could lead to a higher likelihood of problematic consequences (e.g., failing to go to work the day after drinking) that elicit more shame, thus perpetuating the cycle. For those less prone to shame initially, shame could come to maintain problematic drinking after drinking becomes intense through other pathways (e.g., negative reinforcement related to anxiety or social reinforcement) with shame occurring when important violations of social norms eventually occur. If violations of important norms begin to occur regularly, shame could then serve as a form of negative affect that could fuel further drinking to escape it.

To our knowledge, the only existing research that examines both the antecedent and consequential sides of shame in relation to drinking within the same study is the third study from Giguere et al. (2014). In that study, the researchers found that some college students who perceived themselves as drinking more than their peers experienced shame after drinking which, in turn, predicted increased drinking over the subsequent week. In sum, while the evidence base is small, existing research suggests that shame may not be just an antecedent but also a consequence of excessive drinking, at least for some.

Current study

The present study aimed to assess the potential contribution of shame to the development and maintenance of problematic drinking. To that end, we recruited a community sample with a broad range of drinking behavior (from light to heavy), permitting assessment of a full range of drinking behavior and the effects of shame at every level. Following a baseline assessment, participants were asked to submit data on mood and drinking on a daily basis for 21 days..

We modeled both overall between-subjects levels of shame and daily within-subjects fluctuations in shame in order to model them in a conjoint fashion (Hoffman & Stawski, 2009) . We were particularly interested in whether people who typically experience high levels of shame tend to respond to daily fluctuations in shame differently than those who typically experience low shame. Furthermore, we aimed to increase reliability and validity of daily measurements by using an established multi-item measure of daily shame (see Marschall, Sanftner, & Tagney, 1994). We focused on high shame individuals because their greater experience of shame is likely a powerful determinant of their drinking; previous research has shown that high trait shame is associated with more problematic drinking (e.g. Luoma et al., 2017).

In contrast to previous studies that asked whether drinking occurred at home or outside the home (and inferred that the former was solitary and the latter social), we directly asked whether drinking occurred in a solitary versus social context. This distinction is based on both theory (e.g., Cooper et al., 1995) and data (e.g., Arpin et al., 2015; Mohr et al., 2001; Mohr et al., 2010; Mohr et al., 2005) showing that solitary versus social drinking have distinct antecedents and consequences. Because shame tends to motivate social withdrawal and because solitary drinking might then serve as a means to reduce painful feelings of shame, we expected that shame would be associated with solitary drinking but not social drinking.

Finally, we used zero-inflated Poisson (ZIP) distributions to model drinking data, rather than using Poisson distributions as was done in prior studies. This allows better approximations of the distribution of drinking data with a preponderance of non-drinking days. ZIP models also provide the advantage of allowing us to separately predict the *likelihood* of drinking occurring on a given day versus the *amount* of alcohol consumed, if drinking was initiated that evening.

Methods

Participants

Participants were drinkers recruited from the local community through posters and online advertisements for a study investigating daily mood and drinking patterns. One of these participants reported a level of drinking that was an extreme outlier relative to levels reported by the rest of the sample (i.e., an average of 22 drinks per day and no non-drinking days), and this person's data was therefore excluded from the present analyses. Only participants who completed at least two consecutive diaries were included in the analysis.

The resulting study sample consisted of 70 participants (48 female, 22 male; years of age $M = 34.3$, $SD = 12.9$), with 56 (82%) identifying as White, 8 (11%) multiracial, 5 (7%) as Black, 1 (1%) Asian, and 2 (3%) as Hispanic. Forty-one (59%) were employed, 24 (34%) unemployed, and 3 (4%) not in the labor force. Independent of employment, 15 (21%) identified as current students. One person (1%) had less than a high school education, 8 (12%) had completed high school, 20 (37%) had attended some college (37%), 23 (33%) had completed college, and 18 (26%) had at least some graduate school. Thirteen participants (19%) were currently receiving mental health treatment, and none reported currently receiving treatment for addiction.

Design and Procedure

The Behavioral Health Research Collective Institutional Review Board oversaw research activities. Participants were screened via phone or email to ensure they had at least one drink in the last two weeks. Other inclusion criteria included daily access to the internet, ability to travel to the research center, being at least 18 years of age, and the ability to read English. Following the phone screen, participants were scheduled for an in-person assessment. We required participants to be sober when they came to their appointment. Upon arrival, all participants successfully provided informed consent, whereupon they completed baseline questionnaires, only some of which we report in this paper. Afterwards, a research team member trained participants how to use an online "daily diary" survey and instructed them to complete the survey remotely on a daily basis for the next 21 days following the intake assessment. Participants were instructed to complete the survey between the hours of 4:00 p.m. and 6:00 p.m.; we only included data for diaries received between 3:50 p.m. and 6:10 p.m.. Periodically, we checked in with participants to provide feedback about their diary completion rates and to troubleshoot any obstacles. We based each participant's compensation on the portion of the study they completed, with a maximum compensation amount of $50 for completing all baseline assessments and diaries. On average, participants completed 12.8 ($SD = 5.7$) dairies. In order to conduct study analyses, we required back-to-back diaries, of which we obtained an average of 11.3 ($SD = 6.4$) per participant for a total of 808 diaries.

Measures

Daily ashamed mood. To assess daily ashamed mood we modified the State Shame and Guilt Scale (SSGS; Marschall et al., 1994), a self-report measure that includes a 5-item shame (SSGS-S) subscale. We adapted instructions by asking participants how they felt over the course of the day (vs. at that moment); items from the shame subscale (e.g. "I felt like I was a bad

person") were answered using a Likert-scale ranging from "Did not feel this way at all" (scored as 1) to "Felt this way very strongly" (scored as 5). Items were averaged to obtain a total score and observed internal consistency for the scale was $\alpha = .87$.

Drinks alone/social/total. Participants reported both the number of alcoholic beverages they consumed "while alone" and "while interacting with others" the prior evening (i.e., after completing their last diary but before waking up that day). Participants were presented with familiar types and volumes of alcoholic beverages and instructed to enter the number of drinks consumed for each type; we later transformed answers into standard drinks.

Negative affect. To assess mood, participants reported how they felt over the course of the day (since waking up that day until survey completion that day, 4-6 p.m.) with items from the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988; current study α = .76). To create a measure of overall negative mood that day, we averaged the four negative affect items (upset, hostile, nervous, afraid), which participants rated with a five-point Likert-type scale anchored by "Very slightly or none at all" and "Extremely."

Alcohol Use Disorders Identification Test. The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993; current study α = .85) is a 10-item self-report measure of intake, dependence, and problems related to the consumption of alcohol. The AUDIT is a reliable and valid measure of alcohol abuse, dependence, and harmful use (de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009).

Internalized Shame Scale. The Internalized Shame Scale (ISS; Cook, 1987; current study α = .96) is a 24-item self-report questionnaire measuring internalized shame. The measure has previously shown construct validity and reliability and is considered particularly appropriate for examination of shame in substance dependent populations (Rybak & Brown, 1996).

Results

Descriptive Statistics

The baseline ISS and AUDIT were included to allow comparison of this sample to other samples, and were not included in daily-diary statistical models below. The overall mean score on the ISS ($M = 26.1$, $SD = 17.8$) in this sample was similar to that of college students ($M = 27.5$, $SD = 18.5$) in a paper studying the psychometrics of the ISS (Derosario & White, 2006). AUDIT scores in this sample ($M = 8.8$, $SD = 6.2$) indicated that 47% of the current sample could be identified as engaging in "problematic" use of alcohol based on a cutoff of 8 or more (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), whereas 31% of participants could be identified as engaging in "hazardous or harmful" levels of alcohol use based on a cutoff of 10 or more (Saunders et al., 1993).

Overall, participants reported experiencing greater than zero levels of shame on 34% of days (277 of 808 observations), indicating experiences of shame were fairly common during the reporting period. When participants reported experiencing shame, the average level reported was $M = 1.7$ ($SD = .8$). Participants reported consuming alcohol on 43% of evenings, with social drinking (33% of days) more common than drinking alone (20% of days). On evenings when participants consumed some alcohol, they averaged 3.9 standard drinks ($n = 344$ observations, $SD = 2.9$) in total; they averaged 3.2 drinks with others ($n = 269$ observations; $SD = 2.3$) and 2.9 drinks alone ($n = 164$ observations; $SD = 1.9$).

Zero-order correlations on aggregated (between-subjects) variables are reported in Table 1. We included correlations of participants' average shame and drinking based on averaged levels of those variables from the daily diaries in order to get a general sense of their relationships in this sample, while acknowledging that this does not provide a complete picture

because it aggregates over repeated measures within each participant. As expected, average daily shame was moderately correlated with average daily negative affect, baseline ISS scores, and baseline AUDIT scores. However, there was no significant relationship between average daily shame and average daily drinking. There were no significant relationships between average daily negative affect and any other variable besides average daily shame. Baseline AUDIT scores were positively correlated with all other variables except average daily negative affect.

Predicting Drinking alone from Daily Reports of Ashamed Mood

   Data analytic strategy. As is common in investigations of alcohol use, the distribution of number of drinks consumed was positively skewed and contained a large number of zero-drinks days. To account for the abundance of non-drinking days, we modeled the data as a zero-inflated Poisson (ZIP) distribution. ZIP models estimate two models simultaneously: a logistic regression that estimates the probability that a participant drinks or does not drink on a given day, as well as a Poisson regression that estimates the expected number of drinks a participant will consume on a drinking day. We also attempted to fit zero-inflated negative binomial models to account for overdispersion but found that these models either did not converge or did not show substantially better fit.

   To account for the longitudinal nature of the data, we estimated a multi-level ZIP model with random intercepts in both the Poisson and logistic portions of the model. Because each participant could produce a diary entry each day (i.e., days were nested within participant), we modeled day at Level 1 and person at Level 2. We predicted drinking from within-person fluctuations in shame across the 21 days, between-person differences in shame (calculated as the mean of the daily reports of shame), and the cross-level interaction between the two. We also controlled for within-person fluctuations in negative affect (PANAS-NA) at Level 1, so all other

coefficients should be interpreted as reflecting the effect of shame on drinking when a person is reporting their average amount of negative affect.

Level 1 within-person fluctuations reflect daily variability in a person's responses centered around their average responses across all days. To compute these variables, we centered participants' daily responses around their average across all days. These estimates reflect how daily deviations from a person's average shame or negative affect relate to drinking behavior. The Level 2 between-person variable was the person's average shame across all days. We then grand-mean centered this around the sample average. This estimate reflects how between-person differences in average levels of shame impact daily drinking behavior. The cross-level interaction is the interaction between within-person fluctuations in shame and between-person differences in shame, controlling for within-person fluctuations in negative affect. The cross-level interaction allowed us to estimate whether, for example, someone who usually feels little shame will drink more than someone who usually feels a good deal of shame on a day when they both feel higher-than-average shame (Bolger, Davis, & Rafaeli, 2003; Hoffman & Stawski, 2009). The unified macro (Voronca, Egede, Gebregziahber, & Johnson, 2014) in SAS 9.04 was used to provide estimates for the mixed-effect ZIP model. We ran separate models predicting drinking in social versus solitary contexts and also total drinking on each day. Due to lagging, the models below were based on 656 observations nested within 70 individuals.

Model predicting likelihood of solitary drinking. This portion of the model provides estimates of the likelihood of solitary drinking on any given day. The bottom half of Table 2 includes the estimates for the logistic portion. Overall, the probability of someone drinking alone on a given day was low (20%). We did not find evidence for main effects but did obtain a significant cross-level interaction between within- and between-person differences in shame ($p <$

.05). As can be seen in Figure 1, participants who experience, on average, low or average levels

of shame tend to be more likely to drink alone on days when they experience particularly high

shame. In contrast, participants who tend to experience high shame, on average, are less likely to

drink alone on days when they experience above average levels of shame. In other words, the

probability a person will drink alone increases as their daily shame increases if they tend to

experience low or average shame, but decreases if they tend to experience high shame.

Model predicting number of solitary drinks. This portion of the model provides

estimates of the amount of solitary drinking on days when a person drinks more than zero drinks.

The top half of Table 2 includes the estimates for the Poisson portion. The intercept indicates

that an average person on an average day is expected to drink 1.75 drinks. We did not find

evidence for main effects of within- or between-person shame, or of within-person negative

affect. We did, however, find evidence for the cross-level interaction between within- and

between-person differences in shame ($p = .02$). As can be seen in Figure 2, participants who

experience, on average, low or average levels of shame tend to have *fewer* drinks alone on days

when they feel particularly high shame and are drinking. In contrast, participants who tend to

experience, on average, high levels of shame have *more* drinks alone on days when they

experience particularly high shame and are drinking.

Results for social and total drinking. For comparison, we also investigated whether

within- or between-person variation in shame predicted the number of drinks an individual

consumed in a social setting. Table 3 presents the results of the ZIP model predicting social

drinking. Neither the probability of drinking socially nor the number of drinks consumed in a

social setting were associated with within-person fluctuations in shame, between-person

differences in shame, or the interaction between the two. There was a trend toward daily

fluctuations in negative affect predicting the likelihood of social drinking. A ZIP model

predicting total drinks consumed (social plus solitary drinking) showed no significant

relationships between drinking and within-person fluctuations in shame, between-person

differences in shame, or the interaction between the two (Table 4). Thus, in contrast to solitary

drinking, social and total drinking had no significant relationship with between- or within-person

shame.

Predicting Next Day Shame from Previous Night's Drinking

To examine whether the quantity of evening drinking predicts shame experienced the

next day, we investigated the extent to which the previous night's solitary, social, and total

drinking predicted feelings of shame the next day. To do so, we fit three multi-level models

estimating the effect of within-person fluctuations in evening drinking, between-person

differences in average evening drinking, and the cross-level interaction between the two on

reported shame the following day (see Table 5). We modeled shame as a linear outcome, and fit

models with a random intercept using PROC MIXED in SAS 9.04. One cross-level interaction

was close to significance ($p = .06$), wherein people who tend to have more social drinks feel

more shame when they consume more social drinks than usual, whereas people who tend to have

fewer social drinks feel less shame when they consume more social drinks than usual (see Figure

3). No significant results were found for solitary drinking or total drinks consumed.

<div align="center">

Discussion

</div>

This was the first study, to our knowledge, to model both within- and between-person

variability in shame to predict drinking. In this sample of light-to-heavy community drinkers,

within- and between-person differences in shame interacted to predict daily fluctuations in

solitary drinking, but not social or total drinking. Overall, models predicted that the average high

shame individual in our sample, compared to the average low shame individual, drinks alone more often (see Table 1) and consumes more alcohol alone when they do drink alone (see Table 2). Our finding that shame was only predictive of solitary drinking may help explain why studies using between-subjects measures of shame that did not distinguish between solitary and social drinking have generally shown weak or non-existent relationships between shame and drinking frequency or quantity (e.g., Luoma et al., 2017). This pattern of results also aligns with research showing that social and solitary drinking have different antecedents (e.g., Arpin et al., 2015; Mohr et al., 2005), suggesting that future studies of shame and drinking should distinguish between social and solitary drinking.

Our within-subject results align with those of a previous study showing that variation in ashamed mood predicts solitary drinking in college students (Mohr et al., 2008) and extends these results to a community sample. Similar to Mohr et al., (2008), we observed that higher daily ashamed mood predicted increased quantity of alcohol consumed that evening. However, this pattern was strongly qualified by a cross-level interaction in which a person's average level of ashamed mood moderated the effect of daily fluctuations in shame on solitary drinking. This result underscores the importance of disaggregating between- and within- subject variability in predicting repeated-measure variables, such as those typically found in daily-process or ecological momentary assessment designs (Wang & Maxwell, 2015).

In discussing the observed interaction, we first focus on the results of those who typically experienced above-average levels of shame, who we will call high shame individuals. How shame functions for high shame individuals, as opposed to those who don't tend to experience much shame (i.e., low shame individuals), is of greater importance as shame is more likely to exert important regulatory effects on behavior in this group. This can be seen in Figures 1-2 by

noting that low shame individual effects tended to run parallel to mean effects, whereas high

shame individual effects tended to be at odds with mean effects. For high shame individuals,

high shame days (i.e., days where shame was higher than average for that person) were related to

a reduced likelihood of drinking but a greater quantity of alcohol consumption if drinking was

initiated (see Figures 1 and 2). On low shame days (i.e., days where shame was lower than

average for that person), high shame individuals had an increased likelihood of drinking, but the

amount that was consumed was lower than average for them.

Due to the novelty of these findings, interpretation of the reasons for observed effects are

necessarily speculative. Our interpretation of results for high shame individuals relies mainly on

the resource model of self-control (Muraven & Baumeister, 2000). According to this model, self-

control is a limited resource that can become depleted during self-regulatory efforts and, once

depleted, leads to failures to follow self-imposed limits or delay gratification (Baumeister, Vohs,

& Tice, 2007; Muraven & Baumeister, 2000). Following from this theory, increased levels of

shame may motivate high shame individuals to use self-control resources to inhibit urges to drink

in reaction to shame. This may result in a reduced likelihood of drinking on those evenings but

lead to increases in drinking quantity if self-control efforts fail. This fits with research showing

that shame can motivate attempts to restore a more positive sense of self (de Hooge, Zeelenberg,

& Breugelmans, 2011), suggesting that high shame drinkers may, at first, try to restore a more

positive sense of self through engaging in self-control efforts. Alternately, they may try to refrain

from drinking when they recall how drinking alone while ashamed tends to lead to binges (and,

thereby, negative consequences). However, when attempts at self-control fail, people may have

few resources left with which to moderate drinking, thereby resulting in higher amounts

consumed when drinking does occur (Bensley, Kuna, & Steele, 1990; Muraven, Collins, &

Neinhaus, 2002). This pattern is consistent with research showing that people depleted of self-control resources find it harder to follow social norms that prevent socially inappropriate behavior (DeBono, Shmueli, & Muraven, 2011), that daytime self-control demands predict interpersonal conflicts and neglecting responsibilities later that day (Simons, Wills, Emery, & Spelman, 2016), and that people who generally experience more temptation to drink tend to drink more after self-control is depleted (Muraven & Shmueli, 2006). Other models of self-control could account for the observed patterns (e.g., Inzlicht, Schmeichel, & McCrae, 2014) and additional studies are needed to sift between alternative explanations.

The pattern of decreased likelihood but increased quantity of alcohol consumption on high shame days for high shame individuals can also be interpreted in terms of self-control theory. On low shame days, it would be expected that people would experience less of a motivation to inhibit drinking, as low shame indicates that a person is feeling better about themselves (Gruenewald, Kemeny, Aziz, & Fahey, 2004), and, as a corollary, about their drinking. Since resources would not be expended to resist urges to drink, self-control resources would be more available to moderate the amount of alcohol consumed once drinking began. In addition, lower levels of distress experienced on low shame days may lessen the motivation to drink large amounts of alcohol to escape it.

The idea that temporarily reduced levels of shame may lead to increased drinking parallels the findings of Luoma et al. (2012) who studied a sample of patients on an inpatient unit who were typically experiencing high levels of shame. In this study, greater reductions in shame during inpatient addiction treatment predicted a higher likelihood of relapse at a four-month follow up. Perhaps those who experienced temporarily lowered levels of shame while on the

residential unit were akin to those who temporarily experienced reduced shame in this study –
they were less motivated to refrain from drinking and subsequently were more likely to relapse.

We now turn to focus on low shame individuals. Our results showed that low shame
individuals tended to initiate solitary drinking more often on days with higher than typical levels
of shame, but tended to consume less alcohol than typical on these days. Conversely, on low
shame days, these individuals were less likely to consume alcohol in a solitary context, but
tended to consume more alcohol once they began drinking. Though speculative, the increased
probability of solitary drinking on high shame days (Figure 1) could reflect experiences with
rejection or ostracism that might produce shame, leading to both social withdrawal (Richman &
Leary, 2009) and drinking as a means to escape the painful emotion of shame (Baker et al.,
2004). The decreased quantity of solitary drinking on high shame days (Figure 2) once drinking
was initiated is harder to understand. As research has shown that the stress-dampening effects of
alcohol depend upon on contextual features of the drinking situation (Sayette, 2017), perhaps
there is something different about the drinking situation for low shame individuals that results in
them being less likely to experience drinking alone as successfully allowing them to escape
ashamed mood. Alternatively, perhaps these individuals tend to have a more adaptive response to
shame wherein higher levels of shame are more likely to trigger its repair motive (De Hooge et
al., 2011) thereby resulting in less intense drinking and more behavior aimed at attempting to
repair a positive sense of self. It's also important to note that on low shame days, which were
more typical for these individuals, solitary alcohol consumption was relatively rare. Overall,
these results suggest that shame has a weak influence on the drinking of low shame individuals.

There were no significant finding in models examining the relationship between the
previous night's drinking and shame the next day, but one model did show a trend toward

significance. In this model, people who tended to have more drinks in social contexts felt more shame when they drank more than usual, whereas people who tended to drink infrequently in social contexts felt *less* shame when they had more than usual (Figure 3). This could represent a threshold effect, where people who tend to consume more alcohol feel more shame because they had an unusually high number of drinks for them, thus potentially moving them into a socially unacceptable range of drinking. In contrast, increased drinking among those who drink little would not likely move them into a socially unacceptable range of drinking. This interpretation fits with the research of Giguere et al. (2014), who found that shame is more likely to follow drinking that exceeds a level of drinking that people perceive as normal. Perhaps light drinkers, on the other hand, experience decreased shame the day after relatively heavy drinking in part because they had a particularly positive experience at the social event. It is important to note that the effect is relatively small; the difference in the estimate at the biggest spread in Figure 3 is only 0.2 points on a scale with a standard deviation of 0.58.

Overall, our findings suggest that the sources of daily variability in shame in this sample were largely due to factors other than quantity of alcohol consumed, per se. In addition to studying whether drinking exceeds perceived normal levels, future studies should measure whether drinking exceeds self-imposed drinking limits (Muraven, Collins, Morsheimer, Shiffman, & Paty, 2005). In general, future studies investigating how drinking might lead to shame should measure drinking-related transgressions more directly.

Our results might explain why Mohr et al. (2010) did not find an association between within-person fluctuations in shame and solitary drinking in their sample of moderate-to-high quantity drinkers who were looking to cut back on their drinking, whereas positive associations between daily fluctuations in shame and solitary drinking were found in a college student sample

(Mohr et al., 2008). In particular, their use of a Poisson model that did not account for the preponderance of zero-drinking days may have resulted in biased estimates. It's possible that high rates of zero-drinking days in the college student sample (Mohr et al., 2008) may have resulted in estimates that looked like the middle line in Figure 1, showing a positive association between daily increases in shame and increased probability of drinking. In contrast, the moderate-to-high drinking sample (Mohr, 2010) may have had fewer zero-drinking days, which would better approximate a Poisson distribution and might result in estimates more similar to the middle line in Figure 2 where increased daily shame is associated with less drinking. However, the moderate-to-high drinking sample is likely to still have some zero-drinking days, thus attenuating this pattern and suppressing the association. While highly speculative, this interpretation does reinforce the importance of well specified models.

Our results highlight important caveats in tension reduction models of drinking that suggest that higher levels of negative mood trigger drinking to reduce painful affect. Results support the theory that social and solitary drinking have unique antecedents (Cooper et al., 2005) and also replicate previous findings demonstrating that negative mood may be most strongly associated with solitary drinking (Mohr et al., 2001; Mohr et al., 2010). Our results further underscore the importance of differentiating between different emotional states, and suggest that higher negative affect does not always predict *more* drinking. Specifically, we found that some individuals (i.e., those high in shame) tended to respond to exacerbations in shame with a reduced likelihood of drinking. In addition, it's unlikely that the association between shame and solitary drinking found in our study was due to an association with negative affect in general, as shame predicted drinking even after controlling for daily variability in negative affect. Moreover,

in models not reported above where negative affect was excluded, the association between shame and drinking remained essentially unchanged.

Characteristics of this sample should be considered when discussing generalization. The sample was largely white, fairly well educated, predominantly female, with indications that about one-third to one-half of the sample engaged in problematic drinking. Still, this was not a study of problem drinking, but rather a study of how shame is related to alcohol consumption across a wide range of drinking patterns. Additional populations and variables would need to be investigated in subsequent studies of the development of problematic drinking over time. Relatedly, it may be the case that shame as a consequence of the previous night's drinking may be more prevalent in problem drinkers, as would be proposed by cyclical models of shame that were originally proposed in reference to addicted samples. Likewise, it would be helpful to conduct further studies to examine whether the pattern of results found for high shame participants extends to samples recruited for even higher levels of shame, as this sample appeared to have moderate levels of shame on average. In addition, though sufficient to detect some significant results and larger than one of the two previous studies examining shame as an immediate antecedent for drinking (Mohr et al., 2010), the small-to-moderate sample size of the present investigation was not optimal for producing reliable parameter estimates, necessitating replication with larger samples.

The rate of noncompletion of daily diaries was somewhat high (39% missing days), leaving the possibility that missing data may not have occurred at random, potentially biasing results in unknown ways. In addition, results only focused on evening drinking, raising the possibility that modeling daytime drinking may have resulted in different results. It's possible that our method for quantifying between-subject shame may have affected results in unknown

ways. In most previous studies examining trait shame, shame was measured via self-report questionnaires (e.g.. Dearing et al., 2005; Luoma et al., 2027; Steuwig et al., 2014). In contrast, we elected to aggregate daily reports of shame across all available observations as we believed that an aggregated measure of shame using a validated measure of state shame would result in a better assessment of current propensity toward shame than a retrospective report at one point in time. Empirically, we observed that a questionnaire measure of shame (the ISS) was moderately correlated ($r=.49$) with our aggregated measure of shame suggesting substantial overlap. Finally, it would be helpful if future models added potentially modifiable moderators of the link between shame and drinking in high shame individuals, such as self-compassion (Brooks, Kay-Lambkin, Bowman, & Childs, 2012) or experiential avoidance (Luoma et al., 2012), in order to identify targets for intervention.

These results might also explain some of the appeal of more confrontational, shame-based ways of trying to change drinking. High shame people with alcohol problems may have direct experience with shame motivating them to abstain some of the time. This observation could lead some people to conclude that shaming may increase motivation for abstinence. Anecdotally, some people tend to misuse alcohol when they can "get away with it" (i.e., not be ashamed) and are enticed to maintain a fantasy that they can go on drinking without experiencing any problems. Unfortunately, such thinking doesn't take into account the broader pattern showing that higher levels of shame, over time, are associated with more drinking, even if temporary exacerbations of shame among those who are higher in shame lead to short-term abstinence.

It is becoming increasingly clear that there are many pathways to alcohol problems and dependence (Litten et al., 2015). Thus, in order to develop more targeted and effective preventive

and treatment interventions, it is imperative that we have more nuanced analyses of both

between-subject and within-subject variables that predict problematic drinking behavior. For

example, it may be important to take into account the finding that drinking may be more

common on low shame days for high shame individuals. Perhaps, for people trying to abstain

from alcohol who experience significant shame, periods of temporarily reduced shame may

actually be particularly risky in terms of relapse. Overall, our data provide further support for the

idea that shame is a relevant treatment target among problem drinkers and further suggest that

shame might be a relevant target for preventive interventions. Helping people to experience less

shame in their lives, or perhaps learn how to respond to shame more adaptively—for example,

through self-compassion—may contribute to lower levels of drinking.

References

Arpin, S. N., Mohr, C. D., & Brannan, D. (2015). Having friends and feeling lonely: A daily process examination of transient loneliness, socialization, and drinking behavior. *Personality & Social Psychology Bulletin*, *41*(5), 615–28.

Atkins, D. C., Baldwin, S. A., Zheng, C., Gallop, R. J., & Neighbors, C. (2013). A tutorial on count regression and zero-altered count models for longitudinal substance use data. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors, 27*(1), 166–177.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *AUDIT-The Alcohol Use Disorders Identification Test- Guidelines for use in primary care*. *World Health Organization* (2nd ed.). Geneva, Switzerland: World Health Organization.

Baker, T. B., Piper, M. E., McCarthy, D. E., Majeskie, M. R., & Fiore, M. C. (2004). Addiction Motivation reformulated: An affective processing model of negative reinforcement. *Psychological Review*, *111*(1), 33–51.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*(6), 351–355.

Bensley, L. S., Kuna, P. H., & Steele, C. M. (1990). The role of drinking restraint success in subsequent alcohol consumption. *Addictive Behaviors*, *15*(5), 491–496.

Bolger, N., Davis, A. & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54,* 579-616.

Brooks, M., Kay-Lambkin, F., Bowman, J., & Childs, S. (2012). Self-compassion amongst clients with problematic alcohol use. *Mindfulness*, *3*(4), 308–317.

Cook, D. R. (1987). Measuring shame: The internalized shame scale. *Alcoholism Treatment Quarterly*, *4*(2), 197–215.

Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *Journal of Personality and Social Psychology*, *69*(5), 990–1005.

de Hooge, I. E., Zeelenberg, M., & Breugelmans, S. M. (2011). A functionalist account of shame-induced behaviour. *Cognition & Emotion*, *25*(5), 939–946.

de Meneses-Gaya, C., Zuardi, A. W., Loureiro, S. R., & Crippa, J. A. S. (2009). Alcohol Use Disorders Identification Test (AUDIT): An updated systematic review of psychometric properties. *Psychology & Neuroscience*, *2*(1), 83–97.

Dearing, R. L., Stuewig, J., & Tangney, J. P. (2005). On the importance of distinguishing shame from guilt: Relations to problematic alcohol and drug use. *Addictive Behaviors*, *30*(7), 1392–1404.

DeBono, A., Shmueli, D., & Muraven, M. (2011). Rude and inappropriate: The role of self-control in following social norms. *Personality and Social Psychology Bulletin*, *37*(1), 136–146.

Delrosario, P., White, R. M., del Rosario, P. M., & White, R. M. (2006). The Internalized Shame Scale: Temporal stability, internal consistency, and principal components analysis. *Personality and Individual Differences*, *41*(1), 95–103.

Fjaer, E. G. (2015). Moral emotions the day after drinking. *Contemporary Drug Problems*, *42*(4), 299–313.

Giguere, B., Lalonde, R. N., & Taylor, D. M. (2014). Drinking too much and feeling bad about it? How group identification moderates experiences of guilt and shame following norm transgression. *Personality and Social Psychology Bulletin*, *40*(5), 617–632.

Gottfredson, N. C., & Hussong, A. M. (2011). Parental involvement protects against self-medication behaviors during the high school transition. *Addictive Behaviors*, *36*(12), 1246–1252.

Grant, V. V., Stewart, S. H., O'Connor, R. M., Blackwell, E., & Conrod, P. J. (2007). Psychometric evaluation of the five-factor Modified Drinking Motives Questionnaire - Revised in undergraduates. *Addictive Behaviors*, *32*(11), 2611–2632.

Grant, V. V, Stewart, S. H., & Mohr, C. D. (2009). Coping-anxiety and coping-depression motives predict different daily mood-drinking relationships. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*, *23*(2), 226–237.

Gruenewald, T. L., Kemeny, M. E., Aziz, N., & Fahey, J. L. (2004). Acute threat to the social self: shame, social self-esteem, and cortisol activity. *Psychosomatic Medicine*, *66*(6), 915–24.

Hoffman, L., & Stawski, R. S. (2009). Persons as contexts: Evaluating between-person and within-person effects in longitudinal analysis. *Research in Human Development*, *6*(2–3), 97–120.

Hussong, A. M., Galloway, C. A., & Feagans, L. A. (2005). Coping motives as a moderator of daily mood-drinking covariation. *Journal of Studies on Alcohol*, *66*(3), 344–353.

Hussong, A. M., Hicks, R. E., Levy, S. A., & Curran, P. J. (2001). Specifying the relations

between affect and heavy alcohol use among young adults. *Journal of Abnormal*

Psychology, 110(3), 449.

Kuntsche, E., Stewart, S. H., & Cooper, M. L. (2008). How stable is the motive-alcohol use link?

A cross-national validation of the Drinking Motives Questionnaire Revised among

adolescents from Switzerland, Canada, and the United States. *Journal of Studies on*

Alcohol and Drugs, *69*(3), 388–396.

Litten, R. Z., Ryan, M. L., Falk, D. E., Reilly, M., Fertig, J. B., & Koob, G. F. (2015).

Heterogeneity of alcohol use disorder: Understanding mechanisms to advance

personalized treatment. *Alcoholism: Clinical and Experimental Research*, *39*(4), 579–584.

Luoma, J. B., Guinther, P., Potter, J., & Cheslock, M. (2017). Experienced-based versus scenario-

based assessments of shame and guilt and their relationship to alcohol consumption and

problems. *Substance Use and Misuse , 52*(13), 1692-1700.

Luoma, J. B., Kohlenberg, B. S., Hayes, S. C., & Fletcher, L. B. (2012). Slow and steady wins the

race: A randomized clinical trial of acceptance and commitment therapy targeting shame

in substance use disorders. *Journal of Consulting and Clinical Psychology*, *80*, 43–53.

Marschall, D., Sanftner, J., & Tangney, J. P. (1994). *The State Shame and Guilt Scale*. Fairfax,

VA: George Mason University.

Meehan, W., O'Connor, L. E., Berry, J. W., Weiss, J., Morrison, A., & Acampora, a. (1996).

Guilt, shame, and depression in clients in recovery from addiction. *Journal of*

Psychoactive Drugs, *28*(2), 125–134.

Moberg, C. A., & Curtin, J. J. (2009). Alcohol selectively reduces anxiety but not fear: startle response during unpredictable versus predictable threat. *Journal of Abnormal Psychology*, *118*(2), 335.

Mohr, C. D., Armeli, S., Tennen, H., Carney, M. A., Affleck, G., & Hromi, A. (2001). Daily interpersonal experiences, context, and alcohol consumption: Crying in your beer and toasting good times. *Journal of Personality and Social Psychology*, *80*(3), 489-500.

Mohr, C. D., Armeli, S., Tenne, H., & Todd, M. (2010). The complexities of modeling mood-drinking relationships: Lessons learned from daily process research. In J. D. Kassel (Ed.), *Substance abuse and emotion* (pp. 189–216). Washington, DC: APA.

Mohr, C. D., Armeli, S., Tennen, H., Temple, M., Todd, M., Clark, J., & Carney, M. A. (2005). Moving beyond the keg party: a daily process study of college student drinking motivations. *Psychology of Addictive Behaviors*, *19*(4), 392.

Mohr, C. D., Brannan, D., Mohr, J., Armeli, S., & Tennen, H. (2008). Evidence for positive mood buffering among college student drinkers. *Personality and Social Psychology Bulletin*, *34*(9), 1249–1259.

Muraven, M., Collins, R. L., Morsheimer, E. T., Shiffman, S., & Paty, J. a. (2005). The morning after: limit violations and the self-regulation of alcohol consumption. *Psychology of Addictive Behaviors*, *19*(3), 253–262.

Muraven, M., Collins, R. L., & Neinhaus, K. (2002). Self-control and alcohol restraint: An initial application of the Self-Control Strength Model. *Psychology of Addictive Behaviors*, *16*(2), 113–120.

Muraven, M., & Shmueli, D. (2006). The self-control costs of fighting the temptation to drink. *Psychology of Addictive Behaviors*, *20*(2), 154–160.

O'Connor, L. E., Berry, J. W., Inaba, D., Weiss, J., & Morrison, A. (1994). Shame, guilt, and

> depression in men and women in recovery from addiction. *Journal of Substance Abuse*

> *Treatment*, *11*(6), 503–510.

Potter-Efron, R. T. (2002). *Shame, guilt, and alcoholism: Treatment issues in clinical practice*.

> Binghamton, NY: Haworth Press.

Randles, D., & Tracy, J. L. (2013). Nonverbal displays of shame predict relapse and declining

> health in recovering alcoholics. *Clinical Psychological Science*, *1*(2), 149–155.

Richman, L. S., & Leary, M. R. (2009). Forms of Interpersonal Rejection : *Psychological Review*,

> *116*(2), 365–383.

Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993).

> Development of the Alcohol Use Disorders Identification Test (AUDIT). *Addiction*, *88*,

> 791–804.

Sayette, M. A. (2017). The effects of alcohol on emotion in social drinkers. *Behaviour Research*

> *and Therapy*, *88*, 76–89.

Simons, J. S., Wills, T. A., Emery, N. N., & Spelman, P. J. (2016). Keep calm and carry on:

> Maintaining self-control when intoxicated, upset, or depleted. Cognition & Emotion,

> 30(8), 1415-1429.

Simons, J. S., Wills, T. A., & Neal, D. J. (2014). The many faces of affect: A multilevel model of

> drinking frequency/quantity and alcohol dependence symptoms among young adults.

> *Journal of Abnormal Psychology*, *123*(3), 676–694.

Smart Richman, L., & Leary, M. R. (2009). Reactions to discrimination, stigmatization,

> ostracism, and other forms of interpersonal rejection: a multimotive model. *Psychological*

> *Review*, *116*(2), 365.

Stuewig, J., Tangney, J. P., Kendall, S., Folk, J. B., Meyer, C. R., & Dearing, R. L. (2014).

    Children's proneness to shame and guilt predict risky and illegal behaviors in young

    adulthood. *Child Psychiatry & Human Development*, 217–227.

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral Emotions and Moral Behavior. *Annual*

    Review of Psychology, *58*, 345–372.

Treeby, M., & Bruno, R. (2012). Shame and guilt-proneness: Divergent implications for

    problematic alcohol use and drinking to cope with anxiety and depression

    symptomatology. *Personality and Individual Differences*, *53*(5), 613–617.

Wang, L. P., & Maxwell, S. E. (2015). On disaggregating between-person and within-person

    effects with longitudinal data using multilevel models. *Psychological Methods*, *20*(1), 63–

    83.

Watson, D., Clark, L. A., Tellegen, A. (1988). Development and validation of brief measures of

    positive and negative affect: The PANAS scales. *Journal of Personality and Social*

    Psychology, 54(6), 1063-1079.

Table 1

Spearman Correlations between Shame, Negative affect, and Drinking Measures

	1.	2.	3.	4.	5.	6.	7.
1. Average Daily Shame (SSGS-S)	1						
2. Average Daily Negative affect (PANAS-NA)	.67**	1					
3. Average Total drinks	.14	.11	1				
4. Average Solitary drinks	.19	.15	.80**	1			
5. Average Social drinks	.09	.09	.92**	.59**	1		
6. AUDIT	.39**	.32	.58**	.52**	.53**	1	
7. ISS	.49**	.18	.02	.16	-.03	.36**	1

*Note: *$p < .05$, ** $p < .01$, n=70

Table 2

Multilevel model predicting solitary drinking from shame

Parameter	RR/OR	Estimate	*SE*	*df*	*t*	*p*	95% CI	
							UL	LL
Fixed Effects								
Poisson								
Intercept	1.75	0.56	0.19	68	3.01	0.004	0.19	0.93
Within-Person Shame	0.76	-0.27	0.33	68	-0.81	0.42	-0.94	0.40
Between-Person Shame	1.56	0.44	0.30	68	1.49	0.14	-0.15	1.03
Within-Person x Between-Person Shame	2.34	0.85	0.36	68	2.38	0.02	0.14	1.56
Within-Person Negative Affect	1.03	0.03	0.16	68	0.18	0.86	-0.30	0.36
Logistic								
Intercept	9.12	2.21	0.54	68	4.10	0.0001	1.13	3.29
Within-Person Shame	0.60	-0.50	0.73	68	-0.64	0.49	-1.96	0.95
Between-Person Shame	0.45	-0.79	1.09	68	-0.73	0.47	-2.95	1.38
Within-Person x Between-Person Shame	11.58	2.45	1.22	68	2.01	0.048	0.02	4.88
Within-Person Negative Affect	1.34	0.29	0.45	68	0.64	0.52	-0.61	1.20
Random Effects								
Poisson								
Intercept Variance		0.39	0.20	68	1.98	0.05	0.00	0.79
Logistic								
Intercept Variance		10.69	4.21	68	2.54	0.01	2.30	19.08

Note: Within-person variables are time-varying covariates that have been centered around an individual's average, such that they take a value of zero on days when an individual reports their mean-level of shame or negative affect. The between-person variable is the person's average shame across the whole study, centered around the grand mean. At zero, it reflects the effect of shame on drinking for a person whose average level of shame is the same as the sample average.

Table 3

	Parameter	RR/OR	Estimate	*SE*	*df*	*t*	*p*	95% CI	
								UL	LL
Fixed Effects									
Count	Intercept	2.17	0.78	0.14	68	5.62	<.0001	0.50	1.05
	Within-Person Shame	.95	-0.05	0.18	68	-0.27	0.79	-0.42	0.32
	Between-Person Shame	1.14	0.13	0.32	68	0.41	0.68	-0.51	0.77
	Within-Person x Between-Person Shame	1.60	0.47	0.37	68	1.27	0.21	-0.27	1.20
	Within-Person Negative Affect	1.04	.04	0.12	68	0.30	0.77	-0.21	0.28
Binomial	Intercept	1.90	0.64	0.23	68	2.83	0.01	0.19	1.09
	Within-Person Shame	0.62	-0.47	0.45	68	-1.05	0.30	-1.37	0.42
	Between-Person Shame	1.77	0.57	0.58	68	0.98	0.33	-0.59	1.73
	Within-Person x Between-Person Shame	4.11	1.41	0.92	68	1.53	0.13	-0.43	3.26
	Within-Person Negative Affect	1.82	0.60	0.31	68	1.91	0.06	-0.03	1.22
Random Effects									
Count	Intercept Variance		0.46	0.17	68	2.71	0.01	0.12	0.81
Binomial	Intercept Variance		1.69	0.58	68	2.92	0.005	0.53	2.85

Multilevel model predicting social drinking from shame

Table 4

Multilevel model predicting total drinking from shame

	Parameter	RR/OR	Estimate	*SE*	*df*	*t*	*p*	95% CI	
								UL	LL
Fixed Effects									
Count	Intercept	2.35	0.86	0.13	68	6.37	<.0001	0.59	1.12
	Within-Person Shame	1.00	-0.001	0.14	68	-0.01	0.99	-0.28	0.28
	Between-Person Shame	1.15	0.14	0.28	68	0.49	0.63	-0.42	0.69
	Within-Person x Between-Person Shame	1.15	0.14	0.23	68	0.59	0.56	-0.33	0.60
	Within-Person Negative Affect	.96	-.04	0.09	68	-.45	0.65	-0.23	0.14
Binomial	Intercept	1.01	0.01	0.25	68	0.04	0.97	-0.48	0.50
	Within-Person Shame	.72	-0.33	0.42	68	-0.79	0.43	-1.18	0.51
	Between-Person Shame	1.29	0.25	0.57	68	0.44	0.66	-0.89	1.40
	Within-Person x Between-Person Shame	3.91	1.36	0.77	68	1.78	0.08	-0.17	2.90
	Within-Person Negative Affect	1.52	0.42	0.31	68	1.36	0.18	-0.20	1.04
Random Effects									
Count	Intercept Variance		0.64	0.19	68	3.40	0.001	0.26	1.01
Binomial	Intercept Variance		2.20	0.75	68	2.93	0.005	0.70	3.70

Table 5

Models predicting shame from the previous night's solitary, social, and total drinking

Effect	Estimate	SE	df	t	p
Intercept	1.28	0.05	68	24.10	<.0001
Within-Person Last Night Drinks Alone	0.01	0.02	819	0.48	0.63
Between-Person Last Night Drinks Alone	0.06	0.05	68	1.27	0.21
Within-Person x Between-Person Last Night Drinks Alone	-0.01	0.01	819	-1.07	0.28

Effect	Estimate	SE	df	t	p
Intercept	1.28	0.05	68	23.91	<.0001
Within-Person Last Night Drinks Social	0.00	0.01	819	0.25	0.80
Between-Person Last Night Drinks Social	0.04	0.05	68	0.83	0.41
Within-Person x Between-Person Last Night Drinks Social	0.01	0.01	819	1.85	0.06

Effect	Estimate	SE	df	t	p
Intercept	1.28	0.05	68	24.06	<.0001
Within-Person Last Night Drinks Total	0.01	0.01	819	1.21	0.22
Between-Person Last Night Drinks Total	0.03	0.03	68	1.21	0.23
Within-Person x Between-Person Last Night Drinks Total	0.00	0.00	819	0.04	0.97

Figure 1

Average level of shame moderates association between daily variation in shame and probability of drinking alone
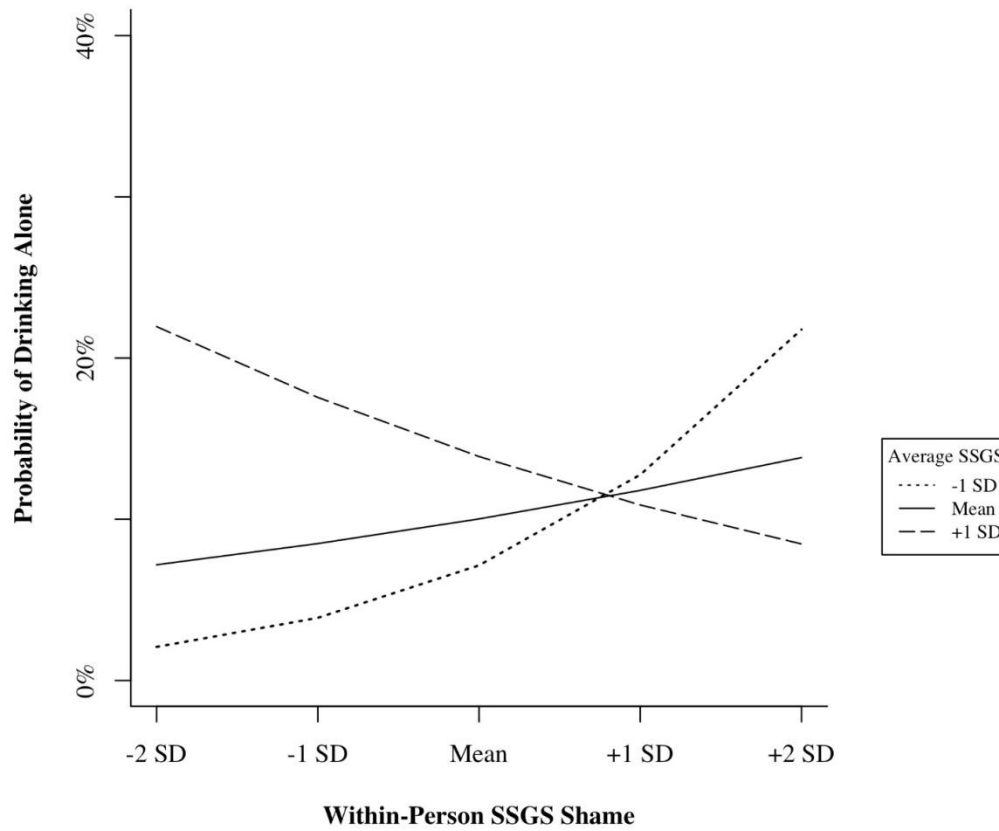
Figure 2

Average level of shame moderates association between daily variation in shame and number of drinks alone
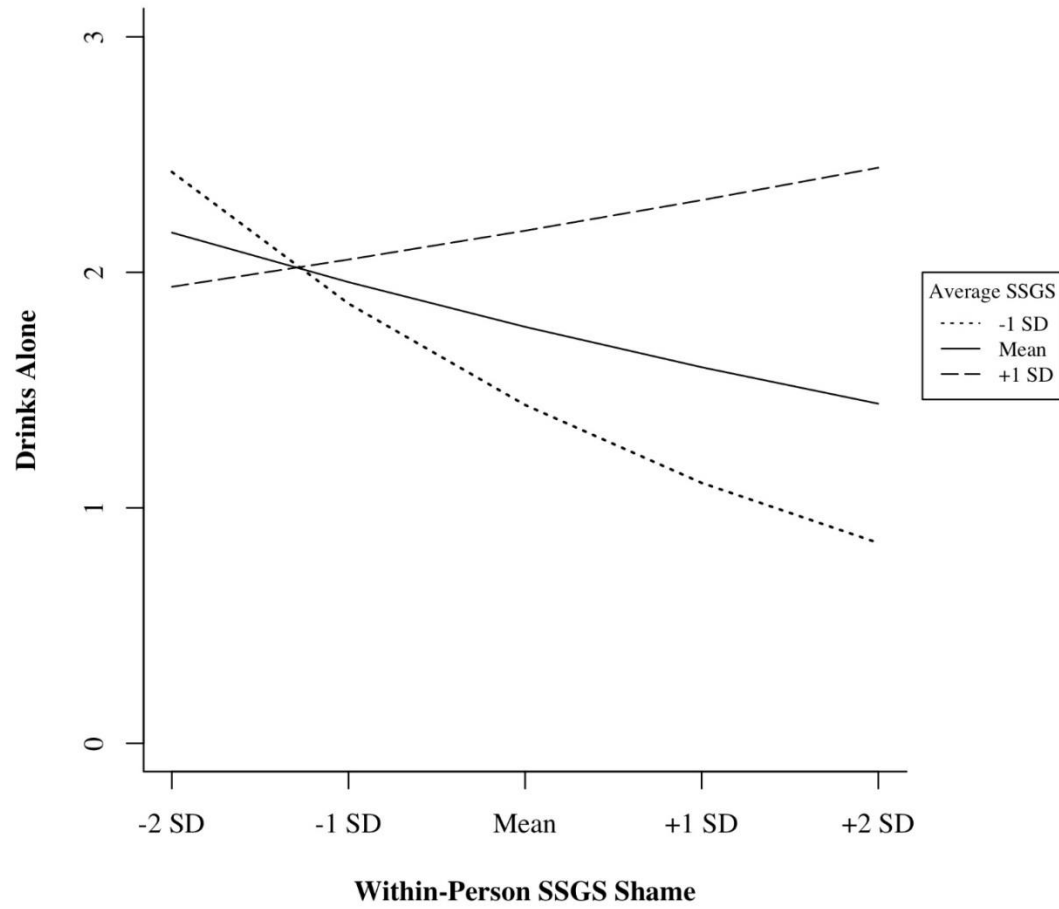
Figure 3

Trend toward average level of drinking moderating association between variation in evening drinking and shame the next day