

THESIS

EMOTION'S ROLE IN CHALLENGING INTERPERSONAL CONTEXTS AND
SUBSTANCE USE: A MULTILEVEL MEDIATION ANALYSIS

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ABSTRACT

EMOTION'S ROLE IN CHALLENGING INTERPERSONAL CONTEXTS AND SUBSTANCE USE: A MULTILEVEL MEDIATION ANALYSIS

Emotions have a well-established role in substance use, however there are several mixed findings on how exactly positive affect (PA) and negative affect (NA) influence substance use. Interpersonal contexts are known to influence both emotions and substance use, especially among youth. This study attempted to clarify the relationship of emotions and substance use by hypothesizing that there is a cascade effect of challenging interpersonal contexts (CICs) that facilitate acute changes in PA and NA which, in turn, leads to increased substance use. This study used secondary data from a parent ecological momentary assessments (EMA) study to examine the links between CICs, emotions, and substance use in a sample of young adult college students. Multilevel path analysis results echoed other studies in that an occurrence of a CIC was associated with participants feeling overall worse at the same moment (more NA, less PA). Interestingly, at the within-person level, PA at the previous moment exhibited a significant positive direct effect on substance use at the next moment. CICs at the previous moment exhibited an indirect effect on substance use at the next moment through acute changes in PA at the within level. CICs also exhibited a direct positive effect on substance use at the between-person level. There were no significant observed effects for NA at either the within- or between-person level. Our study replicated how CICs can make individuals feel worse while also indicating unique findings of PA's role in how CICs are associated with substance use.

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TABLE OF CONTENTS

ABSTRACT..... *ii*

ACKNOWLEDGEMENTS *iii*

Introduction..... 1

 Emotions 3

 Interpersonal Contexts and Emotions 6

 Interpersonal Contexts and Substance Use 7

 Emotions and Substance Use 8

 Current study: Relationships between CICs, Emotions, and Substance Use..... 11

 Hypothesis..... 12

 Figure 1 14

Method 15

 Participants and Procedure..... 15

 Measures 17

 Analysis Plan 19

Results..... 22

 Descriptive Statistics..... 22

 Multilevel Path Analysis of CICs, NA, PA, and Substance Use 22

 Figure 2. 26

Discussion..... 28

 Limitations and Future Directions 33

 Conclusion 34

Tables and Figures 36

References..... 40

Appendix..... 55

 Appendix A..... 55

Introduction

Substance use disorders (SUDs) have been a major public health concern in the United States for many years (Hingson et al., 2009) affecting 14.5% (40.3 million) of individuals aged 12 and older (Substance Abuse and Mental Health Services Administration [SAMHSA], 2021). Young adults aged 18-25 are at a particularly high risk of developing a SUD with 24.4% (8.2 million) meeting criteria for any SUD in the past year with past year alcohol use disorder (15.6%; 5.2 million) and cannabis use disorder (13.5%; 4.5 million) being the most commonly endorsed in this age group (SAMHSA, 2021). Given this high prevalence in young adults, it is important to identify and understand modifiable mechanisms that contribute to the development of heavy substance use patterns for both prevention and treatment efforts.

One mechanism thought to contribute to heavy substance use patterns in young people is positive and negative reinforcement (Sher & Grekin, 2007). It is posited that individuals use alcohol and/or cannabis due to the positive or negative reinforcing qualities of these substances (Conger, 1956; Cooper et al., 2016; Simons et al., 1998). Central to these models is the expectation that those who use alcohol and/or cannabis to regulate their emotions become motivated to use when they experience heightened levels of positive affect (PA) and negative affect (NA; Cooper et al., 2016; Sher & Grekin, 2007). Despite the intuitive nature of these models, within-person research has often produced mixed results, especially for NA (Dvorak & Simons, 2014; Simons et al., 2010). While the expected positive association is found in many studies (Hussong et al., 2001; Shadur & Hussong, 2014; Swendsen et al., 2000), there is also research showing inverse or null results for NA (e.g., Hussong et al., 2005). In other studies, people who use substances may use to increase PA (Bhushan et al., 2013; Emery & Simons,

2020; Rankin & Maggs, 2006) or regulate fluctuations in affect (Gottfredson & Hussong, 2013). Taken together, this suggests there is a complex relationship between affect and substance use. Clarity may require consideration of other factors associated with both substance use and emotional functioning.

One factor closely linked to both substance use and emotions is interpersonal contexts (Laws et al., 2017; Locke et al., 2015; Thorberg & Lyvers, 2010). Negative interpersonal experiences such as rejection and exclusion can often lead to NA (Bacon et al., 2015; Leary, 2015). However, though negative interpersonal experiences are more commonly associated with increased NA, in some cases positive or neutral emotions are the prevailing affective response (Holmbeck & Hill, 1991; Laursen & Koplas, 1995). Not surprisingly, interpersonal and social contexts are also tied to greater substance use (Emery et al., 2020; Laws et al., 2017; Meisel et al., 2021; Stickley et al., 2014). Despite these clearly intersecting set of processes, few studies have looked at all three in the same model. In an attempt to better understand these complex relationships, a recent study examined the relationship between disagreements or rejection and drinking on a given day (Fleming et al., 2021). They demonstrated that disagreements occurring earlier in the day increased the likelihood of drinking later that day and that rejection occurring earlier in the day decreased the likelihood of drinking later that day. Interestingly, the results for disagreements and rejection are contrary to one another. While this study sought to clarify the relationship between disagreements/rejection and alcohol use, the mixed findings found may be indicative of something else that is happening in this relationship between these challenging interpersonal contexts (CICs) and drinking. Embedded in the model proposed by Fleming and colleagues is that CICs would give rise to use as an attempt to alleviate NA; however, this specific cascade of CICs to acute shifts in affect to use was not tested. Instead, NA was assumed which presents issues given NA is not the only prevailing emotional response to CICs (e.g., PA

after a disagreement). Therefore, there are some unanswered questions such as 1) do CICs give rise to acute shifts in PA and NA; 2) do these acute shifts in PA and NA mediate the relationship between CICs and substance use. Hence, the aim of the current study is to fill these important gaps in our knowledge to help us better understand the links between interpersonal contexts, emotion, and substance use. In the sections to follow, empirical and theoretical literature on each major construct will be reviewed.

Emotions

Emotions are central to the human experience and have many important functions such as directing attention, tuning the senses, facilitating decision making, aiding social interactions, and creating episodic memories. They can also be unhelpful when mismatched to the context, too strong/weak, or are inappropriate in duration (Gross, 2014). Given the centrality of emotion to the human experience, better understanding their role in decision making is essential. According to the Modal Model of Emotion (Barrett et al., 2007; Gross, 2014), emotions are designed to be fast acting systems that prime the body for a specific set of actions and have two core features: their timing and multifaceted nature. Emotions arise quickly as a result of attending to and appraising a situation's relevance to an individual's goals and/or survival, then responding accordingly (Lazarus, 1991; Scherer, 2005; Scherer et al., 2001). Whatever the goal, and whatever the source of the situational meaning for the person, it is this meaning born from rapid information processing that gives rise to emotion. Emotions are a cumulation of numerous neurobiological systems working together to generate a specific emotion at a certain time, in order to organize the necessary resources needed to swiftly carry out a set of actions in response to environmental circumstances (Levenson, 1999).

The Modal Model of Emotion also proposes the following sequence of events when emotions arise: situation, attention, appraisal, and response (Gross, 2014). The first in the sequence is the situation, meaning the context a person finds themselves in that is evoking the emotion. This can be external (ex: approaching a snake) or internal (ex: thinking you're not good enough). Directing attention to the situation is the second phase that then leads to the third element of appraisal. Appraisal means to take inventory of the circumstance and interpret the situation in relation to goals of the individual. This can happen implicitly or explicitly. These appraisals often happen quickly and without much effort when presented with a new situation. Lastly, the emotional response happens. The emotional response then triggers neurobiological and behavioral changes needed to effectively navigate the environment. Often the emotional response can change and introduce modification to the initial situation, triggering the sequence again. For example, if there is a situation where a person was walking down the street and saw someone they know and waved at them, but that person didn't wave back. This situation directs attention to the relationship between these people and the person that waved might appraise this inaction on the other person's part to be because they aren't as close as they thought, and then respond by feeling the emotion sadness. Importantly, this happens so fast that much of the sequence is often unconscious. Given emotions are so complex and situation/time dependent, defining and measuring them has proven difficult.

Measuring emotions can be challenging because they are hard to define, fleeting, and hard to recall. Affect is often an umbrella term under which emotions, stress responses, feelings, and moods are subsumed. Also, affect is dynamic and often somewhat transient (Kassel, 2010) given its dependence on situations and goals. They can change quickly or linger for a while. Recall of emotions are not very accurate either. It is hard to recall emotions felt during a certain situation because current affective states can color past recall of emotions (Bower, 1981; Snyder

& White, 1982). Also, when recalling past moods, they are often inaccurate and overexaggerated (Thomas & Diener, 1990). To truly measure emotions, they need to be observed during or soon after they happen, be sensitive to their dynamic nature, and capture contextual information about situations of interest. In order to model affect in this way, advanced data collection methods that can gather intensive repeated measurements need to be used.

Ecological momentary assessment (EMA; Stone & Shiffman, 1994) is a data collection technique that uses repeated assessments to capture participants' emotional, behavioral, or cognitive experiences, in real or near real time while participants are in their natural environment (i.e., in vivo) via smart phones. As such, EMA can catch emotions while they are happening, during specific situations of interest, or closely after they happen (Kassel, 2010). EMA also enhances the generalizability of findings in several keyways. First, EMA reduces retrospective recall bias that can affect more traditional global or single occasion measures by asking questions in close proximity to the event in question. Second, the data is collected in "real world" settings that more accurately reflect the lived experience of individuals compared to laboratory settings. EMA methods use a few different approaches to gather intensive longitudinal data such as event-based sampling (gathering data when an event of interest happens), fixed-interval sampling (gather data at the same time on a regular basis), and random-interval sampling (gathering data at random times on a regular basis; Silvia & Cotter, 2021). Using these types of methods, along with advanced statistical modeling, allows researchers to have more accurate depictions of emotional dynamics, which is especially useful for identifying situations that facilitate specific patterns in emotions that, in turn, increase risk for behaviors triggered by emotions such as substance use. One such trigger relevant to both affective dynamics and substance use are interpersonal contexts.

Interpersonal Contexts and Emotions

Interpersonal relationships are a part of everyday life and something that affects everyone. Relationships can come in many different forms such as friends, romantic partners, parents, peers, and colleagues. Each of these interpersonal contexts has specific functions that meets the needs of both people such as socialization and connection. Throughout evolution, humans have developed a need for reciprocity in relationships (Buunk & Schaufeli, 1999). If an individual perceives a lack of reciprocity in a relationship, it can lead to many forms of NA such as depression (Kuijer et al., 1997), burnout (Buunk & Schaufeli, 1993), anger (Meier & Semmer, 2013), anxiety (Qian et al., 2015) and loneliness (Buunk & Prins, 1998). Social relationships are also shown to increase the positive emotion and well-being across all ages (Goswami, 2012; Kawachi & Berkman, 2001). Young people often experience more PA and less depressed mood when with friends compared to times when alone (Csikszentmihalyi & Hunter, 2014; Schneiders et al., 2007). Not surprisingly, these relationships are a critical element of this life phase because adolescents are neurobiologically sensitive to peer approval, making them a primary source of reward and more likely to influence risky behaviors (Steinberg, 2007, 2008). However, this outsized role in the daily life of young people can present a host of challenges as young people learn to navigate their social surroundings. These CICs, in turn, can lead to an array of emotions and can affect substance use.

CICs are relational contexts that might be difficult for a young person to navigate effectively such as a disagreement or being rejected (Fleming et al., 2021; Hepp et al., 2018). Research suggests that CICs illicit strong NA among participants such as sadness, anger, aggression, and lower self-esteem (Bacon et al., 2015; Chow et al., 2008; Gerber & Wheeler, 2009; Leary, 2015; Stroud et al., 2000; Warburton et al., 2006). The connection between CICs and NA is intuitive; however, CICs also appear to result in reliable decreases in PA in meta-

analyses of these effects (Gerber & Wheeler, 2009). Overall, CICs appear to contribute to a unipolar shift toward feeling worse, characterized by both decreased PA and increased NA. While research hints that CICs are associated with acute changes in affect (Fleming et al., 2021), and these shifts are, at least in part, triggers for substance use, this has not been tested directly using EMA.

Interpersonal Contexts and Substance Use

Literature suggests that interpersonal experiences may influence amount and type of substance use episode (e.g. Fleming et al., 2021; Laws et al., 2017). Social rejection was associated with increased alcohol consumption in daily diary and experimental lab studies (Bacon et al., 2015; Laws et al., 2017; Rabinovitz, 2014). Among adolescents, feeling lonely (an emotion reflecting the perception of the lack of interpersonal connection), was associated with higher risk behaviors such as alcohol and other substance use (Antunes et al., 2021; Heinrich & Gullone, 2006; Stickley et al., 2014). In a study of young adult friendship dyads and alcohol use, those who had less supportive/intimate friendships drank more after feeling sadness or hostility, and that these drinking episodes increased these emotions in the following week (Hussong et al., 2001). This relationship of friendship dynamics effecting drinking when preceded by certain NA alludes to affect's potential to be a mediator of the CIC and substance use relationship. From the current research, CICs seem to influence substance use, but the literature is still sparse and does not consider emotions that may drive substance use. It also does not say that CICs always lead to one type of affect over another. However, it does show that interpersonal contexts have some influence on substance use, yet more literature is needed to parse out this relationship. CICs could be an important variable to study in the emotion and substance use relationship as it is seen

to have some effects on both emotion and substance use. Especially in young adults and adolescents, where peer influences weigh heavily on their affect.

Emotions and Substance Use

Emotion is central to almost every etiological model of substance use. These models posit substance use is negatively and positively reinforced due to the specific effects of substances on the brain (Baker et al., 2004; Conger, 1956; Wikler, 1948). Neurobiologically, drugs and alcohol are thought to stimulate the mesolimbic and mesocortical dopamine systems, which are responsible for reward, motivation, and behaviors that facilitate life (Feltenstein & See, 2008). These brain regions are designed to govern reward that occurs from natural activities, such as eating, making friends, and sexual activity (de Wit & Phan, 2010; Koob & Le Moal, 2001; Panksepp, 2010). However, these same systems are activated when using substances. The PA created from both the natural activities and substance use become positively reinforcing further promoting these behaviors (de Wit & Phan, 2010). This leads to doing these rewarding behaviors again. However, the seeking and using of addictive substances repeatedly happens more frequently and on a larger scale than naturally rewarding behaviors given the highly rewarding nature of the substances (Hyman et al., 2006).

Not only does neurobiology contribute to the etiology of substance use, but it is also responsible, at least in part, for an emotional feedback loop caused by repeated use. This feedback loop is known as allostasis. Allostasis occurs because regular substance use causes the reward centers in the brain to be chronically overactivated. In response to this overactivation, the brain changes how reward is processed leading to dysregulation over time (Koob & Le Moal, 2001). When the brain is at homeostasis, how much reward is required to change behavior is relatively low which makes naturally rewarding activities enticing. However, substances activate

the brain for much longer and at higher rates than natural rewards. To accommodate this, the brain adapts by shifting the reward threshold upward. This makes natural rewards insufficiently motivating which, in turn, results in numerous downstream issues in functioning (e.g., appetite suppression, behavioral restriction). In an attempt to bring the brain closer to homeostasis, the body begins releasing the stress hormone cortisol to offset the rewarding effects of substance use. An effect of this downregulation in reward activation is tolerance. Tolerance is important so that natural activities can compete with the drugs in terms of magnitude. However, after long periods of time, cortisol can cause major mental and physical illness from living at a state that deviates so heavily from homeostasis, also known as an allostatic load. Cortisol not only curbs the intoxicating effects of drugs, creates tolerance, and brings someone away from their homeostasis, but also facilitates withdrawal when drugs aren't in the body. When individuals need more substances to feel like they used to, and the cortisol is making them feel physically and emotionally unwell when they don't have substances, it creates a feedback loop of big emotions and using substances to cope. Simply put, emotions may cause individuals to start using, but the more they use to deal with the emotions, the more dysregulated the emotions get, and the more they have to use to cope, effectively leading to a downward spiral of addiction (Gross, 2009; Koob & Le Moal, 2001).

Even though the allostasis model stated above is theoretically sound, individuals do not always use to cope with emotions. Several experience sampling studies indicate negative emotions may be reliably associated with more substance use (Hussong et al., 2001; Shadur & Hussong, 2014; Swendsen et al., 2000). However, some studies suggest that not all emotions are created equally and that only certain negative emotions, such as stress, fear, and shyness, are related to substance use (Hussong et al., 2005; Park et al., 2004). There has also been results showing no relationship between mood and drinking (Crooke et al., 2013). Contrarily,

individuals have indicated using more when having PA (Rankin & Maggs, 2006). Large scale meta-analytic work on alcohol use and affect shows that at the day-level individuals were more likely to drink and drink heavily on days high in PA, while NA was not associated with drinking (Dora et al., 2022). Meanwhile, person-level effects in EMA research show that PA is inversely related to alcohol consumption (Dvorak & Simons, 2014; Emery et al., 2020, 2021; Emery & Simons, 2020). While there is significantly less research focused on moment to moment fluctuations in PA's impact on substance use, work also suggests this has an inverse relationship where moments that are characterized by lower PA increase the likelihood of use in the next moment (Emery et al., under review).

Several studies attempted to clarify these mixed findings on emotions and substance use by studying affect lability, meaning how much emotions fluctuate within a given time. Affect lability has been associated with increased substance use and problems (Gottfredson & Hussong, 2013; Rankin & Maggs, 2006; Shadur et al., 2015; Simons & Carey, 2006). However, another study found that affect lability was only directly associated with problems, not more use (Simons et al., 2014). Taken together, some research trying to parse out these mixed findings have been proposed, none of them to date have solved why negative emotions don't always lead to use in every situation. Perhaps, maybe these studies need to propose looking at more developmentally appropriate and contextually based NA, such as CICs.

Neurobiologically, younger individuals have less developed socioemotional networks, which are responsible for things such as thinking before acting and emotion regulation (Steinberg, 2007). This makes this population extremely sensitive to social or emotional stimuli. Risky behaviors, such as substance use, become very salient, especially when peers are around because adolescents are wired to really care what their peers think of them (Steinberg, 2008). Therefore, in these instances where NA leads to use, it could be context dependent because of

what is happening with their peers during that time. In particular, if they had any sort of NA stemming from their social network, this NA will be bigger than other feelings because they put an outweighed importance on what their peers think. Therefore, taking into account CICs in this affect and substance use relationship may be a missing piece to why there is such contradictory evidence.

Current study: Relationships between CICs, Emotions, and Substance Use

Three studies have hinted at the relationship between CICs, emotions, and substance use. Hussong et al. (2001) found that young adults who felt an increase in sadness and hostility exhibited a greater likelihood of drinking if they had less close friendships. Bonar et al. (2021) found that at the between-person level, youth who have more severe cannabis and alcohol use and have negative peer influence tend to have more loneliness. At the within-person level, youth who have more alcohol use severity, negative peer influence, and parental substance use also tend to have more loneliness. Lastly, Fleming et al., (2021) examined the relationship of two types of CICs, rejection and disagreements, on same day alcohol use in individuals with and without Borderline Personality Disorder (BPD). They found that rejection decreases the likelihood of drinking and was not moderated by BPD. Disagreements increased the likelihood of drinking, but only for individuals with BPD. The researchers discuss that this may have something to do with emotions, but the relationship between these CICs and substance use has not been elucidated in the current literature base. While these three studies examine CICs, emotions, and substance use, none of them examine the mechanisms that drive this relationship or use rigorous EMA methodologies. The EMA methodology is a key factor in this study as it can provide a temporal associations between the variables, capture the dynamic nature of emotions while reducing retrospective recall bias, and be in an in vivo setting. The current study

investigates using EMA to clarify the relationship between CICs, emotions, and substance use using a multilevel path analysis by hypothesizing that emotions mediate the relationship between CICs and substance use.

Hypothesis

It is hypothesized that CICs will lead to increased substance use indirectly through acute changes in both negative affect (NA) or positive affect (PA). To address this overarching hypothesis, several smaller hypotheses will be tested. Each number below corresponds to a pathway in Figure 1.

1. Hypothesis 1: At both the within- and between-person levels, CIC will exhibit a positive direct effect on NA; such that, at the within-person level, moments when a CIC is present will be associated with increased NA at the same moment, and at the between-person level those who experienced more CICs during the sampling period will exhibit greater average NA overall.
2. Hypothesis 2: At both the within- and between-person levels, NA will exhibit a positive direct effect on substance use; such that, at the within-person level, greater NA during the previous moment will be associated with a greater likelihood of substance use at the next moment, and at the between-person level, those with greater average NA overall will exhibit a greater proportion of use moments during the sampling period.
3. Hypothesis 3: At both the within- and between-person levels, CIC will exhibit a negative direct effect on PA; such that, at the within-person level, moments when a CIC is present will be associated with decreased PA at the same moment, and at the

- between-person level, those who experienced more CICs during the sampling period will exhibit lower average PA overall.
4. Hypothesis 4: At both the within- and between-person levels, PA will exhibit a negative direct effect on substance use; such that, at the within-person level, lower PA during the previous moment will be associated with a greater likelihood of substance use at the next moment, and at the between-person level, those with lower average PA overall will exhibit a greater proportion of use moments during the sampling period.
 5. Hypothesis 5: When controlling for NA and PA, CIC will exhibit a positive direct effect of substance use; such that, at the within-person level, moments when a CIC is present will be associated with a greater likelihood of substance use at the next moment, and at the between-person level those who experienced more CICs during the sampling period will exhibit greater proportion of use moments during the sampling period.
 6. Hypothesis 6: At both the within- and between-person levels, CIC will exhibit a positive indirect effect on substance use through NA; such that, at the within-person level, moments when a CIC is present will be associated with a greater likelihood of substance use at the next moment through acute increases in NA, and at the between-person level, those who experienced more CICs during the sampling period will exhibit greater proportion of use moments during the sampling period through greater average NA overall.
 7. Hypothesis 7: At both the within- and between-person levels, CIC will exhibit a positive indirect effect on substance use through PA; such that, at the within-person level, moments when a CIC is present will be associated with a greater likelihood of substance use at the next moment through acute decreases in PA, and at the between-

person level, those who experienced more CICs during the sampling period will exhibit greater proportion of use moments during the sampling period through lower average PA overall.

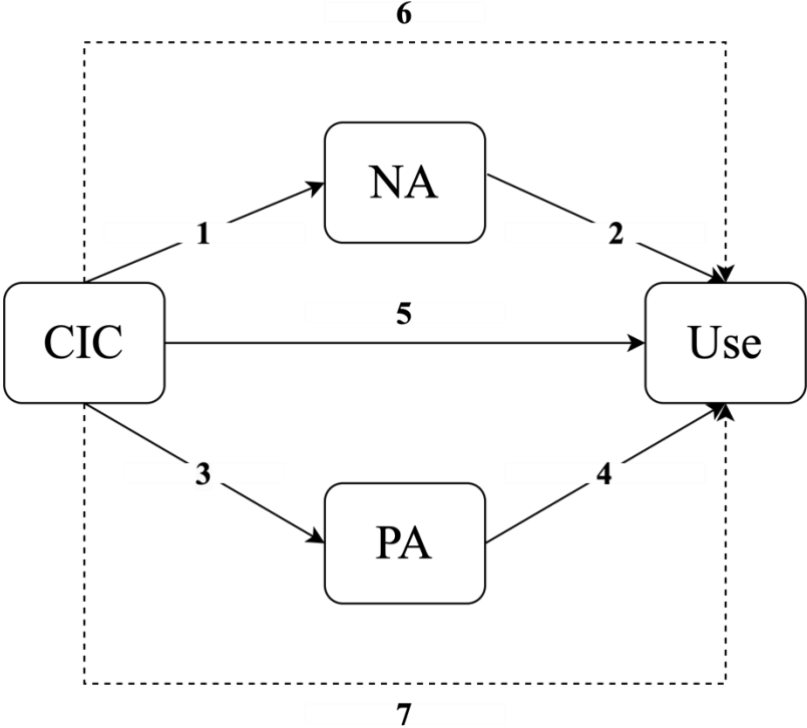


Figure 1
Note. Solid lines depict direct effects and dashed lines depict indirect effects. Numbers near path lines correspond to hypothesis numbers listed above.

Method

Participants and Procedure

Participants

The current data are a subset of a larger parent study. A sample of 340 undergraduate students aged 18-25 were recruited for a larger parent EMA study on emotions and behavioral health decisions in young adult college students. Given the larger parent study included nonusers, and the aim of our study is to understand how CICs are associated with substance use, participants were included in the present study if they endorsed using alcohol or cannabis at least 2-3 times a month in the past 90 days at baseline which represents a total of 197 participants in this sample. This sample was mostly female (73.10%, $n = 144$), predominately white (73.06%, $n = 179$), and the mean age was 19 years old ($SD = 1.46$). For full demographic information see Table 1.

Recruitment

Participants were recruited from the psychology research pool at Colorado State University.

Power Analysis

Power analysis simulations suggest that that multilevel models that have medium (i.e., .30) intraclass correlations (ICC; defined as the proportion of variance associated with the between person level out of the total variance of both levels; Arend & Schäfer, 2018) with at least 30 within-person observations and 150 participants are powered to detect within-person effects of 0.09 or greater and between-person effects of 0.24 or greater (Arend & Schäfer, 2018). 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). In the secondary data

collected, participants can have up to 70 within-person observations and contains 197 people. Thus, taken together, the data for the present study exceed the necessary minimum values; and therefore, should be powered to detect at least as small as those stated above.

Procedure

Ecological Momentary Study. Participants completed an informed consent during the initial study visit before starting the study. After informed consent, participants completed a baseline assessment. Participants were then trained to use an EMA application on their personal cell phone. Participants were assessed for 14 consecutive days. The surveys are programmed using mEMA software (Tuomenoksa, 2013) developed by ilumivu inc. The program prompts participants to complete 5 brief ~2-minute surveys regarding their affect, substance use, and contextual factors. There are two distinct types of assessments, 1 morning survey that participants completed between 9:30 a.m. – 12:30 p.m. daily and 4 surveys at random times within 3.5-hour blocks between 10 a.m. and 11:59 p.m. daily. The morning survey inquired about plans for the day and experiences of the previous day. The random surveys inquired about the participant's experience in the previous 30 minutes. Surveys started the day after the in-person lab visit and continued for 14 days. After two weeks of these 5 daily surveys, participants received an email and text saying they have finished the study and are free to delete the app off their phone. Individuals who consented to participate in the study received course credit contingent upon completion of survey responses. Each initial study visit was worth 0.5 of a course research credit. Each survey taken counts as 0.05 of a course research credit. Over 14 days, participants had the chance to earn up to 4 course research credits.

Measures

Baseline Measures

Demographic information. Participants answered questions regarding age, sex, gender identity, race/ethnicity, height, weight, employment status, and veteran status.

Alcohol use disorder. The Alcohol Use Disorder Identification Test (AUDIT) is a 10-item questionnaire assessing severity of alcohol use disorder. Items are scored on a 0-4 scale, except for questions 9 and 10 which have possible responses of 0, 2, and 4. Scores range from low risk (1-7), hazardous or harmful risk (8-14), and moderate to severe alcohol use (15 or more; Babor et al., 2001). The AUDIT exhibits high internal consistency as well as strong criterion and predictive validity (de Meneses-Gaya et al., 2009; Reinert & Allen, 2002).

Alcohol consumption. Alcohol use is assessed in two ways at baseline: frequency and quantity. Alcohol use frequency is assessed by a single item “How often have you used alcohol in the last 90 days” on a 12-point rating scale of “Not at all” to “More than once a day” (Simons & Carey, 2006). Alcohol use quantity is assessed using the Modified Daily Drinking Questionnaire (MDDQ) adapted from Dimeff et al. (1999) and estimates how many standard drinks a person has and hours spent drinking on each day of the week. The MDDQ is comprised of a grid representing the 7 days of the week where participants indicate typical daily alcohol consumption for an average week over the past 90 days. Quantity will be determined by the mean number of standard drinks (one standard drink = 12 oz. beer, 5 oz. wine, or 1.5 oz liquor) on a given drinking day.

Cannabis use disorder. The Cannabis Use Disorder Identification Test-Revised (CUDIT-R) is an 8-item questionnaire assessing severity of cannabis use disorder. Items are scored on a 0-4 scale, except for questions 9 and 10 which have possible responses of “No” or

“Yes.” Scores at 8 or more indicate hazardous use and scores of 12 or more indicate potential cannabis use disorder (Adamson et al., 2010). This revised version has acceptable to high internal consistency, high discriminant validity (ROC curve of 0.960), and excellent test-retest reliability (Adamson et al., 2010; Loflin et al., 2018; Schultz et al., 2019).

Cannabis use. Cannabis use frequency was assessed using an adapted version of the alcohol use frequency scale (Simons & Carey, 2006). Cannabis consumption will be defined as how often an individual used cannabis in the last 90 days on a 12-point scale. Answers ranged from “Not at all” to “More than once a day.”

EMA Measures

Challenging interpersonal contexts (CICs). During random surveys, participants were asked if they had experienced any of 7 possible CICs within the last 30 minutes. Participants were presented with a checklist comprised of the 7 options and instructed to check all that apply. The 7 response options include: “Had a disagreement,” “Had an argument,” “Got stood up,” “Got ditched,” “Had a difficult conversation,” “Got rejected,” and “Shut down during an interaction.” If they didn’t experience any, they can choose “none of the above.” These options were combined to represent the absence (0) or presence (1) of CICs in the previous 30 minutes.

Emotions. PA and NA in the previous 30 minutes is assessed during random surveys by items from subscales of the PANAS-X (Watson & Clark, 1999) and Larsen and Diener’s affect circumplex model (Larsen & Diener, 1992). NA was represented by 4 items: sad, lonely, anxious, and angry. PA was assessed by 5 items from the joviality subscale: happy, excited, calm, grateful, and relaxed. Items were rated on 11-point scales ranging from 0 = not at all to 10 = extremely. Indices of PA and NA will be defined as the participant’s mean at each random survey.

Substance use. Substance use is assessed in multiple ways across both random and morning surveys. In the morning survey, participants were asked how many total standard drinks of alcohol they consumed yesterday and on how many different occasions did they use cannabis yesterday. In the random surveys, participants were asked how many standard drinks of alcohol they consumed and if they used any THC containing cannabis products in the past 30 minutes. Given the likely skewed distributions for past 30 minutes of substance use, these will be collapsed into a single yes (1) or no (0) indicators of momentary substance use. Previous research supports the validity of self-report substance use EMA data by demonstrating significant associations between transdermal biomarkers of alcohol use and self-report (Simons et al., 2015).

Analysis Plan

Data Handling and Preparation

First, ranges and distributions were evaluated for all variables. We examined skewed and kurtotic distributions and deemed no transformation necessary (Tabachnick & Fidell, 2013). Univariate outliers were determined by assessing box plots and z scores for all variables. When analyzing outlying values, there were none that fit outside of the appropriate range ($SD > 3.29$, $p < .001$) and therefore did not need to be Winsorized (Tabachnick & Fidell, 2013). To evaluate linearity, scatterplots of all variables were assessed. Binary variables were examined for outcome frequencies that were less than 10% of the distribution, in which none of them were, so no action was necessary.

Primary Analyses

To test the hypothesized direct and indirect effects, a multilevel path analysis was estimated in MPlus 8.0 (Muthén & Muthén, 2017) with random intercepts. The model employed maximum likelihood robust estimation, which allowed the inclusion of cases with missing data

and accommodates slight skew in variables. These missing data were assumed to be missing at random, but not entirely random (Enders & Bandalos, 2001). The data has a two-level structure with moments (Level 1) nested within persons (Level 2). The model contained a dichotomous CIC variable, continuous PA and NA variables, and a dichotomous substance use variable. CIC had direct paths to PA and NA, which then had direct paths to substance use at both within- and between-person levels (see Figure 1). Given PA and NA are continuous variables and CIC is binary, where 1 represents the presence and 0 represents absence of CICs, the direct paths from CIC to PA and NA represent linear regression coefficients where 1 is compared to 0. For direct paths of PA and NA to substance use, these direct paths are continuous variables predicting a binary outcome which represents logistic regression coefficients. Historically, logistic regressions are interpreted using odds ratios, however in models that have random slopes, odds ratios are not available, so we will interpret the unstandardized regression coefficients. A direct path from CIC to substance use was also included to test the tenability of the hypothesized indirect effects.

At Level 1, exogenous covariates included orthogonal day of the week indicators and elapsed days which had direct paths to all endogenous variables (e.g., CIC, PA, NA, and substance use) in the model. The inclusion of day of the week addressed daily variation in mood and substance use as well as potentially reducing auto-correlation across days (Mohr et al., 2001). Including the number of days elapsed since starting the study controlled for changes over time (e.g., reactivity to the assessment protocol). At Level 2, sex was included as an exogenous covariate with direct paths to all variables in the model to account for known sex differences in mood and alcohol use. These known sex differences include men showing a higher prevalence of substance use (Center for Behavioral Health Statistics and Quality, 2017), but women progressing from first use to substance use disorder quicker than men (Hernandez-Avila

et al., 2004; McHugh et al., 2018). Level 1 variables were centered within-persons by subtracting person averages from momentary values (i.e., person-centered). Level 2 variables were centered by subtracting the overall sample averages from person-level averages (grand-mean centered). 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.

Random variation in the slopes were assessed systematically with a model building approach (i.e., increasing model complexity in steps), which means each potential random slope was examined individually for significance. Slopes that are non-significant were specified as fixed effects to simplify model estimation. Slopes with significant random components were then entered into the model starting with the largest effects first and going one at a time. Lastly, we allowed random slopes and random intercepts to covary.

Traditionally, path models are tested for model fit. However, this model requires numeric integration, therefore traditional model fit indices used to interpret the fit of structural equation models (e.g., CFI, RMSEA, SRMR, and χ^2) have not been developed. The indirect effects were determined by testing the significance of the product of coefficients of each path in the mediation (Preacher & Kelley, 2011; paths 6 and 7 in Figure 1). To test the tenability of our indirect effects approach we also used Monte Carlo confidence intervals (Preacher & Selig, 2010). Monte Carlo confidence intervals help correct the asymmetric distribution of indirect effects which assists in getting nonbiased results.

Results

Descriptive Statistics

There was a total of 11,032 possible random surveys (i.e., 197 participants x 14 days x 4 surveys a day). The data set contained 9,440 surveys (85.60% of the possible surveys, $SD = 16.1\%$). Participants experienced CICs on 11.23% and used substances on 11.92% of the surveys. At the within-person level (i.e., level 1), substance use exhibited a small positive correlation with CICs. PA had a small inverse correlation with CICs, while NA had a small to medium positive correlation with CICs, which makes sense because having CICs generally make individuals feel overall worse. PA had a small positive correlation with substance use and NA had a moderately positive correlation with PA. At the between-person (i.e., subject means; level 2), substance use displayed a small positive correlation with CICs. Again, PA had a small inverse correlation with CICs and NA had a moderately positive correlation with CICs. NA had a moderate inverse relationship with PA. For more detailed description of means, frequencies, and correlations, see Tables 2 and 3. The ICC was .48 for NA, .42 for PA, .13 for substance use, and .15 for CICs. NA and PA are within the medium range of ICCs and fit in the expected range (.40-.60) for affect ICCs.

Multilevel Path Analysis of CICs, NA, PA, and Substance Use

To test the hypothesized associations between CICs, NA, PA, and substance use, a multilevel path analysis was estimated where CICs had direct paths to NA and PA, and NA and PA had direct paths to substance use. There was also a direct path from CICs to substance use. The indirect effects were determined by testing the significance of the cross-products of coefficients of each path in the mediation (paths 6 and 7 in Figure 1). One path looks at the association between the occurrence of a CIC on substance use via acute changes in NA while the

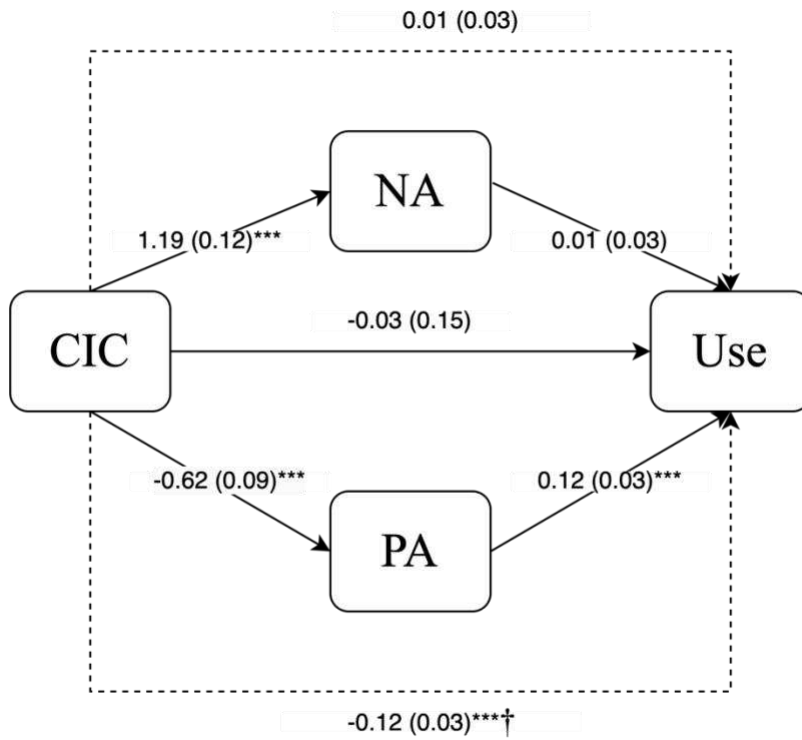
other path looks at the association between the occurrence of a CIC on substance use via acute changes in PA. At level 1 for all effects, orthogonal day of the week indicators and elapsed days were included as exogenous covariates with direct paths to all endogenous variables (e.g., CIC, NA, PA, and substance use). PA and NA variables were allowed to covary with each other at level 1. At level 2, sex was included as an exogenous covariate with direct paths to all variables in the model. PA and NA variables were allowed to covary with each other at level 2. In this model, all of the hypothesized paths are estimated simultaneously, and each path coefficient represents a semi-partial estimate. Random variation in the slopes were assessed with a model building approach and the only path that did not exhibit significant variation was the NA to substance use path. We specified this as a fixed effect and allowed the rest of the slopes to have random variation.

Level 1 – Within-Person Results

Direct effects. Consistent with the hypothesis at level 1, experiencing a CIC had a significant positive direct effect with NA at the same moment ($p < .001$), such that experiencing a CIC was characterized by greater NA. Inconsistent with the hypothesis, NA at the previous moment exhibited no significant direct effect with substance use at the next moment ($p = .643$). Consistent with the hypothesis, experiencing a CIC had a significant inverse direct effect with PA at the same moment ($p < .001$), such that experiencing a CIC was characterized by less PA. Inconsistent with our hypothesis, PA at the previous moment exhibited a significant positive direct effect with substance use in which those who had more PA at the previous moment were more likely to use substances at the next moment ($p < .001$). Inconsistent with our hypothesis, a CIC at the previous moment did not exhibit a significant direct effect with substance use at the next moment ($p = .844$; see Figure 2 for detailed values). As expected, level 1 residuals of PA

significantly inversely covaried with the residuals of NA ($b = -0.749$, $p < .001$; see Table 4 for detailed description of covariates).

Indirect Effects. Inconsistent with our hypothesis, there was a significant negative indirect effect of CICs on substance use via PA such that experiencing a CIC at the previous moment was associated with a less likelihood to use substances at the next moment due to acute decreases in PA ($p < .001$; see Figure 2). Inconsistent with the hypothesis at level 1, there was no significant indirect effect of CICs on substance use via acute changes in NA ($p = .647$). Total effects at the within level were not significant ($b = -0.130$, $p = .367$). To test the tenability of our indirect effects approach we also ran indirect effects through Monte Carlo confidence intervals (MCCI). For level 1, the MCCI for the NA indirect effect was not significant (95% [-0.047, 0.077]) and the PA indirect effect was significant (95% [0.058, 0.11]). This is consistent with the products of coefficients approach, thus we can interpret these findings without caution (see Figure 3).



Level 1

Level 2

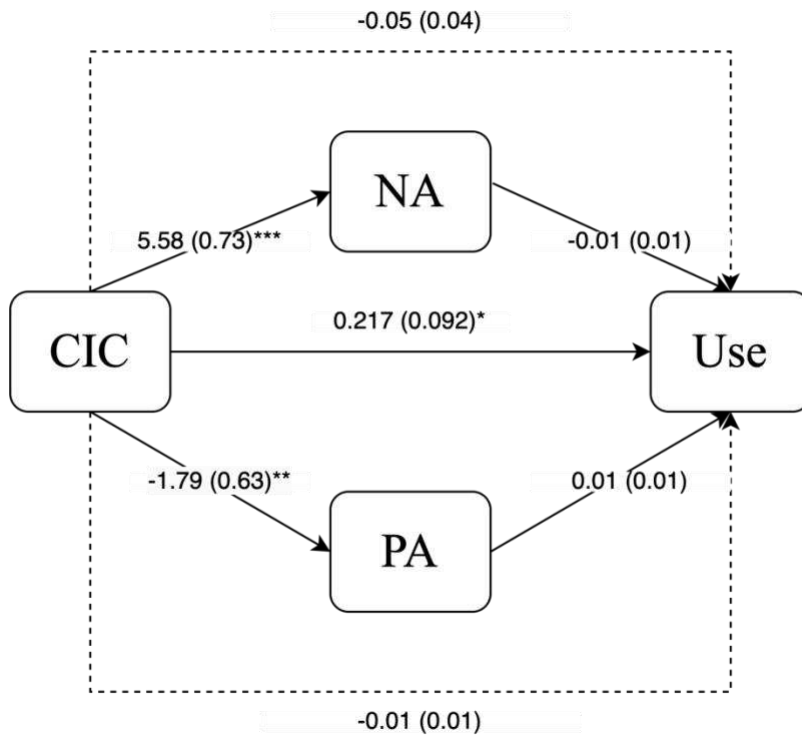


Figure 2.

Note. Final model of level 1 within effects are shown above the line, level 2 between effects are shown below the line. These are unstandardized coefficients with the standard error in parenthesis. Covariates of day of the week, day in the study, and sex are not depicted (see Table 4 for details on covariates). CIC = challenging interpersonal context. NA = negative affect. PA = positive affect. SU = substance use. Solid lines are direct effects, dashed lines are indirect effects. * $p < .05$, ** $p < .01$, *** $p < .001$, † denotes Monte Carlo confidence intervals do not include 0.

Level 2 – Between-Person Results

Direct Effects. Consistent with the hypothesis at level 2, CICs had a significant positive direct effect with NA at the same moment ($p < .001$), such that experiencing a CIC was characterized by greater NA. Inconsistent with the hypothesis, NA at the previous moment exhibited no significant direct effect with substance use at the next moment ($p = .234$). Consistent with the hypothesis, experiencing a CIC had a significant inverse direct effect with PA at the same moment ($p = .004$), such that experiencing a CIC was characterized by less PA. Inconsistent with our hypothesis, PA at the previous moment exhibited no significant association with substance use at the next moment ($p = .508$). Consistent with our hypothesis, CICs at the previous moment exhibited a positive significant direct effect with substance at the next moment, such that those who experienced a CIC at the previous moment were more likely to use substances at the next moment ($p = .018$; see Figure 2 for detailed values). As expected, level 2 residuals of PA significantly inversely covaried with the residuals of NA ($b = -0.296$, $p = .007$; see Table 4 for detailed description of covariates). Sex significantly covaried inversely with CICs, but no other main variables.

Indirect Effects. Lastly, no significant indirect effects were found at the level 2 mediation for NA ($p = .227$) or PA ($p = .532$), which was inconsistent with the hypotheses (see Figure 2). Total effects at the between level were not significant ($b = 0.158$, $p = .054$). To test the tenability of our indirect effects approach we also estimated indirect effects through MCCI. For level 2, the MCCI for the NA indirect effect (95% [-0.14, 0.30]) and the PA indirect effect (95%

[-0.048, 0.072]) showed no significant indirect effects. This is consistent with the products of coefficients approach, thus we can interpret these findings without caution (see Figure 3).

Discussion

Youth is marked by increases in mood-driven and risk-prone behavior (Albert & Steinberg, 2011; Buchanan & Eccles, 1992; Somerville et al., 2010). In young people, peer influence plays a large role in risky decision making, such as substance use, given social acceptance by peers is of outsized importance in the rewards that drive behavior in this group (Steinberg, 2008). Indeed, the social-emotional lives of young people drives strong approach tendencies toward rewards while discounting potential negative consequences (Somerville et al., 2010; Steinberg, 2008). This outsized role of peers in the daily life of young people can present a host of challenges as young people learn to navigate their social surroundings. Given the importance of peers in this population, the potential for CICs can lead to an array of emotions that may affect substance use. Not surprisingly, emotions are central to most models of substance use (Conger, 1956; Cooper et al., 2016; Simons et al., 1998); however, there is still no clear evidence of a pattern for how they give rise to individual decisions to use. Historically emotion research, especially NA, has been mixed (Crooke et al., 2013; Dora et al., 2022; Dvorak & Simons, 2014; Emery et al., 2020, 2021; Emery & Simons, 2020; Hussong et al., 2001, 2005; Park et al., 2004; Rankin & Maggs, 2006; Shadur et al., 2015; Swendsen et al., 2000). Thus, if social situations have an outsized importance in young people's behavior, we may need to look at emotions that are a result of interpersonal dynamics. Therefore, perhaps it is not all NA, maybe it is just the NA that is a direct result of CICs that influence substance use in this younger population. Moreover, CICs may not just lead to more NA, it could also lead to less PA, reflecting an overall trend toward feeling worse after a CIC (Bacon et al., 2015; Chow et al., 2008; Gerber & Wheeler, 2009; Leary, 2015; Stroud et al., 2000; Warburton et al., 2006). Research has shown low PA is a risk factor for substance use in this population (Emery et al., 2024; Emery & Simons, 2020), though it has received considerably less attention than NA.

Several studies exist examining CICs, emotions, and substance use (Bonar et al., 2021; Fleming et al., 2021; Hussong et al., 2001), yet none of them have reconciled the contradictory findings nor have they typically employed rigorous EMA methodologies that appropriately sequence the events in real time. Using a multilevel path analysis, the current study tested how CICs influence emotion which may contribute to substance use in a young-adult population to further parse out emotion's role in substance use. This was tested using direct and indirect effects at both the within- and between-person levels. Because of the theoretical literature, it was hypothesized that CICs will lead to increased substance use indirectly through acute changes in both NA or PA (i.e., within-person). Major findings of this study include replicating CIC's effect on participants feeling worse overall (Bacon & Engerman, 2018; Chow et al., 2008; Gerber & Wheeler, 2009; Leary, 2015; Stroud et al., 2000; Warburton et al., 2006) and PA's unexpected inverse mediating relationship on CICs and substance use only at the within-person level. In the following paragraphs, the findings of each hypothesis are discussed in respect to their theoretical rationale that formed them.

Experiencing a CIC was associated with more NA and less PA at both the within-person (i.e., level 1) and between-person (i.e., level 2) levels. This pattern of results was consistent with our hypotheses that experiencing a CIC would be positively associated with NA and negatively associated with PA at both levels. This is in line with the literature that states CICs are often positively associated with NA (Bacon & Engerman, 2018; Chow et al., 2008; Gerber & Wheeler, 2009; Leary, 2015; Stroud et al., 2000; Warburton et al., 2006) and negatively associated with PA (Gerber & Wheeler, 2009). That is, when individuals experience a CIC, they are more likely to feel worse overall, reflected in an increase in NA and a decrease in PA. While previous EMA research has hypothesized that CICs are associated with acute changes in affect among those that

use substances (Fleming et al., 2021), to our knowledge, this is the first study to explicitly test this proposed pattern. Thus, this represents a novel contribution to the literature.

Inconsistent with our hypothesis, experiencing a CIC at the previous moment was not associated with an increased likelihood of substance use at the next moment at the within-person level. However, consistent with the hypothesis at the between-person level, individuals who experienced more CICs over the two weeks tended to use more often during the sampling period. This pattern is somewhat inconsistent with previous literature documenting positive associations between forms of CICs and substance use at both the within- and between-persons level (Antunes et al., 2021; Bacon et al., 2015; Fleming et al., 2021; Heinrich & Gullone, 2006; Hussong et al., 2001; Laws et al., 2017; Stickley et al., 2014). While the exact reasons for the lack of within-person effect observed here is unknown, it could be due to time lag differences in the current study compared to previous research (daily vs. momentary). Our random survey sampling schedule was designed such that participants would receive a survey randomly across 3.5-hour time blocks. Functionally, this means participants could have a lag between CICs and use as short as a few minutes and as long as a few hours. Future research would benefit from examining the optimal time lag between CICs and substance use. Research has also shown that using substances is associated with worse interpersonal functioning (Bohnert et al., 2010; Farris & Fenaughty, 2002; Torvik et al., 2013), meaning there could be a reciprocal relationship at play where more substance use may be associated with more CICs and more CICs could be associated with more substance use. The model presented here only tested one direction of this potential feedback loop given the research question. However, future research should examine alternative models.

NA at the previous moment was not significantly associated with an increased likelihood of substance use at the next moment at the within-person level, nor was average NA significantly

associated with a greater proportion of substance use events of the sampling period at the between-person level. These findings are inconsistent with both our hypotheses and seminal theoretical models implicating NA as a central driver of substance use (Baker et al., 2004; Conger, 1956; Wikler, 1948). However, finding null associations is not unheard of in this literature. A metaanalysis of daily diary and EMA studies testing if affect predicts drinking within-person found that people were not more likely to drink on days characterized by NA, and instead were more likely to drink and drink heavily on days characterized by higher PA (Dora et al., 2022). Our study extends this to the moment-level with both alcohol and cannabis use. Though speculative, a possible reason for the null association for NA at either level that warrants consideration is relatively low levels of NA observed in our sample. Theoretical models state when NA becomes increasingly intense it should draw the individual's attention to the need for emotion regulation, triggering information processing and motivation directed toward substance use (Baker et al., 2004). Similarly, another metaanalysis suggests that effect sizes of NA and PA on alcohol consumption were not statistically different from each other, nor does the specific emotion or valence of emotions influence the amount of alcohol used (Tovmasyan et al., 2022). Rather, these researchers state it may be the intensity of the emotion that leads to individuals using. We found low levels of NA ($M = 2.45$); therefore, it is possible that there wasn't enough NA to trigger use. Future research may need to consider clinical samples or samples with cooccurring conditions to find data with higher NA.

At the within-person level, PA at the previous moment had a significant positive association with substance use at the next moment. At the between-person level, PA had no significant association with proportion of use moments during the sampling period. Both were inconsistent with our hypothesis that there would be a significant negative association between PA and substance use at both levels, such that low PA would be associated with increased

substance use. Previous seminal research echo's this hypothesis by stating that individuals who have less PA will use more substances (Gross, 2009; Koob & Le Moal, 2001). However, depending on the level, it is not uncommon to find a positive association or no association between the PA and substance use (Crooke et al., 2013; Dora et al., 2022; Mohr et al., 2001; Rankin & Maggs, 2006). In fact, as previously noted, a recent meta-analysis indicated that individuals were more likely to drink and drink heavily on days characterized by more PA (Dora et al., 2022) and some have speculated that this may be due to celebratory reasons or that PA makes individuals more sociable or reward seeking, leading them to find themselves in situations where alcohol is readily available (Dora et al., 2022; van Hoorn et al., 2016). Interestingly, the meta-analysis did not test between-person effects. Previous research testing both has found a positive association at the within-persons level between daytime PA and the likelihood/quantity of alcohol consumption that night and a negative association for PA and proportion of drinking days at the between-person level (Simons et al., 2014). This discordance across the within- and between-person levels has been observed elsewhere (Colder et al., 2010; Emery & Simons, 2020). There has been an implicit assumption that between-persons relationships mimic within-person associations. These data are the latest addition to a small but growing literature that indicates this is not a valid assumption.

At the within-person level, no indirect effect was found for the CICs, NA, and substance use relationship. However, there was a significant negative indirect effect found for the CICs, PA, and substance use relationship at the within-person level such that the occurrence of a CIC was associated with less substance use through acute decreases in PA. Neither indirect effect was found at the between-person level. These findings were inconsistent with our hypothesis that the occurrence of a CIC will lead to more substance use through indirect effects of increased NA at both levels. It is also inconsistent with our hypothesis about PA such that the occurrence of a CIC

will lead to more substance use through indirect effects of decreased PA at both levels. No studies to this date have proposed this specific indirect effect, just one study hinting that negative emotions may be involved in certain types of CICs and their association with drinking, but no mediation was proposed (Fleming et al., 2021). While these results are not what we expected, there is research showing that a CIC occurring is more likely to decrease PA (Gerber & Wheeler, 2009) and that there can be a positive relationship of PA and substance use (Dora et al., 2022; Rankin & Maggs, 2006). It has been replicated in the current study that CICs led to overall feeling worse (elevated NA, lowered PA), but how NA and PA influence substance use seems to still be mixed. It is possible, as discussed above, that the lower intensity of NA didn't alert individuals to want to use (Baker et al., 2004; Dora et al., 2022; Tovmasyan et al., 2022) and that PA is associated with more use at the within-person level, but not at the between-person level. These speculations taken together could be a reason as to why there was an indirect effect through PA at the within-person level, and no other significant indirect effects.

Limitations and Future Directions

There are several limitations to this study. First, the sample of this study is predominately white female college students from a Western university, so generalizability to other populations may have limitations. However, our model incorporates sex effects to offset this limitation. Secondly, while we included several CICs in the study, it is possible we did not capture every type of CIC. Also, our CIC variable represented the presence or absence of a CIC and would not account for potential severity of CICs, having multiple CICs, or how each individual CIC may have an unique effect on the model (Grzywacz & Almeida, 2008). Thirdly, while our study is comprehensive in its ability to capture a lot of observations across multiple contexts, there is no experimental manipulation and several effects are cross-sectional, thus causality should not be assumed. However, there is high external validity in our study due to the rigorous methodology.

Temporal precedence is another strength of this cross-sectional work. We tested a hypothesized ordering of effects that is consistent with previous research, however alternative models are possible. For example, substance use predicting emotions which, in turn, is associated with interpersonal problems. Future directions may include understanding the reciprocal nature of CICs and substance use to understand how the temporal nature of these variables influence emotions. Lastly, as previously stated, levels of NA were low, which may have influenced our modeling. Future research may test samples with higher intensity NA, such as clinical samples and samples with cooccurring disorders. Continued research on the links between affect and substance use is necessary as the findings remain mixed.

Conclusion

The current study examined the mediating role of affect between CICs and substance use. Results replicated previous work suggesting CICs lead to overall feeling worse (Bacon et al., 2015; Chow et al., 2008; Gerber & Wheeler, 2009; Leary, 2015; Stroud et al., 2000; Warburton et al., 2006) and extends this to a sample of young-adults that use substances regularly. The results also showed a lagged positive association between PA and substance use at the within-person level as well as an inverse indirect effect of CICs on substance use through acute decreases in PA at the within-person level. This suggests that PA may have a nuanced role in the CIC and substance use relationship. As such the current study contributed to the literature on interpersonal contexts, emotions, and subsequent substance use in several ways. First, due to the mixed results surrounding emotions and substance use, CICs provided some clarity to the connection between emotions and substance use. Secondly, while previous research has implied this sequence of events, no studies have examined all of these variables and this specific cascade with a large sample of EMA data. Understanding the mechanisms that drive the relationship between CICs, emotions, and substance use continues to add to the mechanisms of substance use

and substance use disorders literatures, which could ultimately lead to better treatment of the disorder. Future directions should consider understanding the reciprocal nature of CICs and substance use as well as finding samples with higher NA to test this relationship.

Tables and Figures

Table 1
Demographic Information (n = 197)

	<i>n</i>	<i>%</i>
Sex		
Female	144	73.10
Male	53	26.90
Gender		
Female	137	69.54
Male	52	26.40
Gender nonconforming	3	1.52
Trans man	2	1.02
Other identity (ex: demigirl, female/nonbinary)	2	1.02
Trans women	1	0.51
Race		
White	179	73.06
Hispanic or Latino/Latina	34	13.88
Asian	11	4.49
Black or African American	8	2.45
American Indian or Alaska Native	5	2.04
Native Hawaiian or Other Pacific Island	2	0.82

Table 2
Variable Means and Frequencies (n = 197)

	<i>M</i>	<i>SD</i>		
PA	5.27	1.95		
NA	2.45	2.06		
	Frequency	Percent	Subject Mean	Subject SD
CIC binary	1,060	11.23	.12	.12
SU Binary	1,100	11.92	.12	.13

Table 3*Level 1 and Level 2 Correlation Matrices*

L1 Variables	1	2	3	4
1. CIC	-			
2. SU	.038**	-		
3. PA	-.12***	.057***	-	
4. NA	.28***	-.015	-.33***	-

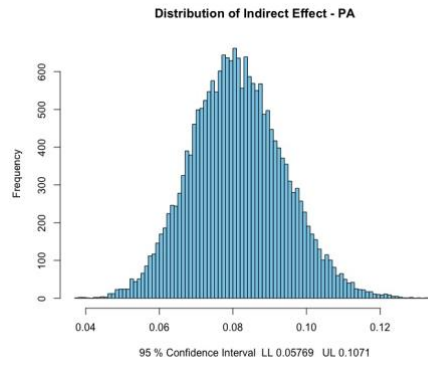
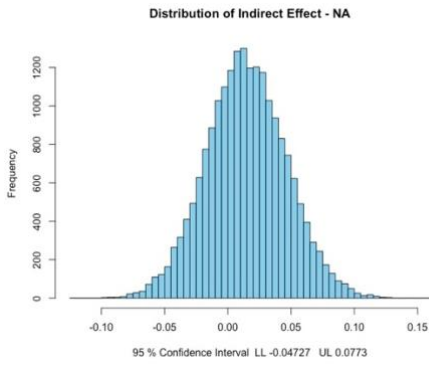
L2 Variables	1	2	3	4	5
1. CIC	-				
2. SU	.14*	-			
3. PA	-.16*	.030	-		
4. NA	.49***	-.017	-.24***	-	
5. Sex	-.12	.06	-.064	-.094	-

Note: L1 variables are the within-person level and L2 variables are the between-person level. L2 variables are all subject means. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Sex (men = 1, women = 0).

Table 4*Effects of Covariates on Main Path Analysis*

Level	Variables	CIC		NA		PA		Use	
		<i>b</i>	<i>p-value</i>	<i>b</i>	<i>p-value</i>	<i>b</i>	<i>p-value</i>	<i>b</i>	<i>p-value</i>
Within- Person	Monday	-0.025	.102	0.111	.091	-0.212	.005	-0.071	.616
	Tuesday	-0.014	.358	0.150	.088	-0.195	.033	0.159	.330
	Wednesday	-0.023	.177	.0155	.059	-0.217	.011	0.141	.344
	Thursday	-0.014	.423	0.200	.013	-0.186	.037	0.281	.049
	Friday	-0.016	.314	0.054	.542	0.011	.896	0.602	.000
	Saturday	-0.005	.742	-0.217	.010	0.333	.000	0.933	.000
	Elapsed Date	0.002	.263	0.020	.018	0.020	.018	-0.005	.536
Between- Person	Sex	-0.033	.035	-0.116	.542	-0.242	.272	0.023	.257

Note: Bold denotes significance.



L1

L2

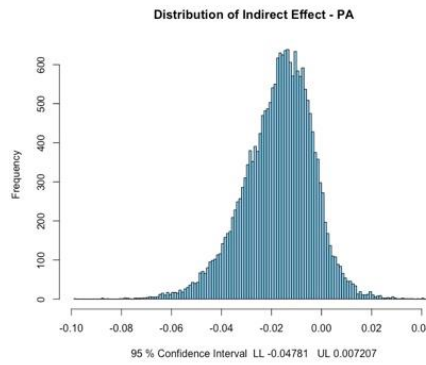
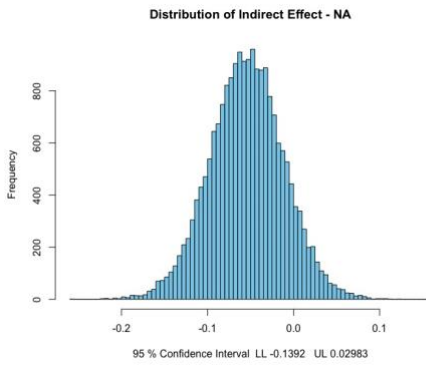


Figure 3.
 Distribution of indirect effects using MCCI. No inclusion of 0 denotes significance.

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Appendix

Appendix A

EMA Protocol - 5 surveys a day for 14 days

- 1 morning survey at 9:30am
- 4 random surveys every 3.5 hours from 10am-midnight

Morning Survey

I. Context

Context

1. Where are you?

- Work School Home Bar Party
- Restaurant Recreational place In transit None of the above

2. What is your current situation? CHECK ALL THAT APPLY

- A. I am alone
- B. I am with friends
- C. I am in a social situation with strangers
- D. I am in a social situation with people I know
- E. I am socializing with people who are drinking
- F. None of the above

3. What time did you go to sleep last night?

4. What time did you wake up today?

II. Alcohol Use

Alcohol Use

5. Do you plan on drinking ALCOHOL today?

- No Yes Don't know, see what happens

6. Do you plan on using CANNABIS today?

- No Yes Don't know, see what happens

7. How many drinks of ALCOHOL did you have yesterday TOTAL? SCROLL

- 0 1-2 3-4 5-6 7-8
- 9-10 11-12 13-14 15-16 17-18
- 19-20 21-22 23-24 25 or more

8. Which THC-containing cannabis products did you use yesterday (CHECK ALL THAT APPLY)?

- None Flower Edibles Concentrates (e.g., dabs) Other

9. On how many different occasions did you use CANNABIS yesterday TOTAL? SCROLL

- 0 1-2 3-4 5-6 7-8
- 9-10 11-12 13-14 15-16 17-18
- 19-20 21-22 23-24 25 or more

III. Anhedonia/ Exe

Anhedonia/ Exe

10. Think about the most enjoyable contact you had WITH OTHERS yesterday. How much enjoyment did you get from it?

- 0 - Not at all 1 2 3 4
- 5 6 7 8 9

10 - Extreme

11. Think about the most enjoyable thing you did during SCHOOL, WORK, or CHORES yesterday. How much enjoyment did you get from it?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extreme

12. Think about the most enjoyable thing you did for RECREATION, LEISURE, or ENTERTAINMENT yesterday. How much enjoyment did you get from it?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extreme

13. To what extent did you worry about the MEANING OF LIFE yesterday?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

14. To what extent did you think about how your CHOICES HAVE CONSEQUENCES yesterday?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

15. To what extent did you think about the fact that LIFE WILL END yesterday?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

16. To what extent did you feel ISOLATED from others yesterday?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

IV. Thank you

Thank you

17. Thank you for completing your morning survey.

OK

Random Survey

I. Context / Affect

Context / Affect

1. Where are you?

Work School Home Bar Party

Restaurant Recreational place In transit None of the above

2. What is your current situation? CHECK ALL THAT APPLY SCROLL

A. I am alone

B. I am with friends

C. I am in a social situation with strangers

- D. I am in a social situation with people I know
- E. I am socializing with people who are drinking/using
- F. I am with people I typically drink/use with
- G. I am with classmates/coworkers
- H. I am with my parents
- I. I am with a romantic partner
- J. None of the above

3. How HAPPY have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

4. How GRATEFUL have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

5. How EXCITED have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

6. How BORED have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

7. How CALM have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

8. How SAD have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

How RELAXED have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

10. How LONELY have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

11. How ANXIOUS have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

10 - Extremely

12. How ANGRY have you felt in the last 30 minutes?

0 - Not at all 1 2 3 4

5 6 7 8 9

- 10 - Extremely
13. How STRESSED have you felt in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
14. How much have your feelings been UNDER CONTROL in that last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
15. How much have your feelings GOT IN THE WAY in that last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
16. How much have your emotions felt OVERWHELMING in that last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
17. How much AWE did you experience in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
18. To what extent did you try to make your GOOD feelings LAST LONGER in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
19. To what extent did you try to DECREASE your GOOD feelings in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
20. To what extent have you been FOCUSED on your FEELINGS in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
21. To what extent have you been FOCUSED on your PROBLEMS in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
- II. Mindful / Exe
 Mindful / Exe
22. How focused on the PRESENT MOMENT have you been in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
23. How able to accept your THOUGHTs and FEELINGS have you been in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9

- 10 - Extremely
24. How MEANINGFUL does your life feel right now?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
25. How much do you feel your life has PURPOSE right now?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
26. Have any of the following happened to you in the last 30 minutes? CHECK ALL THAT APPLY
 Had a disagreement Had an argument Got stood up Got ditched Had a difficult conversation
 Got rejected Shut down during a interaction None of the above
- III. Sub Use
 Substance Use
27. How many drinks of ALCOHOL have you had in the last 30 minutes?
 0 1 2 3 4
 5 6 7 8 9
 10 or more
28. Have you used any THC-containing CANNABIS products in the last 30 minutes?
 Yes No
29. How INTOXICATED are you right now?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
30. Have you been CRA VING substances in the last 30 minutes?
 0 - Not at all 1 2 3 4
 5 6 7 8 9
 10 - Extremely
31. Have you experienced any of the following since your last survey? CHECK ALL THAT APPLY
 Got into fight Did something embarrassing Got injured Felt confused Blacked out
 Felt sick to your stomach None of the above
32. Have you experienced any of the following since your last survey? CHECK ALL THAT APPLY - SCROLL
 Passed out Did something impulsive Did something you regret Neglected responsibilities
 Damaged property
 Drove intoxicated None of the above
33. Have you experienced any of the following since your last survey? CHECK ALL THAT APPLY
 Found it difficult to limit use Used more than planned Used longer than planned None of the above
34. Did you use any STRATEGIES to reduce your risk of unwanted negative consequence of substance use in that last 30 mins?
 Yes No
35. What strategy(s) did you use?

IV. Thank you

Thank you

36. Thank you for completing the survey. If you have not completed your morning survey please do so now.

Emotion & Behavior Baseline

Start of Block: ID

ID Please enter the participant's ID number

End of Block: ID

Start of Block: Demographics

Dem_1

Please take your time and answer each question carefully. Please select the most appropriate answer. Enter appropriate values in boxes when indicated.

Dem_age How old are you?



sex What sex were you assigned at birth, such as on an original birth certificate?

- Male (1)
- Female (0)
- Do not wish to respond (2)

gender How do you describe yourself?

- Male (1)
- Female (0)
- Trans Man (2)
- Trans Woman (3)
- Gender NonConforming (4)

Different Identity (5) _____

Do not wish to respond (6)

ethnicity Do you consider yourself Hispanic or Latino/Latina?

- Yes (1)
 - No (2)
 - Do not wish to respond (4)
-



race What race do you consider yourself to be? Select all that apply.

- American Indian or Alaska Native (1)
 - Asian (2)
 - Black or African American (3)
 - Native Hawaiian or Other pacific Islander (4)
 - White (5)
 - Do not wish to respond (6)
-

Page Break

Dem_height_text What is your height?

Example: "5 foot 2 inches"



height_feet
Feet:
(enter "5")

▼ 2 (2) ... 10 (10)



height_inch Inches: (enter "2")

▼ 0 (0) ... 11 (11)



weight What is your weight? (in pounds)

▼ Less than 80 lbs (80) ... 600 (600)

Page Break



employed What is your current employment status?

- Full-time employed (work 30 or more hours per week) (1)
 - Part-time (work less than 30 hours per week) (2)
 - Unemployed, disabled, retired, other (3)
 - Full-time student (4)
 - Homemaker/stay at home mom or dad (5)
-



vet Are you a veteran?

- Yes (1)
 - No (0)
 - Currently in the military (2)
-

Page Break

End of Block: Demographics

Start of Block: Alcohol and Cannabis Use



AUDIT1 How often do you have a drink containing alcohol?

- Never (0)
- Monthly or less (1)
- 2-4 times a month (2)
- 2-3 times a week (3)
- 4 or more times a week (4)

Skip To: CUDIT0 If How often do you have a drink containing alcohol? = Never

Q208

One standard drink is equal to:

Standard American Beer – 12 oz. Can, Bottle, or Glass

Wine – 5 oz. Glass

Wine Cooler – 12 oz. Bottle

Hard Liquor (80 proof, 40% alcohol) – 1.5 oz. or One Standard Shot (i.e., a double = 2 drinks)

Hard Liquor (100 proof, 50% alcohol) – 1.oz



AUDIT2

How many standard drinks containing alcohol do you have on a typical day when drinking?

- 1 or 2 (0)
- 3 or 4 (1)
- 5 or 6 (2)
- 7 to 9 (3)
- 10 or more (4)

Page Break



AUDIT3 How often do you have six or more drinks on one occasion?

- Never (0)
- Less than monthly (1)
- Monthly (2)
- Weekly (3)
- Daily or almost daily (4)

Page Break



AUDIT4 During the past year, how often have you found that you were not able to stop drinking once you had started?

- Never (0)
 - Less than monthly (1)
 - Monthly (2)
 - Weekly (3)
 - Daily or almost daily (4)
-

AUDIT5 During the past year, how often have you failed to do what was normally expected of you because of drinking?

- Never (1)
 - Less than monthly (2)
 - Monthly (3)
 - Weekly (4)
 - Daily or almost daily (5)
-

AUDIT6 During the past year, how often have you needed a drink in the morning to get yourself going after a heavy drinking session?

- Never (1)
 - Less than monthly (2)
 - Monthly (3)
 - Weekly (4)
 - Daily or almost daily (5)
-

AUDIT7 During the past year, how often have you had a feeling of guilt or remorse after drinking?

- Never (1)
 - Less than monthly (2)
 - Monthly (3)
 - Weekly (4)
 - Daily or almost daily (5)
-

AUDIT8 During the past year, have you been unable to remember what happened the night before because you had been drinking?

- Never (1)
- Less than monthly (2)
- Monthly (3)



AUDIT9 Have you or someone else been injured as a result of your drinking?

- No (0)
- Yes, but not in the past year (2)
- Yes, during the past year (4)



AUDIT10 Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested you cut down?

- No (0)
- Yes, but not in the past year (2)
- Yes, during the past year (4)

Page Break



AUF How often have you used alcohol in the last 90 days?

- More than once a day (1)
- Once a day (2)
- 6 days a week (3)
- 5 days a week (4)
- 4 days a week (5)
- 3 days a week (6)
- 2 days a week (7)
- 1 day a week (8)
- 2-3 times a month (9)
- Once a month (10)
- Less than once a month, but at least once in the last 90 days (11)
- Not at all (0)

Page Break

ddq

Think of a typical week in the last 90 days (3 months) for you. (Where did you live? What were your regular weekly activities? Were you working or going to school? etc.) Try to remember as accurately as you can, how much and for how long you typically drank in a week during that 90 day period (3 months).

For the past 90 days (3 months), please fill in a number for each day of the week indicating the typical number of standard drinks you usually consume on that day in the upper box and the typical number of hours you usually drink on that day in the lower box.

Note: You may have to scroll down in the dropdown menu to find you desired answer

Remember - One standard drink is equal to:

Standard American Beer – 12 oz. Can, Bottle, or Glass

Wine – 5 oz. Glass

Wine Cooler –12 oz. Bottle

Hard Liquor (80– proof, 40% alcohol) – 1.5 oz. or One Standard Shot (i.e., a double = 2 drinks) Hard Liquor (100– proof, 50% alcohol) – 1.oz



ddq Number of standard drinks

	Number of standard drinks (1)	Number of hours spent drinking (2)
Monday (1)		
Tuesday (2)		
Wednesday (3)		
Thursday (4)		
Friday (5)		
Saturday (6)		
Sunday (7)		

Page Break

X→

CUDIT0 Have you used any cannabis over the past six months?

- Yes (1)
 - No (0)
-

X→

CUDIT1 Over the past 6 months, how often do you use cannabis?

- Never (0)
 - Monthly or less (1)
 - 2-4 times a month (2)
 - 2-3 times a week (3)
 - 4 or more times a week (4)
-

X→

CUDIT2 How many hours were you “stoned” on a typical day when you had been using cannabis?

- 1 or 2 (0)
 - 3 or 4 (1)
 - 5 or 6 (2)
 - 7 to 9 (3)
 - 10 or more (4)
-



CUDIT3 How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?

- Never (0)
 - Less than monthly (1)
 - Monthly (2)
 - Weekly (3)
 - Daily or almost daily (4)
-



CUDIT4 How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?

- Never (0)
 - Less than monthly (1)
 - Monthly (2)
 - Weekly (3)
 - Daily or almost daily (4)
-



CUDIT5 How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis?

- Never (0)
 - Less than monthly (1)
 - Monthly (2)
 - Weekly (3)
 - Daily or almost daily (4)
-



CUDIT6 How often in the past 6 months have you had a problem with your memory or concentration after using cannabis?

- Never (0)
 - Less than monthly (1)
 - Monthly (2)
 - Weekly (3)
 - Daily or almost daily (4)
-



CUDIT7 How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children?

- Never (0)
 - Less than monthly (1)
 - Monthly (2)
 - Weekly (3)
 - Daily or almost daily (4)
-



CUDIT8 Have you ever thought about cutting down, or stopping, your use of cannabis?

- Never (0)
 - Yes, but not in the past 6 months (2)
 - Yes, during the past 6 months (4)
-

Page Break



CUF How often have you used cannabis in the last 90 days?

- More than once a day (1)
- Once a day (2)
- 6 days a week (3)
- 5 days a week (4)
- 4 days a week (5)
- 3 days a week (6)
- 2 days a week (7)
- 1 day a week (8)
- 2-3 times a month (9)
- Once a month (10)
- Less than once a month, but at least once in the last 90 days (11)
- Not at all (0)

End of Block: Alcohol and Cannabis Use

Start of Block: Recreational Drugs



Rec_drugs Have you used **recreational drugs** other than alcohol and/or cannabis - OR - use prescription drugs recreationally in the last year?

- Yes (1)
-
- No (0)



rec_drugs_list Please select the following substance(s) that you have used recreationally in the past year.

- Cocaine (1)
 - Heroin (2)
 - Methamphetamine (3)
 - MDMA / Ecstasy / Molly (4)
 - LSD (5)
 - Psilocybin / Magic mushrooms (6)
 - Peyote (7)
 - DMT (8)
 - Ketamine / Special K (9)
 - Prescription pain killers (10)
 - Prescription stimulants (e.g., Adderall) (11)
 - Prescription anti-anxiety (e.g., Xanax) (12)
 - Other (13) _____
-



Rec_drugs_usage How often do you use recreationally?

- Less than once a month (0.1)
 - One day a month (0.25)
 - Two days a month (0.5)
 - Three days a month (0.75)
 - One day a week (1)
 - Two days a week (2)
 - Three days a week (3)
 - Four days a week (4)
 - Five days a week (5)
 - Six days a week (6)
 - Daily (7)
-

Affect This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and indicate to what extent you IN GENERAL feel the emotion described.

	Very Slightly or Not at all (1)	A Little (2)	Moderately (3)	Quite a Bit (4)	Extremely (5)
Happy (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Joyful (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sad (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angry (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Irritable (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lonely (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grateful (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excited (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energetic (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stressed (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nervous (18)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calm (19)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relaxed (20)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bored (28)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ashamed (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guilty (29)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determined (30)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confident (31)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break



DSM5-Crosscut During the past TWO (2) WEEKS, how much (or how often) have you been bothered by the following problems?

	None Not at all (1)	Slight Rare, less than a day or two (2)	Mild Several days (3)	Moderate More than half the days (4)	Severe Nearly every day (5)
Little interest or pleasure in doing things? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling down, depressed, or hopeless? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling nervous, anxious, frightened, worried, or on edge? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling panic or being frightened? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Avoiding situations that make you anxious? (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Q1259 The questions below ask about your feelings in more detail and especially how often you have been bothered by a list of symptoms during the past 7 days

PROMIS In the past SEVEN (7) DAYS....

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
I felt worthless (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I had nothing to look forward to (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt helpless (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt sad (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt like a failure (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt depressed (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt unhappy (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt hopeless (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt fearful (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt anxious (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt worried (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found it hard to focus on anything other than my anxiety (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt nervous (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt uneasy (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I felt tense
(15)



Page

affect_forecast Each item below describes what a particular picture looks like. Attempt to predict how you would feel when viewing each picture, using the nine-point scale.

	Unpleasant 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	Pleasant 9 (9)
A palm tree leaning toward the ocean as the sun sets (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A puppy carrying flowers in its mouth as it walks through field (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A child watches fireworks in the night sky while sitting on their father's shoulders (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Children wave as they go down a waterslide (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A Ferris wheel lights up the night as it spins (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Two men
standing
close
together
argue while
in a crowd
on the
street (6)



Pieces of moldy bread lay in a stack on a table (7)



View from behind a microphone as an audience waits for the speaker to begin (8)



A spider inside a toilet paper roll on a dispenser next to the toilet (9)



A child sits on the ground, arms folded while covered in dirt (10)



savor For each of the statements listed below, please select the one number that best indicates how true the particular statement is for you. There are no right or wrong answers. Please be as honest as you can.

	Strongly disagree 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	Strongly agree 7 (7)
It's hard for me to hang onto a good feeling for very long (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how to make the most of a good time (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When it comes to enjoying myself, I'm my own "worst enemy" (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When something good happens, I can make my enjoyment of it last longer by thinking or doing certain things (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I can't
seem to
capture
the joy of
happy
moments



(5)

I feel fully
able to
appreciate
good
things that
happen to
me (6)

I don't
enjoy
things as
much as I
should (7)

It's easy
for me to
enjoy
myself
when I
want to
(8)

SHAPS This questionnaire is designed to measure your ability to experience pleasure in the last few days. It is important to read each statement very carefully. Select one of the answers to indicate how much you agree or disagree with each statement

	Definitely Agree (1)	Agree (2)	Disagree (3)	Definitely Disagree (4)
I would enjoy my favorite tv show (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would enjoy being with my family or close friends (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find pleasure in my hobbies and pastimes (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be able to enjoy my favorite meal (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would enjoy a warm bath or refreshing shower (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find pleasure in the scent of flowers or the smell of a fresh sea breeze or freshly baked bread (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would enjoy seeing other people's smiling faces (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I would enjoy
looking good
when I have
made an
effort with
my
appearance
(8)

I would enjoy
reading a
book,
magazine, or
newspaper
(9)

I would enjoy a cup of tea or coffee or my favorite drink (10)

I would find pleasure in small things, e.g. bright sunny day, a telephone call from a friend (11)

I would be able to enjoy a beautiful landscape or view (12)

I would get pleasure from helping others (13)

I would feel pleasure when I receive praise from other people (14)

boredom_proned For each of the statements listed below, please select the one number that best indicates how true the particular statement is for you. There are no right or wrong answers.

Please be as honest as you can.

	Strongly Disagree 1 (1)	2 (2)	3 (3)	4 (4)	Strongly Agree 5 (5)
I often find myself at "loose ends," not knowing what to do (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it hard to entertain myself (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Many things I have to do are repetitive and monotonous (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It takes more stimulation to get me going than most people (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't feel motivated by most things that I do (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In most situations, it is hard for me to find something to do or see to keep me interested (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Much of the time, I just sit around doing nothing (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Unless I am
doing
something
exciting, even



dangero
us, I feel
half-
dead
and dull
(10)

End of Block: Affect

Start of Block: Medical Issues Diagnostic

med_text Please select the following medical conditions, diseases, or disorders that you currently experience.

If you do not experience any of these conditions, please click "None of the above."



mental_health Mental Health

- Depression (1)
- Generalized Anxiety Disorder (2)
- ADD/ADHD (3)
- Autism (4)
- Post traumatic stress disorder (PTSD) (5)
- Bipolar disorder (6)
- Schizophrenia (7)
- Eating disorder (8)
- Obsessive compulsive disorder (OCD) (9)
- Dissociative disorder (10)
- Social Anxiety Disorder (11)
- Panic Disorder (12)
- None of the above (13)



sleep_disorders Sleep Disorders

- Insomnia (1)
 - Apnea (2)
 - Restless leg syndrome (RLS) (3)
 - Narcolepsy (4)
 - None of the above (5)
-



SUDs Substance use disorder

- Alcohol (3)
 - Non-prescription painkillers (e.g., heroin) (2)
 - Prescription painkillers (e.g., Oxycontin) (1)
 - Tobacco or nicotine (e.g., e-cigs, cigarettes, chew) (4)
 - Methamphetamine (5)
 - Cocaine (6)
 - Prescription anxiety medication (e.g., Valium, Xanax) (7)
 - Prescription stimulants (e.g., Adderall) (8)
 - None of the above (9)
-

other_conditions Other disorders not listed above:

Page Break

mindful Below is a collection of statements about your everyday experience. Using the 1–5 scale below, please indicate how frequently or infrequently this is **generally** true for you. Please answer according to what really reflects your experience rather than what you think your experience should be.

	Never or very rarely true (1)	Not often true (2)	Sometimes true, sometimes not true (3)	Often true (4)	Very often or always true (5)
I'm good at finding the words to describe my feelings (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can easily put my beliefs, opinions, and expectations into words (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I watch my feelings without getting carried away by them (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tell myself that I shouldn't be feeling the way I'm feeling (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's hard for me to find the words to describe what I'm thinking (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I pay attention to physical experiences, such as the wind in my hair or sun on my face (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I make judgments about whether my thoughts are good or bad (8)

I find it difficult to stay focused on what's happening in the present moment (9)

When I have distressing thoughts or images, I don't let myself be carried away by them (10)

Generally, I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing (11)

When I feel something in my body, it's hard for me to find the right words to describe it (12)

It seems I am "running on automatic" without much awareness of what I'm doing (13)

When I have
distressing
thoughts or
images, I feel
calm soon
after (15)

I tell myself I
shouldn't be
thinking the
way I'm
thinking (16)

I notice the
smells and
aromas of
things (17)

Even when
I'm feeling
terribly upset,
I can find a
way to put it
into words
(18)

I rush through
activities
without being
really
attentive to
them (19)

Usually when
I have
distressing
thoughts or
images I can
just notice
them without
reacting (20)

I think some
of my
emotions are
bad or
inappropriate
and I
shouldn't feel
them (21)

I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow (23)

when I have distressing thoughts or images, I just notice them and let them go (24)

I do jobs or tasks automatically without being aware of what I'm doing (22)

I find myself doing things without paying attention (29)

I disapprove of myself when I have illogical ideas (31)

Page Break

End of Block: Mindfulness

Start of Block: exestential

ECQ The following statements are about experiences people sometimes have. Think about how often you have such an experience and appropriate the right answer.

	Never 1 (1)	Seldom 2 (2)	Sometimes 3 (3)	Often 4 (4)	Always 5 (5)
The question of whether life has meaning makes me anxious (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It frightens me when I realize how many choices life offers (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worry about not being at home in the world, as if I do not belong here (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Existence feels threatening to me, as if at any moment something terrible could happen to me (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It frightens me that at some point in time I will be dead (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worry about the meaning of life (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I try to forget
that all my
choices have
consequences
(7)

I get anxious
because of
losing touch

with myself (8)

I struggle with
the feeling
that in the end
I am on my
own in life (9)

It makes me
anxious that
my life is
passing by
(10)

When the
question of
whether life
has meaning
enters my
mind, I try to
think quickly
about
something
else (11)

I worry about
not living the
life that I could
live (13)

The
awareness
that other
people will
never know
me at the
deepest level
frightens me
(14)

I worry that,
out of the
blue,
something
terrible might
happen to me
(15)



I try to push
away the
thought that
life will end
(16)



It frightens me
that things I
once
considered
important
seem
meaningless
when I look
back on them
(17)

I am afraid
that I do not
get out of life
what is in it
(18)

I try to avoid
the question
of who I really
am (19)

I have the
anxious
feeling that
there is a gap
between me
and other
people (20)

I become
anxious when
I realize how
vulnerable my
body is to the
dangers of life
(21)

I worry about
having to let
go of
everything at
the moment of
my death (22)

I am afraid
that I will
never know
myself at the
deepest level
(24)