

The Role of Emotion Regulation in Substance Use Disorders: State of the Science and Next Steps

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Consuming substances, such as alcohol, cannabis, cocaine, nicotine, and opioids, can produce rapid and powerful changes in how a person feels. Individuals often turn to substances to either decrease, increase, or sustain emotional states, including negative affect (e.g., anxiety, sadness, anger, stress), positive affect (e.g., joy, calm, love), and substance craving (Kober, 2014). Substance use – including use that is motivated by the desire to change one’s emotional state (e.g., to relieve stress or to increase enjoyment at a social event) – is common and not necessarily problematic. However, individuals can develop a substance use disorder (SUD), defined as a pattern of problematic substance use characterized by impaired control, physical dependence, psychosocial problems, and/or risky use (APA, 2013).

A large body of empirical research indicates that emotion regulation (ER) difficulties underlie the development and maintenance of SUDs (Cheetham, Allen, Yücel, & Lubman, 2010; Kober, 2014; Weiss, Kiefer, et al., 2022). Indeed, substance use itself can be viewed as a maladaptive emotion regulation strategy (Kober, 2014). In this chapter, we review the state of the scientific literature on ER and SUDs. First, we focus on the role of craving and regulation of craving in SUDs. We posit that craving is an emotion and that regulation of craving is a core component of ER among individuals with SUDs. Second, we focus on the roles of negative and positive affect and their regulation in SUDs. We conclude by focusing on future directions.

The Role of Craving and its Regulation in SUDs

Craving is defined as a strong desire for substances (APA, 2013). Although researchers recognize that craving has an emotional component, craving is still not consistently conceptualized as an emotion itself. We posit that substance craving is an emotion (Giuliani & Berkman, 2015). ER experts define an emotion as a psychological state that: (a) consists of loosely coupled patterns of subjective experience, physiology, and behavioral response tendencies; (b) fluctuates relatively frequently over time; (c) is triggered by internal and external cues; and (d) serves an evolutionary function to motivate situationally-appropriate action. By this definition, craving is an emotion because craving: (a) involves the subjective experience of wanting, physiological changes (e.g., activation of the ventral striatum, increases in blood

pressure, respiration, and salivation), and behavioral urges to use substances (Ray & Roche, 2018); (b) fluctuates many times within the same day (Ellis et al., 2022); (c) is triggered by internal and external cues (Skinner & Aubin, 2010); and (d) serves the function of promoting the attainment of resources that increase survival and adaptation to the environment (Panksepp, Knutson, & Burgdorf, 2002).

Craving is a core symptom of SUDs and is linked with a range of internal and external cues via classical and operant conditioning (Skinner & Aubin, 2010). Recently, craving was added as a diagnostic criterion for SUD in the DSM-5 (APA, 2013). Critically, substance use relieves craving, and craving is a robust predictor of substance use. In a meta-analysis conducted by our group, we found that craving and cue reactivity (i.e., physiological and neural responses to cues paired with substance use), on average across 656 statistics, from 237 studies, representing 51,788 human participants, had a significant prospective positive association with substance use (Odds Ratio of 2.05; Vafaie & Kober, 2022). Moreover, craving prospectively predicted substance use across all craving measures (e.g., multi-item craving questionnaires, single-item measures, and especially cue-induced craving), substance types (e.g., alcohol, cannabis, cocaine, nicotine, and opioids), and substance-use assessment methods (e.g., retrospective self-report questionnaires, ecological momentary assessment reports, etc.).

Further, a recent study using ecological momentary assessment showed that craving, relative to negative and positive affect, is more consistently a proximal and prospective predictor of same-day substance use (Burgess-Hull & Epstein, 2021). These data suggest that craving may play a greater role in precipitating momentary substance use than positive and negative affect.

In our view, ER includes the regulation of craving. (Kober, 2014). Indeed, a substantial body of literature demonstrates that the strategies individuals use to regulate substance craving play a critical role in substance use behavior. For example, studies to date suggest that cognitive reappraisal, mindful acceptance, distraction, stimulus control, arousal reduction, seeking social support, and drug refusal are effective strategies for reducing substance use across types of SUDs (Roos, Bowen, & Kober, 2021; Roos, Kober, Trull, MacLean, & Mun, 2020).

Research on treatment for SUDs further suggests that regulation of craving may be a core mechanism of recovery. Studies suggest that the therapeutic effects of behavioral therapies for SUDs may be driven by improvement in regulation of craving (Witkiewitz, Bowen, Douglas, & Hsu, 2013). Regulation of craving is the primary target of many leading behavioral therapies for SUDs, including cognitive behavioral therapies (CBT) and mindfulness-based therapies (MBT). CBT teaches strategies to manage cravings such as cognitive reappraisal, distraction, stimulus control, arousal reduction, seeking social support, and drug refusal. Emerging research using our “Regulation of Craving” (ROC) task suggests that CBT may enhance regulation of craving primarily via a “top-down” process that enhances cognitive control over craving, via greater recruitment of prefrontal cortex (e.g., Kober et al., 2010; Suzuki et al., 2020).

In contrast, MBTs have a targeted focus on acceptance of craving. Further, studies suggest that MBT may enhance regulation of craving primarily via a “bottom-up process” in which reactivity to cues and craving is reduced, as indicated by less activation in regions associated with cue-reactivity and craving, without co-occurring increases in prefrontal cortex activation (Kober, Brewer, Height, & Sinha, 2017; Kober, Buhle, Weber, Ochsner, & Wager, 2019; Westbrook et al., 2013).

Given the central role for regulation of craving in SUDs, we recently developed a brief standalone digital intervention focused solely on training in the regulation of craving, and have shown that it leads to reduced substance use (Lopez, Ochsner, & Kober, 2022).

The Role of Negative Affect and its Regulation in SUDs

Substances can provide potent temporary relief from negative affect. Hence, many theories posit that negative affect and its regulation play key roles in SUDs (McHugh & Kneeland, 2019). Elevated negative affect and co-occurring emotional disorders (e.g., PTSD, depression, anxiety) are prospective predictors of greater substance use over time (e.g., months or years; Bradizza, Stasiewicz, & Paas, 2006). Ecological momentary assessment studies suggest that negative affect may play an indirect role in driving momentary substance use daily life. Specifically, these studies show that negative affect predicts greater

craving, which in turn predicts substance use (Burgess-Hull & Epstein, 2021; Wemm, Larkin, Hermes, Tennen, & Sinha, 2019).

Difficulty regulating negative affect is consistently associated with greater substance use, whether assessed as: (1) infrequent use of adaptive strategies (Roos, Bowen, & Witkiewitz, 2020); (2) frequent use of maladaptive strategies (Aldao, Nolen-Hoeksema, & Schweizer, 2010); or (3) deficits in trait-level ER abilities, such as awareness, understanding, and acceptance of negative emotions, and engaging in conscious, goal-oriented behaviors when distressed (Weiss, Kiefer, et al., 2022); and (4) elevations in trait-level emotional vulnerabilities, such as distress intolerance (Mattingley, Youssef, Manning, Graeme, & Hall, 2022), anxiety sensitivity (Wolitzky-Taylor et al., 2018), negative urgency (Smith & Cyders, 2016), and stress reactivity (McHugh & Kneeland, 2019). However, most of this research has used retrospective self-report questionnaires.

Importantly, studies suggest that behavioral therapies for SUDs may exert their therapeutic effects – at least in part – via reducing negative affect and improving negative affect regulation (Kober et al., 2017; McHugh & Kneeland, 2019; Roos, Bowen, et al., 2020). CBT typically targets negative affect regulation strategies such as problem solving, arousal reduction, communication skills, cognitive reappraisal, and seeking social support. MBT typically targets awareness, understanding, and acceptance of negative affect (Roos, Kober, et al., 2020).

The Role of Positive Affect and its Regulation in SUDs

Substances are often used to induce, maintain, or enhance positive affect. Indeed, many theories posit that positive affect and its regulation underlie SUDs (Garland, 2021). Research indicates that positive affect plays a complex role in SUDs. For instance, the role of positive affect varies depending on whether it is assessed at the trait-level or momentary-level. Higher trait-level positive affect (e.g., average levels over time) appears to be a protective factor that reduces substance use (Emery & Simons, 2020). Relatedly, anhedonia, or a dispositional difficulty experiencing pleasure, is a risk factor in the development and maintenance of SUDs (Kiluk, Yip, DeVito, Carroll, & Sofuoglu, 2019). These findings are consistent with the notion that the ability to consistently experience positive affect over time may be

crucial in preventing individuals from turning to substances to induce positive affect (Garland, 2021). On the other hand, individuals may turn to substances to maintain or amplify levels of positive affect, such as during social gatherings. Consistently, studies using ecological momentary assessment indicate that intraindividual increases in momentary positive affect predict greater momentary substance use (Emery & Simons, 2020).

Adding to the complexity, the role of positive affect may depend on problem severity. Research suggests that high positive affect (particularly as a momentary state) may play the greatest role in driving substance use among individuals at the ‘early onset’ or ‘risky use’ stages relative to individuals with SUDs (Cheetham et al., 2010). Furthermore, research suggests that low trait-level positive affect may play the greatest role in driving substance use among individuals with relatively more severe SUDs (Garland, 2021).

Researchers have assessed a variety of constructs related to positive affect regulation. Studies indicate that several aspects of difficulties in positive emotion regulation are associated with greater substance use, including: (1) infrequent use of adaptive strategies such as positive reappraisal, mindful awareness, and savoring (Garland, 2021); (2) use of dampening as a positive downregulation strategy (e.g., “this is too good to be true”; Peckham, McHugh, Kneeland, Björgvinsson, & Beard, 2020); (3) trait-level positive urgency, or the tendency to respond impulsively to positive emotions (Smith & Cyders, 2016); and (4) other difficulties regulating positive affect, such as non-acceptance of positive affect (e.g., feeling guilty for feeling happy; Weiss, Brick, et al., 2022).

Research suggests that improvements in positive affect regulation may mediate the effect of – at least some – behavioral therapies for SUDs (Garland, 2021). CBT for SUD typically targets positive affect regulation strategies such as behavioral activation, goal setting, changing social networks, and positive reappraisal, whereas MBT targets mindful awareness, savoring, and values clarification.

Future Directions

Applying Existing ER Frameworks to Understand Regulation of Craving

When craving is conceptualized as an emotion, researchers can apply existing ER theoretical frameworks to better understand regulation of craving in SUDs (Giuliani & Berkman, 2015). For example, the extended process model of ER (see chapter 1) may be useful for categorizing regulation of craving strategies. Applying the ER ability model (Gratz, Weiss, & Tull, 2015) to regulation of craving could facilitate the development of a measure similar to the Difficulties in Emotion Regulation Scale that taps into core difficulties in regulating craving (e.g., lack of recognition, non-acceptance, lack of strategies). Applying more recent ER frameworks (Southward, Sauer-Zavala, & Cheavens, 2021) could advance our understanding of the nuances of regulation of craving related to repertoire shifts and ordering of strategies in specific contexts.

Use of Intensive Longitudinal Measurement

Most research on the role of ER in SUDs has used global, retrospective self-report questionnaires or laboratory/experimental tasks. Further use of intensive longitudinal measurement methods, such as ecological momentary assessment, is needed to elucidate the dynamic role of ER in varying situational contexts. We provide recommendations for applying intensive longitudinal measurement to study ER in SUDs (Roos et al., 2020; also see Chapter 3).

Integration of ER Measurement into Intervention Studies

Some progress has been made in understanding ER as a mechanism of change in SUD interventions (Roos et al., 2021). However, many important questions remain: What are the common and unique ER mechanisms of change across varying intervention approaches (e.g., CBT vs. MBT)? Are certain ER strategies particularly effective for certain SUD subtypes, or in specific situational contexts in daily life? And what are the key obstacles and facilitators of improvements in ER among individuals with SUD? Further research aiming to answer these questions has the potential to refine SUD interventions and inform the development of novel interventions.

Dynamic Associations Between Substance Use and ER Over Time

Many theories posit a vicious cycle in which substance use itself may have detrimental effects on subsequent ER (Kober, 2014). At the proximal level, momentary substance use is thought to impair

momentary decisions related to ER. Heavy substance use may prompt next-day withdrawal symptoms that in turn impairs next-day ER ability. Moreover, it is thought that chronic heavy substance use over extended periods of time may impair functioning in the prefrontal cortex, which in turn may substantially undermine the ability to engage in “top-down” regulation of emotion states (Kober, 2014). More longitudinal studies, particularly those applying neuroimaging and intensive longitudinal measurement, are needed to evaluate these hypotheses.

Understanding ER Across the Stages of Substance Use

Researchers have posited that the initial use of substances may be primarily motivated by a desire to increase positive affect and/or decrease negative affect, whereas later stages of substance use may be primarily motivated by a desire to decrease craving or other symptoms of withdrawal (Cheetham et al., 2010). Further research is needed to explicitly test this hypothesis and to understand how deficits in the ability to regulate distinct affective states may play unique roles across stages of substance use.

Nuanced Assessment of Emotional States

Most studies examining the role of craving, negative affect, and positive affect in SUDs measure these states in a global manner (e.g., total scores). However, total scores may obscure important nuances, such as physiological versus cognitive dimensions of emotion, low- vs. high-arousal emotions, and types of negative emotions (e.g., sadness, anxiety, anger, shame, loneliness) or positive emotions (e.g., excitement, contentment, gratitude, fulfillment, calm). Future research is needed to explore these nuances, including research using intensive longitudinal methods. The field may need to move beyond the categorization of “positive” vs. “negative” emotions, which may provide limited insight on the complex role of emotions and their regulation in SUDs.

Research on ER Among a Wider Variety of SUD Types

Literature on the role of ER in SUDs has been predominantly among individuals with alcohol, cannabis, or tobacco use disorders. More research is needed to investigate the role of ER among individuals with other substance use disorders (e.g., cocaine, opioid, benzodiazepine use disorder), as well as individuals using multiple substances.

Conclusion

Taken together, ER plays a critical role in SUD, including the regulation of craving, negative affect, and positive affect. Notably, recent research suggests that relative to negative and positive affect, craving may be a more consistent proximal precipitant of substance use. Hence, we believe it is time for the field to pay even closer attention to regulation of craving in SUDs. This means conceptualizing craving as an emotion and applying existing ER frameworks to study regulation of craving. Continued investigation of ER in SUDs will be an integral part of the SUD field's effort to improve treatment for SUDs.

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