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Adolescent Substance Use and Comorbid Psychopathology: Emotion Regulation Deficits as a Transdiagnostic Risk Factor

Julia M. Shadur[1] · **Carl W. Lejuez**[1]

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Abstract Rates of substance use and comorbid psychopathology peak during adolescence, highlighting the need to identify transdiagnostic risk processes that cut across conditions and elucidate early embedded risk factors for comorbidity across development. The current review highlights *emotion regulation deficits* as a core transdiagnostic risk factor underlying the development of substance use, addiction, and comorbid psychopathology in adolescence. We present the dual systems model of neurological development to highlight adolescence as a critical period of increased risk for emotion regulation difficulties, corresponding risk behaviors, and psychopathology. We describe malfunction in the neurobiological regulation system underlying the relationship between emotion regulation and risk for addiction and comorbidity. We pull from two established developmental theories including both the externalizing pathway and the internalizing pathway to substance use disorders, which together highlight how early embedded risk in the form of emotion regulation deficits can explain mechanisms underlying the development of addiction and comorbid psychiatric disorders.

Keywords Emotion regulation · Transdiagnostic · Substance use · Comorbidity · Psychopathology · Adolescence

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✉ Julia M. Shadur
jshadur@umd.edu

Carl W. Lejuez
clejuez@umd.edu

[1] Department of Psychology, Center for Addictions, Personality, and Emotion Research, University of Maryland at College Park, 2103 Cole Field House, College Park, MD 20742, USA

Introduction

Adolescence marks a period of notably increased risk for substance use and alcohol and substance use disorders (AUDs/SUDs), as well as comorbid psychopathology [1]. Substance use escalates significantly through high school where 68 % of 12th graders have tried alcohol, 46 % marijuana, and 25 % any illicit drug other than marijuana [2], with overall rates of substance use peaking between the ages of 16 and 25 [3••]. Approximately 2.8 % of youths aged 12–17 in the USA meet criteria for an AUD and 3.5 % meet criteria for an SUD, with a combined 5.2 % meeting criteria for either an AUD and/or an SUD [4]. Rates of adolescent internalizing disorders (e.g., depressive disorders 8.2 % [5]; anxiety disorders 12.7 % [6]) and externalizing disorders (e.g., disruptive behavior disorders 22.9 % and attention deficit hyperactivity disorder 17.5 % [6]) are even higher. Further, up to 40 % of youths with an AUD/SUD also meet the criteria for at least one other comorbid psychiatric disorder [7], and 25 % of adolescents aged 11–17 who are admitted into inpatient psychiatric hospitals meet the criteria for comorbid mental health and substance use disorders [8]. Comorbidity of AUDs/SUDs with other psychiatric conditions is associated with increased disorder severity and poorer outcomes among youths [7, 9]. Peak rates of these disorders emerge in early adolescence and continue through young adulthood, pinpointing adolescence as a particularly vulnerable and sensitive period for the development of psychopathology.

Prevention efforts are targeted at early risk factors that explain the development of comorbid psychopathology, with a narrowing focus on *transdiagnostic* factors that cut across conditions and thus further exacerbate psychopathology risk [10, 11••, 12••, 13]. The Research Domain Criteria (RDoC)—a recent initiative put forth by the National Institute of Mental Health—encourages research focused on unmasking

biological and psychosocial mechanisms and underpinnings that characterize multiple psychiatric disorders [10, 14]. In line with the RDoC framework, the goal of this review is to integrate recent findings on common underlying risk mechanisms that transcend across comorbid psychological disorders. We focus on *emotion regulation deficits* as a core transdiagnostic risk factor underlying the development of substance use, addiction, and comorbid psychopathology in adolescence. Indeed, disordered and dysregulated mood defines many forms of psychopathology, and difficulty with emotion regulation has been described as a core deficit that emerges across psychiatric disorders and manifests as dysregulation across multiple levels of analysis—biology, physiology, and behavior [15]. Consistent with the theme of this special issue, we emphasize examples of biologically-based indices of emotion regulation deficits, but include supporting data from behavioral and psychosocial-based research as well.

Emotion Regulation: Definition

Current definitions of "emotion regulation" vary quite dramatically both within and across disciplines (a thorough review of the construct of emotion regulation is beyond the scope of this report, but see [15–17, 18•, 19] for recent reviews). For parsimony, our definition of emotion regulation for the current review includes the following: efforts, strategies, and responses, whether conscious or not, involved in modifying or maintaining an emotional state and associated behaviors [e.g., 15, 19–21]. This definition allows for inclusion of multiple dimensions of emotionally-salient processes and regulation of these processes, including but not limited to: emotional reactivity, arousal, sympathetic and parasympathetic activity, impulsivity, effortful control, behavioral and emotional inhibition, emotional awareness, and features of temperament [e.g., 16, 17, 18•, 22]. We employ this more versatile definition of emotion regulation in order to maximize inclusion of findings from research which spans across various emotionally-salient domains as they relate to substance use and comorbid psychopathology.

Emotion Regulation Development

Overview Development of self-control and adaptive emotion regulation strategies is an ongoing process that progresses rapidly through the preschool years [23] and continues to develop and emerge through adolescence [24] and into emerging adulthood [18•] (see [15] for a review of emotion regulation development). Emotion regulation is a relatively stable construct with known behavioral and neurobiological correlates that reliably predict individual differences in self-regulation and impulse control across the lifetime [e.g., 25].

Adolescence as a Critical Developmental Period Adolescents are particularly vulnerable to emotion regulation difficulties. Emotion regulation deficits are one of the many challenges youths face that contributes to the steep escalation in rates of comorbid psychiatric conditions observed throughout adolescence, including increased internalizing, externalizing, and substance use disorders [10, 26]. In addition to the increased stress related to goals of identity development, the onset of puberty, and increasing peer influences [26, 27], adolescents are more vulnerable to elevated emotionality and increased negative affect, and experience more labile and dysregulated mood compared to adults [21, 28, 29••, 30]. Youths are also more likely to have these volatile and dysregulated emotional experiences impact their behavior and decision making [30]. Indeed, greater intra-individual fluctuations in negative affect, conceptualized as dysregulated mood, predict increased risk for adolescent substance use at the daily level [31] and also predict growth in drug use over time [32], as well as more significant symptoms of impairment [33]. Thus, adolescence is a critical developmental window in which emotional dysregulation contributes to increased risk for psychopathology and addiction.

Neurobiology underlying Adolescent Vulnerability to Emotion Regulation Deficits Much of the work examining adolescents' experiences of dysregulated and volatile mood highlights neurobiological changes and wiring in the adolescent brain related to the limbic-striatal system and the prefrontal cortex (PFC) and related circuitry. We focus on how this particular neurological mechanism underlying emotion regulation develops and changes during adolescence in a way that helps explain the increased risk for comorbid psychopathology during this critical developmental window. Specifically, established findings show that adolescents are at a developmental stage in which the limbic-striatal system (responsible for emotional drive, emotional response, arousal, novelty- and sensation-seeking, and reward sensitivity) is more quickly and fully developed than the PFC and related circuitry, which is not fully developed until adulthood (responsible for self-regulation, emotional control, impulse and cognitive control, planning, decision making, and executive functioning) (see [3••, 29••, 34–36, 37••, 38] for reviews).[1]

This pattern of differential neurological development has been referred to as the dual systems model or the maturational imbalance theory [e.g., 36, 43••]; however, there are competing views of this model (see [43••, 44, 45] for a discussion of

[1] An extensive review of the unique and interactive functions across neurobiological regions is beyond the scope of this brief report, and thus we highlight several specific and robust examples in which emotion regulation difficulties manifest as neurobiological differences and help explain risk for comorbid disorders among youths. We refer the reader elsewhere for more extensive and detailed accounts of neural circuits and functions related to psychopathology [e.g., 38, 39••, 40–42].

these issues and related controversies). The resulting developmentally normative mismatch between increased emotional volatility combined with an underdeveloped regulation system means that for youths particularly at risk (e.g., children of substance-dependent parents [46], those with environmental or genetic risk [29••], or psychosocial stress [38]), difficulty with emotion regulation is an identifiable, transdiagnostic, early embedded risk for psychopathology in adolescence—including disorders of addiction, as well as internalizing and externalizing problems [3••, 11••, 15, 17, 19, 47–49, 50•, 51••, 52, 53••, 54–56].

Empirical work consistently shows differences in neurological activity during adolescence with respect to the processing of emotional information and emotion regulation. Compared to both children and adults, neurological circuits responsible for emotionally-salient cue responses are more active among adolescents, including an elevated amygdala response to threat [29••, 57] and elevated ventral striatum activity in response to rewards [3••]. Adolescents with a positive family history of SUD (i.e., at least one parent with an SUD) also show greater amygdala activation in response to emotional stimuli [46]. This pattern of activity in the amygdala is indicative of a hyperactive emotional response system and also indicates poorer PFC regulation [46]. These observed differences in neurological activity, consistent with the dual systems model, contribute to increased emotional volatility and difficulty with emotion regulation that increases during adolescence, which ultimately manifests as increased risk for SUDs and comorbid psychopathology (e.g., [29••, 36]).

Neurobiology of Emotion Regulation and Parallel Behavioral Correlates The observed imbalance in development between the neurological "gas" and "brake" systems [37••] during adolescence generally maps onto behavioral and self-report indices of these regulatory processes as well, with reward sensitivity, sensation-seeking, preference for short-term rather than long-term rewards, and risk-taking behavior also peaking during adolescence, whereas inhibitory behavior and impulse control follows a linear trajectory over time, peaking later in development (see [35, 36, 43••] for reviews).[2] Behavioral indices of disinhibition and regulation in early childhood also map onto the underlying neurobiological regulation mechanisms and correlates over time. In a classic delay of gratification task ("the marshmallow test" [37••]), young children (age 4) were presented with a choice: one marshmallow now, or two after a delay. Individuals who were better able to delay as a child showed greater PFC activity in adolescence and adulthood when presented with a rewarding, tempting stimulus, whereas those who struggled with the delay task in childhood showed greater activity in the ventral striatum and less effective PFC recruitment when in the face of positive reward cues [25, 37••]. Moreover, robust findings showed that children who were able to wait for two marshmallows showed better self-control and focus in adolescence, and even into adulthood were more likely to reach their long-term goals and were at significantly decreased risk for SUDs [37••]. This pattern of findings reflects heterotypic continuity [59] such that the same core underlying deficit (in this case, emotion regulation) is reflected over time but may manifest in different ways across development. This work underscores emotional and behavioral regulation difficulties in early childhood as an embedded risk for later risk-taking and impulsive behavior, setting the stage for substance use disorders and comorbid psychopathology across the lifetime [e.g., 36].

Emotion Regulation Deficits and Risk for Psychopathology

Deficits in emotion regulation in many cases is the defining feature of psychiatric disorder, and emotion regulation deficits predict multiple indices of child and adolescent adjustment throughout development, including internalizing and externalizing symptoms as well substance use and risk for addiction [e.g., 11••, 15, 17, 26, 47, 48, 52, 53••, 60]. Further, emotion dysregulation uniquely predicts psychopathology symptoms across a range of disorders, above and beyond the mere experience of negative affect alone [61]. In sum, there is a robust association between emotion regulation difficulties and the development of psychopathology, particularly during the high-risk period of adolescence.

Efforts to explain this link between emotion regulation and comorbid psychopathology in adolescence point to neurobiology and neural circuitry. The neurobiological mechanism underlying emotion regulation deficits (simply put: a more active emotional response system and less effective regulation of the emotional response) is both (1) the normative developmental imbalance during adolescence (reviewed above), and (2) a parallel process that underlies and further exacerbates risk for addiction and comorbid psychopathology more generally. Indeed, less effective regulation by the PFC in the face of hyperactive subcortical regions is part of what explains the notable links between stress, emotion regulation difficulties,

[2] However, we note that patterns of developmental trajectories of risky decision making may depend on the methodology employed, with a recent meta-analysis [44] showing that when completing behavioral lab-based tasks, adolescents take more risks than adults (as expected), but are comparable, or in some cases, less risky than children (contrary to the expected curvilinear trajectory over time), whereas real-world behavioral measures show that adolescents take more risks than both children and adults. Determining why we observe curvilinear versus linear trajectories in risky decision making across development as a function of methodology is an area for future research. In either case, however, regulation and self-control are not fully developed until adulthood, and adolescence—as compared to childhood—is a period of heightened risk due to increased opportunities and exposure to contexts of drug use and other risky behaviors (e.g., deviant peer networks [58]).

risk for addiction, and comorbid disorders [e.g., 38, 40], and similar underlying neurobiological systems and circuits are implicated in risk for affective disorders, self-control, self-regulation, and risk for addiction [e.g., 38, 50•, 62, 63]. The neurobiological processes underlying emotion regulation deficits can manifest across development in the form of internalizing, externalizing, and/or SUDs, depending on the manner in which the response and regulation system becomes dysfunctional [54]. In other words, emotion dysregulation as a core deficit serves as an embedded risk factor that can lead to multiple, different outcomes (i.e., "multifinality" [13]).

Emotion Regulation and Substance Use Risk

Overview Emotion regulation deficits have been established as robust predictors of substance use risk [52, 53••, 64–69]. Cognitive neuroscience studies have also shown that individuals with SUDs exhibit less effective emotion regulation [70]. Furthermore, individuals with SUDs and comorbid psychopathology show even greater deficits in emotion regulation [71], and substance use risk is greater among those who experience distress and related psychiatric affective disorders [28]. At the point of disorder, less effective emotion regulation and poorer self-control also predict less successful substance use treatment outcomes, including poorer treatment persistence and increased rates of relapse [67, 72].

Dysregulated and negative mood play a key role in the development of addictive disorders. Negative reinforcement models of substance use posit that the use of drugs serves to regulate emotion by removing the stimulus responsible for the experience of negative affect (and symptoms of withdrawal with increasingly severe SUDs), thus further reinforcing subsequent use of drugs over time [73–75].[3] Substance use may thus serve as a means of coping with the increased negative affect and dysregulated mood related specifically to internalizing and externalizing disorders [e.g., 78]. It is also important to highlight that emotion regulation difficulties play a role as both a cause and a consequence of drug use, with bidirectional effects showing that poorer emotion regulation predicts increased drug use, but increased drug use also predicts poorer emotion regulation [for reviews, see 28, 38, 50•, 53••].

Neurobiology of Emotion Regulation Deficits underlying Risk for Addiction The dual systems model highlights how emotion regulation difficulties, reward-seeking, sensation-seeking, and impulsivity increase during adolescence, placing youths at further risk for engaging in drug use and other risk behaviors [e.g., 43••, 79]. The underlying mechanism reflects a hyperactive subcortical system and an underdeveloped PFC. With regard to the onset and maintenance of SUDs, recent work builds upon the dual systems model and focuses on the uniquely important role of the PFC as a key center of emotional and behavioral regulation [40, 53••]. The PFC is the primary source of disruption in emotion regulation with respect to the development of SUDs, with reduced PFC volume and thickness as well as lower activation in areas responsible for emotion regulation and executive functioning among individuals with SUDs [53••]. This model describes how drug craving leads to increased activation in subcortical regions (specifically the ventral striatum and amygdala), and opportunities for regulation of the experience of craving and associated negative affect can come either from the PFC or from the direct effects of drug use. In cases where the PFC is less effectively able to regulate, as is the case for those with SUDs, drug use may be the selected way to cope with and regulate distress. This then begins a problematic negative cycle in which the use of drugs further compromises the regulation abilities of the PFC, leading to further emotion regulation deficits and risk for other forms of comorbid psychopathology [53••].

Further, substance abusers are more likely to have greater sensitization and dysfunctional limbic system responses to negative affect and also exhibit greater connectivity between the limbic and PFC regions during emotional processing, but lower levels of connectivity during cognitive reappraisal and regulation tasks, indicative of poorer regulation of negative emotional experiences and less effective cognitive control [70]. Indeed, elevated limbic system response and activity in the amygdala and ventral striatum, combined with decreased regulatory response of the PFC, define the emotion regulation difficulties [e.g., 39••] that provoke substance use in the first place [53••, 65] and also increase the risk for other psychiatric disorders consistent with deficits in emotion regulation, including internalizing and externalizing disorders [39••].

Developmental Pathways to Addiction and Comorbid Psychopathology—Putting it All Together

Deficits in emotion regulation prescribe the onset of risk in two prominent developmental pathways leading to SUDs and comorbid psychopathology, including the externalizing pathway [80, 81] and the internalizing pathway [82, 83••]. Although core to both pathways, the manifestation of such emotion regulation deficits may be different (e.g., more inhibited behavior for those who develop comorbid internalizing symptoms and SUDs [82]). However, of note is the high comorbidity between internalizing and externalizing disorders, and thus these risk trajectories are not considered mutually exclusive

[3] Although beyond the scope of this review, we refer the reader elsewhere for a more detailed review of the negative-affect-based processes underlying substance use risk, including the importance of discerning within-person versus between-person mechanisms linking negative affect to drug use (see [28, 76, 77•] for a more detailed discussion of these issues).

pathways (see [83••] for a more thorough discussion of these issues).

The Externalizing Pathway to Substance Use Disorders

The externalizing pathway to SUDs is a well-known developmental theory which posits that *behavioral disinhibition*, undercontrol, and poor regulation in early childhood underlie risk across development, manifesting as comorbid externalizing and SUDs over time [80, 81]. In this developmental trajectory, childhood impulsivity and behavioral disinhibition predict disruptive behavior disorders and increased externalizing symptoms in adolescence, which is further exacerbated by environmental risk, ultimately leading to comorbid externalizing and SUDs into adulthood [80].

The externalizing pathway highlights the underlying neurological systems of increased reward sensitivity and reactivity combined with decreased effortful control and regulation that are imbalanced and competing during adolescence (i.e., dual systems model), which further contributes to adolescence being a high-risk period for the onset of substance use and comorbid behavior problems [80, 81]. Indeed, ventral striatum hyperactivity in response to positive reward cues is related to greater behavioral disinhibition and risky decision making, as well as delinquent and impulsive behaviors [39••]. This hyperactive affective response to reward cues combined with poor regulation and compromised executive functioning is associated with risk for comorbid SUDs and externalizing symptoms, including conduct disorder [e.g., 26]. Findings show that PFC functioning is impaired among youths with disruptive behavior disorders and SUDs, particularly leading to impairment of decision making in the context of tempting rewards [84]. Compared to healthy controls, youths with externalizing disorders also exhibit smaller PFC and amygdala volumes, indicating more disinhibited behavior and poorer regulation [84–86].

Although patterns of increased reward sensitivity and poor regulation of affective responses to rewards are evidenced in many studies, there have been mixed findings among youths with disruptive behavior disorders, with results showing either more or less reactive amygdala responses among these youths [84]. Part of what might explain these differences comes from work suggesting that youths with disruptive behavior disorders may actually show lower neural sensitivity to rewards, leading them to engage in more sensation-seeking and reward-seeking behavior to compensate for this lack of sensitivity (see [84] for a review). Indeed, compared to a community control group of boys, adolescent boys diagnosed with comorbid conduct and substance use disorders exhibited hypoactivation in a number of brain regions comprising the limbic–striatal system (including the amygdala) and PFC regions during a risky decision making task with the possibility of gaining rewards [87]. The boys with comorbid psychopathology also showed hypoactivation in response to rewards, consistent with reward insensitivity. Smaller amygdala volumes have been found among youths with disruptive behavior disorders which could also contribute to findings showing diminished reward sensitivity among these youths [84–86]. Differences in reactivity across these brain regions may depend on several factors, including the particular neurological system and circuit of study, the specific lab-based task, and the specific externalizing disorder, a clear direction for future research efforts.

The Internalizing Pathway to Substance Use Disorders

Emotional lability and affect regulation also serve as a common underlying risk factor for comorbid internalizing and SUDs [40, 77•]. However, in contrast with the externalizing pathway which focuses on *behavioral disinhibition*, the internalizing pathway to comorbid affective and SUDs posits that *behaviorally inhibited* temperament and poor emotion regulation early in development predict increased internalizing symptoms and compromised emotion regulation throughout adolescence, ultimately leading to comorbid negative affect and substance use disorders [82, 83••].

A behaviorally inhibited temperamental style can be conceptualized as a form of emotional dysregulation. Behavioral inhibition is characterized by a heightened startle and stress response, elevated response to novelty, negative emotionality, physiological dysregulation, attentional bias toward threat, misinterpretation of neutral cues as threatening, social reticence, and social skill deficits [e.g., 88, 89]. The biological and behavioral correlates of behavioral inhibition are relatively stable and predict increased risk for internalizing disorders [90] and substance use over time [89]. Furthermore, behavioral inhibition interacts with risk-taking propensity, such that increased behavioral inhibition is associated with substance-related problems specifically among youths with high levels of risk-taking propensity [89].

Behavioral inhibition is also implicated in the underlying mechanisms linking emotion regulation to comorbid psychopathology via social skill impairment in childhood. For children with highly inhibited temperamental styles, behavioral inhibition at ages 2–3 predicts more compromised emotion regulation abilities at age 5, which subsequently predicts more impaired social skills at age 7 [91]. Early social skill deficits are implicated as a continued risk factor propelling youths along the internalizing pathway to comorbid affective disorders and SUDs [82], and thus behavioral inhibition and corresponding difficulty with emotion regulation deficits in childhood serve as an early embedded risk underlying the internalizing pathway.

The core neurobiological regulation system we have highlighted throughout this review is implicated in the risk for internalizing and SUDs as well, and maps onto the temperamental features of behavioral inhibition over time [92]. Highly inhibited children at age 5 show greater right

orbitofrontal cortex and amygdala volume at age 15, consistent with models of over-regulation and inhibition [85]. Robust findings also show that behaviorally inhibited children and those with anxiety disorders show a hyperactive amygdala response to threat [90, 93], and adolescents with internalizing disorders generally show greater activity in both the amygdala and PFC regions in response to emotionally-salient stimuli [94]. Individuals with internalizing disorders also show more limited connectivity between the amygdala and regions of the PFC, contributing to less effective regulation of the fear response [29••, 39••, 90]. Collectively, this is indicative of a threat-response system that is overly sensitized, with greater amygdala activation combined with more compromised PFC suppression and down-regulation of the emotional threat response [36, 38, 39••, 40, 95].

The link between this heightened emotional response to threat and poor emotion regulation further increases risk for comorbid internalizing and substance use disorders. In contexts of heightened emotional stress and dysregulated states, individuals with comorbid internalizing and substance use disorders may be more likely drawn to drugs as a means to cope, which not only limits learning of effective emotion regulation and coping strategies, but also further reinforces addictive behaviors. Support for this has been found among individuals diagnosed with comorbid PTSD and cocaine dependence who demonstrate an attentional bias toward drug cues specifically when prompted with an emotionally threatening stimulus involving a personal trauma script exposure [96]. Collectively, this pattern of results maps on to the risk trajectory outlined in the internalizing pathway [82]. Indeed, for youths with a history of early behavioral inhibition, emotion regulation difficulties, social skill deficits, and poor coping strategies, drug use may serve as a source of regulation and means to cope particularly in contexts of elevated threat and stress, ultimately leading to comorbid affective and substance use disorders later in development. More advanced mapping of the neurobiological risk factors underlying this developmental pathway is an area for future research efforts.

Conclusions and Future Directions

Although the scope of this report allows only a targeted review of the link between emotion regulation deficits and risk for comorbid psychopathology in adolescence, the extant literature indicates that emotion regulation is indeed a core transdiagnostic risk factor that represents early embedded risk for the development of substance use, addiction, and comorbid psychopathology. Deficits in emotion regulation emerge during adolescence in part due to the dual systems model of imbalanced neurological development between the response and regulation systems, a risk process which is then exacerbated in contexts where the same response and regulation system malfunctions in various ways that can lead to multiple forms of psychopathology. Collectively, this area of research indicates that emotion regulation is a key treatment target for intervention and prevention efforts focused on minimizing psychopathology risk. In addition to supporting individual emotion regulation development and strategies, this work also suggests that minimizing contextual stressors and environmental risk will be critical as well—stressors that we know further compromise emotion regulation abilities (e.g., see [97] for a review of the effects of environmental stress on the response and regulatory systems and subsequent risk for psychopathology).

We note that this review was intentionally limited in scope, leaving many other considerations that must be addressed in the discussion of a topic as large as the risk and development of comorbid psychopathology. Additional factors that must be considered include, but are not limited to, genetic risk, environmental risk, contextual stressors and trauma, parental psychopathology and substance use, and peer influences, with all of these factors interacting with emotion regulation to predict outcomes. Consistent with the frameworks of developmental psychopathology and developmental science [16, 98, 99], we recognize that these complex developmental risk mechanisms must consider transactional processes across multiple levels of analysis (e.g., genetic, neurobiological, behavioral, dyadic, environmental), over time, and across development [12••]. This leaves significant work for future research efforts to continue identifying transdiagnostic risk processes, such as emotion regulation, and examining how these transdiagnostic processes interact with each other over time. These efforts will require a focus on developmental pathways themselves as the outcomes of interest, moving away from a simpler variable-focused approach. Indeed, the internalizing and externalizing pathways reviewed here highlight the developmental processes and risk trajectories as the specific focus of study [83••]. A clear next step for future research on the topic of addiction and comorbid psychopathology will be to examine how these early developmental risk processes relate to the intergenerational transmission of emotion regulation deficits, addiction, and psychopathology risk.

Compliance with Ethics Guidelines

Conflict of Interest Julia M. Shadur and Carl W. Lejuez declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent With regard to the authors' research cited in this paper, all procedures were followed in accordance with the ethical standards of the institutional and/or national research committee on human subjects research and with the Declaration

of Helsinki and its later amendments. This article does not contain any studies with animal subjects performed by any of the authors.

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