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Alcohol use in daily life: Examining the role of trait and state impulsivity facets

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Abstract

Objectives: Using Ecological Momentary Assessment methods (EMA) we aimed to investigate the influence of trait and state (momentary) impulsivity on alcohol use behaviors in daily life. Facets of the UPPS trait model of impulsivity (Whiteside and Lynam, 2001) have been found to differentially relate to alcohol-related outcomes and behaviors in cross-sectional and longitudinal studies. The present work expands on this by assessing UPPS facets in daily life and examining the contributions of trait and state impulsivity facets to daily life drinking behavior.

Methods: 49 participants were prompted at least six times per day for 21 days. A total of 4,548 collected EMA reports were included in analyses. Multi-level models were computed predicting daily life alcohol use behaviors from state and trait impulsivity facets and relevant covariates.

Results: Individual facets of momentary impulsivity differentially related to alcohol outcomes, such that (lack of) premeditation and, to a lesser extent, sensation seeking showed unique patterns of association with drinking and drinking quantity. Only trait levels of (lack of) premeditation were related to drinking behavior in daily life; no other trait UPPS scale significantly related to alcohol use.

Conclusions: These results highlight state difficulties with premeditation as particularly relevant to drinking behavior in daily life. Our results also support the incremental validity of state impulsivity facets over trait level measures in relation to drinking behavior in daily life. These findings offer important insight into the phenomenology of daily-life alcohol use and highlight possible avenues for intervention and prevention efforts.

Public Health Statement: Momentary fluctuations in premeditation predict alcohol use in daily life. Treatments targeting planning or forethought in relation to alcohol use may interrupt this process contributing to daily life drinking behaviors.

Keywords

alcohol; impulsivity; UPPS; Ecological Momentary Assessment; daily life

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Introduction

Impulsivity, broadly defined, is a robust predictor of alcohol use behavior and related outcomes. For example, impulsive features have been shown to contribute to the onset of alcohol use and related problems (McGue et al., 2001; von Diemen et al., 2008), development of AUD (Clark et al., 2002) and severity of alcohol addiction (Mitchell et al., 2005).

Personality research indicates that different facets or aspects of impulsivity are meaningfully distinct and offer unique information about individuals and their behavior. The UPPS model of impulsivity (Whiteside & Lynam, 2001), now among the most widely used assessments of impulsivity, was developed specifically to integrate the mostly commonly assessed impulsive features into a single model. The UPPS model includes the following facets: Urgency, tendency to act on urges under emotional contexts; (lack of) Premeditation, poor planning or forethought; (lack of) Perseverance, poor persistence; and Sensation Seeking, a preference for exciting and novel stimuli or situations. The UPPS model was later amended to differentiate positive and negative urgency, reflecting the tendency toward rash action under positive and negative mood states, respectively (UPPS-P; (Cyders & Smith, 2008).

UPPS trait facets appear to represent unique and specific mechanisms of alcohol use and misuse. Trait urgency has shown distinct associations with alcohol-related problems and impairment concurrently (McCarty et al., 2017; Pearson et al., 2012; Settles et al., 2012; Tran et al., 2018), prospectively (Pedersen et al., 2016), and in meta-analyses (Coskunpinar et al., 2013). Ratings of trait urgency also distinguished between individuals reporting alcohol abuse from those that did not (Whiteside & Lynam, 2003) and related to drinking and driving behaviors (Treloar et al., 2012). Lack of premeditation, or poor planning, demonstrated significant associations with alcohol intake and binge drinking (Tran et al., 2018), alcohol dependence (Coskunpinar et al., 2013). Lack of perseverance has shown weak relationships with alcohol use across studies (Stamates & Lau-Barraco, 2017). Some studies have shown significant associations between poor perseverance and alcohol use (Magid & Colder, 2007; Pearson & Henson, 2013), but these effects frequently were not unique (i.e., the effects were not as strong as those of other facets) or they were attenuated by adjusting for other impulsivity facets (Fischer & Smith, 2008; Kiselica et al., 2015; Magid & Colder, 2007). Trait sensation seeking has been associated with frequency and degree of alcohol use (Adams et al., 2012; Cyders et al., 2009; MacPherson et al., 2010; Pearson et al., 2012), and heavy drinking (Coskunpinar et al., 2013; Kiselica et al., 2015; Quinn et al., 2011; Stamates & Lau-Barraco, 2017). In general, existing research provides robust evidence of the relationship between impulsivity facets and alcohol use at the between-person (or individual-difference) level; however, it does not necessarily provide insight into how impulsivity facets and alcohol use relate in individuals' daily lives.

Recently ecological momentary assessment (EMA; Stone & Shiffman, 1994) has been used to investigate the influence of momentary, or state, impulsivity on alcohol use. Preliminary evidence shows momentary impulsivity relates to alcohol use patterns and alcohol-related behavior in daily life. For example, reduced inhibitory control (increased impulsivity) over the course of a day was associated with increased alcohol consumption that day (Jones et al.,

2018). Daily impulsivity also related to greater odds of heavy drinking and more alcohol related problems that day (Stamates et al., 2019). Drinking was also reported more on days with greater than normal reported sensation seeking (Lydon-Staley et al., 2019). However, these studies have not examined the momentary (or within-day) relationship between impulsivity and alcohol. Moreover, investigations of alcohol use in daily life tend to use monolithic conceptualizations of impulsivity, despite evidence that impulsivity is a multi-faceted construct. One notable exception is a recent study that found momentary fluctuations in negative urgency and lack of planning differentially related to retrospective reports of drinking behaviors (Pedersen et al., 2019).

Although past studies reveal unique associations of individual facets of impulsivity with alcohol use and related outcomes, it remains unclear whether these associations hold when impulsivity and alcohol use behavior are both assessed in daily life. Existing EMA and daily life studies rarely assess multiple impulsivity facets in the moment, essentially ignoring potential facet-level distinctions among impulsive traits. Furthermore, no study to date has assessed both impulsivity facets and alcohol use in daily life, which may have led existing studies to misestimate the association between *state* impulsivity and alcohol in daily life.

The current project addresses this gap in the existing literature. We predicted that momentary facets of impulsivity would demonstrate differential associations with alcohol use in daily life. Using the UPPS model, we assessed four facets of momentary impulsivity (urgency, lack of premeditation, lack of perseverance, sensation seeking) and examined the association of each with alcohol use behaviors. Based on the existing literature, we hypothesized that momentary sensation seeking would relate to the dichotomous drink variable based on evidence relating *sensation seeking* to frequency of drinking (e.g., Cyders et al., 2009; Pearson et al., 2012). Previous work highlighted the relevance of *negative urgency* and *(lack) of premeditation* to binge drinking, alcohol problems, and high-intensity drinking (e.g., Pedersen et al., 2019; Tran et al., 2018); therefore, we hypothesized that momentary urgency and (lack of) premeditation would relate to number of drinks consumed. Given the evidence base supporting the importance of person-level impulsive traits to alcohol use behaviors, we also tested the ability of momentary impulsivity facets to provide predictive information on drinking behavior above and beyond baseline impulsive traits. We expected both momentary and baseline impulsivity facets to contribute significant variance in predicting alcohol use behavior in daily life.

Methods

Procedures and participants

The present study is a secondary data analysis of existing data combined from two EMA studies, with full approval of the relevant Institutional Review Board. Study 1 focused on alcohol craving and associated physiology in daily life. Inclusion criteria were participant age between 18-45, drinking alcohol at least twice per week, meeting criteria for a disorder of emotion dysregulation (i.e., mood, anxiety, borderline personality disorders), and current engagement in outpatient psychological treatment (excluding treatment for problems with alcohol or other drugs). Participants attended a laboratory session during which they completed baseline demographic and other questionnaires, completed a psychophysiological

protocol in a laboratory, and were then oriented to the smartphone-based EMA software and procedure. The EMA portion of the study lasted up to 3 weeks (21 days), during which participants answered prompts throughout the day using a smartphone and wore physiological sensors. The physiological data collected are not analyzed or included in the current article. The EMA protocol consisted of scheduled and participant-initiated reports during participant-specified waking hours. Scheduled EMA reports occurred upon waking (and before noon), and at six random points throughout the day. These reports assessed momentary mood, craving for alcohol and other substances, social context, consumption of alcohol, social conflict, and momentary impulsivity.

Participants in Study 1 were also instructed to self-initiate a report if they: 1) experienced a significant change in mood (mood dysregulation episode), 2) were craving alcohol (craving episode), or 3) consumed their first drink of alcohol in an episode (initial drink). The protocol for Study 1 also included automated prompted follow-up reports 30, 60, 90 and 120 minutes following reported alcohol consumption from random or initial drink prompts. Following completion of the EMA protocol, participants returned for a laboratory debriefing session and were compensated according to their compliance rate, for a total maximum possible compensation amount of $250 for the whole study. Average compliance for participants included in this project was 80% for morning reports and 80% for random prompts.

The 29 participants from Study 1 that were included in this project were primarily female (N=23, 83%) and ranged in age from 18 to 36 years old (M= 23.3; SD= 4.25). 90% of the sample identified as white and 10% identified as black/African-American. Most participants were single/never married (86%) and without children (86%). A total of 2,927 reports from Study 1 were included.

Study 2[1] was designed to investigate neural functional connectivity, physiology, and emotion dysregulation in daily life. Inclusion criteria for Study 2 were: female, right-handedness, and diagnosed with a disorder of emotion dysregulation (i.e., mood, anxiety, borderline personality disorders), and currently in outpatient treatment. The Study 2 protocol was identical to that of Study 1 with the following exceptions: 1) participants completed an fMRI imaging session as part of the baseline laboratory session instead of the psychophysiological procedure in Study 1; and 2) participants self-initiated reports only for mood dysregulation episodes—participants did not initiate reports for craving or drinking episodes and alcohol follow-up reports were not administered. Average compliance for participants included was 88% for morning reports and 87% across random prompts.

A total of 20 participants from Study 2 were included in these analyses. All participants were female and ranged in age from 18 to 37 years old (M= 24.6; SD= 5.21). 90% of the sample identified as white and 10% identified as black/African-American. Most participants were single/never married (78%) and without children (90%). These participants from Study 2 provided a total of 1,621 reports.

[1]Data from the full sample with different research and analytic foci are published in Hua et al. (2019).

Measures common to both studies

***UPPS Impulsive Behavior Scale* (Whiteside and Lynam, 2001).—**The UPPS questionnaire consists of 44 items assessing four distinct aspects of impulsive behavior: Negative Urgency, (lack of) Perseverance, (lack of) Premeditation, and Sensation Seeking. This measure has demonstrated reliability and validity within clinical, community, and college samples. For both studies, participants completed the UPPS during the baseline laboratory assessment session (i.e., before the EMA phase). Alpha coefficients for the UPPS subscales in the combined sample ranged from 0.77 (lack of Premeditation) to 0.90 (Negative Urgency).

Momentary impulsivity.—Momentary impulsivity was assessed during the EMA phase for both studies using a four-item scale corresponding to state manifestations of the four facets of impulsivity outlined in the UPPS model (Whiteside & Lynam, 2001). The items were: “I felt and acted on a strong impulse” (urgency); “I did something without really thinking it through” (lack of premeditation); “I gave up easily” (lack of perseverance); and “I did something for the thrill of it” (sensation seeking). Participants were asked to respond on a 5-point Likert scale (1= *very slightly or not at all*, 5= *extremely*) the degree to which they experienced each in the previous 15 minutes.

Alcohol use.—Alcohol use was assessed in all prompts during the EMA phase. Participants were asked whether they consumed alcohol since they last responded to a prompt (1 dichotomous item) and, if they had, the number of standard drinks that were consumed (1 continuous item). Combining data from both studies, results of unconditional multi-level models (MLMs) indicated that approximately 13% of the variance for the dichotomous drink outcome occurred at the person level, 29% at the day level, and the remaining 58% of variance in the drink variable occurring at the momentary level. For the continuous number of drinks variable, approximately 6% of the variance was accounted for by person, 12% by day, and the remaining 82% accounted for by moments.

Analytic plan

Only participants who drank during the EMA component of the studies were included in data analysis. Additionally, data were constrained to include only the first 21 days of EMA data; due to scheduling, a few participants contributed more than 21 days of data in Study 1 but these were not included. All available data from all prompt types (e.g., random, follow-up, participant-initiated) were used across both studies. A total of 4,548 reports were included in analyses.

All analyses were completed in SAS 9.4 using Proc GENMOD to predict dichotomous drinking (yes/no) and Proc MIXED to predict number of drinks. The data structure was specified as moments nested within days within people. Random effects were included on a model-by-model basis. Random effects were initially included for all impulsivity predictor variables at the moment- and day-levels and individual random effects were then removed if the models did not converge or if the random effects modeled were not significant (suggesting these could be modeled as fixed effects). No person-level random effects were specified. This process was completed iteratively for each random effect in each model. All

models included covariates of age, gender, weekend (yes/no), hour since wake, and day in the study[2]. Participants in Study 1 reported significantly more drinking occasions (n=436) than those in Study 2 (n=111). Frequencies of prompt completion indicate this difference is attributable to participant-initiated drinking reports and drinking follow-ups. To account for this, study (Study 1 or Study 2) was included as a covariate in all models. To account for possible reciprocal effects between impulsivity and alcohol, we also included the cumulative sum of drinks consumed in the day leading up to each prompt as a momentary covariate in all models. Thus, any significant impulsivity effects represent the effects of impulsivity controlling for alcohol already consumed.

Models first were run for each facet separately. Running separate models for each facet allowed us to test for the independent association of each impulsivity facet with drinking behaviors in daily life, addressing our first hypothesis about differential patterns of associations across facets. These models included moment-, day cumulative average-, and person-level effects of a given facet (e.g., moment, day cumulative average and person-level sensation seeking), and covariates. Momentary facet scores represent impulsivity reported concurrently (at the same prompt) as the outcome. At each time-point we computed a cumulative average score, the average of that facet score so far in that day up to a given prompt (Cassell, 2010). We used the cumulative average rather than a day-level average because a day-level average includes all reports within a day (including those after the current prompt and later alcohol use), whereas the cumulative average includes only reports prior to a given prompt. By including the cumulative average impulsivity facet score and the cumulative sum of drinks so far in a day, we adjust for alcohol already consumed and the possible influence of later alcohol use on impulsivity scores. The combined inclusion of these variables therefore effectively controls for possible reciprocal influences of alcohol on momentary impulsivity scores. Impulsivity predictors were centered according to the level of measurement per convention: momentary scores were centered on day means within person; day-level cumulative average was centered on person means within sample; and person-level scores were centered on sample mean. Including the UPPS baseline score for the respective facet as a predictor in each model allowed us to test our second hypothesis about the relative contributions of trait and state-level impulsivity.[3]

We lastly tested the incremental contributions of each facet by entering all four facets (at all levels) and UPPS scales together into the same model with covariates.

Results

Frequencies and Descriptives

A total of 4,548 momentary reports were included in the dataset used for these analyses from 49 total participants. These include 547 drinking reports (13% of total reports). In most drinking reports participants reported consuming one (N=306, 56%) or two drinks (N=154, 28.2%) since the previous prompt. Reports of four or more drinks since the last report were

[2]We also ran models including time since the last completed prompt as a covariate. Inclusion of this variable did not alter the pattern of results, significance of effects, or magnitude of estimates.
[3]We also tested for possible interactions between state and trait impulsivity variables; however, no interaction terms were significant.

relatively infrequent (N=33, 6%). That said, heavier drinking days (e.g., drinking four or more drinks in a day) were reported by 28 of the 49 participants, with 21 of those participants reporting multiple heavier drinking days (mean=4.31 heavy drinking days, SD=2.48).

Descriptives for baseline UPPS scales and person-level aggregates of EMA facets are reported in Table 1. Baseline UPPS questionnaire scale mean scores ranged from 1.91 (lack of premeditation; SD=0.38) to 2.73 (sensation seeking; SD=0.57). No significant gender differences were found for baseline UPPS facet scale scores. EMA assessed impulsivity facets showed a somewhat narrower range of scores, with person-level means between 1.12 (sensation seeking; SD=0.16) and 1.20 (lack of perseverance; SD= 0.27).

Pearson correlations between baseline UPPS facets and person-level aggregates of EMA facets are also reported in Table 1. Convergent correlations between EMA facets and respective UPPS scales were typically moderate, ranging from 0.46 (EMA and UPPS lack of perseverance) to 0.10 (EMA and UPPS lack of premeditation). Intercorrelations among EMA facets suggest some method-specific effects (range 0.31 to 0.83) and poor discrimination between the EMA facets at the person-level. Baseline UPPS intercorrelations did not evince the same method-specific effects (range −0.001 to 0.46), though several scales did demonstrate poor discrimination (e.g., UPPS lack of perseverance, UPPS sensation seeking) similar to EMA facets.

Multi-level models

Table 2 shows the results of the four models predicting *momentary drinking (yes/no)*. Each facet model was run independently of the others, so each facet header represents a unique model predicting momentary dichotomous drink. As shown in Table 2, none of the urgency, (lack of) perseverance, or sensation seeking variables were significant predictors of drinking in the moment. (Lack of) premeditation at the moment- (OR=1.26, $p<0.05$) and at day-levels (OR=1.62, $p<0.05$) significantly predicted drinking. This momentary effect indicates that participants reporting having a drink since the last prompt are also more likely to report experiencing greater difficulties with premeditation in the last 15 minutes. The latter, day-level cumulative average effect indicates that individuals reporting greater than typical difficulties with planning so far that day were 1.62 times more likely to report drinking at a given prompt. Finally, those with higher UPPS (lack of) premeditation scores at baseline were also more likely to report drinking (OR=1.45, $p\leq0.01$).

Table 3 reports the models predicting *number of drinks consumed since the last prompt*. Again, one model was run for each of the four facets independently, for a total of four unique models (one per facet). Urgency and (lack of) perseverance were not significant predictors of how much alcohol the participants reported consuming since the last prompt. Day-level cumulative average was the only level of (lack of) premeditation to predict the drink number outcome. Individuals experiencing greater than typical difficulties with premeditation so far in a day (up to the last prompt) reported having consumed a greater number of drinks since the last prompt (b=0.16, $p<0.05$). In the sensation seeking model, momentary sensation seeking was significant (b=0.08, $p<0.05$); individuals reporting experiencing greater sensation seeking in the past 15 minutes also reported having drank

relatively more alcohol since the last prompt. Though these momentary effect estimates are small, they would equate to meaningful differences in alcohol consumption over an entire drinking episode.

The final model testing the incremental contribution of EMA-assessed impulsivity facets and UPPS traits in predicting the two drinking outcomes (dichotomous drink and drink number) is shown in Table 4.[4] The left column of Table 4 presents estimated odds-ratios from the model predicting dichotomous drink (yes/no). None of the UPPS questionnaire facets significantly predicted participant momentary drinking when entered with EMA facets.[5] Greater EMA cumulative average (lack of) premeditation significantly increased the odds of a participant drinking at any given prompt (OR=1.77, $p<0.05$).[6]

The right-hand column of Table 4 reports effects from the model predicting number of drinks consumed since the last prompt. None of the baseline UPPS questionnaire scales significantly predicted momentary drink number when entered alone or jointly with EMA-assessed facets. The only EMA-assessed facet to significantly relate to momentary drink number when EMA facets was the cumulative average (lack of) premeditation experienced by participants leading up to a given prompt (b=0.19, $p\leq0.01$).[7]

Discussion

This study examined the effects of momentary and trait impulsivity facets on alcohol use behavior in daily life. Using a sample from two combined EMA studies we employed multi-level models to assess two primary questions and related hypotheses. First, we hypothesized that individual momentary facets of impulsivity would show differential and unique patterns of association with alcohol use behavior. Specifically, we posited that sensation seeking would relate to dichotomous drinking and that urgency and (lack of) premeditation would relate to number of drinks consumed. Counter to our hypothesis, urgency was not related to momentary drink number and concurrent sensation seeking was related to momentary drink number, not dichotomous drinking. Our results also identified (lack of) premeditation as particularly salient to drinking in daily life. Difficulties with premeditation over the day so far significantly predicted both momentary drinking and quantity consumed, above and beyond other facets of impulsivity.

Previous EMA studies have shown that deteriorating inhibitory control (increasing impulsiveness) over a day confers risk for drinking (Jones et al., 2018). Our results suggest a similar, though more specific, process whereby individuals are more likely to report drinking and drinking more when they have experienced relatively greater difficulties with thoughtful deliberation so far that day. Individuals with general difficulty with planning (higher UPPS (lack of) Premeditation scores) were also more likely to report drinking at a given prompt. This is consistent with recent work showing that daily fluctuations in (lack of) premeditation

[4]Two additional models were run as part of model building. First, UPPS baseline facets were entered with covariates. Second, EMA person-level facet aggregates were entered with covariates. Results from these models are presented in Supplementary Table 1.
[5]UPPS (lack of) Premeditation significantly predicted likelihood of drinking when UPPS facets were entered alone (OR=1.41, p=0.05; Supplementary Table 1).
[6]The same effects were significant when EMA facets were entered into the model alone (Supplementary Table 1).
[7]See footnote 6.

among individuals with Attention-Deficit Hyperactivity Disorder (ADHD)—characterized by poor planning and attentional control—related to past binge drinking and alcohol related problems (Pedersen et al., 2019).

Together these paint a picture wherein individuals who typically struggle with forethought and planning are particularly susceptible to alcohol use (and heavier alcohol use) as they experience fluctuating increases in those difficulties in daily life, which may ultimately lead to more alcohol-related problems. This process, if replicated in treatment samples, could help explain the significant diagnostic co-occurrence of Alcohol Use Disorder (AUD) and disorders characterized by impulsive tendencies and executive function deficits (e.g., ADHD, Borderline Personality Disorder, Antisocial Personality Disorder). Identifying poor premeditation as particularly important to drinking behaviors in daily life highlights possible avenues for prevention and intervention efforts, including behavioral planning and identifying coping strategies for days or moments of increased impulsivity—such as strategies used in Dialectical Behavior Therapy or Cognitive Behavioral Therapy.

Concurrent momentary poor premeditation significantly related to likelihood of drinking the moment and concurrent momentary sensation seeking significantly related to drink number. The timeframes referenced in the impulsivity and drinking items result in the impulsivity timeframe occurring during and after alcohol consumption. As such, these effects indicate co-occurring changes such that recent alcohol consumption is related to momentary increases in sensation seeking and impairment in forethought.[8] Post-hoc supplemental analyses (see Supplementary Table 2) suggest alcohol may have acute and aggregate effects on (lack of) premeditation and sensation seeking specifically. However, issues of sample size and response rates (particularly reduced responding over the course of drinking episodes) merit caution in interpreting these findings. Future studies could further investigate this using EMA protocols specifically designed to elicit additional participant responses under intoxication and over the duration of drinking episodes (see Piasecki, 2019 for further discussion).

Our second hypothesis stated that both momentary facets and baseline UPPS scores, reflecting state- and trait-levels of impulsivity respectively, would be significant predictors of drinking behavior in daily life. Individuals higher on the UPPS (lack of) premeditation scale were nearly 1.5 times more likely to report drinking at any given prompt. This was, however, the only significant person-level impulsivity indicator (UPPS baseline score or EMA person-level aggregate) across any model.

The (lack of) significant person-level or trait-level effects is not altogether surprising given that our research questions, and consequently the models, focus on momentary instances of drinking behavior. Historically, research has found consistent effects relating trait-level impulsivity to global or long-term patterns of alcohol use behavior; daily life studies, however, have reported less consistent trait-level effects. Our results contribute to a growing

[8]We tested models of reciprocal effects of alcohol on impulsivity ratings. Procedures and results for these analyses are reported in supplementary materials. Generally, results showed that alcohol use predicted increases in (lack) of premeditation and sensation seeking. Because significantly fewer reports were provided after drinking initiation and response rates progressively decreased over the course of drinking episodes, these analyses may be under-powered and findings should be interpreted with that in mind.

body of research suggesting that trait-level impulsivity may be an inconsistent predictor of alcohol use in daily life (Black et al., 2018; Dvorak et al., 2016; Gaher et al., 2014). Some research suggests that impulsive traits more commonly function as moderators of more proximal predictors of drinking, such as mood (Bold et al., 2017; Simons et al., 2010), psychopathology symptom expression (Black et al., 2018; Gaher et al., 2014), or intentions to drink (Stevens et al., 2017).

Correlations between person-level aggregates of EMA facets and UPPS questionnaire scores showed only moderate convergence in this study. Effect estimates from our data are similar to those reported in other studies that have compared momentary assessments of impulsivity to trait measure scores (e.g., Pedersen et al., 2019; Sperry et al., 2018; Tomko et al., 2014). However, low to moderate convergence between EMA-assessed and trait-level measures could indicate that the two capture related but not identical constructs, similar to what has been documented regarding trait self-report and behavioral task measures of impulsivity (see Cyders & Coskunpinar, 2011; Sharma et al., 2014). On the other hand, when considering state and trait impulsivity, perhaps they capture similar domains but through distinct lenses (time-frames). Additional research into these constructs and their respective nomological networks (of associated behaviors, problems, and outcomes) can elucidate how state and trait impulsivity relate to each other or substance use behaviors in daily life.

It is also possible that trait impulsivity may be somewhat of a misnomer. It has been suggested that impulsivity traits do not show the same stable and enduring patterns that other traits do over time. For example, conscientiousness and impulse control (the inverse of impulsivity) show well-established age effects wherein impulse control improves over the lifespan, particularly in middle and late adulthood (McAdams & Olson, 2010). Moreover, several studies, including this one, show intra-individual variability in impulsivity across relatively short periods of time (e.g., Ansell et al., 2015; Jones et al., 2018; McCarthy et al., 2018; Pedersen et al., 2019; Tomko et al., 2014, 2015; Trull et al., 2016). Some suggest that individuals high in impulsive traits likely are not constantly thinking or acting impulsively, rather impulsivity is more likely expressed in “spikes” when individuals think or act impulsively for a brief period (Wright & Simms, 2016). High trait level impulsivity could then be conceptualized as larger or more frequent spikes, or greater variability, aggregated across time. This may explain why trait-level impulsivity scores may not predict specific instances of behavior well, because that aggregation masks consequential brief expressions of impulsive thoughts and behaviors.

The results of this study should be interpreted with several considerations in mind. First, these participants were not selected based on alcohol-related impairment or treatment. Given evidence that trait impulsivity may act as a predisposition to developing Alcohol Use Disorder and other alcohol-related problems, it is plausible that the relationship between state and trait impulsivity and alcohol use in daily life would be different in a sample selected for alcohol-related impairment (e.g., those with chronic AUD). Additionally, most participants reported consuming alcohol at a relatively moderate pace (with most reporting having one or two drinks since the last prompt), which likely impacted estimated effect sizes in models predicting momentary drink number. Heavier drinkers may show different patterns of effects based on rate of consumption, which should be investigated in future studies.

Second, these participants were selected for emotion regulation difficulties (i.e., diagnoses of mood, anxiety, and/or borderline personality disorders) and were predominantly white and female. Therefore, additional research is required to establish how these results may or may not generalize to other groups. Lastly, EMA impulsivity facets were measured with one item each. This choice aimed to minimize participant burden (given this was part of a larger EMA protocol) and the incremental predictive validity of longer scales in EMA protocols, as well as how many items is sufficient, is an empirical question that remains to be answered with future research. However, it is possible that these few items may not have captured all important expressions of the respective facet constructs. Furthermore, EMA impulsivity items demonstrated some high intercorrelations (particularly EMA urgency and (lack of) premeditation and sensation seeking) and low correlations with matched UPPS facet scores (particularly EMA and UPPS urgency). While these EMA impulsivity items tap into constructs differentially related to alcohol use (as evidenced in multilevel model results), it is unclear the degree to which these items—particularly EMA urgency—tap into both the intended UPPS construct and constructs distinct from other aspects of impulsivity. Similar concerns about measurement of momentary or state impulsivity using EMA have been discussed elsewhere (see Stevens et al., 2020) and justify future investigation in relation to the items used here.

Conclusions

This study offers a unique perspective on the long-recognized relationship between impulsivity and alcohol use. Using EMA, we assessed facets of impulsivity and alcohol use behavior in daily life, contributing to the emerging literature on the validity of momentary (state) impulsivity and its relationship to alcohol use behaviors. Our results identify state-level poor planning, or poor deliberation, as significantly relevant to alcohol use in daily life, above and beyond other facets of impulsivity. Additionally, these results support the validity of momentary impulsivity facets above and beyond trait-level measures in relation to drinking behavior in daily life. Future research using EMA methods to investigate these relationships is necessary to replicate and extend these findings using more comprehensive momentary facet assessments within high-risk or high-use groups. However, these results have important implications for understanding the phenomenology of alcohol use and momentary risk factors for drinking.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Descriptives and correlations between impulsivity variables

	1	2	3	4	5	6	7	Mean (SD)
1. EMA Urgency								1.17 (0.18)
2. EMA (lack of) Premeditation	0.83***							1.15 (0.23)
3. EMA (lack of) Perseverance	0.34*	0.36**						1.20 (0.27)
4. EMA Sensation Seeking	0.75***	0.62***	0.31*					1.12 (0.16)
5. UPPS Negative Urgency	0.29*	0.29	0.11	−0.001				2.56 (0.67)
6. UPPS (lack of) Premeditation	0.09	0.10	−0.03	0.13	0.44**			1.91 (0.38)
7. UPPS (lack of) Perseverance	0.25	0.40**	0.46***	0.12	0.43**	0.27		2.07 (0.56)
8. UPPS Sensation Seeking	0.23	0.17	0.18	0.30*	0.35**	0.36**	0.35**	2.73 (0.57)

* p<0.05;

** p≤0.01;

*** p≤.001

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Table 2.

Predicting dichotomous drink (Y/N)

	Urgency			(lack of) Premeditation			(lack of) Perseverance			Sensation Seeking		
	OR	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**	
Intercept	0.02**	0.01	0.04	0.01**	0.004	0.03	0.02**	0.01	0.04	0.01**	0.01	0.04
Momentary facet	1.14	0.93	1.38	1.26*	1.02	1.55	1.01	0.81	1.26	1.22	0.96	1.54
Cumulative average facet	1.41	0.96	2.08	1.62*	1.08	2.43	0.95	0.67	1.33	1.13	0.72	1.80
Person-level facet	1.72	0.92	3.20	1.45	0.95	2.21	0.90	0.48	1.69	2.09	0.98	4.47
UPPS facet	1.10	0.91	1.33	1.45**	1.10	1.91	1.10	0.88	1.38	1.16	0.94	1.42
Covariates												
Cumulative drink sum	1.26**	1.12	1.42	1.26**	1.12	1.41	1.28**	1.14	1.44	1.26**	1.12	1.42
Weekend	1.92**	1.50	2.47	1.92**	1.49	2.47	1.86**	1.45	2.38	1.88**	1.47	2.41
Study day	1.00	0.98	1.02	1.00	0.98	1.02	1.00	0.97	1.02	1.00	0.97	1.02
Hour after wake	1.28**	1.23	1.33	1.28**	1.24	1.33	1.27**	1.23	1.32	1.28**	1.23	1.33
Gender	0.99	0.69	1.43	1.02	0.72	1.45	1.06	0.74	1.51	0.99	0.69	1.40
Age	1.03	0.99	1.06	1.04*	1.01	1.07	1.02	0.99	1.05	1.03	1.00	1.06
Study	0.54**	0.39	0.75	0.54**	0.39	0.75	0.56**	0.40	0.79	0.56**	0.41	0.78

Note.

** p≤0.01.

* p<0.05.

OR= Odds-ratio. CI= Confidence interval.

Table 3.

Predicting drink number

	Urgency		(lack of) Premeditation		(lack of) Perseverance		Sensation Seeking	
	Est	**SE**	**Est**	**SE**	**Est**	**SE**	**Est**	**SE**
Intercept	−0.17	0.18	−0.26	0.18	−0.22	0.18	−0.25	0.19
Momentary face †	0.05	0.03	0.04	0.03	−0.0003	0.03	0.08 *	0.03
Cumulative average facet †	0.01	0.04	0.16 **	0.05	−0.01	0.03	0.06	0.05
Person-level facet	0.20	0.16	0.15	0.12	−0.06	0.12	0.16	0.19
UPPS scale	0.07	0.04	0.08	0.07	0.06	0.05	0.01	0.05
Covariates								
Cumulative drink sum	0.09 **	0.01	0.09 **	0.01	0.09 **	0.01	0.09 **	0.01
Weekend	0.11 **	0.03	0.11 **	0.03	0.11 **	0.03	0.11 **	0.03
Study day	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.002
Hour after wake	0.04 **	0.003	0.04 **	0.003	0.04 **	0.003	0.04 **	0.003
Gender	0.03	0.09	0.05	0.09	0.06	0.09	0.07	0.09
Age	0.003	0.01	0.01	0.01	0.004	0.01	0.01	0.01
Study	−0.10	0.05	−0.10	0.06	−0.10	0.06	−0.10	0.06

Note.

** p≤0.01.

* p<0.05.

† indicates retained random effect.

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Table 4.

All four EMA and UPPS facets entered jointly

	Drink (Yes/No)			Drink number	
	OR	95% CI		Est	SE
Intercept	0.01***	0.004	0.03	−0.20	0.20
EMA Urgency moment.	1.01	0.79	1.29	0.03	0.03
EMA Premeditation moment.	1.24	0.95	1.62	0.01	0.03
EMA Perseverance moment.	0.97	0.77	1.21	−0.01	0.02
EMA Sensation Seeking moment.	1.16	0.90	1.49	0.06†	0.04
EMA Urgency c. avg.	1.24	0.79	1.94	−0.05	0.05
EMA Premeditation c. avg.	1.77*	1.08	2.90	0.19**†	0.06
EMA Perseverance c. avg.	0.76	0.53	1.09	−0.04	0.03
EMA Sensation Seeking c. avg.	0.83	0.50	1.38	−0.004	0.05
EMA Urgency person	0.40	0.07	2.21	0.20	0.37
EMA Premeditation person	1.70	0.57	5.05	0.003	0.24
EMA Perseverance person	0.69	0.34	1.41	−0.09	0.13
EMA Sensation Seeking person	2.98	0.56	15.89	0.003	0.34
UPPS Negative Urgency	1.07	0.82	1.40	0.06	0.06
UPPS Premeditation	1.37	0.92	2.03	0.03	0.09
UPPS Perseverance	0.93	0.70	1.24	0.03	0.06
UPPS Sensation Seeking	1.07	0.81	1.41	−0.03	0.06
Covariates					
Cumulative drink sum	1 25***	1.11	1.40	0.09***	0.01
Weekend	1 94***	1.51	2.49	0.11***	0.03
Study day	1.00	0.98	1.02	0.003	0.002
Hour after wake	1 29***	1.24	1.34	0.04***	0.003
Gender	0.97	0.68	1.39	0.03	0.09
Age	1.03	1.00	1.07	0.004	0.01
Study	0.59***	0.43	0.83	−0.08	0.06

Note.

*** p≤0.001

** p≤0.01.

* p<0.05.

† indicates retained random effect.

Moment.=Momentary; Premeditation= (lack of) Premeditation; Perseverance= (lack of) Perseverance; c.avg. = cumulative average.