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From Early Attachment to Engagement With Learning in School: The Role of Self-Regulation and Persistence

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This article presents theoretical arguments and supporting empirical evidence suggesting that attachment experiences in early life may be important in the later development of self-regulation and conscientious behavior. Analyses of data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (NICHD Early Child Care Research Network, 2005; $N = 1,149$) were conducted to test the association between attachment, measured at 15 and 36 months, and 3 measures of self-regulation (social self-control rated by teachers, task persistence as measured by observers in a series of lab tasks, and a continuous performance test) between Grades 1 and 5. Mediation analyses were also conducted to test whether self-regulation mediates the effect of attachment on children's engagement with learning in the classroom, as measured by direct observation. The results confirmed the hypothesis that attachment would be related to later self-regulation, but only for social self-control, and attentional impulsivity, not task persistence. Furthermore, social self-control at Grade 1 mediated the effect of attachment (at both 15 and 36 months) on school engagement at Grade 5, even when Grade 1 school engagement was statistically controlled. The discussion focuses on the potential importance of early attachment experiences for the development and maintenance of conscientiousness across the lifespan.

Keywords: attachment, conscientiousness, self-regulation, learning, school

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Conscientiousness, broadly defined, refers to the tendency to be organized, careful, persistent in one's endeavours, responsible, trustworthy, cooperative and self-possessed in one's dealings with others (Roberts, Chernyshenko, Stark, & Goldberg, 2005). Conscientiousness is thus considered to be closely related to the concepts of self-management or self-regulation (Hoyle, 2006), with both intrapersonal aspects (planning, impulse control) and interpersonal ones (considering others, trustworthiness, compliance with norms and expectations). It is also clear, from the several articles in this special issue, that conscientiousness carries with it

sizeable benefits for health and wellbeing across the lifespan. Therefore, the causal factors that give rise to individual differences in conscientiousness are an important focus for prevention research. Despite its status as a primary dimension of adult personality being well established (Goldberg, 1990), much less is known about the *developmental antecedents* of conscientiousness. This includes, most notably for the purposes of this report, the role of social experience in shaping its emergence across development. Behavior genetic studies after all consistently point to the potential importance of both environmental, social experiences, in shaping individual differences in conscientiousness (Bergeman et al., 1993). Furthermore, studies have indicated that variance in conscientiousness in adulthood may be relatively predictable from measurements of child behavior taken in very early childhood (Caspi et al., 2003). Such temperamental variables likely represent the joint effect of both genetic and environmental influences (Saudino, 2005). There are thus grounds to investigate the developmental processes that contribute to conscientiousness, and its constituent behaviors, in early life.

As reviewed by Eisenberg, Duckworth, Spinrad, & Valiente (2013) in this issue, there is clear evidence that the broad constellation of behaviors and attitudes that typically fall under the common latent factor of conscientiousness in adults can also be identified at least at school-age if not earlier (Goldberg, 2001; Halverson et al., 2003). Furthermore, correlational studies indicate

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that there are consistent and coherent links between aspects of temperament—particularly effortful control and positive affectivity—and conscientiousness in childhood (Halverson et al., 2003). While one might consider childhood personality and temperament to be partially overlapping sets of indicators best conceptualized at the same level of analysis, a causal-developmental perspective encourages a consideration of more complex inter-relationships, beyond the statistical correlations among trait indicators at a given point in time. For example, this perspective highlights the possibility that different traits emerge at different developmental phases, causally influence later-emerging traits over time, and may represent the manifestation of behavior under the control of distinct mechanisms, with distinct developmental antecedents. Rothbart, Ellis, Rueda, and Posner (2003), for example, have argued that temperament represents basic and early-emerging traits rooted in neurobiological systems that are influenced by genes and experience. Temperamental dispositions then causally influence the emergence of more generalized beliefs, attitudes and habits that progressively cohere into dimensions of personality. Self-regulatory mechanisms are considered especially relevant in this emergent process, particularly for conscientiousness, because they are viewed as modulating reactive tendencies (e.g., impulsive approach, distractibility, fearfulness) that, unchecked, might undermine successful learning and adaptation in a range of developmentally important contexts. This approach thus focuses attention on the early causal influences on self-regulation, and the manner in which self-regulation then supports conscientious behavior over time and across contexts. In the current article, we therefore examine the role of early social experiences in the growth of self-regulation across childhood and investigate its unfolding contribution to conscientious behavior in a particularly important learning context—the school classroom. These inter-related developmental processes are an important subject for research in their own right but also serve to illustrate a developmentally focused approach to understanding the emergence and maintenance of conscientiousness that may have broader application across the lifespan.

The quality of the parent–child attachment relationship is one potential source of influence on the development of self-regulation and its subcomponents. The attachment relationship between a young child and their primary caregivers has been the focus of extensive investigation in the fields of developmental, clinical and applied psychology (Cassidy & Shaver, 2008). This focus is motivated by the assumption that secure primary attachment relationships provide the child with developmental advantages that are relatively stable over time. A host of studies provide evidence of such developmental benefits in domains that are arguably relevant to the subject of conscientiousness. Research indicates, for example, that children with secure attachments, relative to their insecure counterparts, tend to have fewer behavioral problems (Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsley, & Roisman, 2010), are more resilient when faced with challenge (Matas, Arend, & Sroufe, 1978; Murray et al., 2011), are more socially competent (Cohn, 1990; Elicker, Englund, & Sroufe, 1992; Waters, Wippman, & Sroufe, 1979), and may show more advanced cognitive development (particularly in language, see van IJzendoorn, Dijkstra, & Bus, 1995).

This body of research suggests that it may be important to consider the ways in which self-regulation is embedded in, and

shaped by, primary attachment relationships. It is also necessary to explore the mechanisms via which these relational processes support the child's broader adjustment. In this article we concentrate on the potentially fruitful intersections between the field of attachment and children's self-regulation. In particular, we explore the notion that, via several plausible mechanisms, secure attachment may promote aspects of self-regulation, which in turn may bolster adaptation in a range of contexts. Through this process, we suggest, secure attachment could also support the emergence of conscientiousness as a stable trait, with potentially long-term implications for achievement and health. Having outlined this theoretical background we then present data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD; NICHD Early Child Care Research Network, 2005) to test the contribution of attachment to the *growth* of self regulation across the primary school years and explore the impact of both on a key example of immediate significance for understanding the contribution of self-regulation to children's emergent conscientiousness, and ultimately their long-term achievement: engagement with learning in the classroom.

Attachment and Self-Regulation

Attachment theory provides a relatively well-articulated model for understanding the ways in which selected aspects of the parent–child relationship may affect a child's emotional and social behavior in the short and long-term, including self regulation and thus conscientiousness, and places special emphasis on the child's use of the parent as a *secure base* from which to explore the environment (Bowlby, 1988). In Bowlby's (1969) original work on attachment, he proposed that the attachment behavioral system had been shaped by natural selection to support the survival of immature offspring, by actively monitoring the whereabouts and availability of attachment figures and signaling to or actively seeking out those individuals when there were "natural clues" to threat in the environment. According to this view, establishment of contact with an attachment figure leads to termination of attachment behavior, reduces anxiety and thereby engenders feelings of comfort. The attachment system was thus conceptualized as a homeostatic regulatory system, switching on when threat was present, and switching off when a perception of safety was achieved.

Crucially, Bowlby (1969) proposed that the attachment system operates in dynamic interplay with other behavioral systems whose behavioral 'outputs' might be incompatible with that of the attachment system. The prime example of this described in Bowlby's (1969) early work, and taken forward by many others in the field since, was exploration (see, e.g., Waters & Cummings, 2000). Clearly, exploration of the environment is incompatible with simultaneously seeking comfort from a primary caregiver, and thus the attachment system when activated must in some sense inhibit exploration. When the comfort-providing function of the attachment system is operating successfully however, achievement of contact should terminate attachment behavior and "release" the exploration system from inhibition, thereby promoting the child's return to exploration.

It was this dynamic interplay between attachment and exploration that gave rise to the term "secure base," which neatly captures

the notion that by consistently providing a haven of safety in times of threat, a secure attachment provides support for the child's effective exploration of the environment. This central element of attachment theory makes understandable the once seemingly paradoxical prediction that a secure attachment relationship promotes the separation-individuation process and the growth of autonomy (Matas et al., 1978). This model of attachment and exploration helps conceptualize at least one of the ways in which the parental relationship might support the child's productive engagement with the environment, by providing the child with confidence that he or she can fall back on a supportive figure in times of need.

Theorists further assume that this process gradually becomes something that is less immediately dependent on the parent's presence—that is, becomes internalized—thereby enabling it to generalize across time and context (see Arend, Gove, & Sroufe, 1979; Sroufe, 1988). This process of generalization may be viewed as emerging as a result of more than one (self-regulatory) process. First, the child becomes increasingly able to cognitively represent parental figures and their likely supportive responses in their absence, such that the knowledge that the parent will be supportive continues to influence effective exploration outside of the confines of the parent-child relationship (e.g., at nursery or school, see Suess, Grossmann, & Sroufe, 1992). Second, through repeated experiences of supportive care, the child acquires more sophisticated abilities to regulate their emotions, which may, in turn, enhance the child's broader capacities for coping and adaptation (Calkins & Leerkes, 2004; Cassidy, 1994). Third, the repeated experience of successful, and supported, exploration of the environment provides the child with greater opportunities to learn, take initiative, cope with challenge independently, and internalize skills for self-regulation (Riksen-Walraven, Meij, van Roozendaal, & Koks, 1993).

Empirical Support for the Role of Attachment in Self-Regulation

The theoretical proposition that secure attachment facilitates the young child's effective exploration of the environment and the internalization of skills for mastery and self-regulation has been the basis of much research on the developmental consequences of attachment. In their classic investigation, Matas, Arend, and Sroufe (1978) predicted and observed that 24-month-old children who had earlier been classified as secure in the Strange Situation Procedure engaged more enthusiastically with challenging exploratory tasks, spent more time on-task, and proved less likely to become emotionally frustrated than their insecure counterparts; similar results emerged at age 4–5 years when teachers rated these same children on their capacity to cope with emotional and social challenges (i.e., ego-resiliency; Arend et al., 1979). Such work stimulated Belsky, Garduque, and Hrcncir (1984) to test the hypothesis—and find support for the notion—that secure infants would manifest a smaller competence-performance gap when the cognitive sophistication of their exploratory play was monitored. Further evidence of greater competence in exploration and engagement among secure children was reported by Riksen-Walraven et al. (1993), who observed, like Hazen and Durrett (1982) had before them, that secure infants later explored a novel toy with greater engagement, energy and enthusiasm when they were 30-month-old toddlers than did children with insecure attachment

histories. More recently, Murray et al. (2011) found that the anticipated adverse effect of maternal postnatal depression on children's ego-resiliency at 5 and 9 years of age—that is, their capacity to cope and maintain regulatory competence in the face of stress resulting from losing a rigged game—was mediated by earlier attachment history. Of interest, too, are Gilliom, Shaw, Beck, Schonberg, and Lukon's (2002) data showing that secure attachment in infancy forecasts increased capacities for delay of gratification, often considered a component of effortful control, which is itself regarded as a feature of self-regulation and thus would seem pertinent to this report on attachment and conscientiousness. Further and perhaps more direct evidence of a link between attachment and effortful control was provided by Fearon and Belsky (2004), who analyzed data from the continuous performance test—which required children to respond to an infrequently appearing target presented on a computer screen, and withhold a response to more frequently occurring nontargets—administered at age 54 months to children enrolled in the NICHD Study of Early Child Care and Youth Development. Children judged secure in the Strange Situation at 15 months were less likely to miss targets (an index of inattention) than insecure children (avoidant and disorganized), an effect that was more pronounced for children raised in more adverse social circumstances. Similarly, insecure children, particularly boys from more stressful social circumstances, tended to be more impulsive, as they more frequently responded to nontargets than secure children.

Attachment, Self-Regulation, and Engagement With Learning

If it is indeed the case that attachment promotes self-regulation one would expect that such effects would be apparent in a range of circumstances where emotional and behavioral self-control, persistence, attentional focus, and planning would be important. Arguably the most significant of these in childhood is the school classroom, where normative expectations for children's behavior strongly emphasize these behaviors. There is extensive evidence that self-regulatory ability is related to scholastic achievement and engagement with learning (Rothbart & Jones, 1998; Sektnan, McClelland, Acock, & Morrison, 2010; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008). Rothbart and Jones (1998) have argued that a key contribution of self-regulatory ability to school achievement is via its effects on children's capacities to derive intrinsic reward from engaging in challenging tasks (“mastery motivation”). By being able to resist distraction, manage frustration, focus attention, and persist at a difficult task, children with better self-regulatory abilities will likely experience a greater sense of efficacy in dealing with challenge, gain greater intrinsic (satisfaction) and extrinsic reward (e.g., praise) from their successes and manage the emotions associated with setbacks more effectively. Repeated experiences of these kinds would be expected to increase motivation to engage in learning, stabilize this tendency over time, and promote its generalization to other contexts (Rothbart & Jones, 1998). The notion that these processes may be influenced by the quality of early primary caregiving relationships has been strongly advocated by Pianta, Smith, and Reeve (1991). Although limited research has directly explored the role of early attachment security in engagement with learning at

school, there is good evidence that the quality of parent–child interaction, itself a reliable if modest predictor of attachment security (De Wolff & van IJzendoorn, 1997), is related to child competence and behavior problems in the classroom (Pianta & Harbers, 1996; Pianta et al., 1991).

The Current Study

As reviewed up to this point, there are good theoretical reasons for expecting secure attachment to be associated with greater self-regulatory capacity over the course of development, and the modest body of existing evidence suggests that this may be the case. Furthermore, there is good evidence that self-regulatory ability is a determinant of school engagement and achievement, which is arguably a critical context in which emergent conscientiousness develops. However, most of the work on attachment and self-regulation has been limited in statistical power and restricted to single points in time, which precludes a developmental analysis of the *growth* of self-regulatory skills. Furthermore, few if any studies have examined the seemingly plausible hypothesis that self-regulatory capacities may mediate the effect of attachment on later developmental outcomes and on school engagement in particular.

In the current article, we examine children’s behavior in the classroom, and particularly their engagement with learning, because this should be a highly discriminating context for observing the effects of individual differences in self-regulatory capacity, is an important context in which conscientiousness is manifest and develops and because of its broader relevance for subsequent achievement (e.g., see Wentzel, 1999; Wolters, 1999). A further reason for choosing this outcome is that it represents a more novel outcome from the point of view of existing attachment research, and hence affords the opportunity for a more exacting test of the theory outlined above. In other words, while attachment effects may be expected, given past research, in relation to more commonly studied outcomes such as behavioral problems, a model based on self-regulation as a primary mediating process would make the more novel prediction that attachment effects should be evident in the classroom, where the requirements for self-regulation are demanding.

The current article therefore (a) examines the role of attachment security, as measured at 15 and 36 months using standardized observational instruments, in the *growth* of self-regulatory behaviors across the early school years (Grades 1 to 5), (b) tests the role of self-regulatory processes in *change* in children’s engagement with learning in the classroom from Grade 1 to 5, and (c) tests whether self-regulatory processes mediate the effects of attachment on change in school engagement.

Method

Participants

The NICHD SECCYD recruited 1,364 families through hospital visits shortly after the birth of a child in 1991 at 10 U.S. locations (for detailed description of recruitment procedures and sample characteristics, see NICHD Early Child Care Research Network, 2001). During selected 24-hr intervals, all women giving birth ($N = 8,986$) were screened for eligibility. From that group, 1,364

families completed a home interview when the infant was 1 month old and became the study participants. Details of the sampling plan can be found in NICHD Early Child Care Research Network, 2005). In terms of demographic characteristics, 26% of the mothers had no more than a high school education at time of enrollment, 21% had incomes no greater than 200% of the poverty level at sixth grade, and 22% were minority (i.e., not non-Hispanic European American). In this article we report on analyses based on 1,149 children who had data on attachment at 15 months and 1,140 children who had data on attachment at 36 months. The cases included in the analyses were different to those not included on several demographic variables, with the included families drawn from generally less disadvantaged circumstances. Families in the current analyses were less likely to report during the study period that the child’s father did not live in the family home ($t_{1362} = 2.70$, $p < .001$), had a higher average family income ($t_{1362} = 3.43$, $p = .001$), and had greater maternal education ($t_{1361} = 5.18$, $p < .001$), and the mothers tended to be older ($t_{1362} = 4.38$, $p < .001$).

Measures

Measurements used in the research reported herein were selected from the NICHD SECCYD archive to provide information regarding (a) attachment, (b) self-regulation, and (c) school engagement. Measures of these constructs were chosen deliberately to minimize the possibility that shared method variance could influence the longitudinal associations. Thus, attachment was measured in relation to the child’s mother in all cases, whereas three distinct indices of self-regulation (see below) were based on teacher reports, observer ratings of child behavior in the presence of the father (or other adult—and not the mother) or in the child’s objective performance. School engagement was assessed by trained research assistants, directly observing the children in the classroom.

Information about this public data set can be found at <http://secc.rti.org/>. Ethical approval was granted by each of the 10 data-collecting universities before any data included in this reported were collected, and at each age of measurement, informed consent was secured from parents and/or teachers.

Attachment

Infant–mother attachment security was assessed at both 15 months and 36 months. The 36-month attachment assessment was included in light of some evidence that later attachment assessments may carry greater predictive strength than earlier ones (Fearon et al., 2010; McCartney, Owen, Booth, Clarke-Stewart, & Vandell, 2004). At 15 months, Ainsworth and Wittig’s (1969) standard Strange Situation procedure was used. At 36 months, a modified Strange Situation procedure (SSP) based on recommendations by Cassidy and Marvin (1992) and the MacArthur Working Group on Attachment was used. Each SSP videotape was coded twice at a central location by two of three coders blind to all information on the children, using the Ainsworth et al. (1978) standard criteria of secure (B), insecure-avoidant (A), insecure-resistant (C), disorganized (D), and unclassifiable (U) at age 15 months and the system developed by the MacArthur Working Group on Attachment (Cassidy & Marvin, 1992) at 36 months. Even though several years separated coding of 15- and 36-month

attachments, every effort was made to insure that the same coders did not code the same children at both times of measurement. Reliability at 15 months was calculated based on 867 randomly paired cases. Inter-coder agreement on the four-category A, B, C, and D classifications was 75.7% ($\kappa = .58$). At 36 months, agreement with the five-category classification system was 83% ($\kappa = .69$; NICHD ECCRN, 1997). Only cases classified A, B, C, or D are included in this study ($N = 1,149$).

Self-Regulation

Three distinct aspects of self-regulation that may be differentially related to attachment history are included in this report. Social self-control reflects the child's ability to regulate behavior and affect in the context of social relationships, as reported by teachers. Task persistence reflects the child's capacity to engage consistently in a challenging task without becoming distracted or irritable. Effortful control (EC) represents the capacity to inhibit pre-potent responses.

Social self-control (SSC). Ten items from the self-control subscale of the Social Skills Rating System (Gresham & Elliott, 1990) were used, repeatedly across the primary school years, to measure behavioral and emotional regulation in social contexts, with items reflecting the extent to which teachers judged children to be able to control temper in conflict situation with peers; compromise in conflict situations; respond appropriately to peer pressure; respond appropriately to teasing by peers; control temper when in conflict situation with adults; receive criticism well; accept peer ideas during group activities; cooperate with peers without prompting; respond appropriately when pushed or hit. When these 10 items were subject to principle component analysis and oblimin rotation, separately at each of five ages of measurement, to determine whether these items did in fact load strongly onto a common factor across grades, evidence emerged that two items needed to be dropped at Grade 1 (only) to generate highly internally consistent measures: "accepts peer ideas for group activities" and "gets along with people who are different." Chronbach's alpha ranged from .91 to .94 across grades.

Task-persistence (TP). TP was measured during the Adult-Child Interaction Task (ACIT) designed for the NICHD SECCYD study to assess the quality of father/partner/other adult and child behavior during a semistructured teaching and play situation which presented behavioral and emotional challenges when children were in Grades 1, 3, and 5. These interactions were videotaped and rating scales used to measure parenting dimensions and child behaviors. Further details of the interaction tasks at each age are presented in the supplemental online materials.

Children were rated on a 7-point scale ranging from *very high* to *very low* (levels of TP). TP is a measure of the child's involvement in the tasks irrespective of the degree to which the parent is instrumental in creating the persistence. Children scoring low in TP show no involvement in the discussion or the tasks, and either refuse to get involved or spend the time off-task, easily distracted, inattentive, bored and/or fidgety. Children scoring very high on TP are actively engaged with all of the discussion and tasks and works persistently at the tasks (either independently or with the help of the father/partner/other adult), offering ideas and asking questions.

Effortful control (EC). Performance at 54 months and Grade 1 on the Continuous Performance Task (CPT) served as indicators

of EC (see Mirsky, Anthony, Duncan, Ahearn, & Kellam, 1991; Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956). The task required children to press a button whenever a target stimulus appeared on a computer screen. At 54 months, children were presented with 22 blocks of 10 stimuli; the stimulus duration, at this age, was 500 ms, with an inter-stimulus interval of 1,500 ms. At Grade 1, 30 blocks of 10 stimuli were presented; each stimulus lasting 200 ms, with an inter-stimulus interval of 1,500 ms. The target stimulus was randomly presented twice in each block with all response data automatically tallied by the computer.

Following the earlier article by the NICHD ECCRN (see Belsky, Fearon, & Bell, 2007) we used children's commission errors (i.e., responses to nontargets) as a single indicator of EC, as these were previously found to be associated with children's behavioral problems and have been used extensively in other clinical and developmental studies. The test-retest reliability of the CPT is good in the age range studied in this research (Belsky et al., 2007; Halperin, Wolf, Greenblatt, & Young, 1991).

School-Engagement

School-engagement was measured using direct in-school observations, obtained using the Classroom Observation System at Grades 1, 3, and 5 (NICHD Early Child Care Research Network, 2005, 2006). The focus of the observations was the child's behavior and experiences within the classroom. Observations were recorded on a 7-point scale regarding the degree to which the child was engaged in classroom activities and teacher-child interactions during several observational cycles by trained observers (see supplemental online materials for further information). Inter-rater reliability was $> .80$ at each age.

Missing Data

The numbers of cases with valid data varied significantly across time and across measures (see Table 1 for a summary). To avoid excluding cases with missing data, which can undermine statistical

Table 1
Covariances and Correlations Between Self-Regulation Measures by Grade

Variable	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Social self-control					
Grade 1	7.822	0.440	0.410	0.419	0.406
Grade 2	3.636	8.734	0.457	0.485	0.486
Grade 3	3.447	4.062	9.053	0.492	0.454
Grade 4	3.449	4.220	4.360	8.673	0.512
Grade 5	3.478	4.396	4.180	4.614	9.369
<i>M</i>	10.810	11.011	10.675	10.786	10.798
<i>SD</i>	2.797	2.955	3.009	2.945	3.061
Task persistence					
Grade 1	0.960		0.130		0.086
Grade 2		0.128			
Grade 3			1.012		0.271
Grade 4				0.080	
Grade 5					0.902
<i>M</i>	6.089		5.627		5.257
<i>SD</i>	0.980		1.006		0.950

Note. Covariances appear below the diagonal, correlations above the diagonal. Variances are shown on the diagonal.

power and bias parameter estimates (Allison, 2003), we employed the full-information maximum likelihood (FIML) method, which uses all the available data to estimate the parameter estimates of a model (by calculating the log-likelihood of the data for each observational unit separately). This approach is clearly superior to mean substitution and list-wise deletion, and of comparable performance to multiple-imputation (Allison, 2003; Schafer & Graham, 2002).

Data Analysis

The longitudinal data on social-self control (SSC) and task persistence (TP) were analyzed using latent growth curve (LGC) models. These offer a multivariate approach to longitudinal data analysis based on the general structural equation modeling framework. The advantage of this approach is that it allows for (a) the estimation of the overall growth, (b) the estimation of the heterogeneity in the growth curve at the individual level, and (c) the flexible analysis of the invariance of growth parameters across groups, as well as the influence of constant and time-varying covariates, and the efficient estimation of effects in the presence of missing data (Curran & Willoughby, 2003).

The models were first constructed to estimate the initial level at Grade 1 (the intercept parameter) and growth from Grades 1 to 5. The overall means and variances in these parameters were also estimated using maximum-likelihood estimation. The quality of the model fit was simultaneously tested using the maximum-likelihood ratio-test statistic and indices of model fit (i.e., the comparative fit index [CFI], and the root-mean-square error of approximation [RMSEA]). CFI of values of .90 or above and RMSEA values of .08 or lower are considered to indicate an acceptable model fit (Bentler, 1990).

With the growth parameters of SSC and TP in hand, we investigated their relation to attachment security, comparing secure and (all) insecure children. We did this by comparing models where both the intercept and growth parameters were allowed to vary across the secure and insecure attachment groups with alternative models where either (a) the intercept parameter was constrained or (b) the growth parameter was constrained. Again, the quality of the model-fit was ascertained by inspecting the CFI and RMSEA values.

Finally the models of SR and TP across Grades 1 through 5 as a function of attachment were used to predict school-engagement at Grade 5, controlling for school-engagement at Grade 1, thereby resulting in the prediction of *change* in school engagement. This was done to test the notion that these self-regulatory measures (SSC and TP) mediate the effect of attachment on change over time in school engagement, as observed in the classroom. In these final models we treated attachment as a binary independent variable (as opposed to two groups in which separate growth models were run, as in the first and second models), and regressed the intercepts of SSC on attachment security, and Grade 5 school engagement (net of Grade 1 engagement) on the intercept, so that indirect paths (attachment > self-regulation > school engagement) could be estimated. Tests of mediation were conducted on the indirect paths. By controlling for Grade 1 school engagement when predicting school engagement 4 years later, we strengthened the basis for causal interpretations regarding the predictor (attach-

ment security) and mediator (self-regulation), we also controlled for Grade 1 school engagement.

Due to the high level of nonlinearity associated with the CPT scores from 54 months to Grade 4, LGM models were not estimated and only the CPT data at 54 months and Grade 1 were used in the mediation analysis. In this case, EC at both 54 months and Grade 1 were treated as potential mediators between early attachment and school engagement. All analyses were conducted using Mplus Version 4.21 (Muthén & Muthén, 2006).

Model CFI Derivation

Owing to the sensitivity of CFIs to misspecification, both in the marginal mean and covariance structure, a relatively novel approach was utilized to obtain the CFI for each LGM. For each LGM we computed two different CFIs, each based on a comparison of a null model against a hypothesized model in which either the mean structure or the covariance structure was saturated. In doing so, these adjusted CFIs can more precisely capture lack of fit in the mean structure or covariance structure of a LGM than traditional CFIs (see Wu & West, 2010).

Results

The results are presented in four subsections: (a) descriptive statistics; (b) the latent growth curve fittings (LGCs) of self-regulation and task persistence, respectively, over Grades 1 to 5, and Grades 1, 3, and 5; (c) the attachment-group effects on both LGCs; and (d) the mediating effects of SSC, TP, and EC (investigated separately as a function of attachment group) on change in school-engagement from Grade 1 to 5.

Descriptive Statistics and LGC Modeling of Social Self-Control and Task-Persistence

Table 1 presents the descriptive statistics for teacher-reported social self-control and task-persistence from Grades 1 to 5; recall that for task-persistence data were only obtained at Grade 1, 3, and 5. The covariance/correlations amongst these variables are also included. The data show that, overall, children's self-control levels peaked at Grade 2, declined at Grade 3, and then remained relatively stable throughout Grades 4 and 5; this suggested some general decline and the possibility of a degree of curvilinearity to the data. A latent growth curve model comprising a random intercept and both a linear and quadratic slope proved a good fit to the data, $\chi^2(6) = 11.36, p = .08$; CFI = .99; RMSEA = .028. However, constraining the quadratic term to zero did not significantly reduce overall model fit, $\Delta\chi^2(4) = 2.68, p = .62$. Constraining the linear slope to zero did reduce overall model fit ($\Delta\chi^2 = 11.01, p = .01$). A model with intercept and linear slope was thus chosen as the best fitting model. This model fit the data well (CFI = .99, RMSEA = .019; CFI = .99, $p = .33$ [covariance saturated]; CFI = 1.00, $p = .64$ [mean saturated]). The intercept showed significant variance (variance = 3.809, $SE = 0.33$); the variance of the slope was marginally significant (variance = 0.065, $SE = 0.034$).

Overall task-persistence levels showed a gradual decline from Grade 1 to 3 and then to 5. This suggests a linear pattern to the data and therefore a linear growth curve would best describe the pattern

of growth. A latent growth curve model comprising a random intercept and random linear slope fit the data well, $\chi^2(1) = 1.266$, $p > .05$; CFI = .995; RMSEA = .017; significant individual variation occurred in the intercept and slope variance (intercept variance = 0.173, $SE = 0.083$; linear slope variance = 0.112, $SE = 0.043$).

Attachment Security and the Growth of Social Self-Control, Persistence, and Effortful Control

Table 2 presents both the sample means and standard deviations of teacher-ratings of social self-control and task-persistence levels from Grades 1 to 5 by attachment group (secure vs. insecure attachment) as measured at both 15 and 36 months of age. Table 3 shows the intercept and growth parameter estimates of teacher-reported self-control and task-persistence. The LGC models were estimated in order to investigate the main effects of attachment group at both 15 and 36 months of age on both the intercept and change parameters for children's self-control and task-persistence levels.

When we examined the growth curves of social self-control and persistence as a function of attachment security we found significantly better social self-control in secure children at Grade 1 (the intercept), for both 15-month and 36-month attachment security, but no effects of attachment on persistence. To show this we proceeded as follows: (a) first we tested a latent growth curve model for teacher-reports of both children's social self-control and task-persistence levels and checked whether the variances of our self-regulation measures could be assumed to be equal across attachment groups; (b) we then ran models in which the intercept and growth parameters, between the attachment groups, were allowed to vary. We then tested whether constraining intercepts and slopes between attachment groups led to a significant reduction in model fit relative to the models from Step 2, which provides direct tests of our hypotheses concerning attachment effects on self-regulation. A detailed account of Steps 1 and 2 are presented in the supplemental online materials. Here, we focus on our primary hypothesis tests.

Constraining the intercept parameters to be equal across attachment groups, relative to an unconstrained model, gave rise to decreases in model fit for social self-control but not task persistence scores: As a function of attachment at 15 months the change in model fit for social self-control was $\Delta\chi^2(1) = 7.71$, $p = .006$; for task persistence, $\Delta\chi^2(1) = 2.53$, $p = .11$. As predicted, chil-

Table 3
Intercepts and Slopes for Overall LGC Models, and Separately by Attachment Group at 15 and 36 Months

Variable	Intercept		Linear slope	
	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>
Base LGC models				
Social self-control	10.787	<.001	-0.009	0.969
Task persistence	5.999	<.001	-0.407	<.001
Attachment LGC models				
Social self-control				
15 m Insecure	10.507	<.001	0.041	0.157
15 m Secure	10.993	<.001	-0.028	0.184
36 m Insecure	10.340	<.001	0.045	0.143
36 m Secure	11.055	<.001	-0.016	0.290
Task persistence				
15 m Insecure	5.999	<.001	-0.407	<.001
15 m Secure	6.113	<.001	-0.405	<.001
36 m Insecure	5.992	<.001	-0.419	<.001
36 m Secure	6.115	<.001	-0.406	<.001

Note. LGC = latent growth curve; m = months.

dren who were secure at 15 months scored more highly overall on social self-control at baseline (Grade 1) than insecure children (secure intercept = 10.99; insecure intercept 10.51; see Table 3). The effect size was modest, with Cohen's $d = 0.20$. Turning to 36-month attachment, in the case of social self-control there was a highly significant difference in the intercept between the attachment groups, $\Delta\chi^2(1) = 16.69$, $p < .0001$. As predicted, secure children at 36 months scored more highly on social self-control at Grade 1 than insecure children (secure intercept = 11.06; insecure intercept = 10.34; see Table 3). The difference in intercepts was equivalent to a medium effect size, with $d = 0.36$. For persistence, the effect of 36-month attachment on the intercept was not significant, $\Delta\chi^2(1) = 3.01$, $p = .080$.

When the growth parameters (i.e., slopes) were constrained, however, the goodness of model fit was not substantially altered for social self-control or task persistence as a function of attachment at either 15 or 36 months. Thus, there was no evidence from these data that the growth of social self-control or persistence beyond Grade 1 varied as a function of attachment security.

Table 2
Mean Social Self-Control and Task Persistence by School Grade and Attachment Security

Variable	Grade 1			Grade 2			Grade 3			Grade 4			Grade 5		
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Social self-control															
Secure (15 m)	11.03	2.659	565	11.17	2.870	524	10.77	3.000	545	10.95	2.759	494	10.93	2.829	510
Insecure (15 m)	10.58	2.890	349	10.74	3.053	311	10.47	3.024	324	10.67	3.114	309	10.74	3.212	309
Secure (36 m)	11.07	2.632	584	11.27	2.850	535	10.94	2.786	544	11.04	2.771	512	11.05	2.912	516
Insecure (36 m)	10.35	2.999	353	10.61	3.127	317	10.29	3.246	329	10.48	3.068	306	10.58	3.115	307
Task persistence															
Secure (15 m)	6.13	0.915	457				5.68	1.010	418				5.32	0.939	412
Insecure (15 m)	6.01	1.080	271				5.58	0.974	237				5.19	0.951	255
Secure (36 m)	6.14	0.988	487				5.67	0.983	441				5.32	0.925	426
Insecure (36 m)	6.00	0.962	255				5.55	1.079	228				5.16	0.991	239

Note. m = months.

Finally, in simple regression analyses, we found that attachment security at both 15 months and 36 months was associated with later EC at 54 months ($B = -.026, SE = 0.008, p = .001$ and $B = -.023, SE = 0.008, p = .004$, respectively), but not with EC at Grade 1 (attachment at 15 months, $B = .000, SE = 0.003, p = .887$; attachment at 36 months, $B = -.003, SE = 0.003, p = .218$).

Mediating Effects of Teacher-Reported Effortful Control, Social Self-Control, and Task Persistence on School Change in Engagement From Grade 1 to 5

Having discerned significant associations between attachment, social-self-control at Grade 1 and EC, we sought to test the proposition that these indices of self-regulation might mediate the effect of attachment on observed school engagement. As a preliminary step, we began by testing the association between the intercepts and slopes of social self-control (the mediator) and school engagement. To strengthen causal interpretations regarding these mediators we also controlled for Grade 1 school engagement, so that the effects of self-control on Grade 5 school engagement could not simply have resulted from the fact that they covaried at Grade 1 and may both have been stable over time. The analyses therefore effectively tested the role of self-regulation on *change* in school engagement between Grades 1 and 5. The intercept significantly predicted change in school engagement ($B = .86, SE = 0.28, \beta = .20, p < .001$) as did the slope ($B = 8.91, SE = 4.67, \beta = .27, p = .04$). Although task persistence did not relate to early attachment security (and therefore could not be a mediator), it is nevertheless worth noting that the intercept of persistence, though not the slope, also predicted change in school engagement (Intercept: $B = 8.34, SE = 0.384, \beta = .32, p < .001$; Slope $B = -1.66, SE = 3.17, \beta = -.064, p = .30$).

Having established that social self-control was predictive of later school achievement we then set out to directly test its medi-

ating role in the effects of attachment on school engagement. To do so, we treated attachment security as a binary independent variable (as above), and regressed the intercept of social self-control on attachment security, and school engagement at Grade 5 on social self-control and attachment, so that indirect paths (attachment > self-regulation > school engagement) could be estimated (see Figure 1). Tests of mediation were conducted on the indirect paths.

Our analyses yielded evidence of mediation for both 15-month and 36-month attachment via social self-control. Specifically, taking 15-month attachment first, the path from attachment to the intercept of social self-control was significant ($B = .47, SE = 0.17, p = .006$), as was the path from the intercept of social self-control to Grade 5 engagement ($B = .97, SE = 0.18, p < .001$). The indirect effect of attachment on Grade 5 “engagement with learning” via the intercept of social self-control was also significant, indicating significant mediation ($B = .46, z = 2.35, p = .019$). For 36-month attachment the mediation effect of social self-control was highly significant (indirect path via intercept $B = .69, z = 3.23, p < .001$). The effect of attachment on social self-control was strongly significant ($B = .73, SE = 0.17, p < .001$), as was the effect of social self-control on Grade 5 engagement (seen previously, $B = .94, SE = 0.18, p < .001$). These findings are summarized in Figure 1.

In an additional analysis, we tested whether the mediating pathways between 15-month and 36-month attachment to Grade 5 “engagement with learning” (via social self-control) were independent of each other, by estimating them simultaneously and testing mediation from this combined model. The results showed that both mediating pathways remained significant, independently of one another (15-month attachment: $B = .42, SE = 0.19, z = 2.26, p = .012$; 36-month attachment: $B = .70, SE = 0.21, z = 3.36, p < .001$).

In the case of effortful-control, although significant associations had emerged between attachment at both 15 and 36 months and

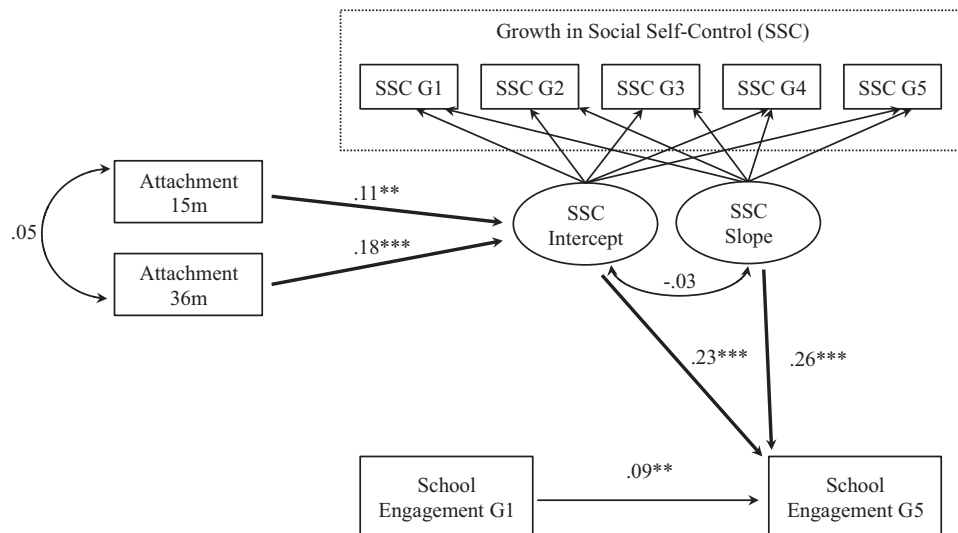


Figure 1. Summary of mediational pathways between attachment at 15 and 36 months (m) and school engagement at Grade (G) 5. For clarity, nonsignificant correlations between attachment and Grade 1 school engagement not shown. Also not shown are nonsignificant associations between attachment and slope of SSC. ** $p < .01$. *** $p < .001$.

scores on the CPT at 54 months, no mediating effect on school engagement was found.

Discussion

It is only relatively recently that researchers have begun to address questions regarding the early developmental processes that give rise to conscientiousness in childhood and adulthood. When doing so, it is essential that research questions are framed using models of social and cognitive development, and consider the multiple pathways and contexts within which nascent conscientiousness emerges. We argued, on the basis of prior research and theory (e.g., Rothbart & Jones, 1998) that self-regulation represents a critical early function that contributes to the emergence of a broader set of habits, attitudes and skills that coalesce into the construct of conscientiousness in later development. This likely takes place through a continuous transaction between the child's self-regulatory competences and relevant learning environments, of which the school classroom is a key example. We further argued that the quality of attachment relationships ought to be considered a candidate distal influence on this process, because existing research indicates that attachment may influence children's self-regulatory skills.

The study thus set out to (a) examine the role played by mother-child attachment in the development of self-regulation across the school years, (b) test the contribution of self-regulation to children's engagement with learning in the classroom, and (c) test the degree to which self-regulation mediates the relationship between attachment security and school engagement.

The proposal that attachment security might promote self-regulation received support from this study. Attachment security, measured using standardized laboratory assessments, predicted later self-regulation in the manner expected, as rated by teachers and as seen in children's performance in a continuous performance test. This was the case for both attachment measured in infancy and attachment at preschool age (36 months), though the effect sizes tended to be larger in the latter case. Overall, the effects of attachment security were not large, but when one considers the consistency of effects at both ages (15 and 36 months), the duration of time that had elapsed between assessments of attachment and outcome, and the clean separation of measurements (lab-based assessments of attachment and teacher reports of self-control/computer-based test of EC), the findings may nevertheless be important.

The stronger associations found in this study between later-measured attachment and developmental outcomes are consistent with other investigations focusing on attachment and later behavioral problems (Fearon et al., 2010; McCartney et al., 2004). While the shorter gap between assessments of attachment and outcome may be partly responsible for these larger effects, it is also quite plausible that changes in the developmental character of attachment take place after infancy, which amplifies its predictive capacity (Fearon et al., 2010). The findings overall are quite consistent with several other studies indicating that secure attachment is associated with greater self-regulatory skills, as defined and measured in a variety of ways (Calkins & Leerkes, 2004; Kochanska, Philibert, & Barry, 2009; Matas et al., 1978; Murray et al., 2011; Riksen-Walraven et al., 1993).

It is notable that in this study the effects of attachment were found most robustly in relation to social self-control as rated by teachers and was not apparent when we examined persistence as measured during a series of structured tasks. This discrepancy in the findings could indicate that attachment promotes regulation more strongly when regulation occurs in a social context (in this case peers), or that it influences emotional regulation more than behavioral regulation. The SSRS self-control scale does after all tap a number of socially situated regulatory behaviors, many of which require emotional regulation (e.g., responding appropriately to provocations from peers, controlling one's temper). However, it was notable that attachment was nevertheless linked to effortful control as measured by a continuous performance test, which would seem to undermine the notion that attachment's effects are restricted entirely to the social domain.

The current work suggests that considering young children's experiences within primary relationships may help shed further light on the processes that support their readiness to navigate the social and cognitive challenges of the school environment. In that regard, it was notable in this investigation that self-regulation, measured at Grade 1, was robustly predictive of directly observed engagement with learning in the classroom at Grade 5, and indeed more specifically with the change in school engagement between Grades 1 and 5. This finding suggests that appropriately controlling one's responses to social challenges may be an important prognostic indicator, and possibly direct causal influence, on the continuing development of children's capacities to engage with learning. The effect of attachment security, as measured at 15 and 36 months, on school engagement at Grade 5 was mediated by social-self-regulation skills, but not task persistence or effortful control. This apparently selective role for social self-regulation in relation to school engagement may indicate that the social aspects of self-regulation are most critical for supporting children's learning at school. In general, these findings point to the potential significance of attachment in children's capacities to get the most out of their early experiences in school, which, in turn, is a critical determinant of their longer-term scholastic achievement (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Welsh, Nix, Blair, Bierman, & Nelson, 2010). The fact that attachment, measured in infancy (Bokhorst et al., 2003) or preschool (O'Connor & Croft, 2001; Roisman & Fraley, 2008), appears not to be strongly heritable bolsters the view that the effects we have observed in this study represent environmental pathways rather than genetic ones.

In past literature on the subject of attachment there has been debate about what the breadth of plausible effects of attachment on later developmental outcomes ought to be (Sroufe, 1988). Indeed, some have suggested that the net has been cast too widely and have argued for a so-called "narrow view," in which the effects of attachment are restricted to functioning within close interpersonal relationships or only to socioemotional functioning (see Belsky & Cassidy, 1994). The current inquiry provides further evidence that a very narrow view of the developmental legacy of early attachment security and insecurity may not be correct. Our finding that attachment security is related to self-regulation and school engagement appears consistent with what Belsky and Cassidy (1994, Figure 16.1) characterized as a domain-general perspective on the sequelae

of attachment. The fact that past research has already suggested that several other, broader, outcomes may be associated with attachment as well, perhaps most notably language, also lends credence to this point of view.

In this article we suggested, following others, that attachment may promote children's capacities for self-regulation, which in turn may also provide the child with greater opportunities for learning and the further consolidation of skills for self-regulation over development. However, the current results only provide partial and indirect support for such theorizing, and direct evidence for the proposed mechanisms is lacking. Furthermore, the findings of this study, though longitudinal, are nevertheless correlational, and so the causal role of attachment in the development of self-regulation and school engagement cannot be determined. In that regard, clinical trials aimed at increasing rates of secure attachments would be extremely informative. Thus far, attachment focused intervention studies have not reported effects on self-regulation or school engagement. It is worth noting, however, that van den Boom's (1995) well-known intervention study, which had quite dramatic effects on rates of secure attachment, also provided evidence of longer-term effects on peer cooperation, an outcome almost certainly overlapping with the aspect of self-regulation (social self-control) that was linked with attachment in the current study. The possibility that attachment may causally influence self-control is thus worthy of further investigation using developmentally focused clinical trials.

The data reported here only pertain to the effect of attachment on childhood self-regulation and school engagement. However, given the extensive evidence that conscientiousness has long-term predictive significance for health and wellbeing, there may be significant potential benefit in identifying the very early determinants of conscientiousness for health and development in *adult life*. However, there are formidable hurdles to be overcome in order to systematically chart the impact of early social experience on adult outcomes, and isolate the intermediate developmental mechanisms. There are evident problems with using retrospective measures to assess early life experiences in adult cohorts (Hardt & Rutter, 2004), so prospective data are crucial. However, few long-term cohort studies have data of sufficient sensitivity to reliably establish the quality of early care so that the necessary long-term linkages could be tested. Nevertheless, several longitudinal cohort studies do exist that may be amenable to addressing such questions in relation to attachment and early parenting (e.g., see Grossmann, Grossmann, & Waters, 2005), particularly if they could be harmonized with other partially overlapping adult cohorts (see the work by Kern, Hampson, Goldberg, & Friedman, 2013, in this issue). Data harmonization may represent the most immediately tractable way of testing these vital longitudinal questions and could enable a more comprehensive investigation of the effect of early experiences on self-regulation and health/well-being across the life course.

References

Ainsworth, M. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation* (Vol. xviii). Hillsdale, NJ: Erlbaum.

- Ainsworth, M. D. S., & Wittig, B. A. (1969). Attachment and exploratory behavior of one-year-olds in a strange situation. In B. M. Foss (Ed.), *Determinants of infant behavior* (pp. 113–136). London, England: Methuen.
- Allison, P. D. (2003). Missing data techniques for structural equation modeling. *Journal of Abnormal Psychology, 112*, 545–557. doi:10.1037/0021-843X.112.4.545
- Arend, R., Gove, F. L., & Sroufe, L. A. (1979). Continuity of individual adaptation from infancy to kindergarten: A predictive study of ego-resiliency and curiosity in preschoolers. *Child Development, 50*, 950–959. doi:10.2307/1129319
- Belsky, J., & Cassidy, J. (1994). Attachment: Theory and evidence. In M. Rutter & D. Hay (Eds.), *Development through life: A handbook for clinicians* (pp. 373–402). Oxford, England: Blackwell.
- Belsky, J., Fearon, R. M. P., & Bell, B. (2007). Parenting, attention and externalizing problems: Testing mediation longitudinally, repeatedly and reciprocally. *Journal of Child Psychology and Psychiatry, 48*, 1233–1242. doi:10.1111/J.1469-7610.2007.01807.X
- Belsky, J., Garduque, L., & Hrcir, E. (1984). Assessing performance, competence, and executive capacity in infant play: Relations to home-environment and security of attachment. *Developmental Psychology, 20*, 406–417. doi:10.1037/0012-1649.20.3.406
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*, 238–246.
- Bergeman, C. S., Chipuer, H. M., Plomin, R., Pedersen, N. L., McClearn, G. E., Nesselroade, J. R., . . . McCrae, R. R. (1993). Genetic and environmental-effects on openness to experience, agreeableness, and conscientiousness: An adoption twin study. *Journal of Personality, 61*, 159–179. doi:10.1111/j.1467-6494.1993.tb01030.x
- Bierman, K. L., Nix, R. L., Greenberg, M. T., Blair, C., & Domitrovich, C. E. (2008). Executive functions and school readiness intervention: Impact, moderation, and mediation in the Head Start REDI program. *Development and Psychopathology, 20*, 821–843. doi:10.1017/S0954579408000394
- Bokhorst, C. L., Bakermans-Kranenburg, M. J., Fearon, R. M., van IJzendoorn, M. H., Fonagy, P., & Schuengel, C. (2003). The importance of shared environment in mother–infant attachment security: A behavioral genetic study. *Child Development, 74*, 1769–1782. doi:10.1046/j.1467-8624.2003.00637.x
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. London, England: Hogarth Press and the Institute of Psycho-Analysis.
- Bowlby, J. (1988). *A secure base: Parent–child attachment and healthy human development* (Vol. xii). New York, NY: Basicbooks.
- Calkins, S. D., & Leerkes, E. M. (2004). Early attachment processes and the development of emotional self-regulation. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory, and applications* (2nd ed.). New York, NY: Guilford Press.
- Caspi, A., Harrington, H., Milne, B., Amell, J. W., Theodore, R. F., & Moffitt, T. E. (2003). Children's behavioral styles at age 3 are linked to their adult personality traits at age 26. *Journal of Personality, 71*, 495–514. doi:10.1111/1467-6494.7104001
- Cassidy, J. (1994). Emotion regulation: Influences of attachment relationships. *Monographs of the Society for Research in Child Development, 59*(2–3, Serial No. 240), 228–249.
- Cassidy, J., & Marvin, R. S. (1992). *Attachment organization in preschool children: Coding guidelines*. Unpublished coding manual, MacArthur Working Group on Attachment, Seattle, WA.
- Cassidy, J., & Shaver, P. R. (Eds.). (2008). *Handbook of attachment theory, research and clinical applications* (2nd ed.). New York, NY: Guilford Press.
- Cohn, D. A. (1990). Child–mother attachment of six-year-olds and social competence at school. *Child Development, 61*, 152–162. doi:10.2307/1131055

- Curran, P. J., & Willoughby, M. T. (2003). Implications of latent trajectory models for the study of developmental psychopathology. *Development and Psychopathology, 15*, 581–612. doi:10.1017/S0954579403000300
- De Wolff, M., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*, 571–591. doi:10.1111/j.1467-8624.1997.tb04218.x
- Eisenberg, N., Duckworth, A. L., Spinrad, T. L., & Valiente, C. (2013). Conscientiousness: Origins in childhood? *Developmental Psychology, XX*, XXX–XXX.
- Elicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships in childhood from early parent–child relationships. In R. D. Parke & G. W. Ladd (Eds.), *Family peer relationships: Modes of linkage* (Vol. ix, pp. 77–106). Hillsdale, NJ: Erlbaum.
- Fearon, R. M. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Lapsley, A. M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children’s externalizing behavior: A meta-analytic study. *Child Development, 81*, 435–456. doi:10.1111/j.1467-8624.2009.01405.x
- Fearon, R. M. P., & Belsky, J. (2004). Attachment and attention: Protection in relation to gender and cumulative social-contextual adversity. *Child Development, 75*, 1677–1693. doi:10.1111/j.1467-8624.2004.00809.x
- Gilliom, M., Shaw, D. S., Beck, J. E., Schonberg, M. A., & Lukon, J. L. (2002). Anger regulation in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. *Developmental Psychology, 38*, 222–235. doi:10.1037/0012-1649.38.2.222
- Goldberg, L. R. (1990). An alternative “description of personality”: The Big-Five factor structure. *Journal of Personality and Social Psychology, 59*, 1216–1229. doi:10.1037/0022-3514.59.6.1216
- Goldberg, L. R. (2001). Analyses of Digman’s child-personality data: Derivation of Big-Five factor scores from each of six samples. *Journal of Personality, 69*, 709–744. doi:10.1111/1467-6494.695161
- Gresham, F. M., & Elliott, S. N. (1990). *The Social Skills Rating System*. Circle Pines, MN: American Guidance Service.
- Grossmann, K. E., Grossmann, K., & Waters, E. (Eds.). (2005). *Attachment from infancy to adulthood: The major longitudinal studies*. New York, NY: Guilford Press.
- Halperin, J. M., Wolf, L., Greenblatt, E. R., & Young, G. (1991). Subtype analysis of commission errors on the continuous performance test in children. *Developmental Neuropsychology, 7*, 207–217. doi:10.1080/87565649109540488
- Halverson, C. F., Havill, V. L., Deal, J., Baker, S. R., Victor, J. B., Pavlopoulos, V., . . . Wen, L. (2003). Personality structure as derived from parental ratings of free descriptions of children: The inventory of child individual differences. *Journal of Personality, 71*, 995–1026. doi:10.1111/1467-6494.7106005
- Hardt, J., & Rutter, M. (2004). Validity of adult retrospective reports of adverse childhood experiences: Review of the evidence. *Journal of Child Psychology and Psychiatry, 45*, 260–273. doi:10.1111/j.1469-7610.2004.00218.x
- Hazen, N. L., & Durrett, M. E. (1982). Relationship of security of attachment to exploration and cognitive mapping abilities in 2-year-olds. *Developmental Psychology, 18*, 751–759. doi:10.1037/0012-1649.18.5.751
- Hoyle, R. H. (2006). Personality and self-regulation: Trait and information-processing perspectives. *Journal of Personality, 74*, 1507–1526. doi:10.1111/j.1467-6494.2006.00418.x
- Kern, M. L., Hampson, S. E., Goldberg, L. R., & Friedman, H. S. (2013). Integrating prospective longitudinal data: Modeling personality and health in the Terman Life Cycle and Hawaii Longitudinal Studies. *Developmental Psychology, XX*, XXX–XXX.
- Kochanska, G., Philibert, R. A., & Barry, R. A. (2009). Interplay of genes and early mother–child relationship in the development of self-regulation from toddler to preschool age. *Journal of Child Psychology and Psychiatry, 50*, 1331–1338. doi:10.1111/j.1469-7610.2008.02050.x
- Matas, L., Arend, R.-A., & Sroufe, L. A. (1978). Continuity of adaptation in the second year: The relationship between quality of attachment and later competence. *Child Development, 49*, 547–556. doi:10.2307/1128221
- McCartney, K., Owen, M. T., Booth, C. L., Clarke-Stewart, A., & Vandell, D. L. (2004). Testing a maternal attachment model of behavior problems in early childhood. *Journal of Child Psychology and Psychiatry, 45*, 765–778. doi:10.1111/j.1469-7610.2004.00270.x
- Mirsky, A. F., Anthony, B. J., Duncan, C. C., Ahearn, M. B., & Kellam, S. G. (1991). Analysis of the elements of attention: A neuropsychological approach. *Neuropsychology review, 2*, 109–145. doi:10.1007/BF01109051
- Murray, L., Arteche, A., Fearon, R. M. P., Halligan, S., Goodyer, I., & Cooper, P. (2011). Maternal postnatal depression and the development of depression in offspring up to 16 years of age. *Journal of the American Academy of Child & Adolescent Psychiatry, 50*, 460–470. doi:10.1016/j.jaac.2011.02.001
- Muthén, L. K., & Muthén, B. O. (2006). *Mplus: Statistical analysis with latent variables* (Version 4.2). Los Angeles, CA: Muthén & Muthén.
- NICHD Early Child Care Research Network. (1997). The effects of infant child care on infant–mother attachment security: Results of the NICHD Study of Early Child Care. *Child Development, 68*, 860–879. doi:10.1111/j.1467-8624.1997.tb01967.x
- NICHD Early Child Care Research Network. (2001). Nonmaternal care and family factors in early development: An overview of the NICHD Study of Early Child Care. *Journal of Applied Developmental Psychology, 22*, 457–492. doi:10.1016/S0193-3973(01)00092-2
- NICHD Early Child Care Research Network. (2005). *Child care and child development: Results from the NICHD study of early child care and youth development*. New York, NY: The Guildford Press.
- NICHD Early Child Care Research Network. (2006). *The relations of classroom contexts in the early elementary years to children’s classroom and social behaviour*. Cambridge, England: Cambridge University Press.
- O’Connor, T. G., & Croft, C. M. (2001). A twin study of attachment in preschool children. *Child Development, 72*, 1501–1511. doi:10.1111/1467-8624.00362
- Pianta, R. C., & Harbers, K. L. (1996). Observing mother and child behavior in a problem-solving situation at school entry: Relations with academic achievement. *Journal of School Psychology, 34*, 307–322. doi:10.1016/0022-4405(96)00017-9
- Pianta, R. C., Smith, N., & Reeve, R. E. (1991). Observing mother and child behavior in a problem-solving situation at school entry: Relations with classroom adjustment. *School Psychology Quarterly, 6*, 1–15. doi:10.1037/h0088238
- Riksen-Walraven, J. M., Meij, H. T., van Roozendaal, J., & Koks, J. (1993). Mastery motivation in toddlers as related to quality of attachment. In D. Messer (Ed.), *Mastery motivation in early childhood: Development, measurement and social processes* (pp. 189–204). London, England: Routledge.
- Roberts, B. W., Chernyshenko, O. S., Stark, S., & Goldberg, L. R. (2005). The structure of conscientiousness: An empirical investigation based on seven major personality questionnaires. *Personnel Psychology, 58*, 103–139. doi:10.1111/j.1744-6570.2005.00301.x
- Roisman, G. I., & Fraley, R. C. (2008). A behavior-genetic study of parenting quality, infant attachment security, and their covariation in a nationally representative sample. *Developmental Psychology, 44*, 831–839. doi:10.1037/0012-1649.44.3.831
- Rosvold, H. E., Mirsky, A. F., Sarason, I., Bransome, E. D., Jr., & Beck, L. H. (1956). A continuous performance test of brain damage. *Journal of Consulting Psychology, 20*, 343. doi:10.1037/h0043220
- Rothbart, M. K., Ellis, L. K., Rueda, M. R., & Posner, M. I. (2003). Developing mechanisms of temperamental effortful control. *Journal of Personality, 71*, 1113–1144. doi:10.1111/1467-6494.7106009

- Rothbart, M. K., & Jones, L. B. (1998). Temperament, self-regulation and education. *School Psychology Review, 27*, 479–491.
- Saudino, K. J. (2005). Behavioral genetics and child temperament. *Journal of Developmental and Behavioral Pediatrics, 26*, 214–223. doi:10.1097/00004703-200506000-00010
- Sektan, M., McClelland, M. M., Acock, A., & Morrison, F. (2010). Relations between early family risk, children's behavioral regulation, and academic achievement. *Early Childhood Research Quarterly, 25*, 464–479. doi:10.1016/j.ecresq.2010.02.005
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147–177. doi:10.1037/1082-989X.7.2.147
- Sroufe, L. A. (1988). The role of infant–caregiver attachment in development. In J. Belsky & T. Nezworski (Eds.), *Clinical implications of attachment* (pp. 18–38). Hillsdale, NJ: Erlbaum.
- Suess, G. J., Grossmann, K., & Sroufe, L. A. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development, 15*, 43–65. doi:10.1177/016502549201500103
- Valiente, C., Lemery-Chalfant, K., Swanson, J., & Reiser, M. (2008). Prediction of children's academic competence from their effortful control, relationships, and classroom participation. *Journal of Educational Psychology, 100*, 67–77. doi:10.1037/0022-0663.100.1.67
- van den Boom, D. C. (1995). Do first-year intervention effects endure? Follow-up during toddlerhood of a sample of Dutch irritable infants. *Child Development, 66*, 1798–1816. doi:10.2307/1131911
- van IJzendoorn, M. H., Dijkstra, J., & Bus, A. G. (1995). Attachment, intelligence, and language: A meta-analysis. *Social Development, 4*, 115–128. doi:10.1111/j.1467-9507.1995.tb00055.x
- Waters, E., & Cummings, E. M. (2000). A secure base from which to explore close relationships. *Child Development, 71*, 164–172. doi:10.1111/1467-8624.00130
- Waters, E., Wippman, J., & Sroufe, L. A. (1979). Attachment, positive affect, and competence in the peer group: Two studies in construct validation. *Child Development, 50*, 821–829. doi:10.2307/1128949
- Welsh, J. A., Nix, R. L., Blair, C., Bierman, K. L., & Nelson, K. E. (2010). The development of cognitive skills and gains in academic school readiness for children from low-income families. *Journal of Educational Psychology, 102*, 43–53. doi:10.1037/a0016738
- Wentzel, K. R. (1999). Social-motivational processes and interpersonal relationships: Implications for understanding motivation at school. *Journal of Educational Psychology, 91*, 76–97. doi:10.1037/0022-0663.91.1.76
- Wolters, C. A. (1999). The relation between high school students' motivational regulation and their use of learning strategies, effort, and classroom performance. *Learning and Individual Differences, 11*, 281–299. doi:10.1016/S1041-6080(99)80004-1
- Wu, W., & West, S. G. (2010). Sensitivity of fit indices to misspecification in growth curve models. *Multivariate Behavioral Research, 45*, 420–452. doi:10.1080/00273171.2010.483378

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