An examination of the relations between effortful control in early childhood and risk for later externalizing psychopathology: A bi-factor structural equation modeling approach

Deaven A. Winebrake¹, Noa Gueron-Sela², Cathi Propper³, Roger Mills-Koonce³, & Nicholas J. Wagner¹

¹Boston University

²Ben-Gurion University of the Negev

³The University of North Carolina at Chapel Hill

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Contact:

Deaven A. Winebrake
Boston University Department of Psychological & Brain Sciences
64 Cummington Mall
Boston, MA 02215
dw496@bu.edu

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Abstract. Effortful control (EC) is characterized by regulatory strategies that contribute to patterns of (mal)adaptation across development. Deficits in EC pose risk for externalizing psychopathology, but whether and how subfactors of EC differentially influence children's conduct problems (CP), attention deficit disorder behaviors (ADD), and callous-unemotional (CU) traits remains unknown. Research on EC may benefit from alternative modeling strategies that allow for comparisons of overall EC scores and its subfactors in the prediction of externalizing outcomes. The current study uses a bi-factor structural equation modeling approach to examine if general EC and its subfactors (i.e., attentional focusing, low-intensity pleasure, perceptual sensitivity, inhibitory control) at 36 months differentially predict CP, ADD, and CU traits at 84 months. Using a longitudinal sample of 206 children followed from age three to seven years (47.8% female, 42.6% European-American), results indicated that increased general EC at 36 months predicted reduced CU traits and ADD at 84 months. Attentional focusing was the only subfactor to uniquely predict later CU traits, suggesting that attentional abilities hold particular significance for buffering against psychopathy. Findings are interpreted in the context of methodological and theoretical significance for future developmental research, as well as implications for interventions targeting regulatory strategies in early childhood.

Keywords: Effortful control, callous-unemotional traits, self-regulation, bi-factor modeling, developmental psychopathology

Introduction

Effortful control (EC) is a dispositional marker of self-regulation, inhibition, and behavioral restraint with far-reaching influence over social, behavioral, and cognitive adjustment (Nigg, 2017; Rothbart, 2011). Childhood EC underlies emotion regulation, academic success, behavioral inhibition, and social competence, making it a key temperamental attribute across development (Kochanska et al., 2000; Rueda, 2012; Simonds et al., 2007; Valiente et al., 2008). Research suggests that composite EC scores are comprised of subfactors (i.e., inhibitory control, attentional focusing, low-intensity pleasure, perceptual sensitivity) that collectively contribute to children's overarching EC abilities (Rothbart et al., 2001). However, evidence also suggests that these subfactors may differentially contribute to aspects of socioemotional adjustment (Berlin & Bohlin, 2010; Gunn et al., 2009; Towe-Goodman et al., 2011). Thus, considering the independent and joint contributions of EC and its subfactors together may support a more precise and detailed understanding of the impact of children's EC on key developmental processes and outcomes. However, very few studies have formally examined competing measurement models of EC and its subfactors to establish the most appropriate approach to testing their relative influences on children's development.

In addition to the broad relevance of EC for children's social and emotional function, individual variability in EC may contribute to children's psychopathology, including externalizing disorders (Atherton et al., 2020; Olson et al., 2005). Despite this, there is limited research on whether and how variability in functioning across the subfactors of EC may differentiate risk for psychopathology, which limits the extent to which EC can be integrated into personalized and targeted intervention strategies. This gap in the literature is particularly salient regarding the links between EC and callous-unemotional (CU) traits. CU traits describe a

constellation of interpersonal and affective deficits characterized by diminished guilt, empathy, and prosociality (Waller & Wagner, 2019) that predict more stable and severe patterns of antisocial behaviors (Frick et al., 2014) and pose risk for later psychopathy (Eisenberg et al., 2007; Fowles & Dindo, 2009). Children with CU traits often exhibit deficits in emotion-related processes (e.g., recognition, understanding) that have been linked to, but remain distinct from, other forms of externalizing problems (Fanti & Kimonis, 2017). In addition, standard treatments for children's conduct problems (CP) are less effective for children high on CU traits (Hawes & Dadds, 2005), making research examining the mechanisms underlying CU traits an important area of developmental research requiring further exploration.

To address these gaps in the literature, the current study leverages multimethod assessment and comparisons of statistical models to test EC dimensionality and the links between EC in early childhood and later psychopathology. First, we examine multiple statistical approaches for modeling EC by comparing unidimensional, second-order, correlated-factor, and bi-factor models to establish the optimal measurement model for EC and its subfactors. After establishing a statistical model that best represents our EC data, we examine how EC and its subfactors at age three differentially predict children's CU traits, CP, and attention deficit disordered behaviors (ADD) at age seven. Findings from this study help to clarify early temperamental markers of self-regulation that may differentiate pathways to antisocial outcomes by providing additional insight into the etiological mechanisms underlying early emotional and behavioral difficulties.

Effortful Control

EC, defined as the temperamental ability to employ top-down cognitive strategies for the purpose of self-regulation (Nigg, 2017), is a trait-level construct demonstrating stable trajectories

across the toddler, preschool, and childhood years (Olson et al., 2005). Developmental precursors to EC emerge during the first year of life, marking early regulatory differences bridging both cognitive and affective domains (Rothbart et al., 1994; Rothbart et al., 2001). Literature examining EC as a unidimensional construct has found that EC is linked to better social adjustment, academic achievement (Iyer et al., 2010), and cognitive abilities (Tiego et al., 2019). Children with higher EC exhibit better executive attention (Rothbart et al., 2004), working memory (Engle, 2018), and behavioral regulation (Nathanson et al., 2009), as well as augmented self-esteem relating to academic self-efficacy (Liew et al., 2008). Socially, youth with enhanced EC demonstrate increased false-belief understanding (Blair & Razza, 2007) and rule-internalization (Kochanska & Kim, 2014), each of which promotes higher quality friendships (Pratscher et al., 2018), peer acceptance (Slaughter et al., 2002), and empathy across the childhood years (Fortier et al., 2018).

Deficits in childhood EC have been consistently linked to risk for psychopathology, including externalizing problems (Lengua et al., 2008; Murray & Kochanska, 2002; Snyder et al., 2015) and correlates of psychopathy (Eisenberg et al., 2007; Fowles & Dindo, 2009). For example, Murray and Kochanska (2002) demonstrated that both very high and very low EC in toddlerhood significantly predicted increased total problem behaviors in elementary school. Further, lower EC has been linked to more social withdrawal, anxiety, depression, and aggression between the ages of six and nine years (Eisenberg et al., 2009). Higher EC also reduces risk for mental health diagnoses (Nigg, 2006; Verstraeten et al., 2009) and buffers against antisocial outcomes, such as delinquency, across childhood and adolescence (Wolff et al., 2016).

Research suggests the EC may be best characterized as a multidimensional construct rather than unidimensional (Backer-Grøndahl et al., 2016; Rothbart et al., 2001). One method of assessing children's EC and its subfactors is the Children's Behavior Questionnaire (CBQ, Putnam & Rothbart, 2006), a commonly used parent report measure validated for use with children between the ages of three and seven years (Rothbart et al., 2001). Research using exploratory and confirmatory factor analyses to examine data from the CBQ has defined four distinct subfactors that contribute to overarching EC abilities (i.e., inhibitory control, low-intensity pleasure, perceptual sensitivity, attentional focusing, Rothbart et al., 2001). Inhibitory control, defined as the ability to suppress dominant responses (Rothbart et al., 2001), is closely tied to executive abilities (Morasch & Bell, 2011) and can be measured through behavioral delay-of-gratification tasks in addition to parent reports (Holochwost et al., 2018). Attentional focusing indexes sustained attention, such as maintaining engagement with a task (Kochanska et al., 2000; Rothbart et al., 2001). Perceptual sensitivity and pleasure from low-intensity stimuli (i.e., low-intensity pleasure) respectively refer to acute attention orienting and thresholds for arousal that facilitate sensation-seeking (Derryberry & Rothbart, 1988; Rothbart et al., 2001). Taken together, each of these subfactors contributes to facets of self-regulation that promote overall EC abilities.

EC subfactors exert specific influence on children's adjustment across development (Berlin & Bohlin, 2010; Gunn et al., 2009; Towe-Goodman et al., 2011). For example, children with low levels of inhibitory control and attentional focusing are more likely to be diagnosed with ADD and CP (Berlin & Bohlin, 2010; Deater-Deckard et al., 2006; Mills et al., 2018; Raaijmakers et al., 2008; Schachar et al., 1995; Towe-Goodman et al., 2011). Low attentional focusing contributes to emotion recognition deficits (Dadds et al., 2018), while reduced

perceptual sensitivity is related to lower social understanding (Wellman et al., 2011) and increased externalizing problems (Gunn et al., 2009). Although extant literature provides meaningful insight into the influences of EC subfactors on children's psychopathology, the extent to which conclusions can be drawn regarding the relative impact of EC subfactors is limited because they are rarely examined simultaneously, nor do analyses typically account for the overlap between EC and its subfactors to examine unique pathways to behavioral outcomes. This research gap limits the extent to which conclusions may be drawn regarding the mechanisms and processes through which specific subfactors of EC pose the greatest risk for maladaptation over time.

Like most psychological constructs, EC is comprised of diverse and multidimensional content that requires the inclusion of multiple items from heterogeneous domains (i.e., subfactors) to achieve content validity. A common and powerful approach to operationalizing constructs or variables that are not directly observed in a dataset, as is the case for EC, is the use of a latent variable approach in a structural equation modeling (SEM) framework (Bollen, 2002). Latent variable approaches allow for unobserved constructs (e.g., EC) to be estimated from a set of observed indicators or items (e.g., responses on a questionnaire or performance on a task), and the flexibility of the SEM framework provides researchers with the tools necessary to formulate a latent variable measurement model that reflects substantive theory and best represents or fits the observed data (Bollen, 2014). Many psychological assessments yield data that may be consistent with both unidimensional (i.e., general factor) and multidimensional (i.e., two or more subfactors) measurement models (Reise & Haviland, 2005; Rodriguez et al., 2015). In these instances, researchers can leverage existing statistical indices to gain insight into the dimensionality of a construct and guide decisions regarding the most appropriate latent factor

measurement structure for a given construct (see Rodriguez et al., 2015 and Rodriguez et al., 2016).

Four competing latent factor structural models are of interest to the current study (see **Figure 1**), each imposing varying assumptions regarding the dimensionality of EC. Model I is a standard unidimensional model where we hypothesize that the covariances among indicators is best explained by one common factor. Model II is a correlated-factor model in which we hypothesize the existence of multiple related factors. Model III is a second-order model in which we posit the existence of a hierarchical structure characterized by an overarching general factor that is solely derived from the combination of subfactors. Model IV is a bi-factor measurement model that specifies that covariances among indicators are best accounted for by a general factor representing shared variance among all of the indicators and a set of subfactors where variance over and above the general factor is shared among subsets of indicators presumed to be highly similar in content (Rodriguez et al., 2015). Although research supports the notion that EC may be best understood as a multidimensional construct (Backer-Grøndahl et al., 2016), few studies have formally tested competing latent factor structural models of EC, leaving ambiguity as to how to best conceptualize EC.

CU Traits & EC

CU traits refer to interpersonal and affective deficits across social, emotional, and behavioral domains and are characterized by impaired guilt, affective understanding, affiliative behaviors, and empathy (Frick et al., 2014; Waller & Wagner, 2019). CU traits may be reliably measured as young as three years old (Waller & Hyde, 2017), making the identification of temperamental risk for CU traits an important endeavor in service of early identification and intervention. Importantly, CU traits are often comorbid with, but remain distinct from, elevated

ADD and CP, suggesting that different factors may influence transdiagnostic risk for CU traits versus other externalizing disorders (Andrade et al., 2015; Frick et al., 2014; Salekin et al., 2018; Willoughby et al., 2011).

Although findings consistently link deficits in EC with CP and ADD, research addressing EC and CU traits is less prevalent. Evidence suggests that specific characteristics of CU traits, such as low guilt, may be related to diminished EC (Kochanska et al., 2009). Research with young adults finds that lower EC is linked to increased callousness (Meehan et al., 2013) and a high degree of concordance between CU traits and executive difficulties suggests that EC may be one aspect of temperament linked to the manifestation and maintenance of CU traits longitudinally (Ezpeleta et al., 2013). However, research examining CU traits in conjunction with EC in childhood is scarce, and the findings across studies that have examined these links are inconsistent. While some have found that preschoolers with CU traits exhibit reduced EC (Ezpeleta et al., 2013), others have reported no associations between EC and CU traits in early childhood (Waller et al., 2015).

Research on the links between EC and phenotypic correlates of CU traits in young children is more established. For example, lower EC has been correlated with reduced sympathy (Eisenberg et al., 2007), stealing, and lying in early childhood (Gusdorf et al. 2011). Additionally, reduced EC abilities are associated with lower conscientiousness (Nigg, 2006) and diminished affiliative warmth (Cain et al., 2019), each of which is characteristic of CU traits (Assary et al., 2015; Waller & Wagner, 2019). Increased EC may also be a protective factor against behavior problems for preschoolers with low guilt (Kochanska et al., 2009). Furthermore, research has shown that empathy, another important correlate of CU traits, mediates the relations between EC and social competence in early adolescence, suggesting that cognitive self-

regulation and empathic understanding dynamically influence interpersonal adjustment (Zorza et al., 2013). Taken together, it is likely that variability in EC is important for understanding risk for CU traits over time. Further, targeted examinations of the unique influence of EC subfactors on risk for CU traits may help clarify transdiagnostic correlates of externalizing behaviors that may exert specific influence on the emergence of CU traits in childhood.

Current study

The current study addressed existing gaps in the literature by examining how general EC and its specific subfactors at 36 months differentially predicted CU traits, CP, and ADD at 84 months. To establish the optimal measurement model for EC and its subfactors, the current study used a SEM framework to formally compare competing measurement models. Specifically, we compared model fit statistics from unidimensional, second-order, correlated-factor, and bi-factor models to assess which statistical approach optimally fit our EC data. Behavioral and report measures of EC were used as observed indicators in all models. In the second-order, correlated-factor, and bi-factor model, multiple latent factors representing attentional focusing, low-intensity pleasure, inhibitory control, and perceptual sensitivity were estimated based on previous literature (Backer-Grøndahl et al., 2016; Rothbart et al., 2001) and evaluations of competing models were made based on statistical indices described below. Next, we applied the best-fitting model to a multimethod longitudinal analysis of general EC and its subfactors in the prediction of covarying externalizing outcomes.

The current study addressed the following aims. First, we established the best-fitting model of EC in the current sample. We hypothesized that a bi-factor measurement model would best characterize EC and its subfactors given its multidimensional nature and the demonstrated utility of EC subfactors in previous research. Second, concurrent associations between EC

factor(s) at 36 months were examined in relation to CU traits, CP, and ADD, also assessed at 36 months. Finally, longitudinal associations were examined between EC factor(s) at 36 months and children's CU traits, CP, and ADD at 84 months. Based on previous literature (Eisenberg et al., 2007; Ezpeleta et al., 2013; Kochanska et al., 2009), we hypothesized that EC factor(s) would show negative associations with CU traits, ADD, and CP both concurrently and longitudinally. Specific hypotheses regarding links between EC subfactors and study outcomes were not made given the paucity of studies that have simultaneously examined their longitudinal influences on children's externalizing problems. However, based on studies that examined a subset of EC subfactors, we expected that attentional focusing, perceptual sensitivity, inhibitory control, and low-intensity pleasure factors would all negatively predict CU traits, ADD, and CP.

Method

Participants

A total of 206 infants (47.8% female) and their families were recruited through the *suppressed for review*, a prospective longitudinal study following infants from age three months to seven years. Inclusionary criteria at the time of recruitment included infants who were healthy and delivered at full-term with no significant complications or neurological disorders.

Participants were recruited from primarily urban communities using posted advertisements and phone contact through hospital birth records, resulting in a racially and socioeconomically diverse sample in which 56% of parents identified their child as African-American and 42.6% identified their child as European-American. Income group (i.e., above or below poverty line) was calculated based on family size and household income, resulting in approximately 51% of parents reporting low-income status below 200% of the federal poverty line.

Procedure

Families were recruited when infants were three months old to participate in home and lab visits every six months from age three months to 36 months, with follow-up visits completed in kindergarten, first grade, and second grade for a total of 10 data collection timepoints. All families were compensated \$50 at each timepoint for their participation. All questionnaires and parent-child activities were approved by the Institutional Review Board at *suppressed for review*. The current analyses use parent-reported questionnaire data collected during lab visits that occurred when participating children were 36- and 84-months-old, as well as observational data from the 36-month lab visit.

Measures

Effortful control. Effortful control was assessed at 36 months using the Children's Behavior Questionnaire Short Form (CBQ-SF) (Putnam & Rothbart, 2006), a 94-item, 15 scale parent-report measure of temperament that has been validated for children ages three to eight years. The CBQ-SF has four scales contributing to effortful control: attentional focusing (6 items, e.g., "Shows strong concentration when coloring"), inhibitory control (6 items, e.g., "Can wait to do activities when asked"), perceptual sensitivity (6 items, e.g., "Is quickly aware of a new item in a room"), and low-intensity pleasure (8 items, e.g., "Enjoys taking warm baths"). Manifest EC scores were calculated using mean scores from the attentional focusing, inhibitory control, low-intensity pleasure, and perceptual sensitivity scales. Items were rated on a 7-point Likert scale (1 = extremely untrue of your child to 7 = extremely true of your child). CBQ-SF scales were calculated in accordance with the CBQ-SF codebook and returned acceptable internal consistencies (EC, 26 items, $\alpha = .82$; attentional focusing, $\alpha = .71$; IC, $\alpha = .64$; low-intensity pleasure, $\alpha = .69$; perceptual sensitivity, $\alpha = .63$).

Observed inhibitory control. Observed inhibitory control data was collected during the 36-month lab visit using the Gift Wrap task, a validated measure of action delay used to assess children's behavioral inhibition (Kochanska et al., 2000; Wolfe & Bell, 2003). Procedures were followed in accordance with the Wrapped Gift delay task developed by Kochanska et al. (2000). Children were first instructed to face away from an experimenter while the experimenter noisily pretended to wrap a gift box on a nearby table in the lab (60 s). Once the gift was "wrapped," children were asked to sit at the table with the gift while the experimenter left the room to get a bow and were instructed not to touch the gift until the experimenter returned ("Bow phase," 180 s). Delay scores were calculated as time elapsed from the onset of the bow phase based on children's behaviors, resulting in scores reflecting latency to touch ($M = 54.07$ s, $SD = 52.86$ s), lift ($M = 79.52$ s, $SD = 51.90$ s), and open the gift ($M = 105.19$ s, $SD = 36.32$ s). Composite latency scores were calculated as an aggregate of mean latency to touch, mean latency to lift, and mean latency to open the gift ($\alpha = .79$, $M = 79.59$ s, $SD = 40.06$ s).

Callous-unemotional traits. CU traits were measured at two timepoints in the current analyses. Initial CU traits were assessed at 36 months using the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000; Achenbach et al., 2004), a 99-item, standardized, parent-reported assessment of children's emotional and behavioral problems within two months of the report date. Consistent with previous research, five items ("Not guilty after misbehaving", "Punishment does not change behavior", "Unresponsive to affection", "Shows little affection to people", "Too little fear of getting hurt") were used to index CU traits (Waller et al., 2015; Willoughby et al., 2011). Items were rated on a 3-point Likert scale (0 = not true to 2 = very true). The 36-month CU trait items showed moderate internal consistency at levels comparable to

previous literature assessing 36-month CU traits using the CBCL ($\alpha = .65$) (Waller et al., 2012; Waller et al., 2014).

84-month CU traits were assessed using the Inventory of Callous-Unemotional traits (Frick, 2004), a 24-item, parent-reported measure of affective deficits associated with psychopathy. The ICU is a frequently used measure that has been used to assess psychopathic traits in both clinical and community samples and has been validated for use in childhood, adolescence, and adulthood (Ray & Frick, 2020). Items were rated on a 4-point Likert scale (0 = not true at all to 3 = definitely true) and included items such as “Does not care who he or she hurts to get what he or she wants”, “Shows no remorse”, and “Hides his or her feelings from others.” Reliability analyses of ICU scores at 84 months showed high internal consistency in the current sample ($\alpha = .83$).

Externalizing problems. ADD and CP were assessed at 36 months using the CBCL. Consistent with previous research (Waller et al., 2015; Willoughby et al., 2011), ADD and CP at 36 months were assessed using the Attention Deficit Hyperactivity Problems and Oppositional Defiant Problems CBCL subscales, each of which were drawn from DSM-IV diagnostic classifications for ADD and Oppositional Defiant Disorder (ODD). The ADD subscale consisted of 6 items (e.g., “Can’t sit still”) and demonstrated high internal consistency ($\alpha = .83$). CP scores were calculated from the six item ODD scale (e.g., “Defiant”) and also demonstrated high internal consistency ($\alpha = .83$). Similarly, 84-month CP were assessed using the Externalizing Problems subscale of the CBCL. Externalizing problems were calculated using the average scores of the Rule-Breaking Behavior (17 items, e.g., “Lying or cheating”) and the Aggressive Behavior (18 items, e.g., “Bullying”) subscales using the CBCL codebook (Achenbach &

Rescorla, 2000). ADD at 84 months was assessed using DSM-IV diagnostic classifications according to the Attention Deficit Hyperactivity Problems subscale ($\alpha = .82$).

Covariates. Additional covariates were selected a priori to control for demographic variability and potential confounding influences on model outcomes. Demographic covariates included child sex, ethnicity, and income group (i.e., above or below federal poverty levels). To control for early externalizing problems and psychopathic traits, 36-month CU traits, ODD, and ADD scores were also included as covariates in longitudinal prediction models.

Analytic Strategy

Zero-order bivariate correlations were calculated using mean composites of report and task EC data to assess independent associations between all variables of interest prior to subsequent analytic steps. Next, bi-factor model fit was compared against unidimensional, second-order, and correlated-factor models (**Figure 1**) given conceptual and statistical relevance noted in previous research (Reise et al., 2007). All models were estimated in MPlus version 8.1 using maximum likelihood estimation (Muthén & Muthén, 2018). For all models, factor variances were fixed to a value of one, and marker indicators were freely estimated to allow for accurate variance comparisons among factor loadings. Adequacy of model fit for all models was considered in relation to Hu and Bentler (1995) value specifications, including Root Mean Square Error of Approximation (RMSEA; $<.08$), Comparative Fit Index (CFI; $>.95$), and Tucker-Lewis Index (TLI; $>.95$) guidelines.

A unidimensional model was established by estimating a general EC factor from the 27 indicators (i.e., 26 CBQ questionnaire responses and Gift Wrap latency) to assess model fit using an overarching EC factor. A correlated-factor model was estimated by specifying four factors (i.e., inhibitory control, low-intensity pleasure, attentional focusing, perceptual sensitivity) from

the 27 indicators and allowing the factors to covary, thus assessing model fit without a general EC factor while acknowledging potential overlap between subfactors. Consistent with research using the Gift Wrap task to measure inhibitory control (Carlson et al., 2004), children's Gift Wrap latency scores loaded on the inhibitory control factor in the correlated-factor model. A second-order model was assessed by estimating a latent general EC factor from the inhibitory control, low-intensity pleasure, attentional focusing, and perceptual sensitivity subfactors. Unlike the correlated-factor model, subfactors were not allowed to covary to ensure shared variance was reflected in the hierarchical general factor. To assess bi-factor model fit, a general EC factor and subfactors measuring inhibitory control, low-intensity pleasure, attentional focusing, and perceptual sensitivity were specified simultaneously to account for both common and unique variance among the observed indicators (**Figure 2**). Item factor loadings were restricted to reflect the CBQ composites. Children's Gift Wrap latency scores loaded on the EC general factor and the inhibitory control subfactor. After assessing initial bi-factor model fit in relation to unidimensional, second-order, and correlated-factor models, bi-factor model adjustments were made based on modification indices and theory.

To formally examine the multidimensionality of the EC construct, we computed bi-factor reliability statistics. Reliability statistics were assessed in Mplus version 8.1 and evaluated in accordance with statistical measurement specifications (see Rodriguez et al., 2016 for a review). First, we assessed general and specific explained common variance (ECV; IECV). General ECV provides insight into the dimensionality of a construct by indicating the proportion of common variance across items explained by the general factor. Values greater than 0.85 suggest a unidimensional measurement approach, while values less than 0.70 suggest multidimensionality. Analyses of individual explained common variance (IECV) measure how strongly individual

indicators measure the general factor. IECV values above 0.5 suggest that an indicator is more reflective of the general factor than a given subfactor, with a value of 1.0 suggesting that an indicator is entirely reflective of the general factor rather than a given subfactor.

Also important to understanding the dimensionality of a construct is the percentage of uncontaminated correlations (PUC), a value that provides insight into the percent of observed correlations that are influenced by only a single latent variable. Previous literature suggests that a PUC greater than 0.80 suggests a unidimensional construct, while a PUC less than 0.80 indicates that model subfactors may be important to consider for adequate model fit (Reise et al., 2013). Finally, both general and specific subfactor percentage of reliable variance (PRV) values were calculated to assess factor reliability while accounting for measurement error. PRV values provide insight into how much of the reliable variance in a total score or subfactor score is due to the general factor or subfactor, respectively. As such, a general factor PRV value greater than 0.75 indicates that the majority of reliable variance in the total score is attributable to the general factor (i.e., a unidimensional model best fits the data), whereas a PRV value less than 0.50 suggests that specific subfactors have utility in explaining reliable variance. PRV values between 0.50 and 0.75 may support the use of a model that includes both general and specific factors. In contrast, specific subfactor PRV values greater than 0.75 suggests that subfactors may be more reliable for assessing model fit, whereas specific subfactor PRV values less than 0.50 indicate that the subfactor may actually be reflecting the general factor variance. Specific descriptions of these reliability statistics are included in the supplemental materials.

After establishing the most appropriate factor model and confirming EC multidimensionality, the utility of a bi-factor measurement approach to EC was applied in the prediction of externalizing outcomes. Concurrent associations between general and specific EC

factors and externalizing psychopathologies were first assessed by analyzing latent covariances between 36-month CU traits, CP, and ADD and general EC, inhibitory control, attentional focusing, perceptual sensitivity, and low-intensity pleasure factors at 36 months, thereby offering descriptive insights into the conditioned associations between variables. Associations between general and specific effortful control factors at 36 months and children's CP, ADD, and CU traits at 84 months were then assessed using structural equation models within the bi-factor framework. Predictive relations were assessed by regressing 84-month CU traits, CP, and ADD onto general EC, specific inhibitory control, specific attentional focusing, specific perceptual sensitivity, and specific low-intensity pleasure factors in order to isolate the variance uniquely explained by each latent predictor in study outcomes. Covariates in the 84-month outcome model included sex, ethnicity, and income group, as well as 36-month CU traits, CP, and ADD to control for the influence of earlier symptoms on model outcomes. Covariances between study outcomes at 84 months were retained in all models. Although children's EC and early measures of externalizing problems were both assessed at 36 months, post-hoc mediation analyses were conducted to examine 36-month externalizing problems as mediators of the links between EC and its subfactors and 84-month outcomes, thereby testing if the stability of children's externalizing problems may have impacted the longitudinal prediction models.

Results

Descriptive Statistics. Zero-order correlations using manifest variables (see **Table 1**) revealed that 36-month CU traits were negatively correlated with EC, attentional focusing, inhibitory control, low-intensity pleasure, perceptual sensitivity, and Gift Wrap latency, but positively correlated with 36-month CP, 36-month ADD, and all 84-month outcomes. Similar trends were found in 36-month CP and ADD, with both showing significant negative correlations

with EC, attentional focusing, and inhibitory control. However, 36-month CP was negatively correlated with low-intensity pleasure and perceptual sensitivity, while 36-month ADD was not. General EC, EC subscales, and Gift Wrap latency were all positively correlated with one another and negatively correlated with 84-month CP and ADD. All CBQ-SF scales were negatively correlated with 84-month CU traits, but Gift Wrap latency was not. All 84-month outcomes were positively correlated with each other.

Measurement models.

Model comparisons. Table 2 displays model fit statistics across unidimensional, second-order, correlated-factor, and bi-factor models. Model comparisons were assessed using fit statistics in accordance with previous literature (Hu & Bentler, 1995). Results indicated poor unidimensional model fit ($\chi^2 (324) = 846.04, p < .001, CFI = .48, TLI = .43, RMSEA = .095$) and correlated-factor model fit ($\chi^2 (318) = 694.575, p < .001, CFI = .62, TLI = .58, RMSEA = .081$). The second-order model also demonstrated poor fit ($\chi^2 (321) = 705.715, p < .001, CFI = .62, TLI = .58, RMSEA = .082$), indicating that a second-order model did not adequately represent our EC data. Initial bi-factor model fit was good ($\chi^2 (297) = 512.25, p < .001, CFI = .78, TLI = .75, RMSEA = .063$), with better model fit than the unidimensional, second-order, and correlated-factor models and the majority of items loading highly on the general EC factor.

Bi-factor measurement model. The bi-factor model was retained and fit was improved guided by modification indices. Specific modification indices prompted the inclusion of cross-loadings between item 53 (reverse coded; “Has trouble sitting still”) and item 67 (“Is good at following instructions”) onto attentional focusing and inhibitory control factors (Table S2). Further, modification indices suggested the addition of a residual covariance between item 86 (“Enjoys sitting on parent’s lap”) and item 39 (“Enjoys snuggling up next to a parent or

babysitter”) due to their thematic similarities. Additional changes based on modification indices did not significantly improve the model and were not consistent with theory. The final model exhibited good fit (Figure 2. $\chi^2 (294) = 442.92, p < .001$, CFI = .85, TLI = .82, RMSEA = .053). Initial bi-factor factor loadings are provided in **Table S1**. Adjusted factor loadings for the final bi-factor model are provided in **Table S2**.

EC dimensionality. Initial bi-factor reliability statistics (see **Table 3**) showed that only 39.6% of the variance in CBQ-SF EC items and observed Gift Wrap latency scores was explained by a general EC factor (ECV = .396), supporting a bi-factor modeling approach. Additional reliability statistics are provided in **Table S3** and **Table S4**. Analyses of individual explained common variance also indicated that 48.1% of items measured the general EC factor more strongly than their subfactors (IECV > .50), while 51.8% measured their specific subfactors more strongly than the general EC factor (**Table S3**) supporting multidimensionality and the use of a bi-factor model. The percentage of uncontaminated correlations supported the inclusion of a general EC factor (PUC = .77) although failed to reach the .80 threshold expected of solely unidimensional constructs. Total score percentage of reliable variance (PRV) statistics showed that 77.1% of the total score reliable variance was due to the general EC factor (**Table S4**). However, subscale PRV statistics showed that each subscale was a reliable measures of its construct above and beyond general EC ($PRV_{\text{Attentional Focusing}} = .49$, $PRV_{\text{Inhibitory Control}} = .603$, $PRV_{\text{Low-Intensity Pleasure}} = .678$, $PRV_{\text{Perceptual Sensitivity}} = .678$). Collectively, these statistics support the use of a bi-factor model to characterize the multidimensional nature of EC and its subfactors.

Concurrent Associations. Standardized latent covariances were examined using the final bi-factor model to assess the associations between the general EC factor and subfactors with CP, CU traits, and ADD at 36 months. Analyses revealed significant negative correlations between

the general EC factor and concurrent ADD, $\psi = -0.25, p = .025$, CP, $\psi = -.24, p = 0.040$, and CU traits, $\psi = -0.32, p = .004$. Similarly, the specific attentional focusing factor demonstrated negative correlations with concurrent ADD, $\psi = -0.49, p < .001$, CP, $\psi = -0.30, p = .002$, and CU traits, $\psi = -0.31, p < .001$, as did the specific inhibitory control factor ($\psi = -0.31, p = .003$; $\psi = -0.54, p < .001$; $\psi = -0.42, p < .001$ respectively). Neither the specific low-intensity pleasure factor, nor the specific perceptual sensitivity factor was significantly correlated with any concurrent behavioral outcome.

Longitudinal Predictive Associations. The 84-month covarying outcomes were regressed onto the bi-factor EC measurement model and study covariates, including 36-month externalizing problems, within a structural equation modeling framework (**Table 4**). Results revealed a significant main effect of the general EC factor on 84-month CU traits ($B = -0.12, \beta = -0.36, p = .002$) and ADD ($B = -0.52, \beta = -0.19, p = .044$), but not 84-month CP ($B = -1.08, \beta = -0.17, p = .193$). Further, results revealed a significant main effect of the attentional focusing factor on 84-month CU traits ($B = -0.11, \beta = -0.34, p = .002$). No significant associations were found between the specific attentional focusing factor and 84-month CP ($B = -0.79, \beta = -0.12, p = .289$) nor ADD ($B = -0.14, \beta = -0.05, p = .619$). Additionally, no significant associations were found between the specific inhibitory control, perceptual sensitivity, and low-intensity pleasure subfactors and 84-month outcomes. Model fit remained sufficient even with the inclusion of longitudinal outcomes ($\chi^2(492) = 841.549, p < .001$, CFI = .77, TLI = .71, RMSEA = .059).¹

¹ Post-hoc mediation analyses were conducted to test whether EC and its subfactors influenced 84-month outcomes via their influence on earlier externalizing problems. Results revealed significant indirect effects, such that 36-month ADD mediated the links between the specific attentional focusing factor and 84-month ADD ($B = -.317, \beta = -.117, p = .014$). Moreover, the indirect effects of inhibitory control factor and the general EC factor on 84-month ADD via 36-month ADD approached significance ($B = -.208, \beta = -.077, p = .062$; $B = -.153, \beta = -.057, p = .091$ respectively). No other mediated pathways were observed.

Discussion

The current study assessed concurrent and longitudinal relations between general EC and subfactors of EC and children's externalizing problems using a bi-factor structural equation modeling approach. Our results supported the utility of bi-factor modeling in analyses of childhood EC, and suggested that a bi-factor model of EC reflecting a general EC factor and specific attentional focusing, inhibitory control, perceptual sensitivity, and low-intensity pleasure factors offered stronger model fit than second-order, correlated-factor, and unidimensional models. Further, our results supported the application of EC bi-factor modeling in examinations of concurrent and longitudinal risk for externalizing problems. We found that the general EC factor, the specific attentional focusing factor, and the specific inhibitory control factor at 36 months were negatively associated with 36-month CU traits, ADD, and CP, such that increased general EC, attentional focusing, and inhibitory control were associated with reduced externalizing problems. Our results also indicated that the general EC factor and the specific attentional focusing factor negatively predicted CU traits at 84 months, but only the general EC factor was associated with lower ADD at 84 months. No subfactor of EC, nor the general EC factor, was significantly associated with 84-month CP above and beyond 36-month externalizing problems.

Our results extended research in adolescence (Snyder et al., 2015) using a bi-factor approach to examine adolescent EC to predict risk for psychopathology by applying similar models to early childhood. Our comparison of different measurement models offered evidence that childhood EC was best conceptualized as a multidimensional construct. These findings suggested that both the general EC factor and its specific subfactors captured meaningful and distinct variability and, thus, were necessary to adequately represent EC in early childhood. The

present study serves as a foundation for future research aiming to characterize the multidimensionality of EC as a construct. This line of inquiry has the potential to advance not only our understanding of children's EC and its subfactors, but whether and how they exert differential influence across development.

Consistent with previous literature (Rothbart & Rueda, 2005), findings from the bi-factor model suggested that general EC may be a measure of temperamental attributes best represented by the optimal linear combination of items assessing inhibitory control, low-intensity pleasure, perceptual sensitivity, and attentional focusing. Indeed, many items included in the bi-factor model loaded significantly onto the general EC factor, some of which did not load significantly onto subfactors above and beyond their relation to the general EC factor (see **Table S2** for a full list of factor loadings). Results suggested that EC was a unique construct that was conceptually overlapping but distinct from the EC subfactors.

Additionally, our measurement model results suggested that the EC subfactors were best characterized as related but distinct constructs that retained meaningful variance above and beyond the general EC factor. For example, four items loaded significantly onto the low-intensity pleasure subfactor above and beyond general EC. The three low-intensity pleasure items with the strongest factor loadings specifically related to children's experiences with parents (i.e. "Likes being sung to", "Likes the sound of words", "Enjoys sitting parents' lap") while items including "Enjoys gentle rhythmic activities" and "Enjoys looking at picture books" did not meaningfully contribute to this subfactor above and beyond their relations with the general EC factor. Examinations of the items that contributed to the attentional focusing subfactor captured aspects of children's distractibility (i.e., "Is easily distracted when listening to a story") as opposed to the items that did not contribute to this subfactor above and beyond the general EC

factor, which focused more on task immersion or concentration (i.e., “Shows concentration”, “Sometimes becomes absorbed in a picture book”). The items that contributed to the specific inhibitory control subfactor captured behaviors relating to following and adhering to instructions, whereas the item asking about planning behaviors only loaded onto the general EC factor. Interestingly, Gift Wrap latency loaded significantly onto both the EC factor and the inhibitory control subfactor. The perceptual sensitivity subfactor was comprised of three items, two of which were social (i.e. “Notices it when parents are wearing new clothing”, “Comments when a parent has changed his/her appearance”), and one of which was not (“Is quickly aware of some new item in the living room”). These findings suggest granularity in EC subfactors that offers additional support for studying EC as a multidimensional construct.

Theoretical and empirical research supports the notion that increased specificity in definitions and measurement of children’s self-regulation, including EC, may provide insight into childhood (mal)adjustment (Nigg, 2017). Indeed, previous research has shown that specific aspects of inhibitory control, such as prepotent response inhibition, rather than one composite score, are associated with increased symptoms of ADD, but not CP, in preschoolers (Brocki et al., 2007). Similarly, aspects of attentional abilities, such as focused attention, are associated with ADD in adults while sustained attention is not, which is important for understanding the development and manifestation of ADD symptomology (Marchetta et al., 2008). Although additional research is needed to examine unique characteristics of subfactors of EC beyond the influence of general EC abilities, our results provide preliminary evidence that these subfactors may require a finer-lensed approach to understand the nuances supporting them.

Tests of the concurrent and longitudinal associations between childhood EC and externalizing outcomes suggested that diminished EC, inhibitory control, and attentional

focusing were associated with higher CU traits, ADD, and CP at 36 months, and that reduced EC at 36 months predicted higher ADD and CU traits at 84 months. Further, our results provided evidence that deficits in attentional focusing at 36 months may have conferred specific risk for later CU traits above and beyond other subfactors of EC. Our utilization of bi-factor structural equation models addressed the potential for confounding overlap between temperamental factors to establish clear associations between EC subfactors, ADD, CP, and CU traits, thereby advancing our understanding of EC and risk for externalizing psychopathologies across childhood.

Our results indicated that higher EC at 36 months predicted reduced CU traits and ADD longitudinally, accounting for earlier externalizing problems as well as the relations between outcomes at 84 months. Observed links between children's EC and later ADD were consistent with a broad literature characterizing the long-term implications of early regulatory difficulties (Eisenberg et al., 2004). Moreover, although inconsistencies regarding the relations between EC and CU traits exist in the literature, the current findings provide additional support for a growing number of studies that demonstrate predictive associations between children's EC and CU traits (Ezpeleta et al., 2013; Waller et al., 2015) including research linking enhanced EC with reduced CU traits in preschool (Ezpeleta et al., 2013) and phenotypic correlates of CU traits across childhood (Cain et al., 2019; Eisenberg et al., 2007; Gusdorf et al. 2011; Kochanska et al., 2009). The bi-factor modeling approach produced a multiply-informed, broad latent construct capturing many aspects of children's EC. The current findings are consistent in demonstrating the importance of this aspect of self-regulation for risk for future externalizing psychopathology.

Our results also indicated significant relations between attentional focusing and CU traits, such that enhanced attentional focusing at 36 months predicted lower CU traits at 84 months,

above and beyond general EC, other EC subfactors, and included covariates. Attentional focusing is important for children's social understanding and information processing, both of which are impaired for individuals with CU traits (Dadds et al., 2011; Martin-Key et al., 2021; Peltola et al., 2018). These findings are consistent with research linking psychopathy with reduced attentional abilities (Sadeh & Verona, 2008; Zeier et al., 2009) but are the first to demonstrate links between early attentional focusing and later CU traits in childhood above and beyond the influence of general EC. Examinations of the items contributing to the attentional focusing subfactor above and beyond the EC factor revealed an emphasis on aspects of children's distractibility rather than task immersion or concentration. Important to the construct of CU traits, and the "with limited prosocial emotions" specifier for conduct disorder in the DSM-5 (American Psychiatric Association, 2013) is a lack of concern about performance in important activities (Allen et al., 2018). The modeling approach used in the current study may isolate aspects of attentional focusing that parents may associate with a lack of concern or caring for important activities, thus contributing to the observed association between attentional focusing and CU traits.

Despite significant negative correlations between general EC, inhibitory control, and attentional focusing and ADD and CP at 36 months, our longitudinal prediction models showed no significant associations between 36-month attentional focusing and inhibitory control in the prediction of 84-month CP and ADD, nor 36-month general EC and 84-month CP. These findings contradicted our hypotheses and existing literature demonstrating negative associations between EC and CP (Atherton et al., 2020; Eisenberg et al., 2009) and attentional focusing and ADD (Mills et al., 2018). Further, existing literature has linked childhood inhibitory control to

both ADD and CP longitudinally (Brocki et al., 2007), which was not reflected in our results. There are multiple potential explanations for this pattern of findings.

First, it is possible that the characteristics of the EC subfactors most often linked with ADD and CP, including attentional focusing and inhibitory control, were no longer adequately represented in the latent subfactors after accounting for the shared variance with EC. For example, items such as “Approaches places s/he has been told are dangerous slowly and cautiously” and “Is good at following instructions” loaded more strongly on the EC latent factor than on their respective subfactors. The current findings provide evidence toward refining understandings of the specific aspects of EC that confer risk for ADD and CP, as well as the potential contexts in which these links may be particularly influential. This possibility is consistent with previous research noting that subfactors of EC, when examined independently, may differentially predict behavioral outcomes (Gunn et al., 2009; Mills et al., 2018; Rothbart et al., 2001).

Second, there is notable stability in children’s externalizing problems (Kjeldsen et al., 2021), including CP (López-Romero et al., 2015) and ADD (August et al., 1998), and it is possible that this stability (i.e., strong autoregressive associations) may have contributed to the lack of significant links between EC, its subfactors, and 84-month outcomes (Atherton et al., 2018; Barkley, 2016). Indeed, post-hoc analyses showed that 36-month ADD mediated the links between the specific attentional focusing factor and 84-month ADD, suggesting that early deficits in attentional focusing may contribute to early ADD behaviors which persist across childhood. The mediating influences of early ADD on the links between inhibitory control and EC on later ADD also approached significance. Although no other mediated links were observed, it is possible that the strong associations between CU traits, ADD, and children’s CP

limited the extent to which specific predictive associations between EC and its subfactors and later CP could be observed. The current findings could be clarified and extended by future studies which assess aspects of children's EC and externalizing problems multiple times across a wider developmental period.

The current study had a number of strengths. Our use of bi-factor modeling allowed for targeted examinations of general EC and its subfactors, thereby addressing multidimensional components of EC. The current study also benefitted from the use of longitudinal data from a diverse, community sample, which increased the generalizability of our results. Despite these strengths, our results should be interpreted in the context of a number of limitations. First, although an observational measure of children's inhibitory control was included in the EC measurement model, the current study relied heavily on maternal report. However, this is not uncommon given parent-report measures of EC are well-validated, frequently used, and were consistent with our behavioral observations. The current analyses also controlled for earlier reports of CP, ADD, and CU traits in all longitudinal models, which helped address reporter bias. Second, the use of a community sample does not generalize to clinical populations. Future research should examine the role of EC in differentiating risk for externalizing problems among higher risk samples. That is, the current findings should serve as a basis for understanding the relations between EC and varying externalizing outcomes that can then be extended to targeted populations moving forward.

Despite these limitations, the current findings identify EC and its subfactors as potential targets for early interventions. Interventions targeting CU traits have historically focused on emotion recognition, cognitive behavioral therapy, social skills, and parenting strategies; however, broader aspects of children's EC, as well as attention regulation outside of emotional

contexts, have not received as much attention (Wilkinson et al., 2016). The current findings suggest that early deficits in EC and attentional focusing may confer risk for later CU traits. Further, interventions targeting regulatory strategies and externalizing problems more generally may benefit from extending into cognitive domains, establishing top-down regulatory practices that draw upon aspects of EC to facilitate positive adjustment across development.

Conclusion

The current study is the first to offer evidence of the longitudinal relations between EC, CU traits, and externalizing outcomes throughout early childhood using a bi-factor modeling approach. Our results highlight important theoretical and methodological implications that should inform future research focused on understanding specificity in the predictive links between regulation, cognition, and risk for emotional and behavioral problems. Taken together, our data provide novel insights into temperamental attributes underlying differential risk for externalizing psychopathology and maladjustment, offering practical evidence supporting the multidimensional mechanisms underlying developmental trajectories of risk in young children.

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Figure 1. Latent variable models

I. Unidimensional Model

II. Correlated Factors Model

III. Second-Order Model

IV. Bi-factor Model

Figure 2. Hypothesized bi-factor model specifying items to load onto specific low-intensity pleasure, attentional focusing, inhibitory control, and perceptual sensitivity factors while simultaneously loading onto an overarching general “effortful control” factor.

Note. Model fit statistics indicated good model fit ($\chi^2(273) = 473.89, p < .001, CFI = .79, TLI = .75, RMSEA = .064$). Item-factor loadings are presented in **Table S1**. Based on the results of the preliminary bi-factor model, cross-loadings and residual covariances were added to the model, resulting in adjusted estimates reported in the **Table S2**.

Table 1. Zero-order bivariate correlations between study manifest variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Sex (Male = 1)	-														
2. Race (EA = 0, AA = 1)	-0.08	-													
3. Poverty Status	-0.01	0.19**	-												
4. CU Traits (36m)	-0.12	0.04	-0.20**	-											
5. ODD (36m)	-0.16*	0.08	-0.02	0.66**	-										
6. ADD (36m)	-0.12	-0.04	-0.17*	0.66**	0.66**	-									
7. CBQ Effortful Control	0.28**	0.03	0.09	-0.49**	-0.50**	-0.46**	-								
8. CBQ Attentional Focusing	0.17*	0.09	0.16*	-0.41**	-0.37**	-0.49**	0.77**	-							
9. CBQ Inhibitory Control	0.20**	0.10	0.11	-0.50**	-0.52**	-0.48**	0.77**	0.51**	-						
10. CBQ Low-intensity Pleasure	0.20**	-0.06	0.03	-0.16*	-0.17*	-0.12	0.63**	0.36**	0.26**	-					
11. CBQ Perceptual Sensitivity	0.23**	0.00	0.03	-0.21**	-0.23**	-0.11	0.68**	0.28**	0.39**	0.26**	-				
12. Gift Wrap Latency (Observed)	0.22**	0.26**	0.43**	-0.19*	-0.11	-0.15	0.29**	0.21**	0.30**	0.16*	0.17*	-			
13. CU traits (84m)	-0.05	0.01	-0.06	0.34**	0.27**	0.21*	-0.34**	-0.33**	-0.37**	-0.17	-0.13	-0.17	-		
14. Externalizing (84m)	-0.01	0.00	-0.25**	0.47**	0.40**	0.51**	-0.41**	-0.38**	-0.41**	-0.13	-0.13	-0.23*	0.37**	-	
15. ADD (84m)	-0.13	-0.11	-0.31**	0.46**	0.36**	0.58**	-0.43**	-0.44**	-0.42**	-0.16	-0.11	-0.27**	0.29**	0.84**	-
<i>N</i>	206	206	206	178	178	178	168	174	166	177	165	164	122	122	122
Mean	0.49	.43	0.49	0.24	0.51	0.66	5.27	4.78	4.48	6.17	5.26	79.59	0.70	6.95	3.01
Standard Deviation	0.50	0.50	0.50	0.31	0.43	0.47	0.57	0.95	0.89	0.55	0.92	40.06	0.33	6.40	2.78

Note: $p \leq .05^*$, $p \leq .01^{**}$; AA = African American, EA = European American

Table 2. Model fit comparisons

MODEL	DF	χ^2	RMSEA	CFI	TLI
Unidimensional	324	846.043	.095	.477	.433
Correlated factors	318	694.575	.081	.623	.584
Second-order	321	705.715	.082	.615	.579
Bi-factor	297	512.254	.063	.784	.745

Table 3. Bi-factor Reliability Statistics

Explained Common Variance (ECV)	0.396
Individual Explained Common Variance (IECV)	See Table S3
PUC	0.770
PRV – General Factor	0.771
Specific Attentional Focusing	0.490
Specific Inhibitory Control	0.603
Specific Low-Intensity Pleasure	0.678
Specific Perceptual Sensitivity	0.678

Table 4. Associations between general and specific effortful control factors and covariates on 84-month outcomes

Bi-factor Model Outcomes															
	CU					CP					ADD				
Longitudinal Prediction	B	SE	β	p	CI (95%)	B	SE	β	p	CI (95%)	B	SE	β	p	CI (95%)
Covariates															
Sex	.04	.06	.06	.517	(-.06, .14)	.81	1.68	.06	.635	(-1.95, 3.57)	-.56	.50	-.10	.259	(-1.38, .27)
Ethnicity	.06	.07	.09	.445	(-.07, .18)	1.92	.98	.15	.056	(.31, 3.54)	.33	.43	.06	.440	(-.37, 1.03)
Income	.01	.06	.02	.814	(-.09, .12)	-1.95	1.35	-.15	.135	(-4.17, .28)	-1.29	.66	-.23	.048	(-2.38, -.21)
ADD (36mo)	-.19	.10	-.28	.045	(-.36, -.03)	3.99	1.83	.29	.040	(.98, 7.01)	2.88	.72	.48	<.001	(1.69, 4.07)
ODD (36mo)	.00	.12	.00	1.00	(-.20, .20)	-1.26	1.80	-.08	.479	(-4.22, 1.70)	-.97	.75	-.15	.191	(-2.22, .27)
CU (36mo)	.25	.15	.23	.082	(.00, .50)	3.22	2.93	.15	.254	(-1.60, 8.03)	.32	1.10	.04	.773	(-1.50, 2.13)
Main effects															
Low-intensity Pleasure	.01	.06	.03	.869	(-.09, .11)	.79	1.88	.12	.674	(-2.31, 3.88)	.39	.48	.14	.412	(-.40, 1.18)
Perceptual Sensitivity	.03	.03	.08	.427	(-.03, .08)	-.81	.73	-.13	.266	(-2.01, .40)	.04	.30	.01	.895	(-.45, .53)
Effortful Control	-.12	.04	-.36	.002	(-.18, -.06)	-1.08	.86	-.17	.193	(-2.49, .34)	-.52	.27	-.19	.044	(-.97, -.08)
Attentional Focusing	-.11	.04	-.34	.002	(-.17, -.05)	-.79	.73	-.12	.289	(-1.99, .42)	-.14	.28	-.05	.619	(-.60, .32)
Inhibitory Control	-.08	.07	-.24	.231	(-.19, .03)	-1.08	1.31	-.17	.412	(-3.23, 1.07)	-.38	.42	-.14	.375	(-1.07, .32)

Note. **Bold text** indicates significant pathways in the regression model.