THESIS

USING ECOLOGICAL MOMENTARY ASSESSMENT (EMA) TO EXPLORE THE ASSOCIATIONS BETWEEN BOREDOM AND ALCOHOL USE IN AT-RISK COLLEGE STUDENT DRINKERS

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ABSTRACT

USING ECOLOGICAL MOMENTARY ASSESSMENT (EMA) TO EXPLORE THE ASSOCIATIONS BETWEEN BOREDOM AND ALCOHOL USE IN AT-RISK COLLEGE STUDENT DRINKERS

Although affective models of alcohol use suggest that people drink as a way of regulating their emotions, previous research on global negative affect (NA) and positive affect (PA) has resulted in findings that vary across the within-person and between-persons levels of analysis. Global NA in particular has failed to be a consistent predictor of drinking behavior in young adults, leading to more recent research showing that discrete forms of NA (i.e., anxiety, anger, sadness) differentially predict the likelihood and quantity of subsequent same-day or next-moment alcohol use. Boredom is one type of discrete NA that has not been extensively researched in relation to alcohol use at the within-persons level. Current theoretical models of boredom conceptualize it as an aversive affective state that occurs in response to a lack of perceived meaningfulness in a given situation, lack of attentional engagement due poor fit between available cognitive resources and cognitive demands in a given situation, or a combination of both kinds of deficits. As such, boredom has two underlying theoretical causes which are believed to operate independently. It also has a variety of theoretical and empirically-supported outcomes, ranging from doing nothing and tolerating it, to seeking out more engaging and/or meaningful activities, to employing a variety of maladaptive behaviors – including substance use – as a means of coping. Past cross-sectional research has demonstrated a positive association between trait boredom (boredom proneness) and alcohol use in young people; however, these studies have not controlled for global NA or PA, have used measures of boredom

proneness that are psychometrically questionable, and have not investigated within-person associations between state boredom and subsequent drinking behaviors on a short time scale.

This secondary analysis of data from a larger Ecological Momentary Assessment (EMA) study was based on momentary assessment data from 160 undergraduate college students who met criteria for at-risk drinking at baseline (based on AUDIT scores ≥ 8). For 14 days, participants were prompted via an application installed on their mobile phones to complete brief assessments four times each day at random intervals approximately 3.5 hours apart, with questions probing current affective states, perceived meaningfulness of the current situation, and alcohol use. Multilevel models were estimated to examine: 1) the within-person main effects of momentary boredom on next-moment likelihood of drinking and quantity of alcohol consumed; 2) between-persons main effects of person-average boredom on proportion of drinking moments and quantity of drinks consumed across the 14-day sampling period; and 3) within- and between-persons interaction effects for sense of meaning predicting the relationship between boredom and alcohol use.

Results indicate that at the within-person level, momentary boredom had a slight but significant inverse relationship with likelihood of drinking at the next moment and no effect of quantity of drinks consumed at the next moment. At the between-persons level, average boredom had no effect on proportion of drinking moments or on quantity of drinks consumed across the 14-day sampling period. Interaction effects were found only at the between-persons level, such that for participants who had a lower-than-average sense of meaning, there was a significant, positive association between average boredom and both proportion of drinking moments and quantity of drinks consumed over the sampling period. Findings suggest that chronic lack of meaning is a risk factor for drinking in response to boredom.

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INTRODUCTION

Although alcohol use by young adults in the U.S. has declined in recent years, excessive alcohol consumption remains prevalent and problematic (Substance Abuse and Mental Health Services Administration [SAMHSA], 2020). In 2019, approximately 38.4% of young adults aged 18 to 25 reported past-month binge drinking (defined as 5 or more drinks per single occasion for males/4 or more drinks per occasion for females), 10.1% reported current heavy alcohol use (defined as binge drinking on 5 or more days in the past month), and 10.7% met criteria for an alcohol use disorder in the past year (AUD; SAMHSA, 2020). In college students, binge drinking is associated with a variety of undesirable consequences including poor academic performance, unplanned and/or unprotected sex, physical and sexual assaults, accidental injuries, and alcohol overdoses (Bolin et al., 2017; White & Hingston, 2013). Furthermore, habitual heavy alcohol consumption and binge drinking are risk factors for developing an Alcohol Use Disorder (AUD; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2015). Understanding the factors that lead to and maintain young adults' alcohol use is a necessary first step to developing more targeted and effective preventions and interventions.

Negative and Positive Affect as Predictors of Alcohol Use

Affect is the center of many current theoretical models of alcohol use (Kassel & Veilleux, 2010). According to affect regulation models of alcohol use, the ability of alcohol to modulate a person's affective state makes it a powerful reinforcer (Baker et al., 2004; Cooper et al., 1995; Koob & Le Moal, 2001, 2008; Sher & Grekin, 2007). Negative reinforcement models like the self-medication hypothesis (Khantzian, 1997; Sher & Grekin, 2007), stress response dampening (Sher & Levenson, 1982), and tension reduction model (Cappell & Greeley, 1987; Conger, 1956;

Greely & Oei, 1999) suggest that people drink to reduce or avoid the experience of negative affect (NA) and are reinforced as the acute physiological effects of alcohol intoxication are perceived to reduce or alleviate stress, anxiety, and other forms of NA. Positive reinforcement models posit that people drink as a way of boosting positive affect, such as through enhancing enjoyable experiences or facilitating social interactions (PA; Cooper et al., 1992; Dvorak et al., 2018). Over time, consistent reinforcement acts as a pathway by which people develop a learned association between drinking and affective outcomes, which can result in increasing alcohol use and associated negative consequences (Koob & Volkow, 2010).

Empirical evidence has not fully borne out these theoretical predictions for the role of NA in shaping alcohol use behaviors. Results across studies have been inconsistent based on a number of factors, including level of analysis (between-persons versus within-person), characteristics of participants (age, clinical versus non-clinical samples), drinking outcomes (likelihood/frequency of drinking versus quantity consumed), and time scale considered (long-term or "trait" level, versus weekly, daily, or momentary).

At the between-persons level, past studies have shown that for people with clinically-significant levels of NA, there is a positive association between NA and alcohol use (Appleton et al., 2018; Briere et al., 2014; Stevenson et al., 2020). A recent meta-analysis of mostly cross-sectional studies also suggests that people endorsing higher levels of drinking-to-cope with NA also reported drinking more frequently and greater levels of consumption (Bresin & Mekawi, 2021). Yet, many studies have found no significant relationship between overall trait-level NA and alcohol consumption in young adults (Dermody et al., 2013; Hussong et al., 2001; McCreary & Sadava, 2000) or have found an inverse relationship (Dvorak et al., 2014; Patrick et al., 2015; Simons et al., 2010; Treloar et al., 2015).

In non-clinical populations, the evidence for a within-person relationship between NA and alcohol use is similarly inconsistent. Although some studies have found modest within-person associations between NA and alcohol use (Armeli et al., 2008; Hussong, 2007; Simons et al., 2005), two recent meta-analyses (Dora et al., 2023; Tovmasyan et al., 2022) found no significant association between NA and the likelihood of same-day drinking. The few experience sampling studies that have examined within-person relationships between NA and drinking at the momentary level have also either found no effect for momentary NA on next-moment drinking (O'Donnell et al., 2019; Sayed et al., 2021) or found a negative association with quantity of drinks consumed and no effect on likelihood (Duif et al., 2020). Overall, the evidence suggests that negative reinforcement may not be a particularly relevant mechanism for alcohol use in young adults, although to the extent it does occur, it has been shown to be related to greater negative consequences from drinking (Blevins et al., 2016; Kuntsche et al., 2005; Simons et al., 2014) rather than likelihood or quantity.

When it comes to positive reinforcement models, evidence seems to differ depending upon whether the analysis is at the within-person or between-persons level. Overall, between-persons studies suggest an inverse relationship between trait PA and alcohol use such that high trait PA is associated with lower levels of alcohol consumption (Hussong et al., 2001; Simons et al., 2014), and low trait PA is associated with higher levels of alcohol consumption (Colder & Chassin, 1997; Simons et al., 2014; Wills et al., 1999).

When it comes to between-persons PA, existing evidence suggests a mostly inverse relationship between trait PA and alcohol use (Colder & Chassin, 1997; Hussong et al., 2001; Simons et al., 2014; Wills et al., 1999). Within-person studies, however, have consistently found that elevated PA is positively associated with subsequent/same-day drinking (Armeli et al., 2008;

Colder et al., 2010; De Leon et al., 2020; Dora et al., 2023; Duif et al., 2020; Dvorak et al., 2018; Emery & Simons, 2020; Howard et al., 2015; Hussong et al., 2001; Mohr et al., 2005; Patrick et al., 2015; Simons et al., 2010, 2014; Stevenson et al., 2021; Tovmasyan et al., 2022). The same positive association has been found at the momentary level, with momentary PA predicting likelihood of drinking at the next moment (Duif et al., 2020; Emery et al., 2023; Sayed et al., 2021) but having no effect on quantity consumed at the next moment (Duif et al., 2020). Thus, the picture that emerges from existing research is that within-person PA is a risk factor for more frequent drinking, but between-persons PA has an overall protective effect on alcohol use.

Boredom as a Potentially Unique Affective Predictor of Alcohol Use

Previous research suggests that at the episode level, certain discrete negative emotions may be better predictors of alcohol use than global NA (Emery et al., 2023). For instance, anxiety but not anger or sadness has been shown to predict alcohol use (Armeli et al., 2008; Hussong et al., 2005). Given the body of cross-sectional research that links trait boredom with various alcohol outcome measures (to be summarized below), there is reason to believe that boredom may be a discrete emotion with unique links to alcohol use, above and beyond its conceptualization as a type of NA.

The existing literature summarized above has not specifically considered boredom when examining how NA or PA predicts drinking behavior. The majority of recent within-person studies have used NA measures that don't include boredom (e.g., Courtney & Russell, 2021; Emery & Simons, 2020; Russell et al., 2020; Waddell et al., 2021). A few studies have included an item for boredom as part of their NA measure but have then collapsed it into a single, global NA score along with items for other emotions such as sadness, anger, etc. (e.g., Jones et al.,

2021; Simons et al., 2005). This approach would obscure any unique predictive role that boredom might play.

Definitions of Boredom

Boredom has been defined in various ways throughout the history of both philosophy and psychology (see Fahlman et al., 2009; Westgate & Steidle, 2020). One definition that is widely cited throughout recent psychological literature states that boredom is "the aversive experience of wanting, but not being able, to engage in satisfying activity" (Eastwood et al., 2012, p. 482). Although boredom has been found to have moderate positive correlations with anhedonia (r = 0.38, $p < .001$) and apathy ($r = 0.24$, $p < .001$), it's been shown to be a statistically distinct construct (Goldberg et al., 2011). Conceptually, boredom is characterized by a motivation or a desire to be engaged, whereas apathy is characterized by a lack of such motivation, and anhedonia is characterized by an inability to experience pleasure, regardless of engagement or motivation (Danckert & Eastwood, 2020). Boredom also frequently includes feelings of restlessness and the perception that time is passing slowly (Bench & Lench, 2013). Boredom appears to be a universal affective experience that is found across cultures (Sundberg et al., 1991), albeit with some cross-cultural variations in self-reported frequency and subjective experiential characteristics (Ng et al., 2015; Sundberg et al., 1991; Westgate & Steidle, 2020).

Boredom as a Specific Form of NA

According to Russell's (1980) Circumplex Model of Emotion, which categorizes different affective states along the two dimensions of valence (pleasant vs. unpleasant) and arousal (high arousal vs. low arousal), boredom is a low-arousal, negative-valence emotion. Although the low-arousal characterization has been disputed and current evidence suggests that boredom can manifest in either low- or high-arousal ways (Dankert et al., 2018; Fahlman et al.,

2013; van Hooft & van Hooff, 2018), the negative-valence aspect of boredom seems to be universally acknowledged (see Vogel-Walcutt et al., 2012 for a review of the various definitions of boredom and how they relate to the two dimensions of the Circumplex Model). Thus, as a specific type of negative emotion, boredom would be expected to follow the same pattern as NA in general when it comes to predicting alcohol use. That is, boredom would be expected to be associated with drinking through a negative reinforcement process and would be expected to predict negative consequences but not increased frequency of use. However, current models of boredom (to be outlined below) suggest that boredom may have unique characteristics that would promote alcohol use via other mechanisms, and boredom might be a particularly relevant factor for young adults' drinking.

Developmental Aspects of Boredom Relevant to Young Adults

Affect may be a particularly salient factor for drinking in young adults. Past research has shown that young people are prone to experiencing intense emotions (Arnett, 1999; Larson et al., 2002) and that affect often drives adolescents' and young adults' drinking (Cooper et al., 2015; Kuntsche & Müller, 2012; Kuntsche et al., 2006). Boredom in particular seems relevant to young adults. One study found that adolescents reported feeling bored approximately one quarter of the time (Larson & Richards, 1991). Recent results from the Monitoring the Future survey that draws on a large, nationally representative sample of U.S. 8^{th} and 10^{th} graders found that about 20% of participants reported experiencing high levels of boredom (Weybright et al., 2020). There's also some suggestion that young people in the U.S. are experiencing increasing levels of boredom in recent years, with self-reported boredom showing a slight but statistically significant increase from 2010 through 2017 (Weybright et al., 2020). Although equivalent statistics for college students are not readily available, Chin et al. (2017) found a trend of boredom decreasing

by age such that they predicted that a 25-year-old would have boredom levels approximately 4 times as high as that of a 45-year-old.

State vs. Trait Boredom

Boredom has been conceptualized as both a transitory state induced by internal and/or external circumstances (Eastwood et al., 2012) and as a more stable personality trait, often referred to as boredom proneness, which varies from person-to-person (Eastwood et al., 2012; Farmer & Sundberg, 1986). Although studying boredom from a trait perspective has the advantage of being readily utilized in cross-sectional designs that correlate individual differences in boredom with individual differences any number of specific outcome variables, there's been increasing awareness in recent years that trait boredom proneness suffers from a variety of construct validity issues (Mercer-Lynn, et al., 2013; Tam et al., 2021; Westgate & Steidle, 2020). Conceptually, trait boredom proneness should predict the frequency and/or intensity of the experience of state boredom. However, measures of trait boredom are only weakly predictive of state boredom. For example, Chin and colleague's (2017) experience sampling study of boredom found that approximately 80% of the variance in momentary (state) boredom was due to situational factors rather than stable individual differences (traits). Furthermore, two commonly used measures of trait boredom, the Boredom Susceptibility Scale (ZBS; Zuckerman et al., 1978) and the Boredom Proneness Scale (BPS; Farmer & Sundberg, 1986) appear to be tapping into divergent constructs (Mercer-Lynn et al., 2011, 2013). Higher scores on the BPS correlate with higher levels of depression, dysphoria, experiential avoidance, and neuroticism; higher scores on the ZBS correlate with higher levels of impulsivity and reward sensitivity and lower levels of neuroticism and experiential avoidance (Mercer-Lynn et al., 2013). The two measures do not correlate strongly with one another (r = .25; Farmer & Sundberg, 1986), and there has been some

suggestion that trait boredom proneness is a multidimensional construct that each of these measures is tapping into to various degrees (Mercer-Lynn et al., 2013). Finally, boredom proneness has been criticized for its lack of face validity, as it appears to be used in an indiscriminate fashion to discuss three related but distinct constructs – frequency of boredom, intensity of boredom, and a global appraisal as one's life as boring (Tam et al., 2021).

Even without these conceptual issues, though, there are a couple of reasons why state boredom is a more appropriate focus of study than trait boredom within the context of substance use research. First, the experience of boredom is not limited to those high in boredom proneness. In a 10-day experience sampling study with a large (N = 3,867) and diverse sample of U.S. adults, 63% of participants reported feeling bored at least once; boredom was the seventh most commonly reported emotion of the seventeen emotions examined; and boredom was more frequently reported than most all other negative emotions except for exhaustion, frustration, and indifference (Chin et al., 2017). Furthermore, the experience of boredom can also be strongly influenced by or even experimentally induced by situational factors such as having to perform monotonous tasks (Markey et al., 2014), having to wait for extended periods of time (Matthies et al.qz, 2012), being under- or over-challenged (Fahlman et al., 2009, 2013; Struk et al., 2015; van Tilburg & Igou, 2012; Westgate & Wilson, 2018), or perceived lack of control over one's environment and options (Struk et al., 2020). As a common human experience that appears to be influenced by a variety of fluctuating internal and external factors, state boredom may well influence drinking behavior regardless of any dispositional tendency towards boredom proneness.

Second, to test the applicability of boredom to existing affect regulation models of substance use requires that boredom be treated as a fluctuating affective state, not as a stable

dispositional tendency. These etiological models posit that momentary fluctuations in affect (along with motivations to change current affect) are among the most proximate predictors of drinking behaviors (Cox & Klinger, 1988) and are what eventually become cues for alcohol craving and alcohol use once the alcohol-affect association has been established (Colder et al., 2010). Therefore, demonstrating that boredom is an antecedent to drinking requires that both boredom and drinking be examined at the momentary, within-person level.

Current Models of Boredom

Over the past two decades, psychological models of boredom have taken two primary directions in explaining how the experience of boredom originates. Attentional models assert that boredom stems from an inability to engage attention with internal or external stimuli, resulting in a sense of dissatisfaction with all available options for behavior (Danckert & Merrifield, 2018; Eastwood et al., 2012; Hunter & Eastwood, 2018; Merrifield & Danckert, 2014). Meaning models, by contrast, are steeped in an existential perspective and posit that boredom is rooted in perceiving one's current activity as meaningless (Fahlman et al., 2009; Moynihan et al., 2021; van Tilburg & Igou, 2012, 2017). Westgate's Meaning & Attentional Components (MAC) Model synthesizes these two perspectives and argues that either a sense of meaninglessness or a lack of attentional engagement is sufficient to evoke the experience of boredom (Westgate & Wilson, 2018). Indeed, Westgate's research team has demonstrated through both experimental manipulation and through meta-analysis of past studies that deficits in attention and deficits in perceived meaningfulness independently predict boredom without being highly correlated with one another and without having any interaction with one another (Westgate & Wilson, 2018).

Westgate's model is explicitly rooted in a functional, constructionist perspective of emotion (e.g., a perspective endorsed by Barrett, 2006; Clore & Ortony, 2013). It assumes that

boredom, like other affective states, is an adaptive signal that emerges as an individual observes their internal physiological cues and their external situation and then constructs an understanding of their situation that is subjectively experienced as a specific affective state. Westgate likens boredom to a "dashboard light" that warns a person when they are veering off course from engaged, meaningful behaviors that are important for their wellbeing or survival. Boredom's function is two-fold: 1) to motivate people to pursue enjoyable, interesting, and/or meaningful activities; and 2) to act as a reinforcement system that rewards behavior that is valuable or important to a person's well-being (Westgate & Steidle, 2020). "Boredom tells us whether our current activity (internal or external) is something we are able to focus on and want to be engaged in (Westgate & Wilson, 2018, p. 690). The attentional component addresses the "able to focus on"; the meaning component addresses the "want to be engaged in."

The MAC model suggests that qualitatively different experiences of boredom arise from the presence or absence of these two factors (Westgate & Wilson, 2018). *Attentional boredom*, which is characterized by low arousal and mind-wandering, is due to a mismatch between a person's current attentional resources and the attentional demands of their present activity. This mismatch can take one of two forms: 1) understimulation, which occurs when a person's resources exceed the demands of their current activity, such as when performing a monotonous task or when an exceptionally bright student is underchallenged in class; or 2) overstimulation, which occurs when the cognitive demands of the activity exceed a person's current resources, such as when a person is too tired to focus on a dense reading or when background noises distract the person from engaging with an otherwise interesting lecture. In this respect, the MAC Model integrates past findings that boredom can be triggered by activities that are too easy or too hard – both situations make it hard to engage & sustain attention (Csikszentmihalyi, 2000;

Danckert & Merrifield, 2016; Eastwood et al., 2012). *Meaningless boredom*, by contrast, is characterized by feelings of disengagement, dysphoria, agitation, and a sense of time passing slowly. As such, it appears to be a higher arousal experience than attentional boredom. It occurs when a person perceives that their current activity is not congruent with their valued goals, at least in an immediate and accessible sense. This last caveat is important because while a person may have many valued goals, their appraisal of meaningfulness will tend to be based on goals that are more concrete and immediately obtainable rather than those that are more abstract and long-term. Finally, it is possible for both forms of boredom to co-exist, in which case, the model predicts that the deficit in meaningfulness will seem to take precedence in shaping the overall experience of boredom (Westgate & Wilson, 2018).

Given these hypothesized causes of boredom, the MAC model prescribes three primary ways in which boredom might be alleviated (Westgate & Wilson, 2018). For attentional boredom, the most obvious solution is to regulate the cognitive demands of the task or the cognitive resources of the individual in a way that brings the two into better alignment. In the case of understimulation, this might consist of making the current activity more complex or adding additional stimulation to the environment. For overstimulation, it might entail boosting cognitive resources through sleep or stimulants, simplifying a complex task by breaking it into more manageable steps, or reducing background distractions. For meaningless boredom, there are two options – reappraisal of the value of the activity at hand or switching to a different activity that the individual deems more meaningful. Since it is difficult, if not impossible, in most situations to assign greater meaning or value to an activity that feels inherently meaningless, switching activities is a far more readily available solution for meaningless boredom. However, this option assumes that the individual has the autonomy to switch their

activity in the moment, which may not be the case if they're in class, at work, or otherwise bound by external constraints. It also assumes that the individual has a clear sense of life meaning, which may not be true for those who are young and still exploring their identity and values or for those who are detached from a sense of meaning, as those experiencing depression may be. Assuming that a person *is* free to switch activities in the face of meaningless boredom (or mixed attentional and meaningless boredom), then the MAC model suggests that they will decide between an *enjoyable* activity or an *interesting* activity. Ideally, the person's current level of attentional resources will guide their decision. If they have low attentional resources, they will tend to opt for enjoyable; if they have higher attentional resources at their disposal, they will tend to opt for interesting. As defined by the model, enjoyable activities are those that are familiar, require little effort, and have proven in the past to be rewarding. Interesting activities, by contrast, require effortful cognitive engagement and typically have a high degree of novelty.

Although Westgate and her team offer empirical support for the basic tenets of the MAC model – the independent contributions of attention and meaning and the differential effects of each factor on the subjective experience of boredom (Westgate & Wilson, 2018), there hasn't yet been any published research on the MAC model's theoretical strategies for alleviating boredom. Although these strategies make logical sense in the context of the overall model, it seems like a stretch to suppose that most people have an awareness of the specific cause of their boredom, let alone an understanding of which strategy might be best suited for alleviating their particular kind of boredom in a given situation. Nevertheless, the three strategies presented do provide a good overview of the ways in which people could conceivably go about addressing boredom, even if it is in an intuitive or hit-or-miss fashion.

The MAC Model & Drinking in Young Adults

Based on the MAC model's theoretical causes of and antidotes to boredom, there are several reasons why young adults might choose drinking alcohol as a solution to boredom. To the extent that the experience of boredom is rooted in an inability to engage attention in a satisfying activity, the shift in attentional control that comes with alcohol intoxication could potentially break a person out of their cognitive impasse and allow them to find a sense of attentional engagement in the immediate moment. Alcohol myopia theory posits that acute alcohol intoxication constricts a person's attention to only the most salient aspects of present-moment experience, with what qualifies as "most salient" largely being determined by contextual factors (Steele & Josephs, 1990). The attentional narrowing that comes with moderate alcohol intoxication has been shown to be associated with enhanced creative problem-solving and divergent thinking (Jarosz et al., 2012). Furthermore, the biphasic effects of alcohol consumption offer a ready solution to both understimulation and overstimulation. Initially, alcohol has a stimulant-like effect that appears to temporarily boost a person's attentional resources and allow them to engage more fully. On the downside of the curve, after peak blood alcohol concentration (BAC) has been reached, alcohol's effects are sedating, which decreases attentional resources. Either way, alcohol would provide a reliable way of modulating cognitive resources to bring them into better alignment with the demands of a task that is under or over challenging.

The MAC model's proposition that subjective sense of value and meaning is guided by immediacy rather than overarching importance suggests another way in which alcohol consumption might be an appealing solution to boredom, particularly for young adults. Westgate (2019) points out that young people may have a general sense of meaning or coherence, but some of the underpinnings of a sense of life meaning such as understanding one's own values and having larger life goals may not have emerged yet. In the face of meaningless boredom,

college students may not have a cohesive sense of which alternative activities might be more meaningful. Even if they do have a more solidly established schema of what is most meaningful to them, the immediacy of certain short-term valued goals, such as bonding with peers or having a full "college experience" as it's been portrayed in the wider culture, may trump more abstract and long-term valued goals, such as succeeding academically or developing healthy habits that support well-being. For this reason, participating in social drinking may well be an activity that is deemed meaningful in a moment of boredom.

Finally, drinking could potentially fulfill either the enjoyable or the interesting aspect of switching activities, depending on a young adult's level of experience with alcohol use. For inexperienced drinkers, there is a level of novelty (even if the cognitively effortful aspect is absent) that would make the experience of drinking alcohol seem "interesting" in the way described by Westgate's model. For those with more experience with alcohol, drinking would certainly meet the definition of an "enjoyable" activity – familiar, low-effort, and reliably pleasurable.

Should a young person discover that drinking provides a go-to solution for dealing with boredom, it could become a vicious cycle that perpetuates their boredom and their alcohol use over the long term. Westgate (2019) suggests that boredom may represent a "feedback system" through which young people develop a sense of individual meaning & purpose by engaging in different activities and then judging their meaning based on the resulting feelings of engagement or boredom. Repeated experiences of boredom leading to drinking and drinking alleviating boredom (momentarily) could then lead to the functionality of boredom getting hijacked by alcohol use via a negative reinforcement process. Instead of redirecting a person to activities that

help them develop new interests and sources of meaning, which would lead to decreased boredom over time, boredom becomes a cue for substance use.

Why Boredom May Predict Alcohol Use Differently than Global NA

Even though boredom seems to fall squarely into the category of NA, its associations with attentional processes and life meaning could make it operate differently from other discrete negative emotions or from overall global NA when it comes to predicting drinking behavior. Furthermore, aside from the specific ways of alleviating boredom outlined by the MAC model, boredom seems to be unique among emotions in that it motivates people to want to change their current experience without specifying what kind of change is needed. This need for change can be so powerful that it prompts people to act in ways that are uncharacteristic of their usual, non-bored behavior. For instance, boredom has been shown experimentally to increase risk-taking and reduce self-control (Kilic et al., 2020). Studies of experimentally induced boredom have shown that people will repeatedly self-administer painful electrical shocks in an attempt to alleviate monotony (Havermans et al., 2015; Nederkoorn et al., 2016). Bench and Lench (2019) call boredom "a seeking state" – the object of which appears to be to seek novelty and stimuli that will change the current affective state, even if that change is to a more negatively-valanced state than the one that elicited the boredom. Since drinking alcohol is an exceptionally effective means of changing one's affect quickly (Gorka et al., 2017), it follows that boredom could represent a unique affective motive for alcohol use, distinct from a more specific desire to reduce NA or boost PA.

Clearly, all of the solutions to boredom discussed here represent a negative reinforcement process insofar as they are aimed at reducing or eliminating the aversive experience of boredom. However, they can also be viewed as positive reinforcement processes, since boosting attentional

engagement, increasing sense of meaning momentarily, and participating in more interesting or enjoyable activities are all inherently rewarding. It may therefore be that drinking in the face of boredom represents a boundary case in which positive and negative reinforcement processes occur simultaneously.

Boredom as a Predictor of Alcohol Use: Evidence from Past Research

Although boredom has not been specifically examined as a predictor of alcohol use to the extent that PA and NA have, there are several lines of evidence suggesting that it may be a relevant contributor to drinking behavior, particularly in young adults. First, cross-sectional research has shown trait boredom proneness to be positively correlated with a variety of hedonic and maladaptive behaviors including problem gambling (Blaszczynski, et al., 1990; Mercer & Eastwood, 2010); risky sexual behavior (Chaney & Chang, 2005; Miller et al., 2014); emotional eating or overeating (Crockett et al., 2015; Ferrell et al., 2020; Koball et al., 2012; Moynihan et al., 2015); financial risk-taking (Miao et al., 2020); and excessive or problematic internet or mobile phone use (Elhai et al., 2018; Lin et al., 2009; Yang et al., 2020). Several cross-sectional studies have also demonstrated a positive association between trait boredom and substance use. For example, studies with adult samples have found positive associations between trait boredom proneness and alcohol use frequency (LePera, 2011) and between trait boredom proneness and risky/problematic alcohol use (Krotava & Todman, 2014). Studies with adolescents have found significant positive associations between boredom proneness and recent binge-drinking, frequent binge-drinking, and consumption of hard alcohol rather than beer or wine (Biolcati et al., 2016, 2018).

A second potential argument for boredom as a driver of substance use is that boredom is often mentioned as a motivating factor when people are asked to self-report their reasons for

engaging in substance use. People in recovery from substance use disorders frequently point to boredom as a trigger for relapse (e.g., Corvinelli, 2007; Laudet et al., 2004; Levy, 2008). This in and of itself may not be suggestive of a general relationship between boredom and drinking behavior, since addiction is well-known to alter the brain's reward pathways in ways that likely make boredom more pronounced for those in recovery (Koob & Le Moal, 2008; Volkow & Morales, 2015). However, several studies have shown that those in non-clinical populations also cite boredom as a motive for their substance use. In a United Kingdom study of young peoples' self-reported reasons for using substances, Boys and colleagues (2001) found that 61% of drinkers reported that they had used alcohol to alleviate boredom during the past year. Similarly, a qualitative study found that nearly half of the young Glasgow teenagers who reported regular substance use mentioned boredom as a motivating factor (McIntosh et al., 2005). In a large national U.S. study, 24% of 18-year-olds reported drinking because of boredom (Patrick et al., 2017). Biolcati & Passini (2019) found that endorsement of a boredom-coping motive (distinct from anxiety-coping and depression-coping) was moderately correlated with frequency of alcohol use ($r = .20$, $p < 0.001$) in a sample of Italian adults. In the U.S., results from the national Monitoring the Future study from 2005 to 2014 showed that boredom as a self-reported reason for drinking was positively associated with high-intensity drinking (i.e., 10 or more drinks on a single occasion), and that this association increased significantly from age 18 to age 21 (Patrick et al., 2017). Given that this body of research is based on retrospective self-report, which is subject to recall biases (Fredrickson, 2000; Fredrickson & Kahenman, 1993; Robinson & Clore, 2002; Thomas & Diener, 1990), this line of evidence says little about whether boredom actually precipitates substance use. However, clearly some people perceive it as a relevant explanation for why they drink, and therefore it deserves further investigation.

Finally, there is evidence from a single study suggesting that boredom predicts substance use at the within-person level as well as at the between-person level. In a longitudinal study of high-school students in Cape Town, South Africa, Weybright and colleagues (2015) found that at the between-person level, those higher in trait boredom tended to engage in more substance use (as indicated by an index measure they computed based on frequency & recency of use, calculated for alcohol, tobacco, stimulants, cannabis, and inhalants). At the within-person level, they found that at the biannual assessment timepoints when participants' leisure boredom was higher or lower as compared to their baseline, they were more likely to report engaging in increased substance use. Furthermore, the researchers found that the within-person effect of state boredom predicting greater use was moderated by trait boredom such that participants higher in trait boredom were more affected by the fluctuations in state boredom across timepoints. A major limitation of this study is that it did not examine boredom and substance use at the momentary level. Data was collected at six-month intervals for a period of two to three years. Self-reported state boredom at those time points was correlated with participants' contemporaneous reports of substance use, but there is no indication that the experience of boredom directly preceded or was related to the substance use at the event-level. Furthermore, the survey items used to measure state boredom were asking participants to engage in retrospective self-report, which is known to be prone to biases (Fredrickson, 2000; Fredrickson & Kahenman, 1993; Robinson & Clore, 2002; Thomas & Diener, 1990).

Although the past research discussed above suggests that a positive association exists between the experience of boredom and alcohol use, it is hindered by a number of methodological limitations that prevent a definitive relationship from being observed. The use of

a methodology like Ecological Momentary Assessment would bypass these issues and allow for a more direct and rigorous examination of whether state boredom predicts alcohol use.

Ecological Momentary Assessment (EMA)

Ecological momentary assessment (EMA) is an increasingly common methodology for studying substance use behavior. EMA is an intensive longitudinal method that delivers brief assessments to participants multiple times per day at regular times or random intervals for a period of several days via a smart phone app or mobile device. EMA methodology offers a number of advantages compared to traditional cross-sectional methods of studying substance use and emotion (Shiffman et al., 2008; Wray et al., 2014). First, because multiple observations are collected for each individual participant across different contexts and timepoints, it allows for examination of within-person level associations between variables. At this level of analysis, each individual serves as their own control, allowing researchers to easily discern which factors are related to momentary deviations from that individual's average behavior or mood. In the context of the proposed study, this means that individual differences between participants (such as trait boredom-proneness or a proclivity to drink frequently or heavily) can be disentangled from within-person factors (such as unusually high or low levels of state boredom or alcohol consumption on a given day).

Second, EMA allows for greater granularity in examining dynamic processes at the momentary or day level. This is important because affective states are influenced by a variety of internal and external contextual factors that can fluctuate dramatically across short periods of time (Shiffman et al., 2008). Similarly, drinking is an episodic behavior that is heavily influenced by a person's internal state and contextual cues in the moments or hours leading up to consumption (Shiffman et al., 2008). According to affective models of alcohol use, affect is one

of the most proximal predictors of consumption (Cooper et al., 1992; Cox & Klinger, 1988). Discerning this hypothesized temporal proximity requires observation over very brief periods of time – a matter of hours rather than days, weeks, or months.

Third, EMA methodology results in greater ecological validity compared to experimentally induced methods, as it captures events as they occur within the context of participants' everyday lives. Not only does this result in a more accurate picture of how affective states and alcohol consumption play out in the real world as opposed to artificial laboratory settings, but in the case of college-aged participants, it also provides a more ethical option than supplying alcohol to those who are underaged (Wray et al., 2014).

Fourth, because it is essentially a longitudinal study on a very brief time scale, an EMA study allows researchers to examine the antecedents and consequences of affective states and substance use behaviors. While it cannot show causation because it's not an experimental method, EMA can establish temporal precedence and show whether or not boredom precedes drinking (Piasecki, 2019).

Finally, and importantly given the limitations of past studies in this area, collecting observations at multiple time points throughout a single day avoids the types of recall biases that are inherent in retrospective self-report methods like timeline follow-back or even daily diary methods (Shiffman et al., 2008). People's memories of past emotional states are generally poor and rely on heuristics and systematic biases that can call into question the validity of affective variables when they are measured after the fact. For example, negative emotional experiences tend to be recalled more readily, while the frequency of positive emotions tends to be underestimated (Thomas & Diener, 1990). Young adults seem especially susceptible to this type of negativity bias (Ready et al., 2007). There is also a mood-congruent recall bias in which

people are more likely to recall affective experiences that are consistent with their current mood at the time of reporting (Bower, 1981; Snyder & White, 1982). Peak and end effects can occur in which people's recollections of past emotions are skewed towards the most intense and most recent experiences (Fredrickson, 2000; Fredrickson & Kahenman, 1993). If an especially long period of time has passed since the emotional experience being reported on and people are unable to access specific episodic memories to cue recall, they are likely to instead rely on semantic memory to tap into either situation-specific beliefs (e.g., afternoons at work are always boring) or identity-related beliefs (e.g., I get bored a lot; Robinson & Clore, 2002). By using EMA random assessments to have participants report on their feelings and behaviors in the current moment or immediate past (e.g., within the last 30 minutes), these types of recall biases can be avoided.

Despite concerns some have raised about compliance and the validity of self-reported substance use, EMA has been shown to be a sound methodology for studying substance use. In a meta-analysis of 126 studies, Jones and colleagues (2019) found a compliance rate of 75%. Other studies have shown that participants remain compliant with random prompts even at relatively high levels of intoxication (Carpenter et al., 2017; Trela et al., 2016). Simons and colleagues (2015) showed that self-reported alcohol consumption the previous night assessed via EMA morning reports could be verified by transdermal alcohol monitoring for approximately 86% of the drinking days – a level equivalent to that of the widely used 1-week timeline follow-back method.

Past EMA Studies on Boredom

There have been a few EMA studies on the general characteristics and correlates of boredom (e.g., Chan et al., 2018; Chin et al., 2017; Goetz et al., 2014) and a handful of EMA

studies on student boredom in a classroom setting (e.g., Goetz et al., 2020; Nett et al., 2011). However, to date, there have been no published studies using EMA that have specifically focused on boredom as a predictor of substance use.

One EMA study of note was conducted by Kuerbis and colleagues (2018), which examined age as moderator for the effect of numerous factors (e.g., mood, loneliness, boredom, stress, poor sleep, social factors, alcohol salience, commitment to not drink heavily) on daily drinking behavior in current problem drinkers wishing to reduce their consumption. Although boredom was not the focus of this study, results showed an age by boredom interaction effect such that higher levels of daily boredom were associated with consumption of more drinks in older adults (age 50 and older) but not in younger adults (age 49 and younger). College age young adults were not well-represented in this study (the "younger adults" group had a mean age of 35.8, *SD* = 7.9, and more than 70% of participants had already completed a bachelor's degree or higher). The sample was also entirely composed of those meeting screening criteria for an AUD, as this was a baseline study prior to enrollment in a randomized controlled trial. Therefore, it is impossible to tease apart boredom as a predictor of drinking and boredom as a consequence of participants' AUD. Finally, in this study, assessments were only made twice each day, limiting the granularity of observations at the momentary level.

Meaning as a Potential Moderator

Given that a deficit in perceived meaning is one of the theoretical underpinnings of boredom (Fahlman et al., 2009; Moynihan et al., 2021; Westgate & Wilson, 2018) and significant associations have been found between sense of meaning and experiences of state boredom (Chan et al., 2018; Li & Jia, 2022), it is plausible that sense of meaning could moderate the relationship between boredom and alcohol use.

Sense of meaning (sometimes referred to in the literature as Meaning in Life; e.g., Ryan & Deci, 2001; Steger et al., 2006) is a broad and complex construct that has been defined and measured in various ways (King & Hicks, 2021). Contemporary definitions of trait meaning (George & Park, 2016; Martela & Steger, 2016) focus on three underlying dimensions: coherence (the cognitive understanding of how one's life fits in with the larger external world in a sensical way), purpose (a sense of one's activities being directed towards personally-meaningful goals), and significance (a more global assessment that one's life matters and has intrinsic value).

Past research has shown trait meaning to be a robust predictor of various indicators of psychological health and well-being and protective against many forms of psychopathology (Brassai et al., 2011; Steger, 2013, 2022). Regarding alcohol use specifically, cross-sectional studies have found the presence of trait meaning to be associated with lower levels of self-reported alcohol use in young adults (Csabonyi & Phillips, 2020; Steger et al., 2015), lower AUDIT scores (Copeland et al., 2020, 2023), and increased motivation to limit drinking (Palfai & Ralston, 2011). Furthermore, one experimental study found that a brief meaning intervention significantly reduced the incentive salience of alcohol cues in college students as measured by the Stroop task (Ostafin & Feyel, 2019).

Like boredom, sense of meaning has been conceptualized as both a relatively stable individual trait and as a momentary state (Newman & Lutz, 2024; Steger & Kashdan, 2013). Much of the past experience sampling research in this area has examined fluctuations in sense of meaning at a daily level and has found moderate to high correlations between daily meaning and overall trait meaning at baseline (r = .53-.75; Kashdan & Steger, 2007; King et al., 2006; Steger et al., 2008; Steger & Kashdan, 2013). However, experience sampling studies that have

examined fluctuations in meaning at the momentary level – particularly in relation to specific daily activities – have found significant with-in person variations in meaning (Chan et al., 2018; Hooker et al., 2020).

Study Overview

The current study aimed to examine whether boredom independently predicts alcohol use in college students, above and beyond the effects of overall NA and PA. Most of the studies that have been conducted to date on this topic have been cross-sectional, correlational studies that examined the relationship between trait boredom proneness and alcohol use at the between-persons level. However, the fact that some people may be dispositionally prone to experiencing boredom more often or to a greater degree says nothing about how the experience of situational boredom might influence substance use behavior at the individual, within-person level. Past studies have also relied heavily on retrospective recall and have not attempted to correlate state boredom and drinking at the momentary or day level. Using EMA methodology circumvents all of these limitations.

Within-Person Level Aims & Hypotheses

A primary aim of this study was to examine the within-person, moment-to-moment level relationships between state boredom and alcohol use, using both likelihood of drinking and quantity of alcohol consumed as outcome measures.

Hypotheses for the within-person level were:

Hypothesis 1: Boredom at the previous moment will be positively associated with the likelihood of drinking at the next moment, such that previous moments characterized by higher levels of boredom will be associated with a greater likelihood of drinking at the next moment, while controlling for average levels of NA and PA.

Hypothesis 2: Boredom at the previous moment will be positively associated with quantity of alcohol consumed, such that moments previous characterized by increased state boredom will be associated with greater numbers of standard drinks consumed at the next moment, while controlling for average levels of momentary NA and PA.

Between-Persons Level Aims & Hypotheses

A secondary aim was to replicate past between-persons findings using the more rigorous testing afforded by EMA methodologies. Compared to cross-sectional methods, EMA allows for between-person analyses that are more reliable because they are based on aggregated results from multiple observations rather than a single observation and more valid due to elimination of retrospective recall biases (Shiffman et al., 2008).

Hypotheses for the between-persons level were:

Hypothesis 3: Boredom will be positively associated with drinking frequency, such that people higher in trait boredom will have a greater proportion of drinking moments over the 14-day study compared to those lower in trait boredom, while controlling for overall levels of trait NA and trait PA.

Hypothesis 4: Boredom will be positively associated with quantity of alcohol consumed, such that those higher in trait boredom will consume a greater number of standard drinks during across the 14-day study period, while controlling for overall levels of trait NA and trait PA.

Meaning as Moderator Aims & Hypotheses. A third aim was to investigate how sense of meaning moderates the association between boredom and drinking, given that lack of meaning is one of the two factors theorized by the MAC model to give rise to boredom as well as the factor which is associated with a more dysphoric, agitated, and disengaged experience of boredom (Westgate & Wilson, 2018). Because the present study was a secondary analysis of existing data

from a larger parent study, we did not have access to data on the attentional component of boredom proposed by the MAC model. Although the MAC model is specifically focused on explaining state boredom rather than trait boredom-proneness, Westgate and Wilson (2018) speculate that when a person consistently lacks meaningful goals, chronic boredom is likely to result. For this reason, we aimed to investigate meaning as a potential moderator at both the within-person and between-persons levels.

Moderation hypotheses at the within-person level were:

Hypothesis 5: At the within-person level, meaning will moderate the association between boredom at the previous moment and likelihood of drinking at the next moment, such that the positive prospective association between boredom at the previous moment and the likelihood of drinking at the next moment will be weakened (i.e., attenuated) as meaning at the previous moment increases.

Hypothesis 6: At the within-person level, meaning will moderate the association between boredom at previous moments and quantity of drinks consumed at the next moment, such that the positive prospective association between boredom at the previous moment and the number of drinks consumed at the next moment will be weakened (i.e., attenuated) as meaning at the previous moment increases.

Moderation hypotheses at the between-persons level were:

Hypothesis 7: At the between-persons level, meaning will moderate the relationship between a person's average (trait) boredom and frequency of drinking, such that the positive association between trait boredom and proportion of drinking moments across the sampling period will be weakened (i.e., attenuated) as trait meaning increases.

Hypothesis 8: At the between-persons level, meaning will moderate the relationship between a person's average (trait) boredom and average quantity of drinks consumed, such that the positive association between trait boredom and total number of drinks consumed over the sampling period will be weakened (i.e., attenuated) as trait meaning increases.

METHODS

Participants and Procedure

A total of 340 college students, aged 18-24, were initially recruited from a mid-sized state university in the Western United States as part of a larger parent EMA study examining college students' emotional and behavioral health. Inclusion criteria for the parent study did not take alcohol use into consideration; participants were only required to be currently enrolled college students and own a personal mobile phone capable of running the EMA application on either the iOS or Android platform. Therefore, to assure an adequate sampling of drinking behavior for the present analyses, we restricted the analytic sample to only students who endorsed hazardous patterns of alcohol use at baseline, as evidenced by a score ≥ 8 on the Alcohol Use Disorders Identification Test ([AUDIT]; Saunders et al., 1993). This resulted in a sample of 160 participants (71% female) between the ages 18 and 24 (M = 19.1, SD = 1.5). Eighty-six percent of the participants identified as White, 1.9% as Black, 1.9% as Asian, 0.6% as Native American/Alaska Native, 7.5% as multiracial, and 2.5% as "another." Fifteen percent identified as Hispanic/Latine.

Recruitment & Enrollment

Participants were recruited via the psychology department's undergraduate participant pool. Participants were scheduled for an initial in-person laboratory appointment lasting approximately 30 minutes. During this session, they completed an informed consent process, took a 15-minute baseline survey with questions about their demographic characteristics and past-month substance use, had the mEMA application (Ilumivu, 2022) installed on their personal mobile phone, and received training on how to complete the EMA assessments. This EMA

training included an overview of how random prompts worked, a demonstration of how to access and complete the assessments when prompted, a run-through of all items on the random surveys, and education on the definition of a "standard" drink.

EMA study

Participants completed EMA assessments across a period of 14 consecutive days. Four times each day, at random intervals within 3.5-hour blocks between 10:00 a.m. and 12:00 a.m. (i.e., 10:00am–1:30pm, 1:30pm–5:00pm, 5:00pm–8:30pm, and 8:30pm –12:00am), the app prompted participants to complete brief (1–2 minute) assessments asking about their levels of PA, NA, boredom, sense of meaning, and alcohol use during the past 30 minutes. Participants were instructed to complete random assessments during their waking hours only and had the ability to skip prompts when they were sleeping or otherwise unavailable. Assessments remained available for 30 minutes following the initial prompt, with up to 3 additional reminder prompts sent at 7-minute intervals until the assessment was completed or the 30-minute window elapsed.

Compensation

Participants received up to 4 research participation credits for their involvement in the study. One-half credit was given for the initial laboratory enrollment session. Fractional credits were awarded for each EMA assessment completed over the 14-day study period such that one-quarter credit was earned per day if all 5 EMA assessments were completed on that day.

Measures

Baseline Measures

Demographics

Participants provided their age, race, ethnicity, and sex assigned at birth.

Baseline Alcohol Use

Baseline alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993). The AUDIT is a 10-item questionnaire that assesses past-year alcohol use across three dimensions: intake, dependence, and adverse consequences (Saunders et al., 1993). Each item is scored between 0 and 4 points, yielding a total possible score that ranges from 0 to 40. Previous research has shown the AUDIT to be a reliable and valid measure for detecting at-risk drinkers in college student samples, with scores ≥ 7 indicating hazardous patterns of use (DeMartini & Carey, 2009, 2012). For this analytic sample, the AUDIT exhibited good internal consistency ($\alpha = 0.76$).

EMA Measures

Positive and Negative Affect

At each of the four random assessments throughout the day, PA and NA were assessed using items derived from the Positive and Negative Affect Schedule—Expanded Form (PANAS-X; Watson & Clark, 1999) and from the circumplex model of affect (Posner et al., 2005). All affect items were phrased as "During the past 30 minutes, how __ have you felt?" with responses rated on an 11-point Likert-type scale (0 = "*not at all*" to 10 = "*extremely*"). Positive affect was assessed using items for five emotions: happy, grateful, excited, calm, and relaxed. Negative affect was assessed using items for four emotions: sad, lonely, anxious, and angry. The internal consistency and criterion validity of these items has been established in previous studies (Armeli et al., 2008; Emery et al., 2020; Simons et al., 2014; Treloar et al., 2019). All positive affect items and all negative affect items were averaged into composite moment-level PA and NA scores, respectively. At the between-person level, all composite moment-level PA and NA scores across the 14-day sampling period were then averaged for each participant, yielding person-average or "trait" PA and NA scores, respectively. This approach has been used successfully in

previous EMA studies (e.g., Emery & Simons, 2020). We calculated reliability of the positive and negative affect scales for this sample at the within- and between-person level using McDonald's omega (McDonald, 2013) following procedures of Geldhof and colleagues (2014). McDonald's omega (ω) is an index of internal consistency that uses a factor analytic approach to partition the common variance among the items from the unique variance and determines the general factor saturation of the test. It is the ratio of the common variance to the total variance (common and unique; Dunn et al., 2014). Guidelines for ω follow those for Cronbach's alpha. The positive affect scale exhibited acceptable reliability at the within-person level (ω = .76) and excellent reliability between-person level (ω = .90). The negative affect scale also exhibited acceptable reliability at the within-person level (ω = .75) and excellent reliability between-person level (ω = .93).

Boredom

At each of the four random assessments throughout the day, boredom was assessed with a single item: "During the past 30 minutes, how bored have you felt?" which was rated on an 11-point Likert-type scale (0 = "*not at all*" to 10 "*extremely*"). This approach is modeled after other EMA studies that incorporated boredom (e.g., Chan et al., 2018; Kuerbis et al., 2018) and mirrors the phrasing and format of the PA and NA items. At the person level, each participant's momentary boredom scores were averaged across all the completed random assessments during the 14-day study to yield a person-average (trait) boredom score.

Sense of Meaning

At each of the four random assessments throughout the day, meaning was assessed with two items: "How meaningful does your life feel right now?" and "How much does your life feel like it has purpose right now?" which were rated on an 11-point Likert-type scale (0 = "*not at*

all" to 10 "*extremely*"). These items were derived from the Daily Meaning Scale (DMS; Steger et al., 2008), with wording altered to ask about the current moment rather than the current day. The original DMS has been used successfully in past EMA studies of meaning (e.g., Machell et al., 2015; Morse et al., 2024), with items demonstrating acceptable reliability and validity (Kashdan & Nezlek, 2012; Kashdan & Steger, 2007). Scores for the two questions were averaged per moment to yield a moment-level meaning score. Person-average or "trait" meaning scores were computed by averaging each participant's moment-level meaning scores across all random surveys in the 14-day study. For this analytic sample, the meaning items exhibited good reliability at the within-person level ($\omega = 0.85$) and excellent reliability between-person level ($\omega = 0.98$).

Alcohol Consumption

Moment-level alcohol consumption was assessed in each random survey with the following question: "How many drinks of alcohol have you had in the last 30 minutes?" Response options were reported on an 11-point scale (*0* to *10 or more drinks*). Participants were provided with information on standard drink sizes (e.g., 1 standard drink = 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of liquor) during the initial enrollment to help them accurately respond in terms of standard drinks. To assess the likelihood of drinking, moment-level data was dichotomized (0 = *no alcohol consumed*, 1 = *alcohol consumed*). Momentary dichotomized scores were then averaged across all of the momentary assessments to yield a person-level proportion of moments that included drinking over the 14-day sampling period. To assess the quantity of alcohol consumed, the number of drinks in the past 30 min was used. At the person-level, drink quantities were summed across all moments in the 14-day sampling period to yield total number of drinks per person during the sampling period, as reported during all momentary

assessments. EMA self-report of alcohol quantity has been shown previously to be a valid measure based on its correspondence with transdermal alcohol monitoring (Simons et al., 2015). Similar approaches have been used successfully in previous EMA studies that assessed the likelihood and quantity of use on a given day (Emery et al., 2020, 2021).

Analysis Plan

Data Handling & Preparation

First, ranges and distributions were evaluated for all variables. None of the predictors exhibited significant skew or kurtosis. Alcohol outcomes were skewed binary/count variables as hypothesized, and alternative reference distributions were used to analyze these (see Multilevel Models below). Univariate outliers were defined as $SD \pm 3.29$ ($p < .001$; Tabachnick & Fidell, 2013). No univariate outliers were observed. To facilitate the testing of prospective effects, predictors were lagged by one random assessment point ($t - 1$).

Multilevel Models

A series of multilevel models (MLMs) were estimated using Stata 18 (StataCorp, 2023). In all models, data had a two-level structure in which moments (Level 1; within-person) were nested within persons (Level 2; between-persons). Multilevel models (MLMs) take into account the fact that observations from repeated momentary assessments are not independent with respect to the individual person. Two types of models were used to examine the two drinking outcomes: 1) multilevel logistic regressions to model likelihood (a binary variable); and 2) multilevel negative binomial regressions to model quantity of drinks consumed (a count variable). Separate models were also estimated for main effects and for interaction effects, resulting in a total of four MLMs: a main effects likelihood model, a main effects quantity model, an interaction likelihood model, and an interaction quantity model.

In all models, slopes were fixed rather than random because the primary aim lies in estimating the overall effect, rather than exploring between-person variability in slope values. Moreover, incorporating random slopes would introduce additional complexity, particularly when between-person differences in slopes are not central to the research question.

For both main effects models, Level 1 focal predictors included within-person boredom, NA, PA, and meaning at the previous moment predicting alcohol use outcomes at the next-moment (i.e., lagged effects). Analysis of time-lagged momentary associations were confined moments occurring within a given day to better capture the temporal proximity between affect and alcohol use and avoid between-day gaps in analyses. In addition to these Level 1 predictors of interest, six orthogonal day-of-the-week indicators and day-in-the-study were included as covariates. Including the day of the week as a covariate controlled for daily variation in mood and drinking and reduced the potential serial auto-correlation across days (see Mohr et al., 2001). Including the number of days elapsed since initiating the study as a covariate controlled for any potential changes over time due to participants' reactivity to the protocol (i.e., self-monitoring effects (Kazdin, 1974)). Including random intercepts allowed levels of boredom, NA, PA, and meaning to vary between participants. Level 2 focal predictors were between-person aggregates of boredom, NA, PA, and meaning. Covariates for Level 2 included sex (to account for well-known sex-based differences in alcohol use (Erol & Karpyak, 2015)) and age (to account for the likelihood of older participants having greater experience with drinking and the increased access to alcohol for those of legal drinking age). In this context, person-centered variables reflect moment-to-moment deviations from a person's average level, and grand-mean centered variables reflect person deviations from the overall average for the sample.

After the main effects models were estimated, additional models for likelihood and quantity were the estimated which included the interaction terms to test for the moderating effects of meaning. Included interactions terms between boredom and meaning at both the within- and between-person level were added to these models in addition to the main effects for the focal predictors. Interaction effects were probed using a marginal effects at representative values approach (Williams, 2012). Marginal effects are inferential summary statistics that provide a measure of the change in the predicted value of the dependent variable for a one-unit change in a moderating variable while holding all other variables constant. Change is measured in the natural units of the dependent variable. For the interaction models presented here, we calculated the marginal effects of how the relationship between boredom and drinking (likelihood and quantity) varies at representative values of the moderator variable. We used the mean and ± 1 *SD* as representative values of the moderator variable, meaning, consistent with conventions often used in a simple slopes approach, as this gives a meaningful depiction of the specific conditions under which the effects of boredom on drinking are likely produced. Importantly, marginal effects can also quantify the difference in the association between boredom and drinking (i.e., slopes) using the test of second differences (Mize, 2019) at the specified representative values of the moderator (i.e., test of equivalence in slopes). Given some have suggested that significance of the product term in nonlinear models is a poor test for determining if an interaction is present and the significance of the marginal effects at representative values should be used instead (McCabe et al., 2022), we also examined the marginal effects of non-significant product terms at ± 1 *SD* to ensure that our effects are articulated properly. We omitted tests at the mean because that is equivalent to a main effect (i.e., effect of boredom on drinking outcome at mean level of meaning).

Likelihood Main Effects Model

To test the hypothesized main effects of boredom on likelihood of drinking while controlling for NA and PA, a multilevel logistic regression with random intercepts was estimated. At the within-person level (L1), **Hypothesis 1** will be confirmed if the model produces a significant positive effect of lagged momentary boredom on the likelihood of drinking at the next moment, while controlling for lagged momentary PA and NA. At the between-persons level (L2), **Hypothesis 3** will be confirmed if the model produces a significant positive effect of person-average (trait) boredom on the proportion of drinking moments across the study period, while controlling for person-average (trait) NA and PA.

Quantity Main Effects Model

To test the hypothesized main effects of boredom on quantity of drinks consumed while controlling for NA and PA, a multilevel negative binomial regression was estimated. The outcome variable, number of standard drinks, was specified as a count variable. Alcohol consumption data is frequently positively skewed with a large proportion of zeros (Atkins et al., 2013), particularly in non-clinical samples in which a large proportion of moments are expected to be non-drinking moments. Negative binomial regression models are designed to accommodate such skewed count data. At the within-person level (L1), **Hypothesis 2** will be confirmed if the model produces a significant positive effect of lagged momentary boredom on the number of drinks consumed during the next moment, while controlling for lagged momentary NA and PA. At the between-persons level (L2), **Hypothesis 4** will be confirmed if the model produces a significant positive effect of person-average (trait) boredom on the number of drinks consumed across all random assessments during the 14-day sampling period, while controlling for person-average (trait) PA and NA.

Likelihood Interaction Model

To test the hypothesized moderating effect of meaning on the association between boredom and likelihood of drinking, a multilevel logistic regression with random intercepts was estimated. A meaning-by-boredom interaction was included as a focal predictor at Level 1 and Level 2. At the within-person level (L1), **Hypothesis 5** will be confirmed if the model produces a significant effect for the momentary meaning-by-boredom interaction on the likelihood of drinking at the next moment, while controlling for momentary boredom, NA, PA, and meaning and confirming significance using the test of second differences. At the between-persons level (L2). **Hypothesis 7** will be confirmed if the model produces a significant effect for the person-average meaning-by-boredom interaction on the proportion of drinking moments across the 14-day sampling period, while controlling for average boredom, NA, PA, and meaning and confirming significance using the test of second differences.

Quantity Interaction Model

To test the hypothesized moderating effect of meaning on the association between boredom and quantity of drinks consumed, a multilevel negative binomial regression with random intercepts was estimated. Again, a meaning-by-boredom interaction was included as a focal predictor at Level 1 and Level 2. At the within-person level (L1), **Hypothesis 6** will be confirmed if the model produces a significant effect for the momentary meaning-by-boredom interaction on the number of drinks consumed at the next moment, while controlling for momentary boredom, NA, PA, and meaning and confirming significance using the test of second differences. At the between-persons level (L2), **Hypothesis 8** will be confirmed if the model produces a significant effect for the person-average meaning-by-boredom interaction on the average number of drinks consumed across all random assessments during the 14-day sampling

period, while controlling for person-average boredom, NA, PA, and meaning and confirming significance using the test of second differences.

Statistical Power

Power analysis simulations suggest that that multilevel models that have medium (i.e., .30) intraclass correlations (ICC) with at least 10 within-person observations or person-days (i.e., based on a standard EMA study compliance rate of 80% across a 14-day study) and 175 participants are powered to detect within-person effects of 0.1 or greater and between-person effects of 0.23 or greater (Arend & Schäfer, 2019). Previous research demonstrates that affect regularly exhibits ICC values in the .40-.60 range (Emery et al., 2021; Emery & Simons, 2020; Treloar & Miranda Jr., 2017).

RESULTS

Descriptive Statistics

Compliance with the random assessment prompts was 83.9%. Compliance was calculated by dividing the total number of random surveys completed by all participants (7,513), by the total number of completed plus missed random surveys (8,960). Across the 14-day study period, participants completed an average of 46.9 (*SD* = 9.79) random surveys. Drinking was endorsed on 10% of the momentary surveys. Based on data collected during the momentary assessments, participants reported an average of 3.5 (*SD* = 3.7) drinking episodes during the sampling period and consumed at least 1 drink in the past 30 mins during 10% momentary assessments. The mean baseline AUDIT score was 11.8 (*SD* = 4.1, range: 8-28), and 33 participants (20.6%) had an AUDIT score of 15 or higher, suggesting the presence of a moderate to severe alcohol use disorder (Kiluk et al., 2018).

Boredom, negative affect, positive affect, meaning, alcohol use frequency, and drink quantity varied across persons and moments. The intraclass correlations were 0.39 for positive affect and 0.47 for negative affect. This indicates that 39% of the variance in positive affect was due to between-person factors and the remaining 61% was due to moment-to-moment within-person fluctuations. For negative affect, 47% of the variance was due to between-person differences, whereas 53% was due to within-person moment-to-moment variability. The intraclass correlation for boredom was 0.25, indicating that 25% of the variance in boredom was due to between-person factors and the remaining 75% was due to within-person moment-to-moment fluctuations. The intraclass correlation for meaning was 0.60, which indicates that 60% of the variance in meaning was due to between-person differences and the remaining 40% was due to momentary within-person factors.

Not surprisingly, alcohol use frequency and quantity also varied between- and within-persons but exhibited a pattern favoring within-person fluctuations. Specifically, the intraclass correlations were 0.08 for frequency of drinking and 0.06 for quantity of drinks. This denotes that between 92-94% of the variance in alcohol use was at the within-person level. These findings support the stance that these are time-varying constructs appropriate for event-level methods and analyses.

Table 1 shows means and standard deviations for all variables as well as correlations between variables. At the within-person level, boredom exhibited a weak to moderate positive correlation with negative affect (NA) and a very weak but statistically significant negative correlation with both positive affect (PA) and meaning. PA exhibited a moderate positive correlation with meaning and a weak negative correlation with NA. Regarding drinking outcomes at the within-person level, boredom exhibited a very weak but statistically significant negative correlation with likelihood of drinking at the next moment, and PA exhibited very weak but significant positive correlations with both likelihood of drinking and number of drinks consumed at the next moment.

At the between-person level, boredom had a moderate to strong positive correlation with NA. Meaning exhibited a strong positive association with PA and a very weak inverse association with NA. NA had a weak, positive correlation with quantity of drinks consumed over the sampling period. Both NA and PA were weakly inversely correlated with participant age. Proportion of drinking moments and quantity of drinks consumed over the sampling period had a moderate positive correlation with baseline AUDIT scores.

Multilevel Model Analyses

Likelihood Main Effects Model

Contrary to **Hypothesis 1**, at the within-person level (L1), participants were significantly *less* likely to drink at the next moment if the previous moment was characterized by greater boredom (*OR* = 0.950, *p* = 0.042). A significant positive association was found between momentary positive affect (*OR* = 1.21, *p* = 0.000) and likelihood of drinking at the next moment. Neither lagged negative affect (*OR* = 1.04, *p* = 0.293) nor lagged meaning (*OR* = 0.961, *p* = 0.319) were significant prospective predictors of the likelihood of drinking at the next moment.

Contrary to **Hypothesis 3**, at the between-persons level (L2), person-average (trait) boredom (*OR* = .971, *p* = 0.748) did not significantly predict frequency of drinking across the 14-day study period. Likewise, person-average positive affect (*OR* = 1.04, *p* = 0.726), negative affect (*OR* = 1.11, *p* = 0.246), and meaning (*OR* = 0.99, *p* = 0.934) were not significant prospective predictors of drinking frequency.

Quantity Main Effects Model

Contrary to hypothesis (**Hypothesis 2)**, at the within-person level (L1), momentary boredom (*IRR* = 0.97, *p* = 0.349) was not a significant predictor of number of drinks consumed at the next moment. Lagged momentary positive affect (*IRR* = 1.17, *p* = 0.002) did have a significant positive association with quantity of drinks consumed at the next moment. Lagged momentary negative affect (*IRR* = 1.01, *p* = 0.910) and lagged momentary meaning (*IRR* = 1.00, *p* = 1.00) were not significant prospective predictors of quantity of drinks at the next moment.

Contrary to **Hypothesis 4**, at the between-persons level (L2), person-average (trait) boredom (*IRR* = 0.96, *p* = 0.715) was not a significant prospective predictor of quantity of drinks consumed across the study period. A significant effect was found for person-average (trait) negative affect (*IRR* = 1.25, *p* = 0.041), such that those higher in trait NA reported consuming more drinks across the 14-day sampling period. Neither average (trait) positive affect (*IRR* =

0.98, $p = 0.866$) nor average (trait) meaning ($IRR = 1.05$, $p = 0.569$) was a significant prospective predictor of quantity of drinks consumed.

Likelihood Interaction Model

To test the hypothesized moderating effects of meaning on the association between boredom and likelihood of drinking, a meaning by boredom interaction was modeled at both the within-person and between-persons levels. Contrary to **Hypothesis 5**, at the within-person level (L1), there was no significant interaction between meaning and boredom ($OR = 1.00$, $p = 0.782$), indicating that meaning did not significantly moderate the moment-to-moment association between boredom and likelihood of drinking. Marginal effects were estimated at representative values, and a test of second differences confirmed that the difference between the slopes for + 1 SD and -1 SD were not statistically significant (difference in $b < 0.01$, $p = 0.715$).

Consistent with **Hypothesis 7**, at the between-persons level (L2), there was a significant interaction between meaning and boredom ($OR = 0.91$, $p = 0.017$), indicating that person-average (i.e., trait) meaning significantly moderated the association between person-average (trait) boredom and proportion of drinking moments over the EMA sampling period. Marginal effects at representative values of meaning were estimated to probe this moderation effect further. Person-average (trait) boredom exhibited a positive relationship with proportion of drinking moments across the study period for those with lower-than-average trait meaning (-1 *SD*: $b = 0.01$, $p = 0.182$, 95%CI [-0.005, 0.027]), and this effect was attenuated as levels of average (trait) meaning increased (*M*: $b = -0.01$, $p = 0.81$, 95%CI [-0.014, 0.011]; +1 *SD*: $b = -0.02$, $p = 0.089$, 95%CI [-0.31, 0.001]; See Figure 1). A test of second differences demonstrated that the slope values for + 1 and – 1 SD were significantly different from each other (difference in $b = 0.03$, $p = .018$).

Quantity Interaction Model

To test the hypothesized moderating effects of meaning in the quantity model, the interaction of meaning with boredom was modeled at both the within-person and between-persons levels. Contrary to **Hypothesis 6**, at the within-person level (L1), there was no significant interaction between meaning and boredom (*IRR* = 1.00, $p = 0.797$), indicating that moment-level meaning had no moderating effect on the relationship between moment-level boredom and number of drinks consumed at the next moment. Marginal effects were estimated at representative values, and a test of second differences confirmed that the difference between the slopes for + 1 SD and -1 SD were not statistically significant (difference in $b = 0.01$, $p = 0.816$).

In support of **Hypothesis 8**, at the between-persons level (L2), a significant meaning by boredom interaction (*IRR* = 0.89, $p = 0.012$) was found, indicating that person-average (trait) meaning significantly moderated the relationship between person-average (trait) boredom and the quantity of drinks consumed during drinking moments across the EMA sampling period. Similar to the likelihood model, the marginal effects at representative levels of meaning indicated that average (trait) boredom exhibited a positive relationship with quantity of drinks consumed across the study period for those with lower-than-average trait meaning (-1 *SD*: $b = 0.07$, $p = 0.209$, 95%CI [-0.039, 0.178]), and this effect was attenuated as levels of average (trait) meaning increased (*M*: $b = -0.01$, $p = 0.762$, 95%CI [-0.090, 0.066]; +1 *SD*: $b = -0.11$, $p = 0.124$, 95%CI [-0.260, 0.031]; See Figure 2). A test of second differences demonstrated that the slope values for + 1 and – 1 SD were significantly different from each other (difference in $b = 0.18$, $p = .04$).

Table 1

Correlation Matrix and Descriptive Statistics

	M	*SD*	2	3	4	5	6	7	8	9
1. Sex			0.24**	-0.09	-0.22**	-0.05	0.03	-0.07	-0.08	0.04
2. Age	19.1	1.5	–	-0.27***	-0.22**	-0.22**	-0.10	-0.03	-0.11	-0.01
3. Boredom	3.7	2.8		–	0.58***	-0.01	-.04	0.04	0.08	0.06
4. Negative Affect	2.5	2.0		0.38***	–	-0.16	-0.16*	0.11	0.22**	0.09
5. Positive Affect	5.2	2.0		-0.12***	-0.28***	–	0.69***	-0.05	-0.02	-0.02
6. Meaning	5.7	2.5		-0.08***	-0.20***	0.57***	–	-0.02	0.04	-0.13
7. Drinking Moments	3.5	3.7		-0.04*	-0.01	0.06***	0.01	–	0.90***	0.36***
8. Drinks	10.4	13.0		-0.02	0.01	0.06***	0.03	0.80***	–	0.38***
9. Baseline AUDIT	11.8	4.1								–

Notes: N = 160. Level 1 observations = 4,857 person-moments. ***Means*** and ***SDs*** are either person-level aggregates over the sampling period or baseline measures. To the left of the diagonal are the within-person level correlations and to the right are the between-person level correlations. * $p < .05$, ** $p < .01$, *** $p < .001$.

Within-person notes: Negative Affect and Positive Affect = mean in the last 30 minutes. Drinking Moments = drank in the last 30 minutes (yes =1, no = 0). Drinks = number of standard drinks consumed since last momentary assessment.

Between-persons notes: Sex = sex assigned at birth (1 = male, 0 = female). Drinking Moments = total number of drinking moments over the sampling period. Drinks = total number of standard drinks consumed (as reported in momentary assessments) over the sampling period. Negative and Positive Affect = person-mean aggregates over the sampling period.

Table 2

Multilevel Main Effect Model: Likelihood of Drinking

	OR	*SE*	*p-value*	*95% CI*
Within-Person (L1; Time-Varying)				
Monday	0.98	0.26	0.933	0.60, 1.54
Tuesday	1.30	0.33	0.315	0.78, 2.15
Wednesday	1.15	0.30	0.578	0.70, 1.92
Thursday	**2.04**	**0.49**	**0.003**	**1.28, 3.26**
Friday	**4.25**	**0.96**	**< 0.001**	**2.73, 6.62**
Saturday	**5.83**	**1.30**	**< 0.001**	**3.76, 9.03**
Lagged Boredom	**0.95**	**0.02**	**0.042**	**0.90, 1.00**
Lagged Negative Affect	1.04	0.04	0.293	0.96, 1.13
Lagged Positive Affect	**1.21**	**0.05**	**< 0.001**	**1.11, 1.32**
Lagged Meaning	0.96	0.04	0.319	0.89, 1.04
Day in Study	1.00	0.01	0.806	0.97, 1.03
Between-Persons (L2; Time Invariant)				
Person-Mean Boredom	0.97	0.09	0.748	0.81, 1.16
Person-Mean Negative Affect	1.11	0.10	0.246	0.93, 1.34
Person-Mean Positive Affect	1.04	0.13	0.726	0.82, 1.32
Person-Mean Meaning	0.99	0.07	0.934	0.86, 1.15
Sex	0.96	0.23	0.876	0.60, 1.54

Notes: N = 160. Level 1 observations = 4,857 person-moments. *OR* = Odds Ratio. *SE* = Standard Error. Level 1 variables were person-mean centered and Level 2 variables were grand-mean centered. Sex = sex assigned at birth (male = 1, female = 0). Sunday was the reference group for day-of-the-week indicators. Bolding indicates significance at $p \leq 0.05$.

Table 3

Multilevel Main Effect Model: Quantity of Drinks

	IRR	*SE*	*p-value*	*95% CI*
Within-Person (L1; Time-Varying)				
Monday	1.13	0.34	0.678	0.63, 2.02
Tuesday	1.75	0.50	0.051	1.00, 3.06
Wednesday	1.60	0.45	0.094	0.92, 2.76
Thursday	**3.03**	**0.82**	**< 0.001**	**1.78, 5.16**
Friday	**7.22**	**1.93**	**< 0.001**	**4.28, 12.19**
Saturday	**12.25**	**3.31**	**< 0.001**	**7.21, 20.81**
Lagged Boredom	0.97	0.03	0.349	0.92, 1.03
Lagged Negative Affect	1.01	0.05	0.910	0.91, 1.11
Lagged Positive Affect	**1.17**	**0.06**	**0.002**	**1.06, 1.30**
Lagged Meaning	1.00	0.05	1.000	0.91, 1.10
Day in Study	1.01	0.02	0.364	0.98, 1.05
Between-Persons (L2; Time Invariant)				
Person-Mean Boredom	0.96	0.10	0.715	0.78, 1.19
Person-Mean Negative Affect	**1.25**	**0.14**	**0.041**	**1.01, 1.56**
Person-Mean Positive Affect	0.98	0.14	0.866	0.88, 1.26
Person-Mean Meaning	1.05	0.10	0.569	0.88, 1.26
Sex	0.89	0.26	0.699	0.51, 1.57

Notes: N = 160. Level 1 observations = 4,857 person-moments. *IRR* = Incidence Rate Ratio. *SE* = Standard Error. Level 1 variables were person-mean centered and Level 2 variables were grand-mean centered. Sex = sex assigned at birth (male = 1, female = 0). Sunday was the reference group for day-of-the-week indicators. Bolding indicates significance at $p \leq 0.05$.

Table 4

Multilevel Interaction Effect Model: Likelihood

	OR	*SE*	*p-value*	*95% CI*
Within-Person (L1; Time-Varying)				
Monday	0.98	0.26	0.933	0.58, 1.66
Tuesday	1.30	0.33	0.315	0.78, 2.15
Wednesday	1.16	0.30	0.573	0.70, 1.92
Thursday	**2.04**	**0.49**	**0.003**	**1.28, 3.26**
Friday	**4.25**	**0.96**	**< 0.001**	**2.73, 6.62**
Saturday	**5.83**	**1.30**	**< 0.001**	**3.76, 9.04**
Lagged Boredom	**0.95**	**0.02**	**0.040**	**0.90, 1.00**
Lagged Negative Affect	1.05	0.04	0.287	0.96, 1.13
Lagged Positive Affect	**1.22**	**0.05**	**< 0.001**	**1.12, 1.32**
Lagged Meaning	0.96	0.04	0.358	0.89, 1.04
Lagged Boredom X Lagged Meaning	1.00	0.01	0.782	0.98, 1.03
Day in Study	1.00	0.01	0.829	0.98, 1.03
Between-Persons (L2; Time Invariant)				
Person-Mean Boredom	0.99	0.09	0.923	0.83, 1.18
Person-Mean Negative Affect	1.13	0.10	0.190	0.94, 1.35
Person-Mean Positive Affect	0.99	0.12	0.921	0.78, 1.25
Person-Mean Meaning	1.03	0.08	0.719	0.88, 1.19
Person-Mean Boredom X Meaning	**0.91**	**0.03**	**0.017**	**0.85, 0.98**
Sex	1.01	0.24	0.967	0.63, 1.61

Notes: N = 160. Level 1 observations = 4,857 person-moments. *OR* = Odds Ratio. *SE* = Standard Error. Level 1 variables were person-mean centered and Level 2 variables were grand-mean centered. Sex = sex assigned at birth (male = 1, female = 0). Sunday was the reference group for day-of-the-week indicators. Bolding indicates significance at $p \leq 0.05$.

Table 5

Multilevel Interaction Effect Model: Quantity

	IRR	*SE*	*p-value*	*95% CI*
Within-Person (L1; Time-Varying)				
Monday	1.11	0.33	0.724	0.62, 1.99
Tuesday	1.68	0.48	0.068	0.96, 2.95
Wednesday	1.57	0.44	0.105	0.91, 2.71
Thursday	**2.99**	**0.81**	**> 0.001**	**1.76, 5.08**
Friday	**7.13**	**1.90**	**> 0.001**	**4.23, 12.0**
Saturday	**12.2**	**3.29**	**> 0.001**	**7.18, 20.7**
Lagged Boredom	0.97	0.03	0.352	0.92, 1.03
Lagged Negative Affect	1.00	0.05	0.907	0.91, 1.11
Lagged Positive Affect	**1.17**	**0.06**	**0.002**	**1.06, 1.29**
Lagged Meaning	1.00	0.05	0.992	0.91, 1.10
Lagged Boredom X Lagged Meaning	1.00	0.02	0.797	0.97, 1.03
Day in Study	1.01	0.02	0.368	0.98, 1.05
Between-Persons (L2; Time Invariant)				
Person-Mean Boredom	0.98	0.11	0.880	0.80, 1.21
Person-Mean Negative Affect	**1.28**	**0.14**	**0.025**	**1.03, 1.58**
Person-Mean Positive Affect	0.91	0.13	0.499	0.68, 1.20
Person-Mean Meaning	1.10	0.10	0.308	0.92, 1.31
Person-Mean Boredom X Meaning	**0.89**	**0.04**	**0.012**	**0.81, 0.97**
Sex	0.95	0.27	0.854	0.54, 1.66

Notes: N = 160. Level 1 observations = 4,857 person-moments. *IRR* = Incidence Rate Ratio. *SE* = Standard Error. Level 1 variables were person-mean centered and Level 2 variables were grand-mean centered. Sex = sex assigned at birth (male = 1, female = 0). Sunday was the reference group for day-of-the-week indicators. Bolding indicates significance at $p \leq 0.05$.

Figure 1

Level 2 Marginal Effects for Proportion of Drinking Moments

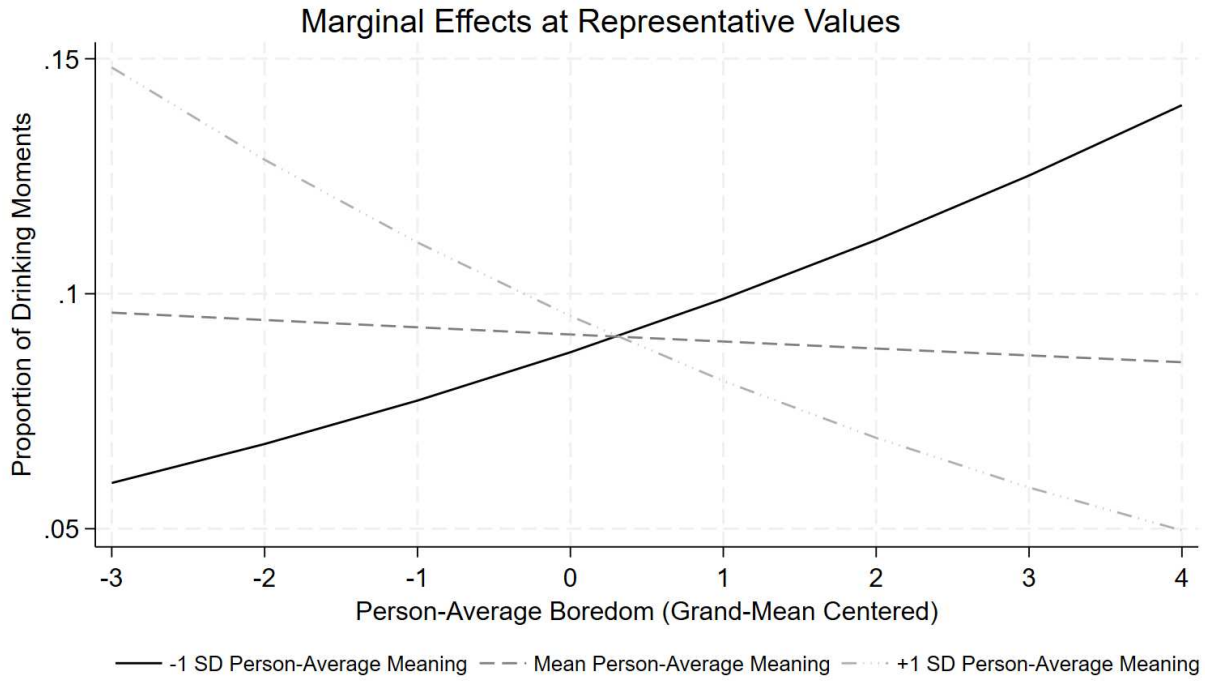
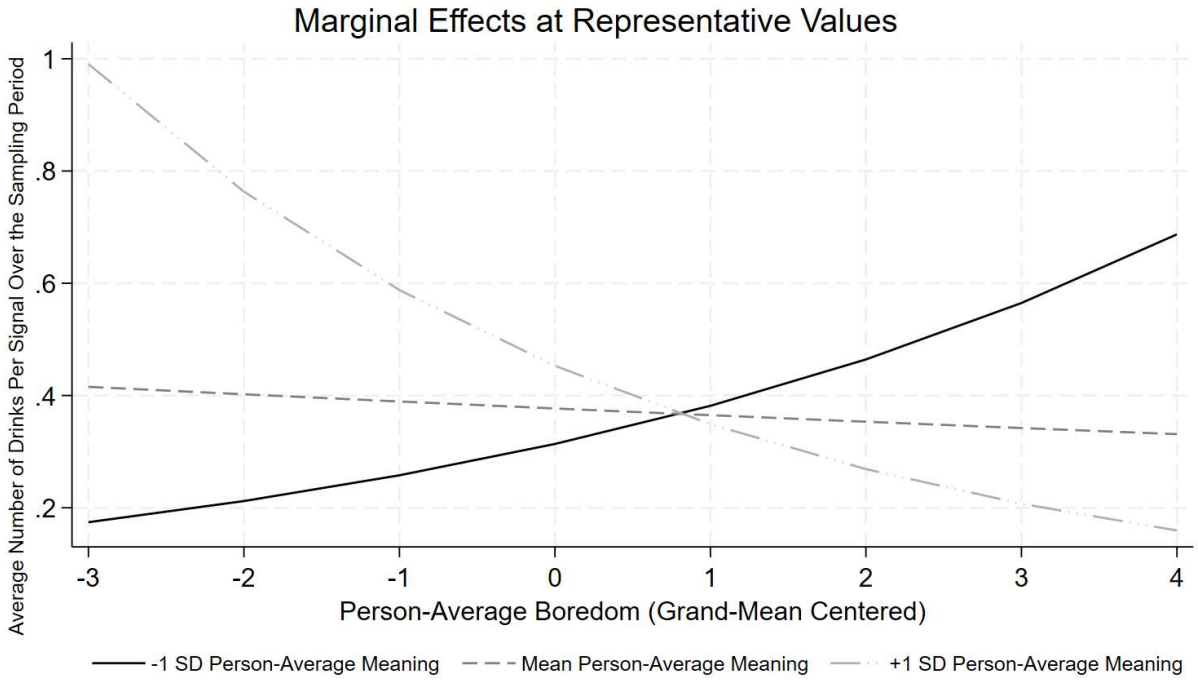


Figure 2

Level 2 Marginal Effects for Quantity of Standard Drinks Consumed



DISCUSSION

Informed by theories of alcohol use that center on affect as one of the most proximal predictors of drinking (Cooper et al., 1992, 2015; Cox & Klinger, 1988; Simons et al., 1998) as well as recent EMA research suggesting that discrete emotions may differentially predict drinking outcomes (Emery et al., 2023), the current study examined boredom as a potentially unique affective predictor of drinking in young adult college students. To our knowledge, it is the first EMA study to explicitly examine the moment-to-moment relationship between boredom and drinking in a college-student sample, a group that could be particularly at risk for the link between boredom and alcohol use. Accordingly, the primary aims were 1) to examine whether momentary boredom predicted likelihood and quantity of drinking at the next moment, while controlling for momentary negative affect (NA) and momentary positive affect (PA); and 2) to use the more rigorous testing afforded by EMA to replicate cross-sectional research showing a positive association between boredom at trait level (i.e., boredom-proneness) and increased frequency and quantity of alcohol use in young people (Biolcati et al., 2016, 2018; LePera, 2011). Given that deficits in meaning have been theorized to be one factor underlying boredom (Westgate & Wilson, 2018), a third aim was to investigate whether sense of meaning moderates the association between boredom and drinking at both the momentary, within-person level and the between-persons level. Overall, the results show that boredom was not a significant prospective *positive* predictor of next-moment drinking at the within-person level, and this study failed to replicate the between-persons main effects association between trait boredom and either frequency or quantity of alcohol consumption. However, meaning was shown to significantly moderate the association between boredom and drinking, but only at the between-persons level (L2), such that trait a positive association between trait boredom and both drinking frequency

and quantity over the sampling period was only evident among those with low trait meaning. This pattern of findings suggests that the strength of the trait-level relationship between boredom and drinking depends on stable, between-person differences in meaning. A more in-depth discussion of these findings appears below.

Within-Person Relationships Between Boredom and Drinking

A primary research question in this study was whether boredom, as a discrete affective state that is generally considered to be a form of NA (Goetz et al., 2014; van Tilburg & Igou, 2017), would differentially predict drinking above and beyond global NA and PA. Results of the current study suggest that momentary boredom did in fact differentially predict the likelihood of next-moment drinking; however, the direction of this association was the opposite of what was theoretically expected. Contrary to our hypothesis (Hypothesis 1), at the within-person level, we found a small but significant *negative* association between momentary boredom and likelihood of drinking at next moment, while controlling for momentary NA and PA. For every one unit increase in boredom above the person-average, there was a 5% decrease in likelihood of drinking at the next moment. Regarding the quantity hypothesis (Hypothesis 2), no significant within-person association was found between momentary boredom and quantity of drinks consumed at the next moment.

These findings are generally inconsistent with what current theories of state boredom would predict. Boredom has been conceptualized as "a seeking state" (Bench & Lench, 2019), and the Meaning & Attentional Components (MAC) model of boredom predicts that in moments of boredom, to the extent circumstances allow, people will seek out a more interesting or more enjoyable activity (Westgate & Wilson, 2018). Although drinking *could* be both an enjoyable and interesting solution to momentary boredom, the MAC model does not predict what specific

solutions a person will choose in the face of boredom. One possible explanation for these unexpected within-person findings is that college students have access to a wide range of alternative activities that may be more immediately available or preferable to drinking in the face of boredom. For example, cannabis use (Lee et al., 2007; Phillips et al., 2017), internet and social media use (Bai et al., 2021; Camerini et al., 2023; Skues et al., 2016), and video gaming (Larche & Dixon, 2021) have all been identified as means of coping with boredom. Alcohol is also a solution to boredom that tends to be less readily available than other options for underage drinkers, which largely characterized this sample (*Mean Age* = 19.1, *SD* = 1.5). Beyond these factors, participants in this sample had relatively low levels of momentary boredom (*Grand Mean* = 3.6, *SD* = 1.5), suggesting that college students – who are generally busy and have abundant social and recreational options available to them – may not be the best population for testing these hypotheses.

Our findings *are* consistent, however, with previous EMA research in college student samples which suggests that NA is an unreliable predictor of drinking at the within-person level (Dora et al., 2023). We initially speculated that boredom could represent a boundary case between NA and low PA. Past research has found that low PA predicts an increased likelihood of subsequent alcohol use (Emery et al., 2023; Emery & Simons, 2020; Simons et al., 2014). Our findings clearly show that boredom did not exhibit this pattern, suggesting that boredom is better conceptualized as a discrete negative affective state. The greater shared variance (L1) between boredom and global NA (14.2%) compared to boredom and global PA (1.4%) suggests that boredom is indeed a form of NA but with distinct characteristics that differentiate its relationship with drinking behavior. Like other discrete negative affective states (e.g., sadness and anger; Emery et al., 2023) that have been shown to decrease drinking likelihood at the momentary level,

boredom appears to be slightly protective against the likelihood of drinking at the next moment and has no meaningful effect on quantity of alcohol consumed.

The current study also failed to find the hypothesized moderating effects for meaning at the within-person level. Momentary meaning did not moderate the relationship between momentary boredom and likelihood of next-moment drinking (Hypothesis 5) or quantity of alcohol consumed at the next moment (Hypothesis 6). These findings are again inconsistent with the MAC model, which predicts that moments of lower-than-average meaning should be characterized by higher-than-average boredom, as perceived lack of meaning is one of the two "components" that is theorized to directly give rise to boredom (Westgate & Wilson, 2018). An important limitation of the present study was that we did not have the data available to examine the other "component" of the model, attentional capacity. Therefore, we have no way of knowing how much of the momentary boredom experienced by participants in this study was *meaningless* boredom versus *attentional* boredom. Although the two types of boredom can co-occur, the MAC model asserts (and preliminary studies demonstrate) that the two components operate independently (Westgate & Steidle, 2020). It is therefore unknown how fluctuations in momentary meaning might interact with attentional boredom.

Between-Persons Interaction Effects for Meaning

One noteworthy positive finding that emerged from the current study was significant between-persons interaction effects, in which trait meaning moderated the relationship between trait boredom and both frequency and quantity of alcohol use over the sampling period. As depicted in Figure 1 (supporting Hypothesis 7), for participants with lower sense of meaning across all momentary assessments (i.e., those with a person-mean one standard of deviation below the grand mean for sense of meaning), there was a significant positive association between

trait boredom and proportion of drinking moments over the EMA sampling period. However, as trait meaning increased (i.e., the grand mean, +1 SD) the positive association between trait boredom and drinking was attenuated. A similar pattern is depicted in Figure 2 (supporting Hypothesis 8), showing trait meaning moderating the relationship between boredom and quantity of alcohol consumed during drinking moments across the 14-day sampling period. Overall, results are consistent with a large body of prior research showing that trait meaning occurs on a continuum. Low trait meaning has been shown to be a risk factor for poorer psychological functioning and maladaptive behaviors while high meaning is associated with greater physical and psychological wellbeing (Steger, 2022; Steger & Kashdan, 2013). Having a sense of meaning appears to buffer against the negative effects of stress (Eisenbeck et al., 2021; Park & Baumeister, 2017), trauma (Owens et al., 2009), suffering (Edwards & Van Tongeren, 2020), and uncertainty (Morse et al., 2024). The fact that we found significant moderating effects at the between-persons level but not for the within-person level suggests that momentary fluctuations in perceived meaning may not be sufficient to alter drinking behavior in response to boredom. Instead, it is more stable, trait-like low meaning that poses a risk factor. It is also possible that the opposing effects for those low in meaning versus those high in meaning effectively cancelled each other out and obscured any detectable within-persons effects.

Our between-persons (L2) findings suggest that those with lower-than-average trait meaning are more prone to drinking in response to boredom. This is broadly consistent with the MAC model. Although the MAC model primarily addresses boredom at the state level (i.e., momentary, within-persons), it theoretically predicts that chronic lack of meaning would give rise to chronic boredom, and that it would be *meaningless* boredom, which is characterized by greater dysphoria, agitation, and dissatisfaction compared to attentional boredom (Westgate &

Wilson, 2018). Those with chronic low-meaning may therefore experience a heightened sensitivity to boredom, making them more likely to engage in drinking as a coping mechanism. According to the *existential escape hypothesis*, boredom represents the threat of meaninglessness, which can prompt people to escape by engaging in low self-awareness behaviors like substance use (Moynihan et al., 2021; Wisman, 2006). Thus, participants in our sample with lower-than-average trait meaning may have experienced more frequent and aversive boredom, which made them more prone to using alcohol to cope with their existential concerns.

Other Hypotheses & Findings

The current study found no between-persons main effect for average boredom predicting either proportion of drinking moments (contrary to Hypothesis 3) or quantity of alcohol reported during momentary assessments over the 14-day sampling period (contrary to Hypothesis 4). These findings are at odds with previous cross-sectional studies that have found a positive association between trait boredom-proneness and alcohol consumption (Biolcati et al., 2016, 2018; LePera, 2011). However, there are multiple methodological reasons that could explain the differences observed here. First, these previous studies did not control for NA and PA as this current study did. As previously mentioned the shared variance (L2) between boredom and NA was 33.6% in our study, suggesting enough of an overlap that controlling for NA is prudent. Second, past studies did not account for the role of trait meaning, which the current study shows to be a highly salient moderator of drinking in response to boredom. Finally, the way we operationalized variables in the present study was meaningfully different from past studies. Although EMA is a more rigorous approach that establishes temporal precedence, eliminates retrospective recall biases, and collects data over multiple timepoints, the way in which we operationalized "trait boredom" was based on aggregated ratings of state boredom. Previous

cross-sectional studies have used self-report measures of boredom-proneness, which have been criticized for their vague definition of the underlying construct (Mercer-Lynn et al., 2013; Tam et al., 2021) and for their poor ability to predict actual state boredom in both experimental (Westgate, 2020) and experience sampling studies (Chin et al., 2017). It is possible that boredom proneness is a broader construct that encompasses dimensions beyond frequency and/or intensity of experiencing state boredom. Indeed, it is a matter of ongoing debate what boredom proneness exactly is. Mercer-Lynn and colleagues (2014) call into question whether the trait versus state distinction (which roughly aligns with between-persons versus within-person levels of analysis) is even appropriate, or whether a more useful distinction is that of person-based versus situation-based state boredom. They argue that it is "unclear whether boredom propensity describes a person who possesses a particular personality trait that is carried across all situations (boring or not), or if it describes a person who reacts strongly to boring situations" (Mercer-Lynn et al., 2014, p. 124). The discrepancy between our findings and previous cross-sectional findings underscores the need for additional research to shed light on this question.

Although no hypotheses were offered for a main effect of meaning on drinking, the current study did not find significant associations at either the within-persons or between-persons levels. This finding is in contrast to previous cross-sectional studies that have found such a positive relationship (Copeland et al., 2020, 2023; Csabonyi & Phillips, 2020). Again, these studies did not control for overall NA and PA. PA especially has been shown to have a robust positive association with trait meaning (King et al., 2006; Miao et al., 2017).

Overall, affect was not a strong predictor of drinking in the current study. However, day-of-week effects were quite consistent, which is in line with previous EMA studies on drinking in college students (Dvorak & Simons, 2014; Lau-Barraco et al., 2016). We found a significant

positive association between PA and likelihood of drinking at both the within-person and between-persons levels. These results align with broader trends in EMA research indicating that PA, rather than NA, is a stronger predictor of alcohol consumption in college students (Dora et al. 2023). Overall, even in our sample selected for at-risk drinking according to AUDIT scores, drinking was more strongly driven by social context and PA rather than as a means of escaping negative affective states. There was also a significant positive association at the between-persons level between trait NA and quantity of alcohol reported during momentary assessments over the course of the study. This is also consistent with past EMA research showing that trait NA is a risk factor for consuming at greater quantities and experiencing more negative consequences from alcohol use (Kuntsche et al., 2005; Merrill & Read, 2010; Simons et al., 2010; Simons et al., 2014).

Strengths, Limitations, and Future Directions

Our findings contribute to an understanding of how boredom predicts alcohol use in college students at both the within- and between-persons levels. Specifically, results suggest that people who experience persistent lack of meaning in their day-to-day lives are at risk for drinking in response to boredom. Strengths of this study included its rigorous EMA methodology which demonstrated temporal ordering of predictor and outcome variables (though not causation), controlling for variables that have been shown to be relevant to drinking outcomes (i.e., overall NA and PA, sex, and day-of-the-week), and limiting the sample to at-risk drinkers.

Results are a combination of null findings and significant effects, demonstrating the complexity of how boredom and meaning interact in relation to alcohol use. The differences between within-person and between-persons findings are consistent with patterns found in past studies on NA and PA and drinking in college students. However, in terms of testing the

predictions of the MAC model of boredom, findings are somewhat inconclusive, with only between-persons interactions being consistent with the MAC model. There are three primary limitations of the present study that should be addressed in future studies in order to provide a fair evaluation of the MAC model's predictions as they relate to drinking.

First, our analytic sample was relatively homogeneous (predominately white, female, psychology majors from one university), which limits overall generalizability of our findings. A large proportion of the sample was under the legal drinking age, which likely constrained participants' ability to immediately obtain alcohol in response to boredom. Furthermore, participants in our study reported relatively low levels of momentary boredom. The unique social and academic structure of college life may buffer against prolonged boredom, limiting the generalizability of these findings to non-student populations who may experience higher levels of boredom. Furthermore, although SES information was not collected in the demographic data for this study, all participants have a degree of relative privilege by virtue of being college students. Elpidorou (2022) asserts that access to opportunities (social, educational, vocational, and leisure time), degree of autonomy, expectations for the future, and specific types of routine activities all lead to important SES-based differences in frequency of boredom, subjective interpretations of boredom, and options for alleviating boredom. Future research into the momentary association between boredom and drinking should focus on a more diverse sample that is of legal drinking age. To be a better test of the MAC model, the sample should also be one that is prone to experiencing higher levels of boredom. This could be accomplished by using baseline scores on boredom proneness as an inclusion criteria or by recruiting young adults who are not enrolled in college and therefore may have a narrower range of engaging activities available to them. Previous research suggests that young adults who do not attend college may

differ significantly from college students in their substance use patterns (Lau-Barraco et al., 2016; Patrick et al., 2015) and that boredom might be an especially relevant factor for substance use in rural communities that lack economic and entertainment opportunities (Patterson & Dobson-Patterson, 2000; Willging et al., 2014). Therefore, future studies on boredom and alcohol use should focus on these understudied populations as a way of acquiring more relevant data and results with more generalizability.

A second limitation of the current study in relation to testing the MAC model's predictions is that our data only included a measure of momentary meaning; it did not include any measures of attentional engagement. Simply put, we were only able to test one half of the MAC model – the "meaning component" of boredom. Without a measure of the "attentional component," we have no way of knowing whether moments characterized by higher boredom were based in participants' perceptions of meaninglessness or attentional disengagement, and the MAC model makes different predictions based on the type of boredom experienced. Westgate and Wilson's (2018) empirical studies in support of the MAC model suggest that attentional boredom, arising from either overstimulation or understimulation, is characterized less by dysphoria and agitation and more by mind-wandering and is more readily "solved" by modulating task demands or sensory inputs, such as by adding or removing background noises, multi-tasking, or removing distractions. For college students, the attentional boredom that occurs when in classes, at work, or attempting to do course work is largely driven by situational constraints (Pekrun et al., 2010) and tends to be resolved when the context changes or through modulating external stimuli (Westgate & Steidle, 2020). Therefore, the perceived meaningfulness of the moment may be irrelevant as a moderating factor and shifting to drinking as a more enjoyable activity is likely unnecessary. If most of the moments of high boredom that

occurred during our sampling period were attentional boredom, this would account for the unexpected main effect of boredom predicting a slightly lower likelihood of next-moment drinking as well as the lack of interaction effect for momentary meaning we found in our within-person analyses. A more comprehensive future study should examine both components of the MAC model by including measures of momentary cognitive understimulation and overstimulation and then examining how the type of boredom (meaningless or attentional) differentially predicts drinking outcomes. It would also be useful to control for contextual factors in the analyses, so that overall findings are not being watered down by moments in which alcohol use is highly unlikely.

A third limitation of the current study's ability to fully test the predictions of the MAC model as it relates to drinking behavior is that the time lag between momentary assessments (~3.5 hours) may have been too long to capture the moment-to-moment relationship between boredom and drinking. While boredom is theorized to have a spill-over effect that extends beyond the immediate moment (Belinda et al., 2024), the exact timeframe for such spill-over remains unclear. As mentioned above, attentional boredom tends to be resolved naturally by shifting to a less constrained context, such as getting out of class or finishing an assignment. However, even for less situationally-constrained experiences of boredom in which people are free to switch to a different activity at will, the several hours between momentary assessments provides a wide window of time in which non-drinking "solutions" to boredom might be identified and pursued. Stated plainly, boredom may have a more limited duration compared to other discrete negative emotions or global NA or PA, and therefore the EMA random assessment schedule may need to be compressed to have the granularity needed to capture boredom's specific associations on subsequent alcohol use. Future research could employ shorter

assessment intervals to more accurately capture the temporal dynamics of boredom and alcohol consumption. Importantly, MLM does not allow for the incorporation of residual autocorrelations which is a potential limitation. Additionally, in this study alcohol use was only captured by random momentary assessments asking about drinking in the last 30 minutes, so it likely did not fully capture participants' full range of drinking behavior during unassessed moments. A further limitation was that there was insufficient data available for us to limit our analyses to unplanned drinking events, which could be a better test of the hypothesized relationship of drinking in response to boredom. Not only are planned drinking occasions not specifically motivated by affective states, but there is the potential for planned drinking to alleviate boredom in advance via anticipatory effects. Future EMA studies could control for these limitations by employing user-initiated surveys at the beginning of a drinking episode to assess boredom and overall NA and PA in the period immediately before the episode started and limit analyses to only unplanned drinking events. Overall, a stronger test of the MAC model's predictions would require a more intentional study design that selects a more appropriate sample, includes measures for both the meaning and attentional components of boredom, employs shorter intervals between momentary assessments, and specifically focuses on unplanned drinking within contexts where alcohol use is a feasible solution to boredom.

Beyond limitations in testing predictions of the MAC model, one other important caveat to interpretating of our findings deserves mention. The way in which we operationalized trait boredom and trait meaning in our between-persons analyses is substantially different from the measures used in much of the existing cross-sectional research on boredom proneness and presence of meaning. Although aggregating momentary experiences of boredom or perceptions of meaning has many advantages in capturing "trait" tendencies (i.e., captures fluctuations over

time across a variety of real-world contexts, avoids retrospective recall biases, minimizes random error), these are frequency/intensity measures that likely miss essential, but more global dimensions of these constructs. Overall, the aggregated state versus true trait question is complex, and consensus seems to point at there being different response processes involved that lead to discrepancies in outcomes (Neubauer et al., 2020; Newman & Lutz, 2024; Park, 2010). When it comes to trait boredom, many researchers in the field have expressed concern over boredom proneness as a "fuzzy" construct that needs more empirical evidence to arrive at a more definitive understanding (Mercer-Lynn et al., 2014; Tam et al., 2021; Westgate & Steidle, 2020). The discrepancy between our between-persons findings and past cross-sectional study findings adds yet a little more weight to this argument. Recent efforts have attempted to measure individual differences aversion to boredom (Bieleke et al., 2022), response tendencies towards boredom (Lench et al., 2025) and coping with boredom (Biolcati & Passini, 2019), which marks progress towards understanding dimensions of boredom proneness beyond frequency of state boredom. A person may well experience boredom frequently but not experience much distress over it or be motivated to engage in coping mechanisms beyond allowing it to run its course.

Given our findings that a persistent lack of meaning is a risk factor for drinking in response to boredom, sense of meaning may be a relevant target for intervention efforts. Mindfulness training (Chu & Mak, 2020; Manco & Hamby, 2021) and Meaning Centered Therapy (MCT; Vos, 2016) are two types of interventions that have been shown to boost sense of meaning across various populations. After demonstrating that the association between dispositional gratitude and boredom proneness is mediated by trait meaning, O'Dea and colleagues (2024) found that a gratitude induction exercise reduced state boredom on a tedious task by increasing state meaning. O'Dea and colleagues (2022) similarly found that trait meaning

mediated the relationship between self-compassion and boredom while controlling for NA and PA, and although they did not specifically test it, suggested that self-compassion-based interventions might reduce boredom proneness by boosting sense of meaning. In regards to drinking, specifically, Ostafin and Feyel (2019) demonstrated that a brief meaning intervention based on consideration of intrinsically valued goals reduced the incentive salience of alcohol cues in a sample of undergraduate students.

While young adults tend to have lower levels of meaning compared to older adults (Steger et al., 2009) and there is some suggestion that dynamic fluctuations between presence of meaning and search for meaning are developmentally normative and not a cause for concern (Newman et al., 2018), it is not clear what factors give rise to chronic perceptions of meaninglessness. A variety of state and trait factors have been identified as having significant associations with lack of meaning, including insecure attachment style (Bodner et al., 2014), loneliness and poor sense of belongingness (Hicks & King, 2009; Lambert et al., 2013; Stillman et al., 2009), lack of perceived autonomy and/or competence (Martela et al., 2018), and cognitive inflexibility (Li & Jia, 2022). Research also suggests that there are individual differences in the sources of information people use to make assessments about meaning. For example, those higher in depressive symptoms rely more on positive events for the presence of meaning (Machell et al., 2015), and those with a less global cognitive focus (i.e., ability to take a "big picture" perspective on their life circumstances) rely more heavily on daily PA for their assessment of meaning (Hicks & King, 2007). Overall, lower trait meaning may be a marker for qualitatively different psychological functioning that leads to drinking to cope not only with boredom specifically but also with a variety of other related issues. Additional research is needed

to replicate the current findings and elucidate relevant mechanisms by which low meaning moderates the association between boredom and alcohol use at the between-persons level.

Conclusions

This study provides novel insights into the relationship between boredom and alcohol consumption in college students. Contrary to predictions, boredom was negatively associated with drinking likelihood at the within-person level, while at the between-persons level, meaning moderated the association between trait boredom and drinking frequency and quantity. These findings suggest that the impact of boredom on alcohol use is contingent on stable individual differences in meaning and the availability of alternative coping mechanisms. Future research should continue to investigate how boredom interacts with other psychological factors to influence substance use behaviors across different populations.

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