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Relations Between Child Temperament and Adolescent Negative Urgency in a High-Risk Sample

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Abstract

Negative urgency, rash action during negative mood states, is a strong predictor of risky behavior. However, its developmental antecedents remain largely unstudied. The current study tested whether childhood temperament served as a developmental antecedent to adolescent negative urgency. Participants (*N*=239) were from a longitudinal study oversampled for a family history of alcohol use disorder (AUD). Negative emotionality (anger and sadness reactivity) and effortful control were measured in childhood (5-8) and negative urgency in adolescence (13-18). Childhood anger reactivity was uniquely related to later negative urgency above and beyond sadness reactivity. Effortful control was not related to later negative urgency; however, a latent variable capturing the shared variance between childhood effortful control and anger reactivity was related to later negative urgency.

Keywords

Negative Urgency; Impulsivity; Temperament; Developmental Psychology; Risky Behavior

Introduction

Impulsivity is a widely studied psychological construct that has included traits ranging from sensation seeking, risk taking, and adventurousness to behavioral undercontrol and disinhibition (Depue & Collins, 1999; Cyders & Smith, 2008). Impulsive personality traits, in broad definition, are considered a transdiagnostic risk factor for a variety of psychological disorders, including substance use disorders, eating disorders, personality disorders, and mood/anxiety disorders (King & Chassin, 2004; Dick et al., 2010; Fahy & Eisler, 1993;Tragesser et al., 2007; Swann et al., 2008; Lipton et al., 2016). However, more modern conceptualizations suggest that impulsivity is a multifaceted construct, defined by unique, yet correlated, subscales (Strickland & Johnson, 2020). Whiteside and Lynam (2001)

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conceptualized these subscales as predispositions to rash action in the presence of positive/negative mood (i.e., positive and negative urgency), not planning ahead (i.e., lack of premeditation), not finishing tasks (i.e., lack of perseverance), and sensation seeking (Cyders et al., 2007; Lynam et al., 2007; Whiteside & Lynam, 2001). Within this framework, positive and negative urgency have been reported as strong predictors of risk-taking behavior (e.g., Cyders et al., 2016), and negative urgency has been specifically related to alcohol dependence and eating disorder symptomology (Anestis et al., 2009; Coskunipar et al., 2013; Fischer et al., 2008; Pearson et al., 2014; Shope et al., 2020). Despite growing research implicating negative urgency as a risk factor for an array of problems, little is known about its developmental antecedents. The present study tests whether childhood temperament serves as a developmental antecedent to adolescent negative urgency.

Negative urgency is thought to differentially map onto facets of the five-factor model of personality. The five-factor model of personality (McCrae & Costa, 1987) breaks down personality traits into neuroticism (i.e., high levels of distress, worry), extraversion (i.e., high levels of sociability, pleasurable emotions), conscientiousness (i.e., thorough thought and planning), agreeableness (i.e., flexibility and friendliness), and openness to experiences (i.e., willingness to try new things). In Whiteside and Lynam's (2001) model of impulsivity, the multiple facets of impulsivity are derived from neuroticism, conscientiousness, and extraversion. Specifically, Costa and McCrae (1992) suggested that the combination of neuroticism and low conscientiousness constitutes a single facet of impulsivity (Costa & McCrae, 1992), namely negative urgency (Cyders & Smith, 2008; Whiteside & Lynam, 2001). In support, several studies suggest that negative urgency represents a combination of low conscientiousness and high neuroticism (Cyders & Smith, 2008; Settles et al., 2012; Siebert et al., 2010). For example, Cyders and Smith (2008) found that neuroticism and conscientiousness in adulthood accounted for 44% of the variance in adult negative urgency.

Considering links between personality traits and negative urgency, early markers of personality traits may serve as developmental antecedents to adolescent negative urgency. One particularly important developmental antecedent to negative urgency might be childhood temperament. Although there are multiple models of childhood temperament, temperament is generally considered to be a developmental antecedent to later personality. Temperament has been defined as "relatively consistent, basic dispositions inherent in the person that underlie and modulate the expression of activity, reactivity, emotionality, and sociability" (Goldsmith et al., 1987). According to Rothbart's model, childhood temperament is thought to be a combination of emotional reactivity (i.e., ways in which a child responds to changes in environment) and regulation (i.e., methods for controlling their reactivity; Rothbart et al., 1994). Reactivity is based on the arousal of a child's behaviors, emotions, and physiology, including the autonomic and central nervous systems, as well as the endocrine system (Goldsmith, et al., 1987, Rothbart et al., 1994). In contrast, regulation/effortful control is based on the ability to activate or inhibit a dominant response, each in reaction to external stimuli (Rothbart et al., 1994). Thus, reactivity is key to understanding how children initially respond to their environment, whereas regulation is key to understanding how a child might exhibit self-control in various situations. Although reactivity and regulation represent distinct constructs, a child's reactivity is likely to affect his/her regulation and vice versa, and thus they are difficult to parse apart one from the other

(Eisenberg et al., 1995; Eisenberg et al., 2000; Rothbart et al., 2000). Rather, the two might share common variance. In the case of negative urgency, this shared variance might represent an amalgamation of high reactivity and low regulation.

As noted earlier, temperament in childhood is considered to be a developmental antecedent to adult personality development. Consistent with notions of continuity between childhood temperament and adult personality, research shows links between childhood temperament and five-factor adult personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, neuroticism). Most relevant to the current study, childhood negative reactivity (i.e., anger and sadness reactivity) has been linked with adult neuroticism, and childhood effortful control (inhibitory control, attention focusing, attention shifting) has been linked with adult conscientiousness (e.g., Eisenberg et al., 2014; Rothbart, Ahadi, & Evans, 2000). Although childhood temperament and adult personality have overlapping variance, temperament is typically conceptualized as a childhood predisposition/early indicator that develops into adult personality.

Taken together, these findings suggest that high negative emotionality and low effortful control in childhood may serve as developmental antecedents to negative urgency in adolescence, and the two might also be expected to interact, such that high negative emotionality combined with low effortful control may be an early manifestation of adolescent negative urgency. In support, Zorrilla and Koob (2019) posit that negative urgency reduces cortical processing thereby lowering inhibitory control, while increasing attention to emotion-evoking stimuli, leading to rash action. Thus, those with low trait inhibitory control and a predilection toward negative emotionality in childhood may well be exhibiting childhood manifestations of negative urgency. However, despite theory and some empirical support, no longitudinal study has tested whether early childhood temperament serves as a developmental predisposition to adolescent negative urgency. The current study provides a longitudinal test of this hypothesized relation.

There is also research suggesting that subfacets of childhood negative reactivity might be differentially related to adult personality and developmental outcomes. Research suggests that childhood anger and sadness reactivity have different genetic underpinnings (Clifford et al., 2015), and that anger/irritability is a higher-order developmental antecedent to neuroticism, whereas sadness is not (Caspi & Shiner, 2006). These data suggest that, within the construct of childhood temperamental reactivity, anger and sadness reactivity might result in different later personality outcomes. In support, Carver and Harmon-Jones (2009) suggested that anger manifests as an approach-oriented motivational state, promoting action based upon a negatively-arousing situation (e.g., restore freedom that was lost, act aggressively toward an offender). In contrast, sadness is thought to be an avoidance-oriented motive, marked by a desire to withdraw/repel (Tooby & Cosmides, 2008). In support of this distinction, Adams and Kleck (2005) found that facial expressions marked by direct eye gaze (approach) were perceived as angrier whereas passive, averted eye gaze (avoidance) was perceived as sadder or more fearful. These findings suggest that anger and sadness reactivity might differentially predict negative urgency.

However, there are also findings that do not support the idea that anger and sadness reactivity differentially predict negative urgency. Some theoretical models of impulsive personality traits suggest that urgency can manifest as both rash ill-advised action and inaction, representing approach and avoidance, respectively (Carver et al., 2009). Further, King et al. (2018) found that individuals high in negative urgency used more disengaging emotion regulation strategies (i.e., inaction/avoidance), and Smith et al. (2013) found that negative urgency was related to internalizing symptoms (i.e., withdrawal). Given the conflicting evidence, the current study tested both general child negative reactivity as well as anger and sadness reactivity as separate, unique developmental antecedents to adolescent negative urgency.

In summary, the present study examined whether facets of childhood temperament served as early indicators of adolescent negative urgency within a high-risk sample of adolescents (oversampled for familial alcohol use disorder [AUD]). Specifically, we tested childhood negative reactivity and effortful control as early indicators of adolescent negative urgency. We also tested whether subfacets of childhood reactivity, specifically anger and sadness reactivity, were differentially related to adolescent negative urgency. We hypothesized that the latent variables of both childhood negative reactivity (i.e., anger and sadness reactivity) and childhood effortful control (i.e., inhibitory control, attention focusing, attention shifting) would be additively related to adolescent negative urgency. In addition, we hypothesized the two would interact, such that for those high in childhood negative reactivity and low in childhood effortful control would be related to greater adolescent negative urgency. In secondary models, we examined whether childhood anger and sadness reactivity were uniquely related to adolescent negative urgency and whether childhood anger or sadness reactivity interacted with childhood effortful control to predict adolescent negative urgency. This was done to test whether there are different pathways to negative urgency through anger versus sadness emotionality. We did not separate facets of effortful control due to a) a lack of theoretical rationale and b) high intercorrelations between specific indicators. Lastly, we hypothesized that family history of AUD would be related to greater adolescent negative urgency in all models.

Methods

Participants

Participants (N = 239) were from a larger longitudinal study examining the intergenerational transmission of AUD (Chassin et al., 1992). The study initially gathered data from parents (G1s) and their children (G2s) across six timepoints. The first three waves (W1-W3) of data were collected annually, and the subsequent three waves of data (W4-W6) were separated by 5-year intervals. As G2s became parents, their children (G3s) were invited to participate in the study at Waves 5 and 6. G3s also participated in three follow-up assessments (W7-W9), which occurred 1.5 years, 3 years, and 4 years after Wave 6. The present study used data from W5 and W8, which hereafter will be referred to as T1 and T2. Participants included in the current study were G3s between the ages of 5-8 years old at T1 (M_{age} = 6.24, SD = 1.13), 13-18 years old at T2 (M_{age} = 15.84, SD = 1.57), had any data at T1 (e.g., age, biological sex, temperament) and a negative urgency score at T2. Thus, children who were

not retained at follow up were excluded. At T1, 32% of participants were Hispanic/Latinx. There were small but significant differences among included compared to excluded individuals, such that those included had higher levels of anger reactivity ($t(334) = 2.14$, $p = .03$) and lower levels of inhibitory control ($t(334) = -2.97$, $p < .01$).

Recruitment and Procedures

Children with a family history of AUD were recruited via court records of DUI arrests, health-maintenance organization wellness questionnaires, and community telephone surveys. Families without a history of AUD who lived in the same neighborhoods as families with an AUD history were recruited using reverse directories. Families with and without AUD were matched on children's age (within 1 year), family composition, ethnicity, and socioeconomic status. Parental lifetime AUD diagnosis was confirmed with a computerized structured interview (Computerized Diagnostic Interview Schedule, Robins et al., 2000). A complete description of sample recruitment is detailed in (Chassin et al., 1992). G2s and G3s were interviewed in-person at the family's residence, in a university setting, or over the phone at T1. G3s completed an online survey at T2. Procedures were approved by the Arizona State University institutional review board.

Measures

Demographics.—Participants self-reported their biological sex (0 = men, 1 = women) and ethnicity (0 = Hispanic/Latinx, 1 = Non-Hispanic/Latinx Caucasian). Age was calculated at T1 from birthdates, which were parent-reported. The present sample was 49% female, and 32% Hispanic/Latinx. Participants were an average age of 6.24 ($SD = 1.13$) in childhood and 15.84 ($SD = 1.57$) in adolescence.

Parental Alcohol Use Disorder.—Parents reported their lifetime AUD symptoms by *DSM-IV* criteria using the C-DIS structured interview (Robins et al., 2000). Parents who were not directly interviewed were assessed using spousal reports on the Family History Research Diagnostic Criteria (Endicott, Andreasen, & Spitzer, 1975). G3s were given a code of one if they had at least one parent who met the criteria for a lifetime alcohol use disorder. Fifty two percent of participants had a family history of AUD.

Negative Urgency.—Negative urgency was measured via adolescent report of the UPPS-R-C (Zapolski et al., 2010), an adapted version of the UPPS-P measure of dispositions toward rash action. This adapted version of the UPPS-P measure assessed fewer items and simplified items based on a) sentence structure, b) number of syllables and c) reading level for children/adolescents. The negative urgency subscale included eight items assessing rash action in a negative mood state (e.g., when I feel bad, I often do things I later regret in order to make myself feel better now) on a scale from 1 (Disagree Strongly) to 4 (Agree Strongly). Due to the study's focus, we analyzed only negative urgency data. The present sample had mean levels of negative urgency above the midpoint ($M = 2.30$, $SD = .63$) and there was excellent internal consistency in the present sample ($\omega = .86$).

Temperament.—Mothers reported on their child's temperament using subscales from the Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001). The CBQ uses a scale of

(1) “Extremely Untrue” to (7) “Extremely True”. Based on a priori hypotheses, the current study included five childhood temperament subscales: anger reactivity, sadness reactivity, attention focusing, attention shifting, and inhibitory control. The anger reactivity subscale (M = 4.54, SD = .92, ω = .83) included 11 items measuring anger/frustration emotionality (e.g., “has temper tantrums when she doesn’t get what she wants”), and the sadness reactivity subscale (M = 4.27, SD = .75, ω = .71) included 12 items measuring sad/depressed mood (e.g., “sometimes appears downcast for no reason”). The attention focusing subscale (M = 4.32, SD = .99, ω = .81) included 10 items measuring the ability to maintain attentional focus on tasks (e.g., “has a hard time concentrating on an activity when there are distracting noises”), the attention shifting subscale (M= 4.00, SD = .79, ω = .75) included 10 items measuring the ability to shift attention from one activity to another (e.g., “can easily shift from one activity to another”), and the inhibitory control subscale (M = 4.64, SD = .91, ω = .84) assessed 12 items measuring the capacity to suppress immediate responses (e.g., “is able to resist laughing or smiling when it isn’t appropriate”).

Following previous studies, an effortful control latent factor was estimated, encompassing attention focusing, attention shifting, and inhibitory control subscales (Eisenberg et al., 2004; Eisenberg et al. 2009) as three indicators of effortful control. Subscales, which have shown to be reliable and valid (e.g., Rothbart et al., 1994), were used to estimate latent factors because of their expected shared variance, rather than parsing apart specific items within each temperament construct that may (or may not) load highly onto a shared variance factor.

Inhibitory control (b = .93, SE = .06, p < .001, 95% CI = [.82, 1.03]), attention focusing (b = .73, SE = .05, p < .001, 95% CI = [.62, .83]) and attention shifting (b = .61, SE = .04, p < .001, 95% CI = [.50, .71]) all loaded onto an effortful control latent factor, though no fit statistics are provided due to a fully saturated model. Latent factor scores were extracted and used in subsequent analyses. In addition, the present study created a negative reactivity latent factor, including both anger and sadness reactivity subscales as two indicators of negative reactivity. Because there were only two indicators of negative reactivity, this latent factor was estimated by constraining commonality (standardized factor weights) to be equal. After constraining standardized factor loadings, anger and sadness reactivity (b = .72, SE = .04, p < .001, 95% CI = [.63, .80]) loaded significantly onto a negative reactivity factor.

Data Analysis

Analyses used multiple regression within a structural equation modeling (SEM) framework via Mplus version 8.4 (Muthén & Muthén, 2019). All variables were examined for non-normality, although no winsorizing was needed. Maximum likelihood estimation with robust standard errors (MLR) was used. Adolescents nested within the same family were accounted for by using adjusted standard error estimates to fit a multilevel data structure via TYPE=COMPLEX in Mplus. Missing data on exogenous variables (i.e., if age was reported at W5 but temperament was not) were estimated using full information maximum likelihood (FIML). Missing data (14.8% of cases) were missing completely at random (MCAR), as missingness on study variables was not related to any pattern of observable data.

For the primary analyses, we estimated a series of measurement and structural models. We began by specifying latent factors of both childhood negative reactivity (i.e., sadness and anger subscales) and effortful control (i.e., inhibitory control, attention focusing, and attention shifting subscales) as described previously. Structural models were tested in the following order: 1) childhood negative reactivity and effortful control were analyzed as single predictors, 2) childhood negative reactivity and effortful control were analyzed as simultaneous predictors, and 3) childhood negative reactivity, effortful control, and the interaction between the two were analyzed as predictors of adolescent negative urgency. This modeling approach is in line with several past studies suggesting that childhood reactivity and regulation might be independent, simultaneous, or interactive predictors of personality (Eisenberg et al., 1995; Eisenberg et al., 2000; Rothbart et al., 2000). Child age, biological sex, ethnicity, and parental history of AUD were included as covariates.

Next, a series of models were analyzed separating childhood anger and sadness reactivity. As noted earlier, subfacets of childhood effortful control (i.e., inhibitory control, attention focusing, attention shifting) were not separated due to a lack of theoretical rationale and high intercorrelations, particularly among inhibitory control and attention focusing ($r = .67$). Thus, childhood effortful control was entered into the model as a factor score derived from a latent factor. These models were tested in the following order: 1) childhood anger reactivity and sadness reactivity as single predictors, 2) childhood anger and sadness reactivity as simultaneous predictors, 3) childhood anger and sadness reactivity in addition to effortful control as simultaneous predictors, and 4) childhood anger and sadness reactivity, effortful control, and their interactions (i.e., anger and effortful control, sadness and effortful control) as predictors of adolescent negative urgency. Each interaction was entered into a separate model. The Benjamini-Hochberg procedure (Benjamini, & Hochberg, 1995) was used to adjust the false discovery rate (FDR), making the effective p-value .012. Reported p-values are actual p-values, and those under .012 are deemed statistically significant.

Statistical power analyses were conducted using G*Power3 (Faul et al., 2007). Power estimates were determined for a single regression coefficient with 6 to 8 covariates, depending on the model. Across models, the current sample ($N = 239$) was adequately powered (> 80%) to detect moderate effect sizes ($f^2 = .038$; $d = .36$). Considering interaction and main effect coefficients have identical degrees of freedom in multiple regression, the current statistical power estimates extend to both main effect and interaction effect sizes. However, decades of research suggest that additional power is needed to detect interaction effects (e.g., Cohen et al., 2003; Jaccard et al., 1990; McLelland & Judd, 1993), making the current study underpowered to detect small to moderate interaction effect sizes.

Results

Bivariate Correlations

All variable distributions were within reasonable skew and kurtosis limits for MLR estimation (See Table 1). Childhood anger reactivity and sadness reactivity were strongly correlated ($r = .52$, $p < .001$), and all childhood effortful control subscales were strongly correlated ($r = .44$-$.67$, $p < .001$). Higher levels of childhood anger reactivity were strongly correlated with lower childhood effortful control ($r = -.50$, $p < .001$), and higher levels of

childhood sadness reactivity were moderately correlated with lower childhood effortful control ($r = -.22$, $p < .01$). Higher levels of adolescent negative urgency were not significantly correlated with childhood anger reactivity ($r = .16$, $p = .02$) or childhood effortful control ($r = -.12$, $p = .08$). Having a family history of AUD was correlated with higher childhood anger and sadness reactivity ($r = .20$-$.21$, $p < .01$) and but was not significantly correlated with adolescent negative urgency ($r = .15$, $p = .02$).

Negative Reactivity Model

We began by testing the effects of childhood negative reactivity and effortful control (factor scores extracted) as developmental antecedents to adolescent negative urgency in separate models (See Table 2). Childhood negative reactivity was not significantly related to adolescent negative urgency ($b = .07$, $SE = .07$, $p = .30$, 95% CI [−.07, .21]). Similarly, childhood effortful control was not significantly related to adolescent negative urgency ($b = -.13$, $SE = .07$, $p < .06$, 95% CI = (−.27, .004]). When testing the two as simultaneous predictors, neither childhood negative reactivity ($b = .02$, $SE = .08$, $p = .84$, 95% CI = [−.14, .17]) nor effortful control ($b = -.13$, $SE = .08$, $p = .12$, 95% CI = [−.29, .03]) was significantly related to adolescent negative urgency, likely due to overlapping variance. The interaction between childhood negative reactivity and effortful control was also not significant ($b = -.03$, $SE = .07$, $p = .65$, 95% CI = [.11, .07]). See Table 2 for a full list of model parameters.

Anger and Sadness Reactivity Model

Next, we tested a series of models that considered anger reactivity, sadness reactivity, and effortful control as developmental antecedents to adolescent negative urgency (see Table 3). In separate models, neither childhood anger reactivity ($b = .14$, $SE = .07$, $p = .04$, 95% CI = [.01, .27]) nor sadness reactivity ($b = -.02$, $SE = .07$, $p = .80$, 95% CI = [−.15, .12]) was significantly related to adolescent negative urgency. When both variables were tested as simultaneous predictors, childhood anger reactivity became significantly related to higher negative urgency above and beyond sadness ($b = .20$, $SE = .08$, $p = .01$, 95% CI = [.05, .25]). However, when adding childhood effortful control to this model, neither anger reactivity ($b = .16$, $SE = .09$, $p = .07$, 95% CI = [−.01, .33]) nor effortful control ($b = -.09$, $SE = .08$, $p = .30$, 95% CI = [−.25, .08]) was significantly related to adolescent negative urgency. There was also no significant interaction between childhood anger reactivity and effortful control ($b = -.28$, $SE = .28$, $p = .33$, 95% CI = [−.12, .04]) or childhood sadness reactivity and effortful control ($b = .06$, $SE = .35$, $p = .86$, 95% CI = [−.63, .75]). See Table 3 for a full list of model parameters.

Shared Variance

Lastly, we specified childhood anger reactivity and effortful control as a latent variable to capture the shared variance between the two. This was done as a post-hoc analysis considering the large correlation between the two, suggesting that their shared variance might be related to later negative urgency. In fact, it could be difficult to obtain evidence of unique effects by either facet of childhood temperament if the variance of each when predicting adolescent negative urgency is overlapping. We did not include childhood sadness reactivity in this latent variable due to 1) a lack of strong relations among childhood sadness

and childhood effortful control, and 2) a lack of relation to adolescent negative urgency. We first tested the latent variable as a developmental antecedent to adolescent negative urgency above and beyond covariates. Childhood anger reactivity (b = .71, SE = .04, p < .001) and effortful control (b = −.71, SE = .04, p < .001) loaded significantly onto the latent variable, and the factor mean was set to 1. The shared variance between the two was robustly related to adolescent negative urgency (b = .31, SE = .12, p = .01, 95% CI = [.07, .54]). Finally, we tested supplementary residual models. Each residual model was tested separately, partialling out the shared variance between childhood anger reactivity and effortful control. These models tested whether the residual unique variance in anger reactivity or effortful control was related to adolescent negative urgency above and beyond their shared variance. However, neither the residual of childhood effortful control (b = .23, SE = .32, p = .47, 95% CI = [−.40, .87]) nor the residual of childhood anger reactivity (b =.03, SE = .13, p = .84, 95% CI = [−.22, .27]) was associated with adolescent negative urgency.

Sensitivity Analyses: Item Overlap

In linking childhood negative reactivity to adolescent negative urgency, one concern is potential item overlap between the constructs. Thus, supplemental models were estimated with items taken out of the negative urgency subscale that map directly onto anger (1item; “When I am mad, I sometimes say things that I later regret”) and sadness (2 items; “When I am upset I often act without thinking”, “I often make matters worse because I act without thinking when I am upset”). This adjusted subscale was highly correlated with the full negative urgency subscale (r = .95, p < .001). Removing these items produced minimal changes to study results. Neither childhood effortful control (b = −.15, SE = .07, p < .04, 95% CI = [−.29, −.01) nor childhood anger reactivity (b = .14, SE = .07, p = .053, 95% CI = [−.002, .28]) was significantly related to adolescent negative urgency. However, childhood anger reactivity was still related to adolescent negative urgency above and beyond sadness reactivity (b = .20, SE = .08, 95% CI = [.05, .35}, p = .009), and the shared variance between childhood anger and effortful control (b = .31, SE =.12, 95% CI = [.07, .55], p = .01) was still related to adolescent negative urgency.

Discussion

The current study tested whether childhood temperamental reactivity and regulation served as developmental antecedents to negative urgency in a sample of high-risk adolescents. To our knowledge, this is the first study testing whether childhood factors, particularly temperament, were longitudinally related to adolescent negative urgency. Given that childhood temperament is thought to be a developmental antecedent to later personality (Rothbart et al., 1994), and negative urgency is thought to be a combination of neuroticism and conscientiousness (Cyders & Smith, 2008; Settles et al., 2012; Siebert et al., 2010), it would make sense that childhood temperament serves as an early indicator of negative urgency. In the higher order models, neither effortful control nor global negative reactivity in childhood were related to adolescent negative urgency. In models testing the subcomponents of childhood negative reactivity (i.e., anger, sadness), anger reactivity was related to higher levels of adolescent negative urgency above and beyond sadness reactivity (which was not related at all to negative urgency). In addition, neither childhood anger reactivity nor

effortful control was uniquely related to adolescent negative urgency when they were included in the same model. Rather, the shared variance between high childhood anger reactivity and low effortful control was associated with adolescent negative urgency (moderate effect size), likely because the overlap between the two was large enough that there was little unique variance by either facet.

These findings advance our understanding of negative urgency, suggesting that childhood temperament is in fact a developmental antecedent. Although theorists have suggested this association (e.g., Cyders & Smith, 2008; Smith & Cyders, 2016), this is, to our knowledge, the first study to provide empirical support. We hypothesized that both childhood negative reactivity and effortful control would be additive and interactive developmental antecedents to adolescent negative urgency. However, when entered into analyses as simultaneous predictors, we found that childhood anger reactivity and effortful control were not additive risk factors for adolescent negative urgency. Rather, anger reactivity (above and beyond sadness reactivity) was significantly associated with adolescent negative urgency, but effortful control was *not* significantly associated with adolescent negative urgency ($p = .058$), when each was entered into separate models. The interaction between anger reactivity and effortful control also did not relate to adolescent negative urgency.

These findings fit into larger theories of how childhood temperamental reactivity and regulation are intertwined when predicting later development outcomes. Although reactivity and regulation are distinct constructs, they are highly correlated such that higher childhood reactivity is associated with lower childhood regulation (e.g., Eisenberg et al., 1995; Eisenberg et al.,2000). Thus, although we hypothesized additive and interactive relations between childhood negative reactivity and effortful control, the strong correlations between the two might explain the lack of these findings. In the current sample, childhood anger reactivity and effortful control were correlated at $r = -.50$. This might have made it difficult to find both additive effects (which would require some unique variance) and interactive effects on adolescent negative urgency. Rather, the present study suggests that it is the overlap of high childhood anger reactivity and low effortful control that was related to negative urgency in adolescence.

The shared variance between high anger reactivity and low effortful control is conceptually similar to the construct of dysregulated irritability. Dysregulated irritability has been defined as the “tendency to respond to frustration with intense and prolonged tantrums as well as to have a chronic angry/cranky mood state” (Smith et al., 2019; Wakschlag et al., 2018; Wakschlag et al., 2019). Thus, this definition emphasizes a) anger reactivity/emotion, and b) a lack of regulation/control. Frequent and uncontrollable temper tantrums are thought to be an overt display of anger/frustration (e.g., Wakschlag et al., 2012), and thus a child who lacks effortful control might struggle to inhibit such displays of anger/frustration reactivity. Taken together, findings both from past literature and the current study suggest that dysregulated irritability might mark a child who reacts strongly to negative situations (reactive environment transactions) and lacks the capacity to regulate responses to such emotions. Stability of dysregulated irritability is seen between early to mid-childhood (Wakschlag et al., 2015), and thus might be an antecedent to negative urgency in adolescence. Therefore, the shared variance between high anger reactivity and low effortful

control might be early markers of a child who may engage in rash action, which could be reinforced as a coping mechanism to strong negative emotions, further developing into negative urgency in adolescence. If rash action alleviates negative emotionality, then a child may then be negatively reinforced by such action, leading to habitually rash action during negative mood states.

Another (and not mutually exclusive) interpretation of our findings is that the shared variance between high anger reactivity and low effortful control is a marker of genetic risk for behavioral undercontrol and negative emotionality. Parental AUD has been shown to confer risk for behavioral undercontrol and negative reactivity/emotionality (Chassin et al., 1993; Colder & Chassin, 1997; Sher et al., 1991). Thus, high anger reactivity and low effortful control might be the childhood manifestation of this heritable disposition toward rash action. The current findings showed significant bivariate correlations between parental AUD and anger reactivity ($p < .01$), but not between parental AUD and effortful control ($p = .08$), or parental AUD and negative urgency ($p = .02$). Considering that anger reactivity was associated with negative urgency above and beyond parental AUD, it is possible that childhood temperament mediates the effects of parental AUD on negative urgency. Future research should test the full mediation model, while also testing buffering and exacerbating effects from family history of AUD to temperament and negative urgency.

It is also worth noting that childhood anger reactivity was related to higher adolescent negative urgency, above and beyond sadness reactivity. Further, the effect size of anger reactivity went from .14 to .20 when including sadness in the model. Thus, a suppression effect was seen with sadness in the model because the effect of anger was not robustly significant when entered alone. Child anger reactivity might be a particularly important developmental indicator of a trajectory toward rash action during negative mood states in adolescence. It may be the case that anger reactivity is uniquely related to rash action due to its approach-oriented nature. Further, anger reactivity may motivate one to act rashly (approach), and partialling out the common variance between sadness and anger strengthened this effect. However, considering that this effect was not significant when anger was in the model without sadness reactivity, future research is needed to investigate this effect.

One explanation for the lack of findings for childhood sadness reactivity might be, at least in part, due to the use of mothers' reports to measure childhood reactivity. It might be easier for mothers to recognize symptoms of anger and irritability than sadness in their children. Christiansen et al. (1992) posited that childhood states indicative of anger may be more observable by parents than are subjective states indicative of sadness. This could lead to more accurate and precise parental reporting of child anger reactivity than of sadness reactivity. If parents are more accurate at identifying their child's anger reactivity than sadness reactivity, this could partially explain the more robust association between childhood anger and adolescent negative urgency in the present data. In addition, childhood sadness/depression is often marked by elevated levels of irritability rather than feeling "down" or "depressed" (Stringaris et al., 2013) and, thus, childhood sadness might be interpreted as anger due to an underlying irritability construct. Therefore, future research is

needed to replicate these results using other measures of childhood temperament, such as child-report and lab-based measures.

Lastly, unexpectedly, effortful control was not related to negative urgency in any model. This may be due to sample size and the emphasis on negative urgency rather than impulsivity, more broadly measured. The effect size for effortful control was small (−.13), and thus may have required a larger sample size to be detected. In addition, effortful control, as a singular developmental antecedent, may be more strongly related to general impulsivity or other facets of the UPPS-P impulsivity model such as lack of premeditation or lack of perseverance. Thus, one who lacks restraint in behavior and attention as a child may develop other impulsive personality traits (rather than negative urgency) in adolescence. Future research using larger samples and the full UPPS-P model are warranted.

The current study contributes to the literature by finding initial longitudinal evidence of child temperament as a developmental antecedent to adolescent negative urgency. However, findings must be considered in light of limitations. First, the present sample lacked statistical power to detect small main effect and interaction effects. Further, effect sizes in the current results were in the small to moderate range, and thus it is possible that with a larger sample, some of the findings that were non-significant, or were eliminated with an FDR correction, may have in fact reached significance. In addition, the sample was from a study of familial AUD and the pattern of findings might not generalize to a lower risk sample. Another study limitation was the measurement of childhood temperament and negative urgency. Childhood temperament was measured via mother reports, which we deemed to be the most accurate, due to some fathers not being custodial parents and lacking time spent with their children. However, other reporters (e.g., fathers) and ways of measuring temperament (e.g., lab-based measures) might produce different results or introduce reporter bias. Finally, we did not measure negative urgency in childhood and the only validated measure of negative urgency is for later childhood (age 7-13). Thus, the current study is unable to discern whether childhood temperament is a unique prospective predictor of adolescent negative urgency over and above childhood negative urgency or whether childhood temperament is an early manifestation of adolescent negative urgency. However, disentangling these two possibilities was not the goal of the current study. Future research should continue to investigate early measures of negative urgency and interrelations between childhood temperament and negative urgency across developmental stages.

Taken together, the present results suggest that the shared variance between low effortful control and high negative reactivity in childhood is related to later negative urgency in adolescence. Considering strong links between negative urgency and risky behaviors, the present results suggest that this shared variance might be worth considering in prevention efforts. Thus, targeting this shared variance at an early age might prevent high levels of rash action and risky behaviors. Recent studies suggest that brief interventions are efficacious in reducing negative urgency in adolescents (Zapolski & Smith, 2017). However, the present study suggests that primary prevention efforts could interrupt this developmental trajectory at earlier ages. Interventions such as the Family Check Up (Dishion et al., 2003) show promise in reducing childhood irritability (Smith et al., 2019), and thus brief, family-based interventions might protect against adolescent negative urgency development. It also might

be important to target parenting of children with temperamental risk. Considering that there might be evocative effects of child temperament that produce high levels of negative urgency, programs designed to promote positive parenting might aid in interrupting a developmental sequence from anger reactivity and low effortful control toward adolescent negative urgency. Future research should examine if and how familial environmental factors might buffer and/or exacerbate the link from temperament to urgency.

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Highlights

- Child temperament served as an early indicator of adolescent negative urgency
- Anger was related to negative urgency above and beyond sadness reactivity
- Shared variance between anger and effortful control was related to negative urgency
- Targeting child temperament could buffer against later Negative Urgency development

Table 1

Descriptive Statistics and Bivariate Correlations Among Primary Variables.

	Mean or % (SD)	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**
1. Biological Sex	49% Female	–	−0.02	0.12	0.01	0.04	−0.07	−0.25**	−0.17**	−0.07	−0.02	−0.24**	0.02
2. Age (T1)	6.24 (1.13)		–	0.07	−0.05	−0.06	0.16**	0.18**	0.14**	−0.01	0.06	0.17*	0.07
3. Ethnicity	32% Latinx			–	0.10	−0.01	−0.04	0.02	−0.06	0.04	−0.03	0.01	−0.05
4. Family History	52% AUD				–	0.21**	0.20**	−0.07	−0.10	0.02	0.24**	−0.07	0.15*
5. Anger Reactivity	4.54 (0.92)					–	0.52**	−0.47**	−0.37**	−0.48**	0.87**	−0.50**	0.16*
6. Sadness Reactivity	4.27 (0.75)						–	−0.19**	−0.16*	−0.36**	0.87**	−0.22**	0.02
7. Inhibitory Control	4.64 (0.91)							–	0.67**	0.56**	−0.38**	0.99**	−0.14†
8. Attention Focusing	4.32 (0.99)								–	0.44**	−0.31**	0.77**	−0.03
9. Attention Shifting	4.00 (0.79)									–	−0.48**	0.64**	−0.08
10. Negative Reactivity	*SD* = 0.83										–	−0.42**	0.11
11. Effortful Control	*SD* = 0.94											–	−0.12†
12. Negative Urgency	2.30 (0.63)												–

Note: Fam = Family. Biological sex is coded as 0 = female, 1 = male, ethnicity is coded as 0 = Non-Hispanic/Latinx Caucasian, 1 = Hispanic/Latinx, Fam History is coded as 0 = No Family History of AUD, 1 = Family History of AUD, Temperament is measured on a scale of 1 (extremely untrue) to 7 (extremely true), and negative urgency is measured on a scale of 1 (strongly disagree) to 4 (strongly agree). Negative Reactivity and Effortful Control are factor scores, so they are mean centered.

** $p < .01$,

* $p < .05$,

† $p < .10$

Table 2

Relations Between Negative Reactivity, Effortful Control, and Adolescent Negative Urgency.

	Reactivity Only				Effortful Control Only				Reactivity and Effortful Control			
	B	**SE**	**95% CI**	***p***	**B**	**SE**	**95% CI**	***p***	**B**	**SE**	**95% CI**	***p***
Age	0.08	0.07	(−0.05, 0.21)	0.24	0.10	0.07	(−0.03, 0.23)	0.12	0.10	0.07	(−0.03, 0.23)	0.13
Sex	0.02	0.06	(−0.10, 0.14)	0.70	−0.01	0.07	(−0.14, 0.12)	0.90	−0.01	0.07	(−0.14, 0.12)	0.91
Ethnicity	−0.07	0.07	(−0.20, 0.07)	0.34	−0.07	0.07	(−0.20, 0.07)	0.34	−0.07	0.07	(−0.20, 0.07)	0.36
Family History	0.14	0.07	(0.01, 0.27)	0.03	0.15	0.07	(0.03, 0.28)	0.019	0.15	0.06	(0.02, 0.27)	0.021
Negative Reactivity	0.07	0.07	(−0.07, 0.21)	0.30	–	–	–	–	0.02	0.08	(−0.14, 0.17)	0.84
Effortful Control					−0.13	0.07	(−0.27, 0.004)	0.058	−0.13	0.08	(−0.29, 0.03)	0.12
Neg React × Eff Control									−0.03	0.07	(−0.11,0.07)	0.65

Note: All model estimates are standardized effects. Neg React = Negative Reactivity; Eff Control = Effortful Control.

Table 3

Relations Between Anger Reactivity. Sadness Reactivity. Effortful Control and Adolescent Negative Urgency.

	Anger Only				**Sadness Only**			
	B	**SE**	**95% CI**	**P**	**B**	**SE**	**95% CI**	**P**
Age	0.09	0.07	(−0.04, 022)	0.18	0.09	0.07	(−0.04, 0.22)	0.20
Sex	0.02	0.06	(−0.10, 0.14)	0.78	0.02	0.06	(−0.10, 0.14)	0.72
Ethnicity	−0.07	0.07	(−0.20, 0.07)	0.34	−0.07	0.07	(−0.21, 0.07)	0.30
Family History	0.13	0.07	(−0.001, 0.26)	0.05	0.17	0.07	(0.04, 0.29)	0.012
Anger Reactivity	0.14	0.07	(0.01, 0.27)	0.041	–	–	–	–
Sadness Reactivity	–	–	–	–	−0.02	0.07	(−0.15, 0.12)	0.80
Effortful Control	–	–	–	–	–	–	–	–
	Anger and Sadness				**Reactivity and Effortful Control**			
	B	SE	95% CI	P	B	SE	95% CI	P
Age	0.11	0.07	(−0.02, 0.25)	0.10	0.12	0.07	(−0.01, 0.26)	0.07
Sex	0.01	0.06	(−0.11, 0.13)	0.90	−0.01	0.06	(−0.14, 0.12)	0.86
Ethnicity	−0.07	0.07	(−021, 0.06)	0.29	−0.07	0.07	(−0.21, 0.07)	0.31
Family History	0.14	0.07	(0.01, 0.28)	0.032	0.15	0.07	(0.02, 0.28)	0.023
Anger Reactivity	0.20	0.08	(0.05, 0.35)	0.01	0.16	0.09	(−0.01, 0.33)	0.07
Sadness Reactivity	−0.12	0.08	(−027, 0.03)	0.12	−0.12	0.08	(−0.28, 0.03)	0.11
Effortful Control	–	–	–	–	−0.09	0.08	(−0.25, 0.08)	0.30
Anger × Eff Control	–	–	–	–	−0.28	0.28	(−0.12, 0.04)	0.33
Sad × Eff Control	–	–	–	–	0.06	0.35	(−0.63, 0.75)	0.86

Note: All model estimates are standardized effects. Interaction terms were tested in separate models. Anger = Anger Reactivity; Sad = Sadness Reactivity; Eff Control = Effortful Control