Published in final edited form as:
J Abnorm Child Psychol. 2013 January ; 41(1): 57–69. doi:10.1007/s10802-012-9665-0.

Individual differences in the development of self-regulation during pre-adolescence: Connections to context and adjustment

Kevin M. King,
University of Washington

Liliana J. Lengua, and
University of Washington

Kathryn C. Monahan
University of Pittsburgh

Abstract

Difficulties with self-regulation are implicated in the development of emotional and behavioral problems during adolescence. Although children's ability to regulate their behaviors continues to improve throughout childhood and adolescence, it remains unclear how contextual risk factors might influence this development during the transition to adolescence, or how variation in the development of self-regulation predicts adjustment. Using a community sample of 214 8–12 year-olds (T1 M=9.5, SD=1.01), we examined growth trajectories of effortful control and impulsivity over three years and tested predictors and outcomes of these trajectories. Although predictors of initial levels of self-regulation were largely equivalent for both effortful control and impulsivity, contextual risk factors were related to variations in the development of impulsivity but not effortful control. However, increases in effortful control, but not impulsivity, were associated with level and rate of change in adjustment problems and positive adjustment, suggesting that different dimensions of self-regulation have different antecedents and outcomes in pre-adolescence and adolescence.

Keywords

effortful control; impulsivity; self-regulation; growth curve modeling; adjustment

Individual differences in the development of self-regulation during pre-adolescence: Connections to context and adjustment The development of self-regulation is key to successful adaptation in childhood and adolescence. Self-regulation has been defined as "processes that serve to modulate reactivity, influence fearful inhibition, surgent or extraverted approach, and the effortful control of behavior (Rothbart, Ellis & Posner, 2004, p.358). Self-regulation is a facet of temperament, and as such is thought to be biologically based and stable, emerge across development, and to be malleable and susceptible to environmental influences (Rothbart, Ahadi & Evans, 2000). Moreover, poor self-regulation is associated with greater social and behavioral problems in childhood (e.g., Eisenberg, Fabes, Karbon, & Murphy 1996; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Rubin, Coplan, Fox & Calkins, 1995). Also, difficulties with self-regulation underlie the emergence of a range of developmental outcomes during adolescence, including externalizing problems, internalizing problems, alcohol and substance use problems, low

Correspondence concerning this article should be addressed to Kevin M. King, Department of Psychology, University of Washington, Box 351525, Seattle WA 98195-1525, kingkm@uw.edu.

empathy, and problems with social and academic competence (e.g., Eisenberg et al., 2003; Krueger et al., 2002; Mischel, Shoda, & Peake, 1988).

While it has long been known capacity for self-regulation develops across childhood, recent investigations have found that self-regulatory capacity continues to develop at the behavioral (Steinberg et at., 2008; Monahan et al., 2009) and neurobiological levels (Luna et al., 2004; Dahl 2004) well into adolescence. Importantly, youth who develop self-regulation more slowly across adolescence appear to be at hieightened risk for externalizing problems (Monahan et al., 2009; King, Fleming, Monahan & Catalano, 2011). Yet little is known about the developmental pattern of self-regulation from late childhood to adolescence nor how variation in the development of self-control is linked to contextual factors or psychological adjustment during this developmental period.

Although it is one of the most broadly studied constructs in psychology, the definition and measurement of self-regulation varies widely across studies (Rothbart, Ellis & Posner, 2004). For example, the terms self-regulation, impulsivity and effortful control have often been used interchangeably among child researchers, and indicators of those constructs tend to be moderately to highly correlated (e.g., Eisenberg et al., 2003; Rothbart et al., 2001). For the current study, we utilized key aspects of Rothbart's definition of self-regulation: effortful control and surgent or extraverted approach (referred to as impulsivity; Rothbart, Ahadi, Hershey, & Fisher, 2001). Effortful control is a core aspect of self-regulation and refers to executive attention regulation and inhibitory control, both mechanisms that facilitate the inhibition of a dominant response for a preferred or correct non-dominant response (Rothbart, Ahadi, & Evans, 2000). Impulsivity refers to speed of response initiation, particularly in approach-motivated contexts, and relates to exuberance or surgency (Rothbart et al., 2001). Thus, effortful control intends to tap the cognitive, executive-based components of self-regulation, and impulsivity intends to tap the approach, motivational components of self-regulation.

One of the greatest limitations of the current literature on self-regulation is that the majority of studies of the predictors and outcomes of effortful control and impulsivity treat these constructs as inert, trait-like constructs, often measured at a single time point. Yet, self-regulatory capacity increases across most developmental periods of childhood (Carlson, 2005; Kochanska et al., 1996; Reed, Pien, & Rothbart, 1984) and adolescence (Blonigen et al., 2009; Roberts, Caspi, & Moffitt, 2001; Monahan et al., 2009; Steinberg et al., 2008). Moreover, in spite of the research on average developmental changes, even less is known about whether all children follow the average trend, or whether some children improve in self-regulation more or less rapidly than average. This is because few studies have explicitly modeled inter-individual variation in *both* levels and change over time in self-regulation (c.f. Monahan et al., 2009; Monahan, Steinberg, Cauffman, & Mulvey, in press) and no studies have modeled variation in the development of self-regulation during pre-adolescence. On the other hand, recent studies have demonstrated individual differences in the rate of self-regulation development during adolescence (King, et al., 2011; Monahan et al., 2009; Monahan, et al., in press) and young adulthood (e.g. Blonigen et al., 2009, Monahan et al., in press). Indeed, from these studies it appears that there is *rank order shuffling* in self-regulation. As growth in self-regulation during pre-adolescence may improve children's ability to navigate the challenges and stressors in their increasingly broadening and decreasingly supervised contexts that mark the transition to adolescence, the first goal of the current study was to assess the rate of change and degree of individual variability in the development of self-regulation during pre-adolescence.

Outcomes of growth in effortful control and impulsivity during pre-adolescence

Prior research has demonstrated that individual differences in *levels* of self-regulation were related to both adaptive and maladaptive adjustment. Higher levels of effortful control have been connected to higher levels of children's social competence, and lower internalizing and externalizing problems (e.g., Kochanska et al., 1996; Olson, Sameroff, Kerr, Lopez & Wellman, 2005) and have been shown to predict children's adjustment problems above the effects of psychosocial risk factors (Gartstein & Fagot, 2003; Lengua, 2002; Olson et al., 2005). Similarly, impulsivity is a risk factor for social and externalizing problems, as well as alcohol and drug use and problems (e.g., Colder & O'Conner, 2004; Eisenberg, Cumberland et al., 2001; King & Chassin, 2004; Sher & Trull, 1994). In addition, multiple studies of adolescent and young adult substance abuse and delinquency have demonstrated that variability in the rate of the development of self-regulation explains additional variance in maladaptive adjustment, above and beyond variability explained by adolescents' level of self-regulation at a given time point (King et al., 2011; Monahan et al., 2009; Monahan et al., in press).

It may also be, then, that individual differences in the development of self-regulation during pre-adolescence predict positive or negative adaptation, over and above the influence of the level of self-regulation. However, no research that we are aware of has examined the consequences of variation in the development of self-regulation on positive developmental outcomes, such as social competence or well-being, and no research among pre-adolescents has examined the impact of this variability on negative outcomes, such as internalizing or externalizing adjustment. Thus the second goal of the current study was to test whether individual variability in the development of self-regulation was related to adaptive or maladaptive adjustment during pre-adolescence.

Contextual influences on the development of self-regulation

Understanding the effects of the social context on children's self-regulation is key to identifying potential mechanisms or points of entry for prevention/intervention efforts (Raver, 2004). Lengua (2011) articulated a model in which economic disadvantage is expected to impact children's developing self-regulation through factors proximal to the child, including family adversity and parenting. In fact, economic disadvantage shows consistent associations with lower self-regulation (e.g. Evans & English, 2002; Hughes, Ensor, Wilson & Graham, 2010; Lengua, 2002; Lengua, Honorado & Bush, 20076; Li Grining, 2007; Mezzacappa, 2004).

Perhaps the strongest evidence of the role of environmental factors shaping self-regulatory abilities prior to adolescence comes from the literature on parenting practices. Maternal warmth, sensitivity, responsiveness, and scaffolding predicted increases in effortful control (e.g. Colman, Hardy, Albert, Raffaelli & Crocket, 2006; Lengua, Honorado & Bush, 2006; Olson, Bates & Bayles, 1990). Also, clear, consistent limit setting and non-punitive discipline predicted increases in effortful control (e.g., Karreman, van Tuijl, van Aken & Dekovic, 2008a; Lengua et al., 2006; Olson et al., 1990), whereas, power assertion, coercion, and punitive discipline were related to lower levels of effortful control (Colman et al., 2006; Karreman, et al., 2008a; Kochanska, Askan, Prisco & Adams, 2008). However, the evidence for the role of parenting in the development of effortful control in older children is less consistent. In a longitudinal study that examined parenting and effortful control in children transitioning from middle-childhood to adolescence, parental warmth and positive expressivity predicted increases in children's effortful control in the earlier time points, but not at later time points (Eisenberg, Zhou et al., 2005), a finding consistent with

evidence that parenting did not predict changes in effortful control in early adolescents (Lengua & Kovacs, 2005; Lengua, 2006).

Although relatively few studies have examined the relation of parenting to the development of impulsivity, those that have consistently show that parenting behaviors are related impulsivity, although there are exceptions (Calkins, Smith, Gill & Johnson, 1998). Power-based control efforts, including strictness and intrusiveness, were related to lower ability to delay or greater impulsivity (Houck & Lecyer-Maus, 2004; Mauro & Harris, 2000; Silverman & Ragusa, 1990), whereas encouragement of independence was related to better delay performance (Silverman & Ragusa, 1990).

Taken together, this literature suggests that parenting practices are connected children's levels of self-regulation, and may be an important force in shaping its developmental trajectories. However, few prior studies have examined whether parenting, let alone other contextual risk factors, predicts the rate of development of children's self-regulation. Thus the third goal of this study was to test whether parenting practices were associated with the development of self-regulation during pre-adolescence, and the fourth goal of the current study was to explore the impact of other contextual risk factors on the development of self-regulation.

Goals of the current study

Thus the present study had four goals: (1) test for individual differences in the development of self-regulation among pre-adolescents, (2) test how variation in the development of self-regulation are related to positive and negative developmental outcomes, (3) test the role of parenting in the development of self-regulation, and (4) explore the impact of other contextual risk factors on the development of self-regulation. Generally, we hypothesized that, independent of the level of self-regulation, less improvement in self-regulation across pre-adolescence would be associated with more adjustment problems and be preceded by poorer parenting and greater exposure to contextual risk.

Method

Participants

This study utilized a community sample of 214 3rd–5th grade children and their female primary caregivers. Participants were recruited through children's public school classrooms. Schools were selected to represent the range of sociodemographic characteristics of the urban area surrounding this Pacific Northwest university to ensure the sample included adequate representation of families of color, single- and two-parent households, and a full range of family income. Approximately 1280 information forms were distributed to families from 59 classrooms in 13 schools; 697 families returned the information forms, with 313 families indicating interest in participating. Based on the target sample size for this study (based on funding), approximately 200 families were randomly selected from the 313 interested families. One child in the target grades per family was asked to participate, and if there was more than one child in the target grades in the family, one child was randomly selected to participate. Children with developmental disabilities and families who were not fluent in English were excluded from participating in the study so as to ensure adequate comprehension of the questionnaires used in this study.

At time 1 children's mean age was 9.5 years (SD=1.01; range 8–12; 57% female). Children were assessed annually for three years. Across assessments, there were a total of 33 children interviewed at age 8, 111 at age 9, 157 at age 10, 162 at age 11, 83 at age 12, 38 at age 13 and 3 at age 14. The sample included 17% African American children, 3% Asian American

children, 67% European American children, 4% Latino or Hispanic children, 2% Native American children, and 7% children with multiple ethnic or racial backgrounds. Ninety-four percent of the female primary caregivers were biological mothers; 4% were adoptive mothers; and 2% were grandmothers. Seventy percent of the families consisted of two-parent households, and 30% were single-parent households. Annual family income was distributed roughly evenly across sextiles of income: 11% less than $20,000; 20% $21,000 to $40,000; 17% $41,000 to $60,000; 16% $61,000 to $80,000; 19% $81,000 to $100,000, and 17% over $100,000. Fourteen percent of families met criteria for poverty status (compared to roughly 8% in the population from which the sample was drawn) based on the 2002 Federal DHHS Poverty Guidelines, the year closest to the completion of time 1 data collection.

Procedures

Data were collected using highly structured, scripted 2 ½ hour interviews were conducted in the families' homes. After confidentiality was explained, mothers signed informed consent forms, and children signed assent forms. Mothers and children were interviewed by separate, trained interviewers in separate rooms (when possible) to ensure the privacy of their responses. Questionnaire measures were read aloud. Families received $40 ($50 if 2 parents participated) compensation for participating at time 1, with compensation increasing by $10 each year the families participated. Attrition was very low over time, with 92–93% of families participating in time 2 and time 3 assessments, and 89% of families having complete data across times.

Measures

We combined data from multiple reporters of self-regulation and positive and negative developmental outcomes in order to partially address the effects of shared method variance and reporter bias. Combining reporters has been suggested to capture differing perspectives of behavior (e.g., Bird, Gould, & Staghezza, 1993; Hinshaw & Park, 1999), increase reliability of measures because it reduces measurement error (e.g., Noordhof et al., 2008) and reduce the number of statistical tests conducted. Although there are limitations to combining reporters (e.g. Tein, Roosa, & Michaels, 1994), including modest to moderate correlations across reporters and loss of information from differing perspectives[1], it is suggested that the practice results in substantial reduction in distortion due to bias and an increase in statistical power (Biesanz & West, 2004) and can produce a more reliable estimate of the construct, increasing the generalizability of the findings (Cook & Goldstein, 1993). Further, mental health problems that are rated as present by multiple informants are assumed to be more severe or generalized across contexts than problems rated by only one informant (e.g., Noordhof et al., 2008; Verhulst, Koot & Van der Ende, 1994). Descriptive statistics for the study measures are presented in Table 1.

Self-regulation—Mothers and children reported on the child's effortful control and impulsivity at all three time points. Respondents rated items on a 5-point Likert scale (1=very false to 5=very true). Scores were mean-weighted sums (i.e., mean of the items present x total number of items on the scale). Mother and child reports were combined by

[1]To examine this possibility, we also examined models utilizing only child or maternal report and models utilizing child report for the predictors and maternal report for outcomes and vice-versa. We compared them to the models utilizing the combined reporter data. There were no consistent differences in the single or cross-reporter models (relative to the combined reporter models) that suggested that one reporter was superior to the other. Both the mean developmental trajectories of both impulsivity and effortful control and their degree of variability in slopes and intercepts was similar across maternal and child report, and similar to that observed in the combined report models. Moreover, all of the effects that were observed in the combined reporter model were observed in most models regardless of reporter, and there was no discernable pattern to suggest that one reporter was superior.

averaging the mother- and child-report scores, and responses were coded such that high scores reflected high levels of the construct.

Effortful control: Effortful control was assessed using the attention regulation (8 items) subscale of the Early Adolescent Temperament Questionnaire (Capaldi & Rothbart, 1992) and the inhibitory control (12 items) subscale of the Child Behavior Questionnaire (CBQ; Rothbart et al., 2001). At the time of data collection, there was not a measure that assessed Rothbart's model of temperament in this age group. Although the CBQ was developed to assess temperament in children ages 3 to 7, previous research has reliably used the measure with children ages 8 to 12 (Lengua & Long, 2002; Morris et al., 2002). Cronbach's alpha for mother and child report of effortful control were .86 and .74, respectively, and mother and child report of effortful control were correlated .23 ($p<.01$). Their combined report was correlated with an observed measure of effortful control (Stroop Color Word Test and a Simon Says task, $r=.36$, $p < .001$). The composite alpha (calculated taking into account the alpha and variance for each contributing scale as well as the covariance between the scales) for the measure combined across reporter was .85.

Impulsivity: Impulsivity was assessed using the impulsivity subscale (7-items) of the CBQ (Rothbart et al., 2001). Alphas for mother and child reports of impulsivity were .63 and .69, respectively, and mother and child report of impulsivity were correlated .40 ($p<.01$), and mother and child report were correlated with observed Difficulty with Delay in a prize delay task ($r = .16$, $p < .001$). The composite alpha for the measure combined across reporter was .76. Finally, impulsivity and effortful control were moderately negatively correlated at each time point ($r = -.52$ to $-.59$, all $p < .001$).

Adjustment Outcomes

Child internalizing and externalizing problems—Mothers reported on children's internalizing ($\alpha = .75$) and externalizing ($\alpha = .82$) problems using the Child Behavior Checklist (CBCL, Achenbach, 1991a). Children's report of externalizing problems ($\alpha = .82$) was assessed using the delinquent and aggressive behavior subscales (28 items) of the Youth Self Report (YSR, Achenbach, 1991b). Although the YSR was designed for 11–18 year olds, we utilized it for the current study because it was the most appropriate measure for the majority of children at later ages in the current study and because it has demonstrated acceptable reliability and validity with this age group (Sandler, Tein, & West, 1994). Self-report of depressive and anxiety symptoms were assessed with the Child Depression Inventory (CDI, Kovacs, 1981), $\alpha = .80$, and the Revised Children's Manifest Anxiety Scale (RCMAS, Reynolds & Richmond, 1978), $\alpha = .85$, respectively. Mother and child report of externalizing (composite $\alpha = .87$) were correlated .40, .40, and .42 (all $p<.001$) at times 1, 2, and 3, respectively, while mother and child report of internalizing (composite $\alpha = .88$) were correlated .20 ($p<.01$) at all 3 time points. Mother and child report of adjustment problems were averaged to create aggregate measures of internalizing or externalizing problems.

Social competence—Social competence was assessed using the mean of mother- ($\alpha = .73$) and child- ($\alpha = .83$) report on the 34-item Social Skills Rating Scale (SSRS, Gresham & Elliot, 1990) which assesses cooperation, assertion, responsibility, empathy and self-control. Mother and child report were correlated with each other across all time points, ($r = .27 – .32$).

Well=being—A composite measure of well-being was constructed from child self-report of self-worth ($\alpha = .72$) and life satisfaction ($\alpha = .81$), which were correlated across all time points ($r = .50 – .54$, $p < .001$). Self-worth was assessed using the global self-worth subscale of the Perceived Competence Scale for Children (Harter, 1982), which assesses the extent to

which a child is happy with the way he or she is leading his or her life. Children also reported on a life satisfaction measure which was adapted from the 11-item general positive affect scale of the Mental Health Inventory (MHI; Veit & Ware, 1983). Items were reworded with age appropriate language for use in this study.

Predictors of Self-regulation

Parenting—At Time 1, parenting was assessed using mother and child reports on the rejection (8 items; α = .67 – .82), inconsistent discipline (8 items; α = .76 – .87) and acceptance (10 items; α = .71 – .87) subscales of the Child Report of Parenting Behavior Inventory (CRPBI, Schaefer 1965; Teleki, Powell & Doddler, 1982), and on the physical punishment subscale (α = .54 – .76 of the Alabama Parenting Questionnaire (APQ; Shelton, Frick, & Wootton, 1996). These subscales were weakly to moderated correlated across reporter, subscale and time (r = .16 – .60, p_{min} < .001).

Other contextual predictors—Other contextual predictors were assessed at time 1: maternal depression, negative life events, and neighborhood disadvantage.

Maternal depression: Mothers reported on their depressive symptoms over the previous month using the 20-item Center for Epidemiological Studies–Depression Scale (CES-D, Radloff, 1977). The internal consistency reliability as assessed by Cronbach's alpha was .91 and scores ranged from 1 – 53 (M = 17.38, SD = 9.86).

Negative life events were assessed using mother and child report on the 27-item General Life Events Schedule for Children (Sandler, Ramirez & Reynolds, 1986). Mothers and children reported on the number of negative life events that occurred over the previous year, and mother and child report scores were averaged.

Neighborhood disadvantage was assessed by parent report on the Neighborhood Questionnaire, which assesses neighborhood safety, social involvement and services (Conduct Problems Prevention Research Group, 1995), and interviewer ratings on the Post-Visit Inventory (PVI: neighborhood environment subscale, which assesses the apparent safety of the neighborhood. Interviewer ratings of the neighborhood were correlated .56 with each other and were combined. Parent report on the Neighborhood Questionnaire was correlated .38 with the PVI neighborhood ratings. Neighborhood risk scores were the average of standardized NQ and PVI scores (Greenberg et al., 1999).

Results

Analytic Strategy

We utilized a latent growth curve modeling approach to test variation in levels and change over time in effortful control and impulsivity. The intercept, or status factor, was set to Time 1, reflecting individual differences in the level of impulsivity or effortful control at the baseline interview (approximately age 9). Hypotheses were tested using MPlus 5.1 (Muthen & Muthen, 2009) with the Maximum Likelihood Estimator with Robust Standard Errors (MLR; Yuan & Bentler, 2000). We accounted for missing data by using full information maximum-likelihood estimation (FIML; Little & Rubin, 1987). Model fit was assessed using Chi-Square as an indicator of exact fit. Where exact fit was not achieved (as chi-square is sensitive to violations of normality and sample size, Hu & Bentler, 1999), we used relative fit indices, specifically the Tucker-Lewis Index (TLI), comparative fit index (CFI) and root-mean square error of approximation (RMSEA).

Change Over Time in Self-regulation

We first developed separate latent growth curve models for effortful control and impulsivity from Time 1 to Time 3. To account for additional variability in level or change over time due to age, we controlled for age to account for cohort differences in initial levels and change over time.[2]

Effortful control—This model fit the data well, χ^2 (12, n = 214) = 12.13, p = .44; CFI = 1.00; TLI = .99; RMSEA = .01. The intercept had a significant mean (μ= 35.39, σ= 0.26, p < .001), that varied across participants (ψ= 12.29, p < .001), and the slope had a significant and positive mean (μ= 0.56, σ= 0.11, p < .001), that also varied across participants (ψ= 1.86, p < .01). This indicated that children exhibited average increases in effortful control from Time 1 to 3 but varied in their initial level of effortful control and their rate of change. Age was unrelated to either initial levels or the rate of change over time. Finally, the slope and intercept were uncorrelated (r = −.17, SE = .13, p = .17).

Impulsivity—This model fit the data well, χ^2 (12, n = 214) = 12.13, p = .44; CFI = 1.00; TLI = .99; RMSEA = .01. The intercept had a significant mean (μ= 20.99, σ= 0.25, p < .001), that varied across participants (ψ= 9.26, p < .001). The slope factor was significant and negative (μ= −0.51, σ= 0.11, p < .001), but did not seem to vary across participants (ψ= 0.36, p = .49). Age was unrelated to the initial levels or rate of change. The slope and intercept were moderately negatively correlated (r = −.36, SE = .17, p < .05). This indicated that children who were initially rated higher on impulsivity showed greater declines in impulsivity across 3 years.

Parallel Growth in Dimensions of Self-Regulation—We next estimated a parallel process latent growth curve model of effortful control and impulsivity. We allowed the residual variances to covary at each time point, which estimated how the two constructs were related in a given year above and beyond their developmental trajectory. These covariances were also fixed to be equal across time (this assumption did not significantly decrease model fit, $\Delta\chi^2$ [2, n = 214] = 4.50, p = .10). This model fit the data well, χ^2 (8, n = 214) = 13.349, p = .10; CFI = .99; TLI = .98; RMSEA = .05. The intercepts were negatively correlated (r = −.56, p < .001), such that lower initial levels of effortful control were associated with higher initial levels of impulsivity. The residual variances of effortful control and impulsivity were also negatively correlated across time, such that variability in effortful control that was not explained by its developmental trajectory was associated with variability in impulsivity, and vice versa. However, the developmental trajectories themselves were uncorrelated (r = −.24, p = .47), and the intercept of impulsivity was uncorrelated with the slope of effortful control, and vice-versa.

The effects of initial levels and change in self-regulation on adjustment

We next explored how effortful control and impulsivity were associated with change over time and levels of adaptive (social competence and well-being) and maladaptive (internalizing and externalizing symptoms) adjustment. We developed separate parallel process growth curve models for each outcome (four models total).. Because we were interested in obtaining temporal precedence in the prediction of adjustment from levels and

[2]Because the current sample varied in age from 8 to 12 at the initial time point, we modeled change over time by wave rather than age, and regressed the slope and intercept factors on age to control for cohort effect. However, this approach might obscure some age-related differences in developmental trajectories. To test this, we restructured the data by age, and modeled change over time by age in an overlapping cohort design accounting for missing data using FIML. The best fitting models used data from ages 9 to 12, and replicated the current findings. In other words, modeling time by age rather than wave did not produce substantive differences in trajectories, predictors or outcomes.

change in temperament, we set the intercept of the adjustment outcomes to Time 3. This allowed us to test the effects of both initial levels and slope of self-regulation on adjustment.

Tables 2 and 3 summarize the findings from these multivariate parallel process models. In general, these models exhibited excellent fit to the data (See Tables 2 and 3). Across analyses, initial levels of effortful control were related to internalizing and externalizing problems, social competence and well-being at Time 3, such that children who were rated as having higher initial levels of effortful control had lower ultimate levels of externalizing and internalizing problems, and higher social competence and well-being, over and above the effects of age, gender, the rate of change in effortful control, and initial levels and change in impulsivity. Moreover, the slope of effortful control also predicted the ultimate, or Time 3, levels of externalizing and internalizing problems and social competence in early adolescence. Children who increased more in effortful control from Time 1 to Time 3 had fewer externalizing and internalizing problems at Time 3, and higher levels of social competence, over and above their initial levels of effortful control. On other hand, neither initial levels nor the rate of change over time in impulsivity were related to any of the outcomes.

Finally, level and rate of change of self-regulation (effortful control and impulsivity) was unrelated to the rate of change (slope) of either adaptive or maladaptive adjustment.

Predicting the development of self-regulation from parenting

Next, we extended the parallel process model to include parental acceptance, rejection, physical punishment and inconsistent discipline (see Table 4). In spite of the lack of residual variance in the slope of impulsivity (over and above the effects of age and gender), we tested predictors of impulsivity slope, as the additional degrees of freedom provided in these models can sometimes provide additional power to detect variation in effects. We found differences across reporters in terms of who reported on maternal parenting, in terms of their effects on effortful control and impulsivity, described in more detail below.

The final model fit the data well, χ^2 (26, n = 214) = 33.271, p = .154; CFI = .99; TLI = .98; RMSEA = .03. Child report of higher maternal acceptance and lower physical punishment were associated with higher initial levels of effortful control, while higher physical punishment and maternal rejection were associated with higher initial levels of impulsivity. On the other hand, maternal report of parenting was unrelated to initial levels of either impulsivity or effortful control. Child report of higher physical punishment and inconsistent discipline were associated with more growth in impulsivity, which translated into greater declines in impulsivity over time. On the other hand, greater levels of maternal rejection (by maternal report) were associated with lower declines in impulsivity over time (Figure 2 illustrates this effect). These effects were similar regardless of whether or not both reporters were included simultaneously in the model. Finally, no parenting variables were related to the rate of change in effortful control over time

Predicting the Development of Self-regulation from Contextual Risk Factors

Finally, we tested other contextual predictors of the level and rate of change over time in effortful control and impulsivity, controlling for child gender and age at Time 1. Family income, maternal depression, stressful life events and neighborhood risk were tested simultaneously to examine their unique effects. These findings are summarized in Table 5. This model fit the data well, χ^2 (18, n = 214) = 17.23, p = .51; CFI = 1.00; TLI = 1.00; RMSEA = .000. Exposure to stressful life events was related to both greater initial levels of impulsivity and lower levels of effortful control, but not to greater change in effortful control. Figure 2 illustrates the convergent effects of exposure to stressful life events on

effortful control: although children exposed to higher than average levels of stressors at the initial time point began with less effortful control, they caught up with their peers faster over time, while those exposed to low stress actually showed the least growth over time. No other contextual predictors were significant above the effects of the other risk factors.

Discussion

Self-regulation skills develop from childhood well into early adulthood and the current study suggests that there is variability in this development from late childhood across the transition to adolscence. On average, individuals showed increases in effortful control and decreases in impulsivity across late childhood, but there was substantial individual variability in these patterns. Notably, the developmental trajectories of these two self-regulatory processes were uncorrelated, suggesting that their development may be influenced by distinct processes.

Consistent with the account that effortful control and impulsivity may be separate self-regulatory constructs, with distinct developmental patterning, across this developmental period, we found that each construct was linked to differential outcomes. Consistent with prior research (Colder & O'Conner, 2004; Eisenberg, Cumberland et al., 2001), better initial levels of self-regulation (lower impulsivity and higher effortful control) was related to greater declines in externalizing psychopathology, greater increases in social competence, and lower final levels of externalizing and internalizing problems and higher social competence and well-being. Moreover, our findings indicated that individual differences in changes over time across effortful control (but not impulsivity) explained variation in adjustment over and above the effects of earlier individual differences. Conversely, individual variability in the development of impulsivity was unrelated to internalizing or externalizing behavior problems, competence and well-being, suggesting that variation in change during other developmental periods may be more critical than during pre-adolescence. Given research indicating that the motivational components of impulsiveness dramatically increase at puberty, the magnitude of the increase and subsequent decrease in the motivational aspects of regulation during and after puberty may begin to play a more important role as motivational impulsiveness overwhelms the adolescents' still-immature cognitive regulatory abilities (Steinberg et al., 2004; 2008).

Given the individual differences in level and rate of change in the development of effortful control and impulsivity, it was also notable that parenting quality and stress were related to the development of self-regulation. Individual differences in initial levels of effortful control and impulsivity were related to poor parenting (e.g. higher parental rejection, and inconsistent and physical discipline), and to stressful life events, suggesting that children in environments characterized by high familial risk will enter the transition to adolescence with impairments in self-regulation. These effects may suggest that the strain from such environments may interfere with the development of self-regulation. It could also be that children with self-regulation deficits shape parenting as well, evoking higher levels of poor parenting as frustrated parents increasingly try to unsuccessfully cope with their child (as in the coercive parenting cycle, Patterson, 1992).

Moreover, a rejecting parenting environment was also was associated with hindering declines in impulsivity over time. It may be that when parents are less rejecting in their behavior towards their child, children's tendency to rush towards reward may diminish because parents are more sensitive to their child's needs (so a lower intensity behavior would be successful in obtaining a reward) and as the child is successively rewarded for appropriate approach behaviors. Conversely, when the parental consequences are more negative they may inadvertently increase approach motivation by randomly reinforcing intense approach behaviors that are occasionally successful, and may also reflect parents'

insensitivity to their children's cues, necessitating larger and more intense approach behaviors by children in order to get a reward. Thus, it may be that interventions that aim to improve parenting or otherwise buffer the risk posed by the environment may, in turn, improve the self-regulatory capacities of pre-adolescent children. Prior research has shown that parenting can shape trajectories of children's behavior (Galambos, Barker & Alameda, 2003). This study supports that research and further implies that parenting plays a vital role in shaping the development of self-regulation.

Moreover, exposure to stressful life events, which were related to lower initial levels of effortful control, were also related to greater increases in effortful control over time. This may reflect a time-specific effect of stressors, where the acute effects of stress exposure dampen a child's ability to inhibit behavior, and with the removal of the stressor a child's effortful control may then return to normal, exhibiting greater improvements over time than a non-stressed child. Future research should attempt to separate the time-specific effects of stress on self-regulation from the chronic effects of stress exposure.

One interesting nuance from the findings is that there were reporter differences in the effects of parenting on self-regulation. First, only the child's perspective of parenting predicted the intercept of either effortful control or impulsivity, suggesting that there are important differences in the child's and mother's perspective of parenting that are associated with self-regulation during early adolescence. Our results suggested that children who perceived their parents to be more inconsistent and to provide more physical punishment showed greater declines in impulsivity over time. This was opposite of our prediction, and opposite of the effects of mother's rejection on the slope of impulsivity. In the case of physical punishment (similar to the effects of life events on effortful control), which also was associated with higher initial levels of impulsivity, these effects seem to represent regression to the mean, where children who reported more physical punishment began with more impulsivity but also showed more declines over time as their impulsivity declined to more normative levels. Alternately, harsh parenting may impair or inhibit a child's approach system, increasing internalizing symptoms and also decreasing approach-based impulsivity. In the case of inconsistent discipline, which was not associated with the initial level of impulsivity, these effects may reflect the development of some internalized self-regulation in the absence of consistent external control. However, as both of these effects are in the opposite direction of what we would have hypothesized, they should be considered with great caution. Alternately, these differences across reporters may reflect something about the nature of the biases inherent in each reporter: children's reports may be biased by their general relationship with their parent, while parents' reports of their parenting behavior may be biased by social desirability. Regardless, the effects of parenting, by either reporter, on the slope of impulsivity in the current study should be presumed to be conditional until future studies can clarify the role of parenting, and the effects of using different reporters for parenting, on the development of self-regulation.

The current study has several strengths, including the longitudinal design, the use of empirically validated measures of temperament, the use of multiple informants, and the examination of a broad range of risk factors and outcomes. However, there are limitations to the current analyses that should caution broader generalization. First, we assumed in our discussion that variability in change over time represented rank order shuffling in self-regulation skills, with some children improving more than others. However, it may be that these changes are temporarily driven by skill acquisition, and thus they may not be stable. An important direction of future research should be to disentangle temporary from permanent changes in self-regulation across development. Also, we used only survey-based, trait measures of self-regulation, and using multiple methods that also incorporate observational or direct measures of self-regulation (such as captured by Stroop and delay of

gratification measures) may provide a more complete picture of the development of the motivational and cognitive dimensions of self-regulation. Future studies should explore the feasibility of multi-method assessments of both the cognitive and motivational dimensions of self-regulation. Moreover, we only had data from three time points, and thus could only specify a linear growth model. Future research with additional time points should test whether different aspects of self-regulation develop in a linear or curvilinear fashion (e.g. Steinberg & Alpert, 2008). We also had a relatively small sample size, which limits our conclusions about null findings; larger samples may find more robust associations between context, parenting and growth in self-regulation. Moreover, we assumed that the effects of contextual factors on self-regulation were unidirectional, when it may be that there are reciprocal relations between context and regulation over time. Future research should explore this possibility. Finally, we only examined three years during late childhood/early adolescence (largely between ages 9 and 12), and it may be that the associations with contextual risk factors or adjustment outcomes differ at different ages, or that the effects of contextual risk factors play out over periods of time longer than the three year span covered in the current study. More research is needed that explores these questions in broader age ranges and with both older and younger samples.

Self-regulation is thought to be the key to successfully navigating the challenges of adolescent development. Recent research has revealed that self-regulation is also a multifaceted construct (e.g. Smith et al., 2007) that changes over time (Steinberg, 2004; Steinberg et al., 2008). The current study highlights the importance of furthering this multi-faceted, developmental perspective of self-regulation. Our findings demonstrate that not only does self-regulation continue to develop during preadolescence, but also that children differ in their rate of change. Those developmental differences are associated with change and ultimate levels of both psychological and behavior problems and adjustment, and perhaps most importantly, those developmental differences are related to modifiable risk factors such as parenting. This suggests that, to some degree, the development of self-regulation across childhood and into adolescence is sensitive to environmental factors. Further understanding the malleability of its development may be critical to understanding adaptive and maladaptive development during pre-adolescence and beyond.

Acknowledgments

Support for this research was provided by NIMH Grant #R29MH57703 to the second author. Portions of these analyses were presented at the 2008 Occasional Temperament Conference in San Rafael, CA, the 2009 Biennial Meeting of the Society for Research on Child Development in Denver, CO, and the 2010 Biennial Meeting of the Society for Research on Adolescence in Philadelphia, PA. The authors thank the families who participated in this study, and Nicole Bush for her contribution to this study.

References

Achenbach, TM. Manual for the Child Behavior Checklist and Revised Child Behavior Profile. University of Vermont, Department of Psychiatry; Burlington, Vermont: 1991a.

Achenbach, TM. Manual for the Youth Self-report and 1991 Profile. University of Vermont, Department of Psychiatry; Burlington, Vermont: 1991b.

Biesanz JC, West SG. Towards understanding assessments of the Big Five: Multitrait-multimethod analyses of convergent and discriminant validity across measurement occasion and type of observer. Journal of Personality. 2004; 72:845–876. [PubMed: 15210019]

Bird HR, Gould MS, Staghezza BM. Patterns of diagnostic comorbidity in a community sample of children aged 9 through 16 years. Journal of the American Academy of Child and Adolescent Psychiatry. 1993; 32:361–368. [PubMed: 8444766]

Blonigen DM, Carlson MD, Hicks BM, Krueger RF, Iacono WG. Stability and change in personality traits from late adolescence to early adulthood: A longitudinal twin study. Journal of Personality. 2009; 76:229–266. [PubMed: 18331280]

Boyce WT, Ellis BJ. Biological sensitivity to context: I. An evolutionary-developmental theory of the origins and functions of stress reactivity. Development and Psychopathology. 2005; 17:271–301. [PubMed: 16761546]

Calkins SD, Smith CL, Gill KL, Johnson MC. Maternal interactive style across contexts: Relations to emotional, behavioral, and physiological regulation during toddlerhood. Social Development. 1998; 7:350–369.

Capaldi DM, Rothbart MK. Development and validation of an early adolescent temperament measure. Journal of Early Adolescence. 1992; 12:153–173.

Carlson SM. Developmentally sensitive measures of executive function in preschool children. Developmental Neuropsychology. 2005; 28:595–616. [PubMed: 16144429]

Colder CR, O'Connor RM. Gray's reinforcement sensitivity model and child psychopathology: Laboratory and questionnaire assessment of the BAS and BIS. Journal of Abnormal Child Psychology. 2004; 32:435–451. [PubMed: 15305548]

Colman RA, Hardy SA, Albert M, Raffaelli M, Crockett L. Early predictors of self-regulation in middle childhood. Infant and Child Development. 2006; 13:421–437.

Conduct Problems Prevention Research Group. Unpublished manuscript. University of Washington; Seattle, WA: 1995. Technical report of the Neighborhood Questionnaire.

Cook WL, Goldstein MJ. Multiple perspectives on family relationships: A latent variables model. Child Development. 1993; 64:1377–1388. [PubMed: 8222878]

Dahl RE. Adolescent brain development: A period of vulnerabilities and opportunities. Annals of the New York Academy of Sciences. 2004; 1021:1–22. [PubMed: 15251869]

Dawe S, Loxton NJ. The role of impulsivity in the development of substance use and eating disorders. Neuroscience & Biobehavioral Reviews. 2004; 28:343–351. [PubMed: 15225976]

Dodge KA, Bates JE, Pettit GS. Mechanisms in the cycle of violence. Science. 1990; 250:1678–1683. [PubMed: 2270481]

Eisenberg N, Valiente C, Fabes RA, Smith CL, Reiser M, Shepard SA, Losoya AH, Guthrie IK, Murphy BC, Cumberland AJ. The relations of effortful control and ego control to children's resiliency and social functioning. Developmental Psychology. 2003; 39:761–776. [PubMed: 12859128]

Eisenberg N, Cumberland A, Spinrad TL, Fabes R, Shepard S, Reiser M, Murphy B, Losoya S, Guthrie I. The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. Child Development. 2001; 72:1112–1134. [PubMed: 11480937]

Eisenberg N, Fabes RA, Karbon M, Murphy BC. The relations of children's dispositional prosocial behavior to emotionality, regulation, and social functioning. Child Development. 1996; 67:974–992. [PubMed: 8706539]

Evenden J. Impulsivity: A discussion of clinical and experimental findings. Journal of Psychopharmacology. 1999; 13:180–192. [PubMed: 10475725]

Evans GW, English K. The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. Child Development. 2002; 73:1238–1248. [PubMed: 12146745]

Hughes C, Ensor R, Wilson A, Graham A. Tracking executive function across the transition to school: A latent variable approach. Developmental Neuropsychology. 2010; 35:20–36. [PubMed: 20390590]

Galambos NL, Barker ET, Alameida DM. Parents *Do* Matter: Trajectories of change in externalizing and internalizing problems in early adolescence. Child Development. 2003; 74:578–594. [PubMed: 12705574]

Gartstein MA, Fagot BI. Parental depression, parenting and family adjustment, and child effortful control: Explaining externalizing behaviors for preschool children. Journal of Applied Developmental Psychology. 2003; 24:143–177.

Giedd JN. Structural magnetic resonance imaging of the adolescent brain. Annals of the New York Academy of Sciences. 2004; 1021:77–85. [PubMed: 15251877]

Greenberg MT, Lengua LJ, Coie J, Pinderhughes E, Bierman K, Dodge K, Lochman J, McMahon R. Predicting developmental outcomes at school entry using a multiple-risk model: Four American communities. Developmental Psychology. 1999; 35:403–417. [PubMed: 10082011]

Gresham, FM.; Elliot, SN. Social Skills Rating System. Circle Pines, MN: American Guidance Service; 1990.

Harter S. The perceived competence scale for children. Child Development. 1982; 53:87–97.

Hinshaw, SP.; Park, T. Research problems and Issues: toward a more definitive science of disruptive behavior disorders. In: Quay, HC.; Hogan, editors. Handbook of disruptive behavior disorders. New York: Kluwer Academic/Plenum; 1999. p. 593-620.

Houck GM, Lecuyer-Maus EA. Maternal limit setting during toddlerhood, delay of gratification, and behavior problems at age five. Infant Mental Health Journal. 2004; 25:28–46.

Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling. 1999; 6:1–55.

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. NIH Publication No 08-6418. National Institute on Drug Abuse; 2008. Monitoring the Future national results on adolescent drug use: Overview of key findings 2007. Retrieved February 14, 2009, from http://www.monitoringthefuture.org/pubs.html

Karreman A, van Tuijl C, van Aken MAG, Dekovic M. Parenting, coparenting, and effortful control in preschoolers. Journal of Family Psychology. 2008; 22:30–40. [PubMed: 18266530]

Kindlon D, Mezzacappa E, Earls F. Psychometric properties of impulsivity measures: Temporal stability, validity and factor structure. Journal of Child Psychology and Psychiatry and Allied Disciplines. 1995; 36:645–661.

King KM, Chassin L. Mediating and moderated effects of adolescent behavioral undercontrol and parenting in the prediction of drug use disorders in emerging adulthood. Psychology of Addictive Behaviors. 2004; 18:239–249. [PubMed: 15482079]

Kochanska G, Askan N, Prisco TR, Adams EE. Mother-child and father-child mutually responsive orientation in the first 2 years and children's outcomes at preschool age: Mechanisms of influence. Child Development. 2008; 79:30–44. [PubMed: 18269507]

Kochanska G, Murray K, Jacques TY, Koenig AL, Vandegeest KA. Inhibitory control in young children and its role in emerging internalization. Child Development. 1996; 67:490–507. [PubMed: 8625724]

Kovacs M. Rating scales to assess depression in school aged children. Acta Paedopsychiatry. 1981; 46:305–315.

Krueger RF, Hicks BM, Patrick CJ, Carlson SR, Iacono WG, McGue M. Etiologic connections among substance dependence, antisocial behavior, and personality: modeling the externalizing spectrum. Journal of Abnormal Psychology. 2002; 111:411–424. [PubMed: 12150417]

Kyrios M, Prior M. Temperament, stress and family factors in behavioral adjustment of 3–5 year old children. Intntl Journal of Behavioral Development. 1990; 13:67–93.

Lengua LJ. The contribution of emotionality and self-regulation to the understanding of children's response to multiple risk. Child Development. 2002; 73:144–161. [PubMed: 14717249]

Lengua LJ. Growth in temperament and parenting as predictors of adjustment during children's transition to adolescence. Developmental Psychology. 2006; 42(2):819–832. [PubMed: 16953689]

Lengua LJ, Honorado E, Bush N. Cumulative Risk and Parenting as Predictors of Effortful Control and Social Competence in Preschool Children. Journal of Applied Developmental Psychology. 2007

Lengua LJ, Kovacs EA. Bidirectional Associations between Temperament and Parenting, and the Prediction of Adjustment Problems in Middle Childhood. Journal of Applied Developmental Psychology. 2005; 26:21–38.

Li-Grining CP. Effortful control among low-income preschoolers in three cities: Stability, change, and individual differences. Developmental Psychology. 2007; 43:208–221. [PubMed: 17201520]

Luna B, Garver KE, Urban TA, Lazar NA, Sweeney JA. Maturation of cognitive processes from late childhood to adulthood. Child Development. 2004; 75:1357–1372. [PubMed: 15369519]

Mauro CF, Yvette HR. The influence of maternal child-rearing attitudes and teaching behaviors on preschoolers' delay of gratification. The Journal of Genetic Psychology. 2000; 16(3):292–306. [PubMed: 10971908]

McMahon SD, Grant KE, Compas BE, Thurm AE, Ey S. Stress and psychopathology in children and adolescents: Is there evidence of specificity? Journal of Child Psychology and Psychiatry. 2003; 44:107–133. [PubMed: 12553415]

Mischel W, Shoda Y, Peake K. The nature of adolescent competencies predicted by preschool delay of gratification. Journal of Personality & Social Psychology. 1988; 54:687–696. [PubMed: 3367285]

Monahan KC, Steinberg L, Cauffman E, Mulvey EP. Trajectories of antisocial behavior and psychosocial maturity from adolescence to young adulthood. Developmental Psychology. 2009; 45:1654–1668. [PubMed: 19899922]

Muraven M, Baumeister RF. Self-regulation and depletion of limited resources: Does self-control resemble a muscle? Psychological Bulletin. 2000; 126:247–259. [PubMed: 10748642]

Muthén, LK.; Muthén, BO. Mplus, 5.0. 2009. http://www.statmodel.com

Noordhof A, Oldehinkel AJ, Verhulst FC, Ormel J. Optimal use of multi-informant data on co-occurrence of internalizing and externalizing problems. International Journal of Methods in Psychiatric Research. 2008; 17:174–183. [PubMed: 18763693]

Olson SL, Sameroff AJ, Kerr DC, Lopez NL, Wellman HM. Developmental foundations of externalizing problems in young children: The role of effortful control. Development & Psychopathology. 2005; 17:25–45. [PubMed: 15971758]

Olson SL, Bates JE, Bayles K. Early antecedents of childhood impulsivity: The role of parent-child interactions, cognitive competence, and temperament. Journal of Abnormal Child Psychology. 1990; 18:317–334. [PubMed: 2376656]

Olson SL, Bates JE, Sandy JM, Schilling EM. Early developmental precursors of impulsive and inattentive behavior: From infancy to middle childhood. Journal of Child Psychology and Psychiatry. 2002; 43:435–447. [PubMed: 12030590]

Olson SL, Sameroff AJ, Kerr DCR, Lopez NL, Wellman HM. Developmental foundations of externalizing problems in young children: The role of effortful control. Developmental and Psychopathology. 2005; 17:25–45.

Patterson, GR.; Reid, JB.; Dishion, TJ. Antisocial boys. Eugene, OR: Castalia; 1992.

Piquero, A.; Farrington, D.; Blumstein, A. The criminal career paradigm. In: Tonry, M., editor. Crime and justice: A review of research. Vol. 30. Chicago: University of Chicago Press; 2003. p. 359-506.

Posner MI, Rothbart MK. Developing mechanisms of self-regulation. Development & Psychopathology. 2000; 12:427–441. [PubMed: 11014746]

Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1:385–401.

Raver CC. Placing emotional self-regulation in sociocultural and socioeconomic contexts. Child Development. 2004; 75:346–353. [PubMed: 15056189]

Reed M, Pien DL, Rothbart MK. Inhibitory self-control in preschool children. Merrill-Palmer Quarterly. 1984; 30:131–147.

Reynolds CR, Richmond BO. What I think and feel: A revised measure of children's manifest anxiety. Journal of Abnormal Psychology. 1978; 6:271–280.

Roberts BW, Caspi A, Moffitt TE. The kids are alright: Growth and stability in personality development from adolescence to adulthood. Journal of Personality and Social Psychology. 2001; 81:670–683. [PubMed: 11642353]

Rothbart MK, Ahadi SA, Evans DE. Temperament and personality: Origins and outcomes. Journal of Personality and Social Psychology. 2000; 78:122–135. [PubMed: 10653510]

Rothbart MK, Ahadi SA, Hershey KL, Fisher P. Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. Child Development. 2001; 72:1394–1408. [PubMed: 11699677]

Rubin KH, Coplan RJ, Fox NA, Calkins SD. Emotionality, emotion regulation, and preschoolers' social adaptation. Development & Psychopathology. 1995; 7:49–62.

Sandler, IN.; Ramirez, R.; Reynolds, KD. Life stress for children of divorce, bereaved and asthmatic children. Paper presented at the American Psychological Association Convention; Washington, DC. 1986 Aug.

Saylor CF, Finch AJ, Spirito A, Bennett B. The Children's Depression Inventory: A systematic evaluation of psychometric properties. Journal of Consulting and Clinical Psychology. 1984; 52:955–967. [PubMed: 6520288]

Schaefer ES. Children's reports of parental behavior: An inventory. Child Development. 1965; 36:413–424. [PubMed: 14300862]

Shelton KK, Frick PJ, Wootton J. Assessment of parenting practices in families of elementary school-age children. Journal of Clinical Child Psychology. 1996; 25:317–329.

Sher KJ, Trull TJ. Personality and disinhibitory psychopathology: Alcoholism and antisocial personality disorder. Journal of Abnormal Psychology. 1994; 103:92–102. [PubMed: 8040486]

Silverman IW, Ragusa DM. Child and maternal correlates of impulse control in 24-month-old children. Genetic, Social & General Psychology Monographs. 1990; 116:437.

Smith GT, Fischer S, Cyders MA, Annus AM, Spillane NS, McCarthy DM. On the validity and utility of discriminating among impulsivity-like traits. Assessment. 2007; 14:155–170. [PubMed: 17504888]

Steinberg L. Risk taking in adolescence: what changes, and why? Annals of the New York Academy of Sciences. 2004; 1021:51–58. [PubMed: 15251873]

Steinberg L. A social neuroscience perspective on adolescent risk-taking. Developmental Review. 2008; 28:78–106. [PubMed: 18509515]

Steinberg L, Albert D, Cauffman E, Banich M, Graham S, Woolard J. Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. Developmental Psychology. 2008; 44:1764–1778. [PubMed: 18999337]

Steinberg L, Cauffman E. Maturity of judgment in adolescence: Psychosocial factors in adolescent decision making. Law and Human Behavior. 1996; 20:249–272.

Tein J, Roosa MW, Michaels M. Agreement between parent and child reports on parental behaviors. Journal of Marriage and the Family. 1994; 56:341–355.

Teleki JK, Powell JA, Dodder RA. Factor analysis of reports of parental behavior by children living in divorced and married families. Journal of Psychology. 1982; 112:295–302. [PubMed: 7175769]

Veit C, Ware J. The structure of psychological distress and well being in general populations. Journal of Consulting and Clinical Psychology. 1983; 51(5):730–742. [PubMed: 6630688]

Yuan KH, Bentler PM. Three likelihood-based methods for mean and covariance structure analysis with non-normal missing data. Sociological Methodology. 2000; 30:165–200.

Figure 2a. Levels and Change in Impulsivity Across Levels of Maternal Rejection.

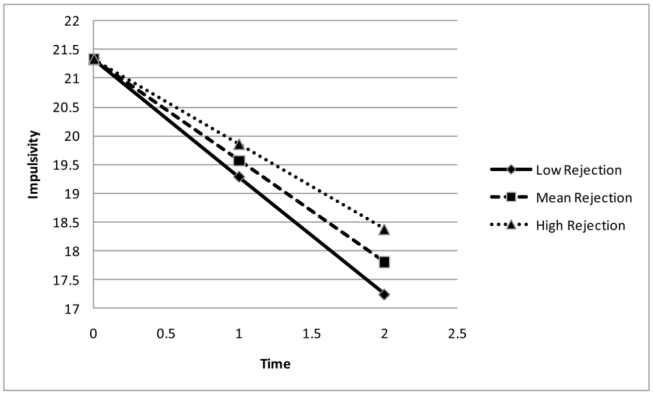

Figure 2b. Levels and Change in Effortful Control Across Levels of Stressful Life Events.

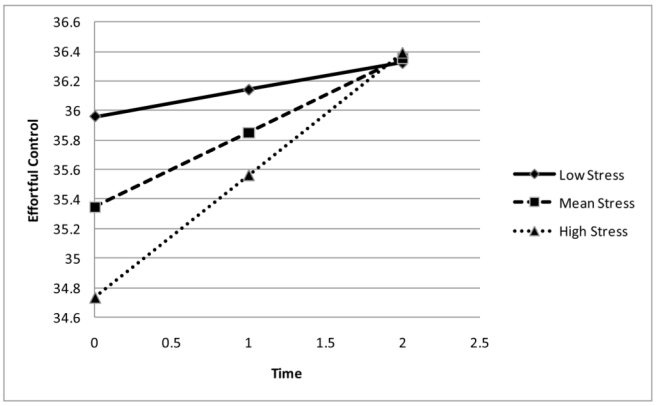

Figure 2.

Figure 2a. Levels and Change in Impulsivity Across Levels of Maternal Rejection.
Figure 2b. Levels and Change in Effortful Control Across Levels of Stressful Life Events.

Table 1

M, SD, range and skew for study variables.

	M	SD	Range	Skew
Self-regulation:				
T1 Effortful Control	35.40	3.90	22.75–44.00	−0.28
T2 Effortful Control	35.89	4.15	25.00–46.25	−0.26
T3 Effortful Control	36.47	4.16	24.50–45.75	−0.40
T1 Impulsivity	21.13	3.75	11.00–30.00	0.03
T2 Impulsivity	20.19	3.40	12.00–30.00	0.21
T3 Impulsivity	20.00	3.37	12.00–28.00	0.11
Adjustment:				
T1 Externalizing	4.53	3.36	0.05–23.50	1.91
T2 Externalizing	4.07	3.08	0.00–21.00	2.05
T3 Externalizing	3.74	3.16	0.00–18.50	1.73
T1 Internalizing	18.55	5.30	9.00–41.00	1.06
T2 Internalizing	17.21	5.63	0.00–40.00	1.28
T3 Internalizing	16.49	5.04	9.50–37.00	1.53
T1 Social Competence	52.13	6.34	34.00–65.50	−0.53
T2 Social Competence	52.90	7.24	31.40–78.00	−0.21
T3 Social Competence	53.10	7.09	28.85–68.00	−0.64
T1 Well-being	25.55	4.16	14.76–48.00	0.39
T2 Well-being	25.10	5.36	13.30–56.00	−0.31
T3 Well-being	25.42	5.17	11.63–33.37	−1.98
Parent:				
Child-report Rejection	7.32	5.61	0.00–30.00	1.05
Mother-report Rejection	9.00	3.34	2.00–19.00	0.49
Child-report Inconsistency	10.05	5.96	0.00–30.00	0.66
Mother-report Inconsistency	7.90	4.84	0.00–26.00	0.51
Child-report Acceptance	31.65	7.05	0.00–40.00	−1.45
Mother-report Acceptance	33.37	4.63	20.00–40.00	−0.40
Child-report Physical Pun.	1.08	2.12	0.00–12.00	3.06
Mother-report Physical Pun.	0.64	1.10	0.00–5.00	1.93
Contextual Risk:				
Maternal Depression	17.38	9.86	1.00–53.00	0.81
Negative Life Events	6.29	2.38	2.00–14.00	0.57
Neighborhood Risk	0.00	0.84	−1.33–2.86	1.18

Table 2

The Effects of Levels and Change in Impulsivity and Effortful Control on Psychopathology.

	Rate of Change, T1–T3 (Slope)				T3 Level (Intercept)			
Externalizing								
	b	***SE***	***Z***	***p***	***b***	***SE***	***Z***	***p***
Age	**0.40**	**0.17**	**2.34**	**0.02**	0.06	0.23	0.26	0.80
Gender	**−0.52**	**0.19**	**−2.76**	**0.01**	0.13	0.16	0.82	0.41
Impulsivity Intercept	0.02	0.11	0.19	0.85	0.13	0.07	1.90	0.06
Impulsivity Slope	1.01	1.26	0.80	0.43	0.00	0.00	--	--
Effortful Control Intercept	0.05	0.08	0.59	0.56	**−0.38**	**0.10**	**−3.99**	**0.00**
Effortful Control Slope	−0.22	0.25	−0.91	0.36	**−0.67**	**0.23**	**−2.98**	**0.00**
Model Fit: χ^2 (26, n = 214) = 31.86, p = .20; CFI = .99; TLI = .99; RMSEA = .03								
Internalizing								
Age	0.16	0.11	1.41	0.16	−0.14	0.38	−0.38	0.71
Gender	−0.10	0.11	−0.92	0.36	**0.82**	**0.38**	**2.14**	**0.03**
Impulsivity Intercept	−0.11	0.12	−0.88	0.38	−0.16	0.24	−0.70	0.49
Impulsivity Slope	0.83	1.34	0.62	0.54	1.16	2.02	0.57	0.57
Effortful Control Intercept	0.02	0.10	0.21	0.84	**−0.80**	**0.19**	**−4.20**	**0.00**
Effortful Control Slope	−0.63	0.43	−1.47	0.14	**−1.57**	**0.69**	**−2.30**	**0.02**
Model Fit: χ^2 (26, n = 214) = 40.88, p = .03; CFI = .99; TLI = .97; RMSEA = .04								

Note: Bolded effects are significant, p < .05

Table 3

The Effects of Levels and Change in Impulsivity and Effortful Control on Well Being and Social Competence.

	Rate of Change, T1–T3 (Slope)				T3 Level (Intercept)			
Social Competence								
	b	***SE***	***Z***	***p***	***b***	***SE***	***Z***	***p***
Age	−0.22	0.25	−0.86	0.39	−0.82	0.48	−1.70	0.09
Gender	0.23	0.27	0.84	0.40	**1.10**	**0.47**	**2.33**	**0.02**
Impulsivity Intercept	0.05	0.13	0.38	0.70	0.35	0.25	1.44	0.15
Impulsivity Slope	−0.08	0.97	−0.09	0.93	−0.12	1.80	−0.07	0.95
Effortful Control Intercept	−0.02	0.10	−0.21	0.84	**1.30**	**0.19**	**6.85**	**0.00**
Effortful Control Slope	1.01	0.58	1.74	0.08	**2.48**	**0.93**	**2.67**	**0.01**
Model Fit: χ^2 (25, n = 214) = 58.07, p = .000; CFI = .97; TLI = .94; RMSEA = .06								
Well Being								
Age					−0.52	0.27	−1.89	0.06
Gender					−0.44	0.29	−1.50	0.13
Impulsivity Intercept	--	--	--	--	0.25	0.16	1.50	0.13
Impulsivity Slope	--	--	--	--	**1.05**	**1.16**	**0.90**	**0.37**
Effortful Control Intercept	--	--	--	--	**0.73**	**0.11**	**6.64**	**0.00**
Effortful Control Slope	--	--	--	--	0.67	0.39	1.71	0.09
Model Fit: χ^2 (26, n = 214) = 67.33, p = .000; CFI = .96; TLI = .93; RMSEA = .06								

Note: Bolded effects are significant, p < .05

Table 4

Unique Effects of Maternal Parenting by Maternal and Child Report on Levels and Change over Time in Effortful Control and Impulsivity

	Effortful Control: Intercept				**Effortful Control: Slope**			
Time 1 Predictors:	***b***	***SE***	***Z***	***p***	***b***	***SE***	***Z***	***P***
Age	0.065	0.283	0.230	0.818	−0.097	0.120	−0.806	0.421
Gender	0.330	0.262	1.258	0.208	**0.316**	**0.124**	**2.557**	**0.011**
Rejection (M)	−0.139	0.096	−1.446	0.148	0.024	0.043	0.550	0.582
Inconsistent Discipline (M)	−0.062	0.056	−1.108	0.268	0.011	0.028	0.402	0.688
Acceptance (M)	0.037	0.060	0.607	0.544	−0.015	0.031	−0.488	0.626
Physical Punishment (M)	0.101	0.242	0.419	0.675	−0.072	0.129	−0.555	0.579
Rejection (C)	−0.029	0.072	−0.402	0.688	0.030	0.032	0.943	0.346
Inconsistent Discipline (C)	−0.091	0.061	−1.502	0.133	0.004	0.028	0.149	0.881
Acceptance (C)	**0.082**	**0.042**	**1.926**	**0.050**	0.028	0.019	1.506	0.132
Physical Punishment (C)	**−0.331**	**0.152**	**−2.173**	**0.030**	−0.042	0.070	−0.600	0.548
	Impulsivity: Intercept				Impulsivity: Slope			
Time 1 Predictors	*b*	*SE*	*Z*	*p*	*b*	*SE*	*Z*	*P*
Age	−0.302	0.233	−1.294	0.196	0.054	0.105	0.516	0.606
Gender	−0.217	0.234	−0.926	0.355	−0.162	0.104	−1.562	0.118
Rejection (M)	−0.031	0.093	−0.331	0.741	**0.085**	**0.040**	**2.140**	**0.032**
Inconsistent Discipline (M)	0.056	0.060	0.937	0.349	−0.028	0.024	−1.163	0.245
Acceptance (M)	−0.021	0.058	−0.359	0.720	0.044	0.028	1.563	0.118
Physical Punishment (M)	0.366	0.289	1.268	0.205	0.037	0.116	0.317	0.751
Rejection (C)	0.107	0.058	1.828	0.068	0.006	0.027	0.211	0.833
Inconsistent Discipline (C)	0.057	0.047	1.202	0.229	**−0.054**	**0.023**	**−2.388**	**0.017**
Acceptance (C)	−0.002	0.038	−0.044	0.965	−0.023	0.018	−1.261	0.207
Physical Punishment (C)	0.241	0.133	1.813	0.070	**−0.162**	**0.056**	**−2.881**	**0.004**

*Bolded regression coefficients were significant at p < .05. M = maternal report, C = child report.

Table 5

Effects of Environmental Context on Levels and Change over Time in Effortful Control and Impulsivity

	Effortful Control: Intercept				**Effortful Control: Slope**			
Time 1 Predictors:	***b***	***SE***	***Z***	***p***	***b***	***SE***	***Z***	***P***
Age	0.302	0.270	1.119	0.263	−0.055	0.110	−0.499	0.618
Gender	0.437	0.264	1.653	0.098	**0.325**	**0.116**	**2.810**	**0.005**
Income	0.063	0.094	0.668	0.504	0.076	0.041	1.850	0.064
Stressful Life Events	**−0.258**	**0.107**	**−2.409**	**0.016**	**0.136**	**0.056**	**2.410**	**0.016**
Maternal Depression	−0.033	0.026	−1.277	0.202	0.013	0.013	1.056	0.291
Neighborhood Risk	−0.233	0.374	−0.622	0.534	−0.173	0.153	−1.131	0.258
	Impulsivity: Intercept				Impulsivity: Slope			
Time 1 Predictors	*b*	*SE*	*Z*	*p*	*b*	*SE*	*Z*	*P*
Age	−0.493	0.230	−2.149	0.032	0.162	0.110	1.474	0.141
Gender	−0.300	0.241	−1.245	0.213	−0.122	0.111	−1.099	0.272
Income	−0.112	0.089	−1.255	0.209	0.003	0.037	0.093	0.926
Stressful Life Events	**0.251**	**0.109**	**2.304**	**0.021**	−0.036	0.055	−0.658	0.511
Maternal Depression	−0.015	0.026	−0.585	0.558	−0.002	0.011	−0.195	0.845
Neighborhood Risk	0.507	0.319	1.592	0.111	−0.139	0.139	−0.999	0.318

*Bolded regression coefficients were significant at p < .05.