Urgency Theory in the context of broader emotion theories: a conceptual review

Lindsey Fisher-Fox, Christiana J. Prestigiacomo
and Melissa A. Cyders*

Department of Psychology, Indiana University Indianapolis, Indianapolis, IN, United States

Negative and positive urgency are two closely related personality traits that reflect the tendency for an individual to engage in maladaptive risk-taking in response to extreme negative and positive emotions, respectively. However, other prominent emotion theories describe how emotions contribute to adaptive, rather than maladaptive, decision-making. This conceptual review considers how Urgency Theory can be integrated with these broader existing emotion theories. We proceed as follows: a) briefly define what is meant by emotions in science and summarize basic human neuroscience underlying emotions; b) briefly describe select theories and research linking emotions to adaptive decision-making, including brain correlates of this effect; c) review Urgency Theory, including contrasting evidence that emotions lead to maladaptive outcomes and brain correlates of this effect; d) discuss how urgency can be integrated into theories that view emotions as both adaptive and maladaptive for decision-making; and e) propose future directions to advance research in this field. We identified four, not mutually exclusive, viable options to integrate Urgency Theory into existing theories: urgency as model-free emotion regulation, urgency as being driven by incidental emotions, urgency as a reflexive response to emotions, or urgency as an individual difference factor. We conclude that although all four options are viable, individual difference and model-free emotion regulation have the most empirical support to date. Importantly, the other two options are less well-researched. Direct tests comparing these integrations is necessary to determine the most accurate way to integrate urgency with existing emotion theories. We believe that this research can identify mechanisms underlying urgency and help inform future intervention and prevention development to reduce negative effects of urgency across numerous maladaptive behaviors and clinical disorders.

Introduction

The experience of emotions is fundamentally adaptive; emotions serve to focus attention to relevant stimuli and prepare the body for action in response to such stimuli (e.g., 1–3). Because of their ubiquitous nature, emotions have long been the focus of psychological study, with research suggesting that they influence a number of explicit and implicit factors related to action, including decision-making (e.g., 4), risk/reward estimations (e.g., 5), attention (e.g., 6), persistence in goal pursuits (e.g., 7), fight vs. flight vs. freeze reactions (e.g., 8), and job performance (e.g., 9).

Cyders and Smith (10) proposed a novel integration of emotions with impulsive response, which they coined "urgency." Key rationale for Urgency Theory is that emotions undermine adaptive decision-making (e.g., 4, 11–14), through less discriminative use of information (15–17), increased distractibility (18), and an increased focus on short-term, rather than long-term, goal pursuits (19). However, there is opposing evidence that emotions can improve, rather than undermine, decision-making. For example, mild increases in positive affect improve problem solving skills (20, 21), such as cognitive flexibility (22, 23), verbal fluency (24), and problem solving (25, 26). There are also anecdotal examples of emotions leading to adaptive behaviors, such as seeking out treatment. Integrating Urgency Theory with broader emotion theories can advance understanding of how and why urgency may contribute to maladaptive outcomes, which can be important for future intervention and prevention development.

Emotions – key terms, definitions, and basic neuroscience

We rely on the classic conceptual framework of Russell (27) to briefly define and differentiate between constructs to be used in the remainder of this review. Core affect, in the Russell (27) framework, is a general term that encompasses both discrete emotions and more diffuse moods. Emotions are discrete experiences directed at or about a specific event, person, or situation (referred to as an object) that are usually shorter in duration, whereas moods refer to a period of prolonged diffuse affect that is not necessarily directed at a specific event, person, or object (27). Ekman (28) describes several factors that make up the experience of core affect; however, here we focus on two independent dimensions relevant to the current review, valence (i.e., pleasure to displeasure) and arousal (i.e., activated/energetic to deactivated/calm). Most discrete emotions can be placed upon these two continua. For example, high arousal and high pleasure represent elation and happiness, high arousal and high displeasure represent distress or anger, low arousal and high pleasure represent calm, and low arousal and high displeasure represent sadness or lethargy. Barrett and colleagues (29) describe the valence dimension as making up the mental representation of emotion, whereas arousal is related to the physical sensations of affect.

Theories suggesting that emotions contribute to adaptive decision-making

Emotions help us set priorities for attention and action and can facilitate adaptive choices and action plans. Pinker (30) said it best: "Most artificial intelligence researchers believe that freely behaving robots will have to be programmed with something like emotions merely for them to know at every moment what to do next" (p. 374). This focusing of attention prepares the individual to respond to meet that emotion. For example, without emotions, we might not know whether to prioritize responding to an email (neutral emotional valence and low emotional arousal in most cases, although there surely are some exceptions to this) or calling a friend whose partner recently passed away (negative emotional valence and high emotional arousal for both the friend and the individual). The negative valence and arousal in the second situation focus attention on the most pressing need and motivates behavior toward the more salient task (and away from the more emotionally-neutral task).

Early neuroscience theories on how emotions affect decision-making focus on distinct systems for affect and cognition, with emotions localized in the limbic system (e.g., 31). A meta-analysis by Kober and colleagues (32) summarized that subcortical activations in the amygdala, ventral striatum, thalamus, hypothalamus, and periaqueductal gray are most commonly found in studies of emotion generation, with an important relationship between these subcortical regions and medial regions of the prefrontal cortex, which may play an important role in the cognitive generation of emotional states. An additional meta-analysis by Lindquist and colleagues (33) concluded that emotions are experienced in the brain through an interacting set of brain regions associated with not only emotion, but also cognition and perception. Phelps and colleagues (34) conclude that multiple neural circuits underlie how emotions influence decision-making depending on a number of contextual factors, including type of emotion or affect experienced and the type of decision-making under study (e.g., risky decisions, social decisions, etc.) (34).

Here, we briefly describe select theories documenting an adaptive role of emotions for decision-making, highlighting potential mechanisms of such an effect and levels of affect at which this effect may occur. For a broader review, see Lerner and colleagues (35).

Somatic marker hypothesis

The Somatic Marker Hypothesis, first proposed by Damasio and colleagues (36), suggests that deficits in decision-making seen in individuals with damage to their ventromedial prefrontal cortex are due, in part, to their inability to use emotional signaling to evaluate decisional options. Damasio sees emotions as a key,

functional part of adaptive decision-making, as somatic markers signal that attention is needed to a particular decision and then help one to evaluate the value of potential responses or decisions (36, 37). Negative somatic markers lead to avoidance of a particular potential response, whereas positive somatic markers lead to approach of an incentive (36, 37). Thus, when somatic markers are absent, decision-making is more random and less advantageous (36). The Somatic Marker Hypothesis proposes that the representation and regulation of emotions in the brain occurs not only in the limbic system, but also in regions of the brain thought to underlie decision-making and planning (e.g., the ventromedial prefrontal cortex, the somatosensory cortices, the basal ganglia, and the insula; 38), suggesting that emotions result from brain sensory input, and shape decision-making and planning, at a neural level (39).

Affect heuristic theory

Affect Heuristic Theory proposes that people use affect heuristics, defined as "representations of objects and events in people's minds that are tagged to varying degrees of affect," to guide decision-making (40). When people make decisions, they consult their pre-existing affect heuristics, which makes decision-making more efficient (40). A recent neuroimaging study found co-activation in the left insula, left inferior frontal gyrus, and left medial frontal gyrus was inversely related to the use of an affect heuristic, suggesting that affect heuristics may be negatively related to giving into momentary affective urges (41).

Affect-guided planning and anticipation

According to Davidson (19), adaptive emotion-based decision-making functions through emotions being linked with more adaptive goals (i.e., the anticipated positive affect, or reduction of negative affect, associated with job success) rather than less adaptive ones (i.e., the reduction of immediate stress through binge eating). Davidson (19) proposes that the prefrontal cortex is responsible for mental representation of goals; when emotions occur, they can be inconsistent with such goals (e.g., when job success is incompatible with disordered level substance use) or they can be consistent with long-term goals (which Davidson calls "affect-guided planning). When emotions are inconsistent with long-term goals, the prefrontal cortex should attempt to override signaling. Asymmetries in prefrontal cortex function appear to distinguish between those who engage in affect-guided planning and those who do not (e.g., 42, 43), suggesting that the ability to maintain anticipated emotions for adaptive pursuits especially in the face of strong, more immediate reinforcers relies on left prefrontal cortex function (19).

Broaden and build theory

The Broaden and Build Theory (44), describes the function of positive emotions as to expand one's thoughts and action urges (i.e.,

to make one's thinking and behavior more creative, more open, and more explorative). Such expansion then allows the individual to develop new skills, resources, and relationships, which are adaptive for survival and produce more positive emotional experiences in return. In Fredrickson's (44) theory, positive emotions are adaptive in that they broaden life experiences and build in new adaptive responding patterns. There is good evidence that positive emotions function to improve decision-making. Fredrickson (45) posits that "positive emotions transform people for the better" and promote future and psychological wellbeing, whereas negative emotions have been adaptive for survival in life threatening situations, such as fear and avoidance when encountering a large animal. A study found that positive affect predicted more flexible coping strategies, as well as future emotional wellbeing (46). In a study utilizing the broaden and build framework, Reschly and colleagues (47) found that, in a sample of high school students, positive emotions predicted greater student engagement in school and greater adaptive coping, showing that positive emotions have similar positive outcomes in adolescents as well.

Dialectical behavior therapy and wise mind

Dialectical Behavior Therapy was developed originally as a treatment for Borderline Personality Disorder; the therapeutic focus on emotions and their ability for adaptive functioning is housed in the common experience that emotions precipitate maladaptive action or inaction (48). Dialectical Behavior Therapy focuses on the cultivation of "wise mind," in which one can utilize and integrate their own rational thoughts (i.e., "rational mind") and emotional reactions (i.e., "emotion mind") to make adaptive, intuitive decisions. There is evidence of adaptiveness of emotions as integrated into Dialectical Behavior Therapy. "Wise mind" has been shown to be important for treatment engagement and success (e.g., 49, 50). Kristeller and Jordan (49) found that a mindfulness-based eating awareness training program increased wise mind, which then led to increases in spirituality, well-being, and improved overall self-regulation. Kearney and colleagues (51) suggest that a meditation intervention increased unactivated pleasant, but not activated pleasant, emotions over time, and decreased both activated and unactivated unpleasant emotions; thus, concluding that the cultivation of wise mind might facilitate both unactivated pleasant emotions and better treatment outcomes for a variety of clinical disorders.

A review of Urgency Theory: emotions contribute to maladaptive decision-making

Development of urgency theory

Research identifying urgency began with the appreciation that impulsivity describes multiple, separate domains of behavior (52). Whiteside and Lynam (52) took an empirical approach and factor analyzed existing impulsivity measures to identify the common,

underlying factors of impulsivity. Results of their factor analysis produced four distinct impulsive traits: sensation seeking (i.e., the tendency to seek out novel and exciting experiences), lack of planning (i.e., the tendency to act without thinking), lack of perseverance (i.e., the inability to remain focused on a task), and urgency (i.e., the tendency to respond rashly in response to extreme emotional states). From these results, Whiteside and Lynam (52) created the UPPS Impulsive Behavior Scale, which has shown usefulness across various populations and has been translated into several languages (e.g., 53–56).

Research then provided evidence that urgency was not a unitary construct and was instead comprised of two separate, albeit related, constructs of negative and positive urgency (57). This led to the addition of a positive urgency subscale into a revised version of the UPPS scale (The UPPS-P Impulsive Behavior Scale; 58). This revised scale is widely used to measure impulsive personality and, like the original scale, has been shown to produce valid and reliable estimates of impulsive behavior traits across age, gender, clinical populations, and language (59–63).

Urgency Theory posits that rash action is thought to occur in response to a specific and discrete experience of emotion that is directed to a specific situation, person, or object (10). When one is experiencing emotions intensely, the loss of available cognitive resources and the interference with rational decision-making increases the likelihood that one's actions will be ill-advised or rash (10). The exact mechanisms of how urgency imparts risk remain of debate. Billieux and colleagues (64) suggested that urgency is driven by poor ability to inhibit prepotent responses during emotional contexts. Eben and colleagues (65) suggested that negative emotions may create a discrepancy between one's current state and desired state. Previous work suggested that urgency was not explained by the interaction of over-reactivity of emotion and lack of planning (e.g., 66). However, later neuroimaging evidence found that urgency is related to increased brain response to negative images (67). Other work suggests that urgency may be driven by over-reactivity to emotional triggers, combined with a deficient ability to regulate this response (64).

Urgency is related to maladaptive risk-taking behaviors

Negative and positive urgency are both associated with involvement in a variety of risky behaviors (10); however, there are some unique associations with different risk-taking behavior across these traits that are important to highlight. Negative urgency is more highly related to increased drinking quantity (i.e., number of drinks consumed in a single drinking episode), drinking to cope, and development of an Alcohol Use Disorder (68, 69). Research has also shown that negative urgency is a strong predictor of severity of problems across a variety of domains including medical, employment, social, family, psychiatric, and substance and alcohol use in those with a substance use disorder (70). Additionally, negative urgency has been shown to predict problems such as pathological gambling, increased eating

problems, self-harm behaviors, risky sexual behavior, compulsive shopping, and craving for cigarettes (71–75).

Positive urgency has also been linked to risky behavior. For example, research has also shown that individuals are prone to engage in heavy and high-risk drinking, pathological gambling, and binge eating when experiencing elevated positive mood states (76–78). Positive urgency uniquely predict risky drinking, risky sexual behavior, and increased drug use in first year college students compared to negative urgency (79, 80). Positive urgency is also associated with increased risk-taking behavior among children (81).

Urgency is related to psychopathology

Urgency has been implicated as a unique risk factor for and as a characteristic of psychopathology. As Johnson and colleagues (82) concluded, "A large body of work indicates that urgency is more robustly related to psychopathology than are other forms of impulsivity … Collectively, this work is beginning to transform psychopathology research to focus on integrating these domains [negative and positive urgency]." Negative urgency has been proposed as a common transdiagnostic endophenotype for a number of ill-advised risk behaviors and clinical disorders (67) and has been associated with disordered eating, Borderline Personality Disorder symptoms, nonsuicidal self-injury, substance use disorder, and aggression (83–85).

Borderline Personality Disorder symptoms are often associated with urgency due to the emotional and impulsive nature of the disorder. Martin and colleagues (86) identified a relationship between insight and urgency within Borderline Personality Disorder: Increased levels of positive urgency were associated with increased clinical insight, meaning the more the patient experienced positive urgency, the more aware of the disorder the patient was, potentially driven by self-reflectiveness, which may have implications for treatment outcomes. Urgency also predicts a more severe course of externalizing behaviors such as earlier onset of alcohol use, alcohol dependence, and smoking cessation difficulty (87–89). Johnson and colleagues (82) assert that negative urgency predicts symptoms worsening (e.g., more drinking problems) over time during negative emotional states, while positive urgency predicts more alcohol use during positive emotional states. These effects were still present even when controlling for other forms of impulsivity or emotionality. Similarly, Howard and Khalifa (90) posit that urgency contributes to the severity and is a core feature of personality disorders and may, in turn, help to explain the link between personality disorders and violence.

Emerging research has also linked urgency with internalizing psychopathology. Research suggests that urgency predicts depression and anxiety symptoms, suicidality, and obsessive thoughts in Obsessive Compulsive Disorder with similar effect sizes between negative and positive urgency, indicating both positive and negative emotions play a strong role in psychopathology (85, 91). In addition, positive and negative urgency were found to mediate the relationship between Post-Traumatic Stress Disorder symptoms and risky behaviors (92).

These patterns of associations with psychopathology have also been replicated in a sample of children and adolescents. in that urgency broadly predicts a range of psychopathology such as conduct disorder, depression, panic and anxiety, and attention deficit hyperactivity disorder (ADHD) – inattentive symptoms (93). Additionally, urgency has been studied as a link in the relationship between adult ADHD and the severity of alcohol dependence, suggesting that those with ADHD may drink to cope when struggling to regulate their emotions (94). Urgency has also been found to be associated with serious suicidal ideation in 9- and 10-year-old children and is particularly salient in White children compared to Black and other race children (95).

Urgency has been implicated in psychotic psychopathology, such as Bipolar Disorder and Schizophrenia. Johnson and colleagues (96) found that urgency was associated with self-harm, suicidal ideation, and suicide attempts with negative urgency being the strongest predictor of suicidal ideation within those with Bipolar I Disorder. The relationship between urgency and suicidal behaviors was still present when controlling for major depression and other psychopathology. Negative and positive urgency are elevated in those with remitted Bipolar I Disorder and schizophrenia (97, 98). Muhtadie and colleagues (98) found that those with Bipolar I Disorder were more likely to engage in impulsive behaviors if they were high in positive urgency, over and above other facets of impulsive personality. Further, positive urgency is elevated in first degree relatives of those with schizophrenia, which may be a characteristic to target in treatment to prevent the development of schizophrenia in first degree relatives (99).

Urgency and treatment outcomes

Recently, urgency has been found to influence and impede the effectiveness of substance use disorder treatments. Hershberger and colleagues (100) conducted a meta-analysis of studies reporting UPPS-P traits at the beginning of cognitive-behavioral treatment for substance use disorders and found that negative urgency (along with lack of planning) at treatment admission predicted poorer response at the end of treatment. This study also found that UPPS-P traits did not change markedly in treatment, necessitating a more directed approach to reducing these traits. In another study, positive urgency was related to increased (rather than decreased) alcohol use and problems following a text-based intervention for 21st birthday drinking (101). Manasse and colleagues (102) similarly found that individuals with higher negative urgency at baseline experienced slower and less pronounced benefit from treatment. There is much more to understand concerning how and why urgency might impede or worsen the effects of treatment and how best to intervene to reduce the negative effects of urgency (see 103).

One construct or two?

While there is strong evidence to suggest that negative urgency and positive urgency are two distinct constructs (10, 104–106), there is still debate about whether these two constructs are better understood as one tendency. Recently, there has been contradictory evidence supporting both sides of this debate. First, Cyders and Smith (104) tested multiple models of the UPPS-P and found that the model designating positive and negative urgency as one factor did not fit the data well, but that the model designating them as sub-factors under a broader urgency factor fit the data best. This was also supported in another study using a more diverse and representative sample (62). Another recent study examined alternative factor models of impulsivity within the UPPS-P to determine whether the five facets of the UPPS-P were independent from one another using confirmatory factor analysis and found that the five-factor model was supported (107). Additionally, Goh and colleagues (108) examined the UPPS-P model of impulsivity utilizing network analysis and found support for "five conceptually distinct and differentially related dimensions" indicating that positive and negative urgency are two distinct constructs.

However, it may be beneficial to conceptualize urgency as one construct. Support for this perspective comes from evidence that the two traits are highly correlated and may be theoretically indiscernible from one another (85, 91, 109, 110). Specifically, Billieux and colleagues (110) concluded that the two facets of urgency converge as a single cluster using item-based network analysis and that it may be more efficient to examine urgency as one construct. Additionally, the high correlation between negative and positive urgency, usually in the range of 0.6 to 0.8, suggests that these two traits may have more shared than distinct variance. In the end, it may be that the distinctiveness of the two traits may be difficult to establish, and it may depend on the sample in which they are measured, the outcomes under examination, and how the traits may cluster together in any particular dataset.

Empirical brain correlates of urgency

Although still in relatively early stages, the empirical research concerning brain correlates of urgency has identified a number of key structures and circuits that contribute to cognitive control, emotions, and salience (see a review by 111). To date, the majority of these studies have primarily focused on negative urgency, rather than positive urgency. Greater dorsolateral prefrontal cortex activation was associated with negative urgency during a simple cognitive control task, indicating that those high in urgency may use greater cognitive resources in cognitive control tasks (112, 113). This may indicate that those high in urgency may use greater cognitive resources during cognitively demanding tasks, making it more difficult to engage in cognitive control (114). Increased right insula activation was related to negative urgency in a decision-making task in which the subject made a risky decision over a safe decision (115). Activation in the orbitofrontal cortex, which is associated with emotion-based learning and decision-making (see reviews by 116, 117), has been found to be significantly related to negative urgency in response to valenced mood images (118). Research has shown that negative urgency relates to increased activation in the left amygdala, a region involved in negative

emotion processing, in response to negatively valenced images (118). Increased negative urgency has been linked to a smaller left ventral striatum and lower regional gray matter volume in the right temporal pole (119).

Studies that include positive urgency often report overlapping neuroanatomical correlates with negative urgency, indicating that emotional dispositions to rash action are implicated within the same regions, regardless of the valence of the emotion (see review by 111, 120). These shared neural correlates are indicated by high gray and white matter intraclass correlation analyses and a similarity of significant regions in linear mixed effect models (120). However, in elastic net analyses, positive urgency was better predicted by structural MRI than negative urgency, despite their overlapping neural correlates (120). Positive urgency has been implicated in greater left frontal asymmetry from the right anterior cingulate cortex, the medial frontal gyrus, and the right inferior frontal gyrus in EEG studies (121, 122). Positive urgency has also been shown to be related to decreased dopamine receptor availability in the bilateral nucleus accumbens, putamen, and caudate (123).

Theories suggesting that emotions contribute to both adaptive and maladaptive decision-making: integrating Urgency Theory

Several theories model the capacity of emotions to be *both* adaptive and maladaptive for decision making, depending on contextual and situational factors. We review four such theories here that we believe provide viable, albeit different, approaches for integrating Urgency Theory into the broader emotion literature.

Integration using model-based and model-free emotion regulation

Emotion regulation refers to one's ability to cope, change, or respond to an emotional experience, and moves through a number of stages and processes, including selection of an emotional experience to modify, attention to a situation, cognitive appraisal of an emotional experience, and an attempt to modulate or respond to the situation (e.g., 124). Although much of the literature on emotion regulation has focused on the modification of negative emotions, some have highlighted the importance of regulating positive emotions as well (e.g., 125), in that maintaining or increasing positive emotional experiences may underlie resilience. Emotion regulation theories propose that emotions that are regulated can be adaptive, whereas emotions that are not regulated may lead to more maladaptive coping (which would be referred to as emotion dysregulation; e.g., 126, 127). For example, a person experiencing depression might be motivated to seek out help, which would be an adaptive emotion-guided response.

However, ongoing depression that does not fuel help- or treatment-seeking can be quite maladaptive; such maladaptive responses might be driven, in part, by a lack of awareness of emotions (e.g., 128).

There are several emotion regulation strategies that have been linked to positive outcomes. For example, emotion reappraisal (i.e., "modifying the emotional meaning and impact of a situation that elicits emotion," 129) of both positive and negative emotions is associated with fewer depressive symptoms, greater self-esteem, life satisfaction, and overall wellbeing (129). Reappraisal has also been shown to decrease negative emotions and increase positive emotions in lab paradigms and when using self-report measures (129, 130). Additionally, individuals that utilize reappraisal report having closer relationships due to the increased likelihood of them sharing their emotions (129, 131), illustrating that emotion reappraisal can be adaptive and, in turn, lead to positive outcomes. MacDonald and colleagues (132) found that rapid improvement in emotion regulation strategies significantly increased posttreatment binge/purge abstinence, decreased depression symptoms, and decreased eating disorder-related cognitive psychopathology at posttreatment for individuals diagnosed with Bulimia Nervosa or Purging Disorder. A creative laboratory-based experiment (133) sought to determine the contexts that influence the adaptiveness of negative emotions, finding that negative emotions linked to context (e.g., being sad in the face of a family member passing away) produce more adaptive responses and were associated with better psychological health and adjustment. Thus, this suggests that negative emotions that match the current needs of an individual and that are successfully regulated are and can be adaptive, whereas those that do not match the current needs or are not regulated can be maladaptive.

Etkin and colleagues (134) propose that the decision to engage in emotion regulation is linked to the predicted outcomes of that regulation – in this way, emotion regulation strategies that are linked to a desired outcome are engaged in, whereas those that are associated with costs are avoided. There is continual updating of these assessments over time, and value predictions (i.e., predictions one makes about the relative cost-benefit of an emotion regulation strategy) that are discrepant with one's current experiences are considered "prediction errors" (134). The authors explain this within the context of model-based and model-free control: In model-free control, one makes a decision based on one's current assessment of prediction errors – i.e., the discrepancy between one's desired state and their current state – which is efficient but not flexible. In contrast, in model-based control, one makes a decision by applying prior knowledge, which is less efficient, but more optimal. The authors propose different underlying circuits related to model-based and model-free emotion regulation, such that model-free emotion regulation may be driven by ventral anterior cingulate cortex and ventromedial prefrontal cortex interactions with limbic-emotional circuits, whereas model-based emotion regulation is governed by frontoparietal regions (e.g., ventral lateral prefrontal cortex, dorsolateral prefrontal cortex, parietal cortex, and supplementary motor areas) interacting with limbic-emotional circuits (134).

Empirical evidence integrating urgency

The literature overall has supported the idea that urgency and emotion (dys)regulation are related (92, 135–143). Some have suggested that urgency is driven, in part, by low levels of emotion regulation (64). Others have found negative relationships between negative urgency and the use of adaptive emotion regulation strategies (112) and that differing levels of urgency within individuals results in different kinds of emotion regulation strategies (144). In addition, research in the brain shows overlap in regions implicated in emotion regulation and urgency. A recent review documented that emotion regulation is underpinned by the lateral prefrontal cortex and the amygdala (145), regions that overlapped with cognitive control and emotion regions related to urgency (see review by 111).

There is one only empirical study directly testing the idea of urgency as model-free emotion regulation. Jara-Rizzo and colleagues (146) conceptualized negative urgency as a sign of poor emotion regulation (also supported by 112), and found that negative urgency is related to emotional suppression, but not reappraisal. The authors suggest that negative urgency results from model-free emotion dysregulation (146), such that model-based emotion regulation may result in emotions facilitating adaptive decision-making, whereas model-free emotion regulation may result in emotions producing more maladaptive decision-making. Such a proposal is viable, based on previous work showing a relationship between brain activity in the ventromedial prefrontal cortex in response to alcohol cues and both negative urgency (e.g., 118) and model-free emotion regulation (134). We see the model-based and model-free framework as an interesting way to guide future investigations aimed at better integrating Urgency Theory with models of emotion regulation and adaptive decision-making.

The mood maintenance hypothesis and the affect infusion model: integration using integral and incidental emotions

Two contrasting theories suggest opposite effects across positively and negatively valenced states and are considered jointly here. The Mood Maintenance Hypothesis suggests that positive mood improves decision-making, producing less risky decisions, whereas negative moods lead to less adaptive decision-making and more risk-taking, in the pursuit of obtaining a reward and bettering one's mood (147, 148). In contrast, the Affect Infusion Model suggests that positive affect produces less adaptive decision-making, through attending to the positive cues in the environment which may make one overly optimistic about an outcome; whereas negative affect leads to more adaptive decision-making, through attending to the negative cues in the environment and acting in ways to avoid subsequent negative outcomes (149). An interesting

study by Grable and Roszkowski (150) found more support for the Affect Infusion model, suggesting that negative affect may be more linked with adaptive decision-making and that positive affect may be more linked with maladaptive decision-making.

Lerner and colleagues (35) propose how integral and incidental emotions may explain how similar emotional valence states may produce differential effects on decision-making while different emotional valence states may produce similar effects on decision-making. Integral emotions are emotions that arise from the situation or decision at hand, and are thought to underlie decision-making in models, such as the Somatic Marker Hypothesis (151). Lerner and colleagues (35) summarize the research on integral emotions as largely providing evidence that emotions benefit and improve decision-making (although there is some evidence that integral emotions can bias decision-making when they do not reflect reality and that in these cases, they can override more rational courses of action; see a review by 152). Incidental emotions, on the other hand, are emotions that carry over from another situation and influence later decisions (35), a process known as the carryover of incidental emotion (e.g., 153, 154). Lerner and colleagues (35) summarize the research on incidental emotions as largely providing evidence for the biasing effects of incidental emotions, a process by which a more diffuse mood continues to bias decision-making even outside of the primary event or situation which activated the initial emotion response.

Empirical evidence integrating urgency

There is no existing empirical evidence directly linking urgency with integral and incidental emotions. However, the idea of integral and incidental models may guide attempts to integrate Urgency Theory and adaptive emotion-guided decision-making. It's possible that adaptive emotion-guided decision-making is influenced largely by integral emotions, whereas more maladaptive, urgency-like decision-making is influenced largely by incidental emotions. Phelps and colleagues (34) suggest that incidental emotion effects on decision-making may be driven by impaired function of the PFC, or shifting neural processes in regions, such as the orbitofrontal cortex, that assess subjective value. Although there is more work to do in this regard, these underlying brain correlates seem to overlap with regions related to negative urgency (e.g., see 118). This may suggest viability of viewing urgency as a mechanism underlying the detrimental effects of incidental emotions on decision-making. Evidence from neuroimaging work shows that the amygdala may underlie task-independent processing of emotions, whereas the ventromedial prefrontal and somatosensory cortices may be involved in more direct processing of emotions (155). Urgency shows relationships with amygdala functioning (118), indirectly supporting the integration of urgency with incidental processing. However, evidence also links urgency with the ventromedial prefrontal cortex (118), suggesting that urgency may not be reflected by the distinction between incidental and integral processing.

Integration using reflexive responsivity to emotions

Carver and colleagues (156) proposed a model wherein emotions are responded to thoughtfully, which would be associated with more adaptive outcomes, or reflexively, which would be associated with less adaptive outcomes. Reflexive responses can be rash action (like in the case of urgency) or rash inaction (e.g., not seeking out treatment for depression, as in the example above) (156). Thus, emotions that are responded to thoughtfully produce adaptive responses. Carver's theory can serve to integrate across Urgency Theory and theories that highlight the adaptiveness of emotions for decision-making. Adaptive or maladaptive responses to emotions might be better subsumed as reflexive or thoughtful behavioral action or inaction (and reflexive and thoughtful responses can be either adaptive or maladaptive in nature). In this model, adaptive emotion-guided decision-making would be represented as thoughtful responses, whereas urgency can be better understood as a marker of reflexive responses to emotions (whether by action or inaction; as supported by 157).

Empirical evidence integrating urgency

There are mixed empirical data to suggest that urgency and reflexive responses to emotions are similar constructs. Smith and colleagues (157) found that urgency appears to be a marker of reflexive responses to emotions as proposed by the Carver model, in that urgency can relate to both rash action and rash inaction; the common factor here appears to be the focus on alleviation of distress or focusing on the immediate emotion rather than the underlying cause of the emotion itself (157). A 2018 study found that negative urgency was associated with using more reflexive emotion regulation strategies, providing support for Smith et al.'s findings (144). However, a recent study by Sperry and colleagues (158) utilizing Ecological Momentary Assessment (EMA) to examine the link between affect and impulsivity did not find an association between internalizing/externalizing psychopathology and momentary links between affect and impulsivity, suggesting that urgency and reflexive responses to emotion may not be the same thing. There is much more research to be done to determine the validity of this option as explaining the integration of these theories, but it is nonetheless a viable and interesting future avenue of investigation.

Integration using individual difference theory

Individual difference theories posit that there are variations across people on numerous factors that drive behavior, including personality, intelligence, and emotionality. These differences can be driven by temperament, learning, or even underlying biological, genetic, or neural underpinnings (e.g., 159). Urgency was proposed

as an individual difference tendency (10), suggesting that Urgency Theory is not universal, but rather only applies to a subset of the population.

Empirical evidence integrating urgency

There is much literature to support the idea that urgency is an individual difference trait (see a review by 160). However, there is also evidence that works against the idea that urgency is an individual difference variable, including that urgency can change in response to treatment or intervention (e.g., 100, 161). This undermines the idea that it is a stable, trait-like construct (e.g., 162, 163), although some suggest that individual differences can change over time (e.g., 164). Thus, although the fact that urgency can change doesn't completely rule out the idea that it is a relatively stable individual difference variable, it is a consideration. Although the field overwhelmingly models urgency as a trait, other approaches have treated urgency as a state-like construct that can be manipulated in the laboratory (see a review by 165).

Conclusion and future directions

In this conceptual review, we conclude that Urgency Theory can be integrated into broader emotion models that include both adaptive and maladaptive effects of emotions on decision-making. We highlight four, not mutually exclusive, possibilities: urgency as a function of model-free emotion (dys)regulation (134); urgency reflecting a reliance on incidental, rather than integral, emotions (as reviewed by 35); urgency as a reflexive, rather than purposeful, response to emotions (156); or urgency as an individual difference tendency that may only apply to a subset of the population.

Although all these possibilities are viable, there is little empirical evidence to inform which, if any, of the theories proposed here best reflect truth. There is no research directly comparing or integrating these constructs into one model; filling this gap is an important future research direction. Some evidence testing these theories is better well-developed than others, suggesting greater viability for some approaches than others; however, other theories are under-researched, suggesting that they may still be viable but require additional empirical study. Measuring these constructs using multiple methods, including self-report, behavioral responding, and neuroimaging, as well as examining the inter-relations among these constructs by testing multiple factor models, would have the most impact in filling this gap. Identifying how and why urgency imparts risk can facilitate development and testing of effective interventions to decrease maladaptive risk-taking, identification of those at risk for maladaptive risk-taking, and matching of interventions to those at risk. Whether or not Urgency can be validly integrated into the above models has impact for how best to intervene.

To date, the most supported integrative theory is that urgency is an individual difference tendency (see a review by 160). This is also the most well-researched theory. Although overwhelmingly supported, studies exist modeling urgency as a state-like behavior,

which may undermine the trait-like view of urgency. In all, it appears that urgency is best conceptualized as a trait, where individuals exist on a continuum (i.e., some have high levels, some low levels, and some in the middle), where the higher the trait, the more the individual engages in maladaptive action while experiencing emotional states. Evidence in the treatment literature suggest that urgency changes very little during treatment (100, 161), supporting the idea that urgency is trait-like and may be difficult to change, suggesting that targeting urgency in a treatment setting may not be a viable approach. Clinically, if urgency is best represented as an individual difference tendency, it would be most effective to identify those high in urgency to receive targeted interventions to reduce urgency-related risk-taking and maladaptive behaviors.

The second best supported integrative theory is urgency model-free emotion dysregulation, with the field generally conceptualizing urgency as associated with higher levels of emotion dysregulation (although the exact mechanism of this relationship is not yet well known). More work is needed to better understand if urgency and emotion dysregulation are the same thing, or if they are two separate, though related, constructs that influence one another or are related due to the presence of a third factor. There is one only empirical study directly testing the idea of urgency as model-free emotion regulation; this study supported the idea of urgency as model-free emotion (146). Replication of this finding is important. Clinically, if urgency is a function of model-free emotion (dys) regulation (134), this would suggest that urgent behaviors may be reduced through a more purposeful use of previous learning structure in the selection of emotion regulation strategy rather than relying on reacting to one's current state. One study (92) applied emotion regulation skills training and found reductions in both urgency and emotion dysregulation, supporting this integration and intervention approach.

The final two theories have less empirical support. The data connecting urgency to a reflexive response to emotions is mixed. Clinically, if urgency reflects a reflexive response to emotions, this would suggest that slowing down and making the decision-making process explicit might be a viable way to interrupt urgent behaviors. However, more direct empirical tests of this integration are necessary to determine if this approach might be effective. The mixed evidence may suggest that there are individual differences in urgency, further supporting the individual difference integration. Finally, to date, no empirical studies have directly tested the integration of urgency with incidental emotions, so a conclusion cannot be made as to the viability of this approach at this time. This integration is supported by theory and overlapping brain regions, but direct empirical tests are needed to determine if this approach is feasible. Clinically, if urgency reflects a reliance on incidental emotions, this would suggest the viability of reducing urgent behaviors through reorienting one's attention away from unrelated emotional experiences and toward ones that are applicable to one's current state. This would need to be tested before clinical application.

As this was a conceptual review, other potential ways to integrate Urgency Theory may exist. We hope that this review catalyzes future empirical research aimed at understanding how best to integrate urgency into these (or other) theories. Although all four options are viable based on existing empirical evidence and theory, individual difference and model-free emotion (dys) regulation have the most support. Importantly, the other two options are less well-researched. Direct tests comparing these integrations would be necessary to determine the most accurate way to integrate urgency with existing emotion theories. We believe that this research can identify key mechanisms underlying urgency and help inform how best to target and modify urgency to reduce its negative effects across numerous maladaptive behaviors and clinical disorders.

Author contributions

LF-F: Conceptualization, Funding acquisition, Writing – original draft, Writing – review & editing. CP: Writing – original draft, Writing – review & editing. MC: Conceptualization, Funding acquisition, Supervision, Writing – original draft, Writing – review & editing.

Funding

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

1. Frijda NH. *The Emotions*. New York: Cambridge University Press (1986).

2. Lang PJ. The motivational organization of emotion: Affect reflex connections. In: van Goozen S, van der Poll NE, Sergeant JA, editors. *The Emotions: Essays on Emotion Theory*. Erlbaum, Hillsdale, NJ (1993). p. 61–96.

3. Saami C, Mumme DL, Campos JJ. *Emotional development: Action, communication, and understanding*. Hoboken, NJ: John Wiley & Sons Inc (1998).

4. Bechara A. The role of emotion in decision-making: Evidence from neurological patients with orbitofrontal damage. *Brain Cogn*. (2004) 55:30–40. doi: 10.1016/j.bandc.2003.04.001

5. Mohr PNC, Biele G, Heekeren HR. Neural processing of risk. *J Neurosci*. (2010) 30:6613–9. doi: 10.1523/JNEUROSCI.0003-10.2010

6. Easterbrook JA. The effect of emotion on cue utilization and the organization of behavior. *psychol Rev*. (1959) 66:183–201. doi: 10.1037/h0047707

7. Lench HC, Levine LJ. Goals and responses to failure: Knowing when to hold them and when to fold them. *Motiv Emotion*. (2008) 32:127–40. doi: 10.1007/s11031-008-9085-1

8. Bandler R, Keay KA, Floyd N, Price J. Central circuits mediating patterned autonomic activity during active vs. passive emotional coping. *Brain Res Bull*. (2000) 53:95–104. doi: 10.1016/S0361-9230(00)00313-0

9. Wallace JC, Edwards BD, Shull A, Finch DM. Examining the consequences in the tendency to suppress and reappraise emotions on task-related job performance. *Hum Perform*. (2009) 22:23–43. doi: 10.1080/08959280802540957

10. Cyders MA, Smith GT. Emotion-based dispositions to rash action: positive and negative urgency. *psychol Bullet*. (2008) 134:807–28. doi: 10.1037/a0013341

11. Bechara A. Decision making, impulse control and loss of willpower to resist drugs: a neurocognitive perspective. *Nat Neurosci*. (2005) 8:1458–63. doi: 10.1038/nn1584

12. Shiv B, Loewenstein G, Bechara A. The dark side of emotion in decision-making: When individuals with decreased emotional reactions make more advantageous decisions. *Cogn Brain Res*. (2005) 23:85–92. doi: 10.1016/j.cogbrainres.2005.01.006

13. Dreisbach G. How positive affect modulates cognitive control: The costs and benefits of reduced maintenance capability. *Brian Cogn*. (2006) 60:11–9. doi: 10.1016/j.bandc.2005.08.003

14. Dolan RJ. The human amygdale and orbital prefrontal cortex in behavioural regulation. *Philos Trans R Soc B-Biol Sci*. (2007) 362:787–99. doi: 10.1098/rstb.2007.2088

15. Forgas JP, Bower GH. Mood effects on person-perception judgments. *J Pers Soc Psychol*. (1987) 53:53–60. doi: 10.1037/0022-3514.53.1.53

16. Gleicher F, Weary G. Effect of depression on quantity and quality of social inferences. *J Pers Soc Psychol*. (1991) 61:105–14. doi: 10.1037/0022-3514.61.1.105

17. Forgas JP. Affect in social judgments and decisions: A multiprocess model. In: Zanna M, editor. *Advances in Experimental Social Psychology*. Academic Press, San Diego, CA (1992). p. 227–75.

18. Dreisbach G, Goschke T. How positive affect modulates cognitive control: reduced perseveration at the cost of increased distractibility. *J Exp Psychol: Learn Memory Cogn*. (2004) 30:343–53. doi: 10.1037/0278-7393.30.2.343

19. Davidson RJ. Darwin and the neural basis of emotion and affective style. *Ann New York Acad Sci*. (2003) 1000:316–36. doi: 10.1196/annals.1280.014

20. Isen AM. The influence of positive affect on risk-preference. *Bull Psycho Soc*. (1984) 22:296–6.

21. Isen AM. Positive affect, cognitive-processes, and social behavior. *Adv Exp Soc Psychol*. (1987) 20:203–53. doi: 10.1016/S0065-2601(08)60415-3

22. Isen AM, Daubman KA. The influence of affect on categorization. *J Pers Soc Psychol*. (1984) 47:1206–17. doi: 10.1037/0022-3514.47.6.1206

23. Isen AM, Niedenthal PM, Cantor N. An influence of positive affect on social categorization. *Motiv Emo*. (1992) 16:65–78. doi: 10.1007/BF00996487

24. Phillips LH, MacLean RDJ, Allen R. Age and the understanding of emotions: Neuropsychological and sociocognitive perspectives. *Journ Gerontol: Ser B: psychol Sci Soc Sci*. (2002) 57:P526–30. doi: 10.1093/geronb/57.6.P526

25. Isen AM, Daubman KA, Nowicki GP. Positive affect facilitates creative problem-solving. *J Pers Soc Psychol*. (1987) 52:1122–31. doi: 10.1037/0022-3514.52.6.1122

26. Green TR, Noice H. Influence of positive affect upon creative thinking and problem-solving in children. *psychol Rep*. (1988) 63:895–8. doi: 10.2466/pr0.1988.63.3.895

27. Russell JA. Core affect and the psychological construction of emotion. *psychol Rev*. (2003) 110:145–72. doi: 10.1037/0033-295X.110.1.145

28. Ekman P. Basic emotions. *Handb Cogn Emotion*. (1999) 98:16. doi: 10.1002/0470013494.ch3

29. Barrett LF, Mesquita B, Ochsner KN, Gross JJ. The experience of emotion. *Annu Rev Psychol*. (2007) 58:373–403. doi: 10.1146/annurev.psych.58.110405.085709

30. Pinker S. *How the Mind Works*. New York: W. W. Norton & Company (1997).

31. Lambert KG. The life and career of Paul Maclean: a journey toward neurobiological and social harmony. *Physiol Behavior*. (2003) 79:343–49. doi: 10.1016/S0031-9384(03)00147-1

32. Kober H, Barrett LF, Joseph J, Bliss-Moreau E, Lindquist K, Wager TD. Functional grouping and cortical–subcortical interactions in emotion: a meta-analysis of neuroimaging studies. *Neuroimage*. (2008) 42:998–1031. doi: 10.1016/j.neuroimage.2008.03.059

33. Lindquist KA, Wager TD, Kober H, Bliss-Moreau E, Barrett LF. The brain basis of emotion: a meta-analytic review. *Behav Brain Sci*. (2012) 35:121. doi: 10.1017/S0140525X11000446

34. Phelps EA, Lempert KM, Sokol-Hessner P. Emotion and decision making: multiple modulatory neural circuits. *Annu Rev Neurosci*. (2014) 37:263–87. doi: 10.1146/annurev-neuro-071013-014119

35. Lerner JS, Li Y, Valdesolo P, Kassam KS. Emotion and decision making. *Annu Rev Psychol*. (2015) 66:799–823. doi: 10.1146/annurev-psych-010213-115043

36. Damasio AR, Tranel D, Damasio H. Somatic markers and the guidance of behaviour: theory and preliminary testing. In: Levin HS, Eisenberg HM, Benton AL, editors. *Frontal Lobe Function and Dysfunction*. Oxford University Press, New York (1991). p. 217–29.

37. Damasio AR. The somatic marker hypothesis and the possible functions of the prefrontal cortex. *Philos Trans R Soc London (series B)*. (1996) 351:1413–20. doi: 10.1098/rstb.1996.0125

38. Damasio AR. Emotion in the perspective of an integrated nervous system. *Brain Res Rev*. (1998) 26:83–6. doi: 10.1016/S0165-0173(97)00064-7

39. Damasio AR. William James and the modern neurobiology of emotion. In: Evans D, Cruse P, editors. *Emotion, Evolution and Rationality*. Oxford University Press, Oxford (2004). p. 3–14.

40. Finucane ML, Alhakami A, Slovic P, Johnson SM. The affect heuristic in judgments of risks and benefits. *J Behav Decision Making*. (2000) 13:1–17. doi: 10.1002/(ISSN)1099-0771

41. Skagerlund K, Skagenholt M, Hamilton JP, Slovic P, Västfjäll D. Investigating the neural correlates of the affect heuristic using functional magnetic resonance imaging. *J Cogn Neurosci*. (2021) 33:2265–78. doi: 10.1162/jocn_a_01758

42. Davidson RJ, Irwin W. The functional neuroanatomy of emotion and affective style. *Trends Cogn Sci*. (1999) 3:11–21. doi: 10.1016/S1364-6613(98)01265-0

43. Davidson RJ, Marshall JR, Tomarken AJ, Henriques JB. While a phobic waits: regional brain electrical and autonomic activity in social phobics during anticipation of public speaking. *Biol Psychiatry*. (2000) 47:85–95. doi: 10.1016/S0006-3223(99)00222-X

44. Fredrickson BL. What good are positive emotions? *Rev Gen Psychol*. (1998) 2:300–19. doi: 10.1037/1089-2680.2.3.300

45. Fredrickson BL. The role of positive emotions in positive psychology. The broaden-and-build theory of positive emotions. *Am Psychol*. (2001) 56:218–26. doi: 10.1037//0003-066X.56.3.218

46. Fredrickson BL, Joiner T. Positive emotions trigger upward spirals toward emotional well-being. *psychol Sci*. (2002) 13:172–5. doi: 10.1111/1467-9280.00431

47. Reschly AL, Huebner ES, Appleton JJ, Antaramian S. Engagement as flourishing: The contribution of positive emotions and coping to adolescents' engagement at school and with learning. *Psychol Schools*. (2008) 45:419–31. doi: 10.1002/pits.20306

48. Linehan MM, Heard H, Clarkin J, Marziali E, Munroe-Blum H. Dialectical behavior therapy for borderline personality disorder. *New York: Guilford*. (1993).

49. Kristeller JL, Jordan KD. Mindful eating: Connecting with the wise self, the spiritual self. *Front Psychol*. (2018) 9:1271. doi: 10.3389/fpsyg.2018.01271

50. Navarro-Haro MV, Modrego-Alarcón M, Hoffman HG, López-Montoyo A, Navarro-Gil M, Montero-Marin J, et al. Evaluation of a mindfulness-based intervention with and without virtual reality dialectical behavior therapy® mindfulness skills training for the treatment of generalized anxiety disorder in primary care: a pilot study. *Front Psychol*. (2019) 10:55. doi: 10.3389/fpsyg.2019.00055

51. Kearney DJ, McManus C, Malte CA, Martinez ME, Felleman B, Simpson TL. Loving-kindness meditation and the broaden-and-build theory of positive emotions among veterans with posttraumatic stress disorder. *Med Care*. (2014) 52:S32–8. doi: 10.1097/MLR.0000000000000221

52. Whiteside SP, Lynam DR. The five-factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Pers Individ Dif*. (2001) 30:669–89. doi: 10.1016/S0191-8869(00)00064-7

53. Miller J, Flory K, Lynam D, Leukefeld C. A test of the four-factor model of impulsivity-related traits. *Pers Individ Dif*. (2003) 34:1403–18. doi: 10.1016/S0191-8869(02)00122-8

54. d'Acremont M, Van der Linden M. Adolescent impulsivity: Findings from a community sample. *J Youth Adolescence*. (2005) 34:427–35. doi: 10.1007/s10964-005-7260-1

55. Whiteside SP, Lynam DR, Miller JD, Reynolds SK. Validation of the UPPS impulsive behaviour scale: a four-factor model of impulsivity. *Eur J Pers*. (2005) 19:559–74. doi: 10.1002/per.556

56. Kämpfe N, Mitte K. A German validation of the UPPS impulsive behavior scale: Further evidence for a four-dimensional model of impulsivity. *Eur J psychol Assess*. (2009) 25:252–9. doi: 10.1027/1015-5759.25.4.252

57. Cyders MA, Smith GT, Spillane NS, Fischer S, Annus AM, Peterson C. Integration of impulsivity and positive mood to predict risky behavior: development and validation of a measure of positive urgency. *psychol Assess*. (2007) 19:107. doi: 10.1037/1040-3590.19.1.107

58. Lynam D, Smith G, Cyders M, Fischer S, Whiteside S. *The UPPS-P questionnaire measure of five dispositions to rash action*. West Lafayette, IN: Purdue University (2007).

59. Cyders MA. Impulsivity and the sexes: Measurement and structural invariance of the UPPS-P Impulsive Behavior Scale. *Assessment*. (2013) 20:86–97. doi: 10.1177/1073191111428762

60. D'Orta I, Burnay J, Aiello D, Niolu C, Siracusano A, Timpanaro L, et al. Development and validation of a short Italian UPPS-P Impulsive Behavior Scale. *Addictive Behav Rep*. (2015) 2:19–22. doi: 10.1016/j.abrep.2015.04.003

61. Dugré JR, Giguére CÉ, Percie du Sert O, Potvin S, Dumais A. The psychometric properties of a short UPPS-P impulsive behavior scale among psychiatric patients evaluated in an emergency setting. *Front Psychiatry*. (2019) 10:139. doi: 10.3389/fpsyt.2019.00139

62. Argyriou E, Um M, Wu W, Cyders MA. Measurement invariance of the UPPS-P impulsive behavior scale across age and sex across the adult life span. *Assessment*. (2020) 27:432–53. doi: 10.1177/1073191119832660

63. Watts AL, Smith GT, Barch DM, Sher KJ. Factor structure, measurement and structural invariance, and external validity of an abbreviated youth version of the UPPS-P Impulsive Behavior Scale. *psychol Assess*. (2020) 32:336. doi: 10.1037/pas0000791

64. Billieux J, Gay P, Rochat L, Van der Linden M. The role of urgency and its underlying psychological mechanisms in problematic behaviours. *Behav Res Ther*. (2010) 48:1085–96. doi: 10.1016/j.brat.2010.07.008

65. Eben C, Billieux J, Verbruggen F. Clarifying the role of negative emotions in the origin and control of impulsive actions. *Psychol Belgica*. (2020) 60:1. doi: 10.5334/pb.502

66. Cyders MA, Coskunpinar A. Is urgency emotionality? Separating urgent behaviors from effects of emotional experiences. *Pers Individ Dif*. (2010) 48:839–44. doi: 10.1016/j.paid.2010.02.009

67. Cyders MA, Coskunpinar A, VanderVeen JD. Urgency – a common transdiagnostic endophenotype for maladaptive risk-taking. In: Zeigler-Hill V, Marcus D, editors. *The Dark Side of Personality*. Washington, DC: American Psychological Association (2016).

68. Fischer S, Smith GT. Deliberation affects risk taking beyond sensation seeking. *Pers Individ Dif*. (2004) 36:527–37. doi: 10.1016/S0191-8869(03)00112-0

69. Coskunpinar A, Dir AL, Cyders MA. Multidimensionality in impulsivity and alcohol use: A meta-analysis using the UPPS model of impulsivity. *Alcohol: Clin Exp Res*. (2013) 37:1441–50. doi: 10.1111/acer.2013.37.issue-9

70. Verdejo-García A, Bechara A, Recknor EC, Pérez-García M. Negative emotion-driven impulsivity predicts substance dependence problems. *Drug Alcohol Depend*. (2007) 91:213–9. doi: 10.1016/j.drugalcdep.2007.05.025

71. Billieux J, van der Linden M, Ceschi G. Which dimensions of impulsivity are related to cigarette craving? *Addictive Behav*. (2007) 32:1189–99. doi: 10.1016/j.addbeh.2006.08.007

72. Billieux J, Rochat L, Rebetez MML, Van der Linden M. Are all facets of impulsivity related to self-reported compulsive buying behavior? *Pers Individ Dif*. (2008) 44:1432–42. doi: 10.1016/j.paid.2007.12.011

73. Deckman T, DeWall CN. Negative urgency and risky sexual behaviors: A clarification of the relationship between impulsivity and risky sexual behavior. *Pers Individ Dif*. (2011) 51:674–8. doi: 10.1016/j.paid.2011.06.004

74. Dir AL, Karyadi K, Cyders MA. The uniqueness of negative urgency as a common risk factor for self-harm behaviors, alcohol consumption, and eating problems. *Addictive Behav*. (2013) 38:2158–62. doi: 10.1016/j.addbeh.2013.01.025

75. Quintero MJ, Navas JF, Perales JC. The associative underpinnings of negative urgency and its role in problematic gambling behavior. *Addictive Behav*. (2020) 111:106533. doi: 10.1016/j.addbeh.2020.106533

76. Rankin LA, Maggs JL. First-year college student affect and alcohol use: Paradoxical within- and between-person associations. *J Youth Adolescence*. (2006) 35:925–37. doi: 10.1007/s10964-006-9073-2

77. Simons JS, Dvorak RD, Batien BD, Wray TB. Event-level associations between affect, alcohol intoxication, and acute dependence symptoms: Effects of urgency, self-control, and drinking experience. *Addictive Behav*. (2010) 35:1045–53. doi: 10.1016/j.addbeh.2010.07.001

78. Jones DR, Allen HK, Lanza ST, Graham-Engeland JE. Daily associations between affect and alcohol use among adults: The importance of affective arousal. *Addictive Behav*. (2020) 112:106623. doi: 10.1016/j.addbeh.2020.106623

79. Cyders MA, Flory K, Rainer S, Smith GT. The role of personality dispositions to risky behavior in predicting first-year college drinking. *Addiction*. (2009) 104:193–202. doi: 10.1111/j.1360-0443.2008.02434.x

80. Zapolski TC, Cyders MA, Smith GT. Positive urgency predicts illegal drug use and risky sexual behavior. *Psychol Addictive Behav*. (2009) 23:348. doi: 10.1037/a0014684

81. Morrongiello BA, Stewart J, Pope K, Pogrebtsova E, Boulay KJ. Exploring relations between positive mood state and school-age children's risk taking. *J Pediatr Psychol*. (2015) 40:406–18. doi: 10.1093/jpepsy/jsu100

82. Johnson SL, Elliott MV, Carver CS. Impulsive responses to positive and negative emotions: parallel neurocognitive correlates and their implications. *Biol Psychiatry*. (2020) 87:338–49. doi: 10.1016/j.biopsych.2019.08.018

83. Settles RE, Fischer S, Cyders MA, Combs JL, Gunn RL, Smith GT. Negative urgency: a personality predictor of externalizing behavior characterized by neuroticism, low conscientiousness, and disagreeableness. *J Abnormal Psychol*. (2012) 121:160–72. doi: 10.1037/a0024948

84. Bresin K, Carter DL, Gordon KH. The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: a daily diary study. *Psychiatry Res*. (2013) 205:227–31. doi: 10.1016/j.psychres.2012.09.033

85. Berg JM, Latzman RD, Bliwise NG, Lilienfeld SO. Parsing the heterogeneity of impulsivity: A meta-analytic review of the behavioral implications of the UPPS for psychopathology. *psychol Assess*. (2015) 27:1129. doi: 10.1037/pas0000111

86. Martin S, Del-Monte J, Graziani P. Impulsivity issues in borderline personality disorder and its links with insight: the role of urgency. *Heliyon*. (2019) 5:e02564. doi: 10.1016/j.heliyon.2019.e02564

87. Stojek M, Fischer S. Impulsivity and motivations to consume alcohol: a prospective study on risk of dependence in young adult women. *Alcohol Clin Exp Res*. (2013) 37:292–9. doi: 10.1111/j.1530-0277.2012.01875.x

88. Riley EN, Rukavina M, Smith GT. The reciprocal predictive relationship between high-risk personality and drinking: An 8-wave longitudinal study in early adolescents. *J Abnormal Psychol*. (2016) 125:798–804. doi: 10.1037/abn0000189

89. Webb Hooper M, Carver CS. Reflexive reaction to feelings predicts failed smoking cessation better than does lack of general self-control. *J Consult Clin Psychol*. (2016) 84:612–8. doi: 10.1037/ccp0000109

90. Howard R, Khalifa N. Is emotional impulsiveness (Urgency) a core feature of severe personality disorder? *Pers Individ Dif*. (2016) 92:29–32. doi: 10.1016/j.paid.2015.12.017

91. Berg JM. The heterogeneous roles of the UPPS-P impulsivity pathways across features of psychopathology. Emory University, Atlanta (GA (2016).

92. Weiss NH, Tull MT, Sullivan TP, Dixon-Gordon KL, Gratz KL. Posttraumatic stress disorder symptoms and risky behaviors among trauma-exposed inpatients with substance dependence: The influence of negative and positive urgency. *Drug Alcohol Depend*. (2015) 155:147–53. doi: 10.1016/j.drugalcdep.2015.07.679

93. Marmorstein NR. Associations between dispositions to rash action and internalizing and externalizing symptoms in children. *J Clinic Child Adolesc Psychol*. (2013) 42:131–8. doi: 10.1080/15374416.2012.734021

94. Daurio AM, Aston SA, Schwandt ML, Bukhari MO, Bouhlal S, Farokhnia M, et al. Impulsive personality traits mediate the relationship between adult attention-deficit/hyperactivity symptoms and alcohol dependence severity. *Alcohol Clin Exp Res*. (2018) 42:173–83. doi: 10.1111/acer.13538

95. Assari S. Racial variation in the association between suicidal history and positive and negative urgency among American children. *J Educ Cult Stud*. (2020) 4:39–53. doi: 10.22158/jecs.v4n4p39

96. Johnson SL, Carver CS, Tharp JA. Suicidality in bipolar disorder: the role of emotion-triggered impulsivity. *Suicide Life-threatening Behav*. (2017) 47:177–92. doi: 10.1111/sltb.12274

97. Hoptman MJ, Antonius D, Mauro CJ, Parker EM, Javitt DC. Cortical thinning, functional connectivity, and mood-related impulsivity in schizophrenia: Relationship to aggressive attitudes and behavior. *Am J Psychiatry*. (2014) 171:939–48. doi: 10.1176/appi.ajp.2014.13111553

98. Muhtadie L, Johnson SL, Carver CS, Gotlib IH, Ketter TA. A profile approach to impulsivity in bipolar disorder: The key role of strong emotions. *Acta Psychiatrica Scandinavica*. (2014) 129:100–8. doi: 10.1111/acps.12136

99. Ho BC, Barry AB, Koeppel JA. Impulsivity in unaffected adolescent biological relatives of schizophrenia patients. *J Psychiatr Res*. (2018) 97:47–53. doi: 10.1016/j.jpsychires.2017.11.008

100. Hershberger AR, Um M, Cyders MA. The relationship between the UPPS-P impulsive personality traits and substance use psychotherapy outcomes: A meta-analysis. *Drug Alcohol Depend*. (2017) 178:408–16. doi: 10.1016/j.drugalcdep.2017.05.032

101. Whitt ZT, Bernstein M, Spillane N, Stein LAR, Suffoletto B, Neighbors C, et al. Positive urgency worsens the impact of normative feedback on 21st birthday drinking. *Drug Alcohol Depend*. (2019), 204. doi: 10.1016/j.drugalcdep.2019.107559

102. Manasse SM, Espel HM, Schumacher LM, Kerrigan SG, Zhang F, Forman EM, et al. Does impulsivity predict outcome in treatment for binge eating disorder? A multimodal investigation. *Appetite*. (2016) 105:172–9. doi: 10.1016/j.appet.2016.05.026

103. Zapolski TCB, Settles RF, Cyders MA, Smith GT. Borderline personality disorder, bulimia nervosa, antisocial personality disorder, ADHD, substance use: common threads, common treatment needs, and the nature of impulsivity. *Independent Practitioner*. (2010) 30:20–3.

104. Cyders MA, Smith GT. Mood-based rash action and its components: Positive and negative urgency. *Pers Individ Dif*. (2007) 43:839–50. doi: 10.1016/j.paid.2007.02.008

105. Smith GT, Fischer S, Cyders MA, Annus AM, Spillane NS, McCarthy DM. On the validity and utility of discriminating among impulsivity-like traits. *Assessment* (2007) 14(2):155–70. doi: 10.1177/1073191106295527

106. Peterson SJ, Smith GT. Impulsigenic personality: Is urgency an example of the jangle fallacy? *psychol Assessess*. (2019) 31:1135–44. doi: 10.1037/pas0000740

107. Teese R, Willie C, Jago A, Gill PR. An investigation of alternative factor models of impulsivity using the UPPS-P. *J Pers Assess*. (2021) 103:324–31. doi: 10.1080/00223891.2020.1739059

108. Goh PK, Lee CA, Martel MM, Fillmore MT, Derefinko KJ, Lynam DR. Conceptualizing the UPPS-P model of impulsive personality through network analysis: Key dimensions and general robustness across young adulthood. *J Pers*. (2020) 88:1302–14. doi: 10.1111/jopy.12572

109. Sperry SH, Lynam DR, Kwapil TR. The convergence and divergence of impulsivity facets in daily life. *J Pers*. (2018) 86:841–52. doi: 10.1111/jopy.12359

110. Billieux J, Heeren A, Rochat L, Maurage P, Bayard S, Bet R, et al. Positive and negative urgency as a single coherent construct: Evidence from a large-scale network analysis in clinical and non-clinical samples. *J Pers*. (2021) 89:1252–62. doi: 10.1111/jopy.12655

111. Um M, Whitt ZT, Revilla R, Hunton T, Cyders MA. Shared neural correlates underlying addictive disorders and negative urgency. *Brain Sci*. (2019) 9:36. doi: 10.3390/brainsci9020036

112. Navas JF, Contreras-Rodríguez O, Verdejo-Román J, Perandrés-Gómez A, Albein-Urios N, Verdejo-García A, et al. Trait and neurobiological underpinnings of negative emotion regulation in gambling disorder. *Addiction*. (2017) 112:1086–94. doi: 10.1111/add.13751

113. Barkley-Levenson E, Xue F, Droutman V, Miller LC, Smith BJ, Jeong D, et al. Prefrontal cortical activity during the Stroop Task: New insights into the why and the who of real-world risky sexual behavior. *Ann Behav Med*. (2018) 52:367–79. doi: 10.1093/abm/kax019

114. Miller EK, Cohen JD. An integrative theory of prefrontal cortex function. *Annu Rev Neurosci*. (2001) 24:167–202. doi: 10.1146/annurev.neuro.24.1.167

115. Xue G, Lu Z, Levin IP, Bechara A. The impact of prior risk experiences on subsequent risky decision-making: The role of the insula. *NeuroImage*. (2010) 50:709–16. doi: 10.1016/j.neuroimage.2009.12.097

116. Rolls ET. Brain mechanisms of emotion and decision-making. *Int Congress Ser*. (2006) 1291:3–13. doi: 10.1016/j.ics.2005.12.079

117. Schoenbaum G, Roesch MR, Stalnaker TA. Orbitofrontal cortex, decision-making and drug addiction. *Trends Neuroscience*. (2006) 29:116–24. doi: 10.1016/j.tins.2005.12.006

118. Cyders MA, Dzemidzic M, Eiler WJ, Coskunpinar A, Karyadi KA, Kareken DA. Negative urgency mediates the relationship between amygdala and orbitofrontal cortex activation to negative emotional stimuli and general risk-taking. *Cereb Cortex*. (2015) 25:4094–102. doi: 10.1093/cercor/bhu123

119. Muhlert N, Lawrence AD. Brain structure correlates of emotion-based rash impulsivity. *NeuroImage*. (2015) 115:138–46. doi: 10.1016/j.neuroimage.2015.04.061

120. Owens MM, Hyatt CS, Gray JC, Miller JD, Lynam DR, Hahn S, et al. Neuroanatomical correlates of impulsive traits in children aged 9 to 10. *J Abnormal Psychol*. (2020) 129:831–44. doi: 10.1037/abn0000627

121. Gable PA, Mechin NC, Hicks JA, Adams DL. Supervisory control system and frontal asymmetry: Neurophysiological traits of emotion-based impulsivity. *Soc Cogn Affect Neurosci*. (2015) 10:1310–5. doi: 10.1093/scan/nsv017

122. Neal LB, Gable PA. Neurophysiological markers of multiple facets of impulsivity. *Biol Psychol*. (2016) 115:64–8. doi: 10.1016/j.biopsycho.2016.01.006

123. Clark L, Stokes PR, Wu K, Michalczuk R, Benecke A, Watson BJ, et al. Striatal dopamine D2/D3 receptor binding in pathological gambling is correlated with mood-related impulsivity. *NeuroImage*. (2012) 63:40–6. doi: 10.1016/j.neuroimage.2012.06.067

124. Gross JJ. Emotion regulation: Current status and future prospects. *psychol Inq*. (2015) 26:1–26. doi: 10.1080/1047840X.2014.940781

125. Tugade MM, Fredrickson BL. Regulation of positive emotions: Emotion regulation strategies that promote resilience. *J Happiness Stud*. (2007) 8:311–33. doi: 10.1007/s10902-006-9015-4

126. Cole PM, Michel MK, Teti LOD. The development of emotion regulation and dysregulation: A clinical perspective. *Monogr Soc Res Child Dev*. (1994) 59:73–102. doi: 10.1111/j.1540-5834.1994.tb01278.x

127. John OP, Gross JJ. Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *J Pers*. (2004) 72:1301–34. doi: 10.1111/j.1467-6494.2004.00298.x

128. Bagby RM, Parker JDA, Taylor GJ. The twenty- item Toronto Alexithymia Scale-I. Item selection and cross-validation of the factor structure. *J Psychosom Res*. (1994) 38:23–32. doi: 10.1016/0022-3999(94)90005-1

129. Gross JJ, John OP. Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *J Pers Soc Psychol*. (2003) 85:348–62. doi: 10.1037/0022-3514.85.2.348

130. Ray R, McRae K, Ochsner K, Gross J. Cognitive reappraisal of negative affect: converging evidence from EMG and self-report. *Emotion (Washington D.C.)*. (2010) 10:587–92. doi: 10.1037/a0019015

131. Mauss IB, Shallcross AJ, Troy AS, John OP, Ferrer E, Wilhelm FH, et al. Don't hide your happiness! Positive emotion dissociation, social connectedness, and psychological functioning. *J Pers Soc Psychol*. (2011) 100:738–48. doi: 10.1037/a0022410

132. MacDonald DE, Trottier K, Olmsted MP. Rapid improvements in emotion regulation predict intensive treatment outcome for patients with bulimia nervosa and purging disorder. *Int J Eat Disord*. (2017) 50:1152–61. doi: 10.1002/eat.22766

133. Coifman K, Flynn J, Pinto L. When context matters: Negative emotions predict psychological health and adjustment. *Motiv Emotion*. (2016) 40:602–24. doi: 10.1007/s11031-016-9553-y

134. Etkin A, Büchel C, Gross JJ. The neural bases of emotion regulation. *Nat Rev Neurosci*. (2015) 16:693–700. doi: 10.1038/nrn4044

135. Anestis MD, Kleiman EM, Lavender JM, Tull MT, Gratz KL. The pursuit of death versus escape from negative affect: An examination of the nature of the relationship between emotion dysregulation and both suicidal behavior and non-suicidal self-injury. *Compr Psychiatry*. (2014) 55:1820–30. doi: 10.1016/j.comppsych.2014.07.007

136. Fossati A, Gratz KL, Maffei C, Borroni S. Impulsivity dimensions, emotion dysregulation, and borderline personality disorder features among Italian nonclinical adolescents. *Borderline Pers Disord Emotion Dysregul*. (2014) 1:5. doi: 10.1186/2051-6673-1-5

137. Pivarunas B, Conner BT. Impulsivity and emotion dysregulation as predictors of food addiction. *Eat Behav*. (2015) 19:9–14. doi: 10.1016/j.eatbeh.2015.06.007

138. Dir AL, Banks DE, Zapolski TC, McIntyre E, Hulvershorn LA. Negative urgency and emotion regulation predict positive smoking expectancies in non-smoking youth. *Addictive Behav*. (2016) 58:47–52. doi: 10.1016/j.addbeh.2016.02.014

139. Espeleta HC, Brett EI, Ridings LE, Leavens ELS, Mullins LL. Childhood adversity and adult health-risk behaviors: Examining the roles of emotion dysregulation and urgency. *Child Abuse Negl*. (2018) 82:92–101. doi: 10.1016/j.chiabu.2018.05.027

140. Jebraeili H, Moradi A, Habibi M. Investigating the role of dimensions of UPPS-P model of impulsivity and age increasing in men's emotion dysregulation. *J Fundament Ment Health*. (2018) 20:228–35. doi: 10.22038/JFMH.2018.10737

141. Hasking P, Claes L. Transdiagnostic mechanisms involved in nonsuicidal self-injury, risky drinking and disordered eating: Impulsivity, emotion regulation and alexithymia. *J Am Coll Health*. (2020) 68:603–9. doi: 10.1080/07448481.2019.1583661

142. Lavender JM, King WC, Kalarchian MA, Devlin MJ, Hinerman A, Gunstad J, et al. Examining emotion-, personality-, and reward-related dispositional tendencies in relation to eating pathology and weight change over seven years in the Longitudinal Assessment of Bariatric Surgery (LABS) study. *J Psychiatr Res*. (2020) 120:124–30. doi: 10.1016/j.jpsychires.2019.10.014

143. Reff J, Baschnagel JS. The role of affective urgency and emotion regulation in vaping susceptibility. *Addictive Behav Rep*. (2021) 14:100355. doi: 10.1016/j.abrep.2021.100355

144. King KM, Feil MC, Halvorson MA. Negative urgency is correlated with the use of reflexive and disengagement emotion regulation strategies. *Clin psychol Sci*. (2018) 6:822–34. doi: 10.1177/2167702618785619

145. Morawetz C, Basten U. Neural underpinnings of individual differences in emotion regulation: A systematic review. *Neuroscience Biobehavioral Rev*. (2024) 162:105727. doi: 10.1016/j.neubiorev.2024.105727

146. Jara-Rizzo MF, Navas JF, Catena A, Perales JC. Types of emotion regulation and their associations with gambling: a cross-sectional study with disordered and non-problem Ecuadorian gamblers. *J Gambling Stud*. (2019) 35:997–1013. doi: 10.1007/s10899-019-09868-7

147. Isen AM, Patrick R. The effect of positive feelings on risk taking: When the chips are down. *Organization Behav Hum Perform*. (1983) 31:194–202. doi: 10.1016/0030-5073(83)90120-4

148. Isen AM, Labroo AA. Some ways in which positive affect facilitates decision making and judgment. *Emerg Perspect Judg Decision Res*. (2003), 365. doi: 10.1017/CBO9780511609978.013

149. Forgas JP. The role of emotion in social judgments: An introductory review and an Affect Infusion Model (AIM). *Eur J Soc Psychol*. (1994) 24:1–24. doi: 10.1002/ejsp.2420240102

150. Grable JE, Roszkowski MJ. The influence of mood on the willingness to take financial risks. *J Risk Res*. (2008) 11:905–23. doi: 10.1080/13669870802090390

151. Damasio AR, Tranel D, Damasio H. Somatic markers and the guidance of behaviour: theory and preliminary testing. In: Levin HS, Eisenberg HM, Benton AL. (Eds.), *Frontal Lobe Function and Dysfunction*. New York: Oxford University Press (1991), pp. 217–229.

152. Loewenstein GF, Weber EU, Hsee CK, Welch N. Risk as feelings. *psychol Bull*. (2001) 127:267. doi: 10.1037/0033-2909.127.2.267

153. Bodenhausen GV. Emotions, arousal, and stereotypic judgments: A heuristic model of affect and stereotyping. In: *Affect, Cognition and Stereotyping*. San Diego, CA: Academic Press (1993). p. 13–37.

154. Loewenstein G, Lerner JS. The role of affect in decision making. In: Davidson RJ, Scherer KR, Goldsmith HH, editors. *Handbook of Affective Science*. Oxford: Oxford University Press (2003). p. 619–42.

155. Winston JS, O'Doherty J, Dolan RJ. Common and distinct neural responses during direct and incidental processing of multiple facial emotions. *NeuroImage*. (2003) 20:84–97. doi: 10.1016/S1053-8119(03)00303-3

156. Carver CS, Johnson SL, Joormann J. Serotonergic function two-mode models of self-regulation, and vulnerability to depression: what depression has in common with impulsive aggression. *psychol Bullet*. (2008) 134:912–43. doi: 10.1037/a0013740

157. Smith GT, Guller L, Zapolski TCB. A comparison of two models ofurgency: urgency predicts both rash action and depression in youth. *Clin psychol Sci*. (2013) 1:266–75. doi: 10.1177/2167702612470647

158. Sperry SH, Sharpe BM, Wright AG. Momentary dynamics of emotion-based impulsivity: Exploring associations with dispositional measures of externalizing and internalizing psychopathology. *J Abnormal Psychol*. (2021) 130:815. doi: 10.1037/abn0000720

159. Caspi A, Moffitt TE. When do individual differences matter? A paradoxical theory of personality coherence. *psychol Inq*. (1993) 4:247–71. doi: 10.1207/s15327965pli0404_1

160. Smith GT, Cyders MA. Integrating affect and impulsivity: The role of positive and negative urgency in substance use risk. *Drug Alcohol Depend*. (2016) 163:S3–S12. doi: 10.1016/j.drugalcdep.2015.08.038

161. Peckham AD, Forgeard M, Hsu KJ, Beard C, Björgvinsson T. Turning the UPPS down: Urgency predicts treatment outcome in a partial hospitalization program. *Compr Psychiatry*. (2019) 88:70–6. doi: 10.1016/j.comppsych.2018.11.005

162. Costa PT Jr., McCrae RR. Set like plaster? Evidence for the stability of adult personality. In: Heatherton TF, Weinberger JL, editors. *Can personality change*? Washington, DC: American Psychological Association (1994). p. 21–40.

163. McCrae RR, Costa PT Jr. A Five-Factor theory of personality. In: Pervin LA, John OP, editors. *Handbook of personality: Theory and research*. New York: Guilford Press (1999). p. 139–53.

164. Robins RW, Fraley RC, Roberts BW, Trzesniewski KH. A longitudinal study of personality change in young adulthood. *J Pers*. (2001) 69:617–40. doi: 10.1111/1467-6494.694157

165. Um M, Revilla R, Cyders MA. A meta-analytic review of the effectiveness of mood inductions in eliciting emotion-based behavioral risk-taking and craving in the laboratory. *Emotion*. (2023) 23:214. doi: 10.1037/emo0001062