

This article was downloaded by: [Institutional Subscription Access]

On: 20 August 2011, At: 11:30

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954

Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Early Education & Development

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/heed20>

Children's Effortful Control and Academic Achievement: Mediation Through Social Functioning

Carlos Valiente ^a, Nancy Eisenberg ^b, Rg Haugen ^b, Tracy L. Spinrad ^a, Claire Hofer ^b, Jeffrey Liew ^c & Anne Kupfer ^b

^a School of Social & Family Dynamics, Arizona State University

^b Department of Psychology, Arizona State University

^c Department of Educational Psychology, Texas A&M University

Available online: 01 Jun 2011

To cite this article: Carlos Valiente, Nancy Eisenberg, Rg Haugen, Tracy L. Spinrad, Claire Hofer, Jeffrey Liew & Anne Kupfer (2011): Children's Effortful Control and Academic Achievement: Mediation Through Social Functioning, *Early Education & Development*, 22:3, 411-433

To link to this article: <http://dx.doi.org/10.1080/10409289.2010.505259>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.tandfonline.com/page/terms-and-conditions>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan,

sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Children's Effortful Control and Academic Achievement: Mediation Through Social Functioning

Carlos Valiente

School of Social & Family Dynamics, Arizona State University

Nancy Eisenberg and Rg Haugen

Department of Psychology, Arizona State University

Tracy L. Spinrad

School of Social & Family Dynamics, Arizona State University

Claire Hofer

Department of Psychology, Arizona State University

Jeffrey Liew

Department of Educational Psychology, Texas A&M University

Anne Kupfer

Department of Psychology, Arizona State University

Research Findings: The purpose of this study was to test the premise that children's effortful control (EC) is prospectively related to their academic achievement and to specify mechanisms through which EC is related to academic success. We used data from 214 children (M age at Time 1 [T1] = 73 months) to test whether social functioning (e.g., social competence and externalizing problems) mediated the relations between EC and academic achievement. Children's adult-reported and observed EC were assessed at T1. Parents'

Correspondence regarding this article should be addressed to Carlos Valiente, School of Social & Family Dynamics, PO Box 873701, Arizona State University, Tempe, AZ 85287-3071. E-mail: valiente@asu.edu

and teachers' reports of social functioning were obtained 2 years later (T2), whereas teachers' and children's reports of academic achievement were obtained 4 years after T2 (T3). Children's T2 social functioning fully mediated the relation between T1 EC and T3 academic achievement in a structural equation model. *Practice or Policy:* Findings highlight the importance of considering social and emotional processes when attempting to improve academic achievement and have implications for curriculum developers and professionals working in preschool programs and elementary schools.

It is clear that children's academic achievement plays a central role in their opportunities for continued learning, academic progress, mental and physical health, and future employment (Bureau of Labor Statistics, 2004; Caspi, Elder, & Bem, 1987; Ensminger & Slusarcick, 1992; U.S. Department of Education, 2004). In an effort to understand why some school children fail to achieve at the desired levels, and why many kindergarten teachers note that a high percentage of their students have difficulty following directions, working in a group, or interacting with peers (Rimm-Kaufman, Pianta, & Cox, 2000), investigators from several disciplines have focused on the role of regulatory abilities/effortful control (EC) in children's academic achievement (Blair & Razza, 2007; McClelland et al., 2007; Valiente, Lemery-Chalfant, & Swanson, 2010). An often separate body of literature supports the premise that relationships with peers and the experience of problem behaviors also have implications for learning and achievement (Ladd, Herald, & Kochel, 2006; Welsh, Parke, Widaman, & O'Neil, 2001). The purpose of the present study was to bring together findings from these literatures in an effort to more fully explain why EC is predictive of academic achievement. We hypothesized that the relation between children's EC and their academic achievement is mediated by their social functioning. We tested this hypothesis in a 6-year prospective study.

EC is a group of temperamentally based skills viewed as the basis of self-regulation. Rothbart and Bates (2006) defined *EC* as "the efficiency of executive attention—including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors" (p. 126). EC develops rapidly in the preschool years and continues to improve in the early school years (Carlson, 2005; Rothbart & Bates, 2006). EC can be measured in a variety of ways, but adults' reports of children's attentional control (the abilities to effortfully focus and shift attention) and inhibitory control (the capacity to effortfully suppress inappropriate approach responses under instructions or in novel or uncertain situations) are perhaps most often used. EC can also be assessed behaviorally, and these tasks often measure persistence, attentional regulation, or the delay of gratification (Kochanska, Murray, & Harlan, 2000; Spinrad,

Eisenberg, & Gaertner, 2007). High levels of EC are adaptive in many contexts and may be especially useful in a classroom setting where children are required to modulate emotional reactivity and behaviors that would otherwise disrupt classroom activities.

Posner and his colleagues' work on the alerting, orienting, and executive attention networks is useful for clarifying the significance and meaning of EC (Posner & Rothbart, 2007; Rothbart, Sheese, & Posner, 2007). The alerting network maintains sensitivity toward incoming information, and the orienting network involves aligning attention with incoming messages (e.g., moving one's eyes toward stimuli). The focus of our investigation is on the more advanced executive attention network, which functions to monitor and resolve conflicts with other neural networks. The process of resolving conflicts involves the activation or suppression of other neural networks and is hypothesized to play a central role in regulatory efforts (Cole, Armstrong, & Pemberton, 2010; Posner & Rothbart, 2007). Regulatory abilities are particularly important given the contextual demands of early elementary classrooms, in which sitting still, attending to instructional materials, and ignoring distracting stimuli are crucial for performing well.

EC AND ACHIEVEMENT

In a seminal review, Raver (2002) made a compelling case for considering students' emotional development in models of school success, noting that self-regulation may impact academic achievement through a number of mechanisms. Raver and others have argued that students' EC provides academic advantages by helping children to focus on their assignments and avoid moving from task to task without completing required assignments (Duncan et al., 2007; Zimmerman, 1998). Motivational mechanisms are also likely to support the association between EC and achievement. Students high in EC are likely to be good at initiating, sustaining, and regulating their motivation for goal-directed learning, and there is clear evidence that motivation for learning is positively related to achievement (Meece, Anderman, & Anderman, 2006; Zimmerman, 1998). Finally, interpersonal mechanisms may mediate the relation between components of EC and achievement. Blair and Diamond (2008) noted that when children have poor self-regulation, school becomes difficult and unpleasant because compliance is challenging, attention control is difficult, and often relationships with teachers are characterized by annoyance and frustration. A large and robust body of literature demonstrates that EC is predictive of high-quality social relationships with both peers and teachers, and these relationships may promote students' academic success (Hamre & Pianta,

2001; Rothbart & Bates, 2006; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008).

Since the publication of Raver's (2002) report, a number of investigators have demonstrated that EC and related constructs predict many components of achievement. For example, in a series of studies, McClelland and colleagues (McClelland et al., 2007; Ponitz, McClelland, Matthews, & Morrison, 2009) demonstrated that observational measures of behavioral regulation are concurrently and prospectively related to scores in mathematics, literacy, and vocabulary. Moreover, attentional regulation has been related to standardized measures of achievement (Duncan et al., 2007; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network, 2003). A number of investigators also have reported concurrent and prospective relations between adults' reports of EC and children's academic success, both for students in the United States (Blair & Razza, 2007; Valiente, Lemery-Chalfant, & Castro, 2007; Valiente et al., 2008) and for those in China (Zhou, Main, & Wang, in press). It is noteworthy that many of the studies conducted in the United States included a significant percentage of minority children (mainly Hispanic children), and the relations between EC and achievement were quite similar for Caucasian and Hispanic children (McClelland et al., 2007; Valiente et al., 2008).

These findings provide relatively clear and consistent evidence that some of the central components of EC are related to achievement concurrently and over 1 to 2 years. What is not clear is whether these relations exist over longer periods of time and why these relations exist. A central goal of this article was to test whether the interpersonal mechanisms discussed previously—specifically social competence and externalizing problems—mediate the relations between EC and academic achievement. Statistical support for such mediation would require that EC predict the measures of social functioning and social functioning predict achievement when EC is controlled (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). There were good reasons to believe that these requirements would be met.

Indeed, there are a number of reasons to expect EC to contribute to children's social functioning. EC could be expected to impact the way children process information and modulate emotion, which is likely to contribute to social competence and the control of externalizing behavior (Dodge, Coie, & Lynam, 2006). In fact, the capacity to divert attention from nonconstructive thoughts to more positive perspectives is associated with low levels of anger, anxiety, and depression (Derryberry & Reed, 2002; Rothbart & Bates, 2006; Silk, Steinberg, & Morris, 2003). Moreover, planning behavior, which is part of EC, is often positively related to high levels of social functioning (Eronen, Nurmi, & Salmela-Aro, 1997).

Results from many studies support the hypothesis that EC is predictive of social functioning. Inhibitory control has been related to internalized compliance, low selfish/antisocial solutions to hypothesized dilemmas, and low externalizing problems (Kochanska & Knaack, 2003; Kochanska, Murray, & Coy, 1997; Martel et al., 2007). Similarly, children's effortful attention focusing and shifting have often been negatively related to externalizing problems, concurrently and prospectively, for children in the United States, China, Indonesia, and Europe (Eisenberg, Pidada, & Liew, 2001; Eisenberg et al., 2009; Muris, Meesters, & Blijlevens, 2007; Muris, Meesters, & Rompelberg, 2007; Zhou, Lengua, & Wang, 2009). Conversely, a number of investigators have reported positive relations between children's EC and their social competence (Eisenberg, Gershoff, et al., 2001; Rothbart & Bates, 2006; Spinrad et al., 2006; Valiente et al., 2008).

SOCIAL FUNCTIONING AND ACHIEVEMENT

As noted previously, children's social competence is hypothesized to predict academic achievement, and Eisenberg, Sadovsky, and Spinrad (2005) hypothesized that social competence might mediate the relations between EC and achievement. Students who are accepted by their peers and who develop and maintain friendships are likely to benefit from being included in classroom activities that provide high-quality opportunities for learning and exposure to educational materials (Wentzel, Baker, & Russell, 2009). There is also evidence that the number of mutual friends a child has and being accepted by peers are important precursors to achievement (Ladd, Birch, & Buhs, 1999). Students who are not accepted by their peers are often less motivated to participate in classroom activities and are at risk for withdrawing from learning opportunities (Wentzel et al., 2009). In a 2-year longitudinal study, Welsh et al. (2001) demonstrated that social competence was positively related to achievement. In one of the few studies to test for the presence of mediation, Valiente et al. (2008) found that teacher- and parent-reported social competence partially mediated the relations between EC and achievement. These findings are informative, but the data were concurrent, and data from longitudinal studies in which the predictor, mediator, and outcome are all measured at different assessments are needed in order to better test the relevant associations.

The co-occurrence of externalizing problems and low levels of academic achievement has been a research focus for some time (Hinshaw, 1992). Externalizing behaviors are quite likely to interfere with appropriately engaging in classroom activities, and children prone to aggressive behavior

may spend less time than less aggressive peers on tasks and may miss learning opportunities while being disciplined for their misbehavior (Arnold, 1997; Coie & Dodge, 1988; Hoglund, 2007). More aggressive children may also experience academic challenges because they have more difficulty than less aggressive peers forming and maintaining close relationships with their teachers (Jerome, Hamre, & Pianta, 2009). Despite relatively clear reasons to expect externalizing problems to predict achievement, findings are mixed, with some investigators finding no consistent direct relations between the constructs (Duncan et al., 2008) and others finding that relations are primarily mediated by the teacher–child relationship (Stipek & Miles, 2008). In contrast, in perhaps the longest longitudinal study to date addressing this issue, children who were consistently high in aggression from age 2 years, 9 months, were more likely than their peers to experience academic challenges when in third grade (NICHD Early Child Care Research Network, 2004).

Despite theoretical reasons to expect externalizing problems to be a mediator of the relation between EC and academic accomplishment, there are few relevant empirical data. The only direct test of mediation of which we are aware involved a kindergarten sample, and in this study externalizing problems did not predict standardized measures of math or literacy when the indices of EC were in the model (Graziano, Reavis, Keane, & Calkins, 2007). However, these authors examined concurrent associations in kindergarten and simultaneously considered the student–teacher relationship (which was a significant predictor and might overlap in prediction with externalizing problems). Perhaps, as noted by Rimm-Kaufman and Pianta (2000), the hypothesized mechanisms need more time to evolve in order to impact students' math and literacy skills and, thus, mediational processes might emerge over time. It is also possible that externalizing problems are more disruptive in the later elementary school years, as such behaviors would be more noticeable and atypical than those occurring in kindergarten (NICHD Early Child Care Research Network, 2004).

THE PRESENT STUDY

During the past decade, the number of investigators reporting relations between EC and academic achievement has grown markedly. It now seems relatively clear that EC is concurrently positively related to academic achievement; there is much less support for prospective relations between these constructs or evidence of the pathways through which EC might influence students' learning and achievement. The first aim of this study was to test whether children's reported and observed EC were prospectively related

to their academic achievement across a 6-year time period. Our second aim was to test whether children's social functioning acted as a statistical mediator of the relations between EC and achievement. We expected positive relations between EC and achievement and expected that social functioning would mediate these relations. We used data from a multi-reporter, multi-method longitudinal study to test our predictions. To examine whether the hypothesized model was robust across several key demographic variables, we explored the potential moderating role of children's sex, socioeconomic status (SES), and age. The associations between sex and achievement are complex, with some findings showing that girls outperform boys and others demonstrating the reverse relation or no relation (Frome & Eccles, 1998; Jordan, Kaplan, Oláh, & Locuniak, 2006; Simpkins, Davis-Kean, & Eccles, 2006; Valiente et al., 2008). Family SES, and especially income, is also a robust predictor of achievement. Families that earn higher incomes may provide more educational opportunities and materials to their children, and these children are also likely to experience lower levels of the chaos and educational disruptions that are associated with low income (Davis-Kean, 2005). Therefore, we included sex and SES as covariates in the equations when we tested the major hypotheses. Because children ranged in age from 4 to 8 at Time 1 (T1), and because age is sometimes positively related to the constructs under consideration, we also included age as a covariate.

METHOD

Participants

Families in this study were involved in a 6-year longitudinal study (Eisenberg, Cumberland, Spinrad, Fabes, Shepard, Reiser, et al., 2001). Parents were recruited to participate at one of four schools or through ads placed in schools, newspapers, and flyers. A key goal of the larger study was to examine relations between parenting, temperament, and problem behaviors in a sample of children experiencing a range of problem behaviors. Therefore, prior to being included in the study, parents completed the Child Behavior Checklist (Achenbach, 1991b). All children who received a *T* score above 59 (which is on the borderline of the clinical cutoff) on either the externalizing or internalizing subscale were asked to participate in the study. A matching procedure based on parents' education and occupation, children's age, and race was used to match children whose *T* scores were below 60 on both internalizing and externalizing to those who scored above 59 on one or both types of problems (not all eligible children were invited to continue with the study). Thus, the sample included children

with one or both types of problem behaviors (at a borderline level or higher) as well as children with scores below the borderline cutoff for both types of problem behaviors. Using this procedure resulted in a continuum of children's scores on both types of problem behaviors from low to relatively high. A total of 214 children were recruited, and data were collected from children, their parents, and teachers. Based on parent report of problem behaviors and the criterion of a *T* score of 60 or above as the cutoff for problem behaviors, 79 children were nondisordered, 31 were high in internalizing problems, 47 were high in externalizing problems, and 57 were high in both internalizing and externalizing problems. These children were not higher in externalizing problems than those in another study conducted in the same school district using all families who volunteered (i.e., with no selection process; Zhou, Hofer, Eisenberg, Reiser, Spinrad, Fabes, 2007).

At T1, 214 children (96 girls and 118 boys) between the ages of 55 and 97 months ($M = 73$) participated. A total of 193 children (88 girls and 105 boys) participated at Time 2 (T2), which was 2 years after T1, and 159 children (71 girls and 88 boys) participated at Time 3 (T3), which was 4 years after T2 (note that T3 in this study has been labeled T4 in other articles because there was an assessment between T2 and T3 in this study). The majority of families were working and middle class (T1 mean income = \$41,000, $SD = \$25,000$; 15% of the families earned less than \$15,000 per year). Mean family income was between \$40,000 and \$60,000 at T2 and T3. At each assessment, approximately 70% of parents had completed some college education. The majority of participants were Caucasian: 77% at T1, 80% at T2, and 78% at T3. Hispanics composed 12% of the sample at T1, 12% at T2, and 11% at T3. At each assessment less than 5% of the sample was Native American, African American, or Asian. Families were paid \$25 at T1 and \$30 thereafter.

We conducted a series of tests to explore whether there were differences on reported or observed EC, social competence, externalizing problem behaviors, mothers' education, fathers' education, income, sex, or race between those who continued at either T2 or T3 and those who did not complete measures after T1. Children who had data only at T1 ($n = 15$) were rated by teachers as having lower levels of EC and social competence, and parents reported lower incomes than those with data after T1, $t_s(193, 192, 192) = -2.13, -2.12, \text{ and } -2.17$, respectively, $ps < .05$. Children who attrited after T1 were also more likely than would be expected by chance to be minorities, $\chi^2(5) = 19.59, p < .001, N = 213$. We also compared those with data at each assessment ($N = 155$) to those who missed an entire assessment ($n = 59$) on reported or observed EC, social competence, externalizing problem behaviors, mothers' education, fathers' education, income, sex, and race.

Children who missed an assessment persisted less on the puzzle task, had fathers with lower levels of education, and had families that earned lower incomes than those with complete data, $t_s(210, 204, 192) = -2.65, -2.97,$ and $-1.97, p_s < .01, .01,$ and $.05,$ respectively.

Procedure

One parent (usually the mother) and the child came to a university laboratory to complete a series of questionnaires and tasks. At each assessment, during the middle and end of the school years, we mailed questionnaires to children's teachers.

SES. At T1, parents provided an estimate of their combined family income as well as the number of years of education both parents had completed. As shown in Table 1, income and education were all significantly and moderately interrelated.

EC. At T1, parents and teachers completed the attention shifting (e.g., "Can easily shift from one activity to another"; 9 items), attention focusing (e.g., "When drawing or coloring in a book, shows strong concentration"; 9 items for parents and 8 items for teachers), and inhibitory control (e.g., "Can lower his/her voice when asked to do so"; 13 items) subscales of the Children's Behavior Questionnaire (Rothbart, Ahadi, Hersey, & Fisher, 2001). Alphas for attention shifting, attention focusing, and inhibitory control subscales were .80, .74, and .84 for parents and .86, .85, and .88 for teachers, respectively. Parents' reports of attention shifting were related to attention focusing and inhibitory control, $r_s(207, 204) = .37$ and $.74, p_s < .01,$ respectively; and attention focusing was positively related to inhibitory control, $r(204) = .61, p < .01.$ An identical pattern emerged for teachers' reports of these variables, $r_s(193, 187, 187) = .61, .76,$ and $.78,$ respectively, $p_s < .01.$ As a result, we averaged these scales within reporter to form parent- and teacher-report scores for EC.

At T1, we also obtained an observed measure of EC during a laboratory visit. Children were seated in front of a puzzle that had a clear Plexiglas back and a cloth-covered front. Children inserted their hands through the cloth (which prevented the children from seeing the puzzle), and observers in a different room could see whether they were cheating by lifting the cloth. The experimenter set the timer for 4 min and told the children that they would receive a prize if they completed the puzzle within the allotted time. They were also told not to look at the puzzle. The experimenter then left the room. We used the amount of time children persisted (e.g., worked

TABLE 1
Descriptive Statistics and Zero-Order Correlations for Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Income	—											
2. Mothers' education	.44**	—										
3. Fathers' education	.39**	.53**	—									
4. T1 EC: Parent report	.07	.03	.14*	—								
5. T1 EC: Teacher report	.17*	.15*	.25**	.49**	—							
6. T1 EC: Puzzle	.12†	.05	.07	.28**	.24**	—						
7. T2 Social competence: Parent report	.11†	-.01	.18*	.56**	.42**	.23**	—					
8. T2 Social competence: Teacher report	.14*	.04	.13†	.33**	.48**	.24**	.47**	—				
9. T2 EXT: Parent report	-.10	-.07	-.11†	-.51**	-.40**	-.09†	-.44**	-.23**	—			
10. T2 EXT: Teacher report	-.18*	-.08	-.23**	-.30**	-.42**	-.20**	-.31**	-.69**	.24**	—		
11. T3 AA: Child report	.25*	.18*	.47**	.22*	.33**	.21*	.25**	.27**	-.08	-.20*	—	
12. T3 AA: Teacher report	.29**	.30**	.42**	.22*	.41**	.21**	.31**	.27**	-.16*	-.15*	.66**	—
<i>M</i>	40.96	14.12	14.04	4.41	4.87	0.55	3.20	3.09	12.79	9.57	6.14	5.49
<i>SD</i>	25.31	2.49	3.05	0.74	1.02	0.30	0.55	0.73	7.79	11.46	2.31	2.19

Note. T1 = Time 1; EC = effortful control; T2 = Time 2; EXT = externalizing problem behaviors; AA = academic achievement.
† $p < .10$. * $p < .05$. ** $p < .01$.

on the puzzle without cheating) divided by the total time spent completing the puzzle as an observed index of EC (interrater reliability: $r[197] = .97$).

Social competence. At T2, parents and teachers rated children's social competence on a modified version of Harter's (1982) Perceived Competence Scale for Children (Eisenberg et al., 1995; Eisenberg, Gershoff, et al., 2001). Socially appropriate behavior (e.g., "This child is usually well behaved"; $\alpha = .76$ for parents and $.87$ for teachers) was the average of four items. Popularity (e.g., "This child has a lot of friends"; $\alpha = .76$ for parents and $.91$ for teachers) was the average of three items. Consistent with prior research (Eisenberg, Gershoff, et al., 2001; Valiente et al., 2008), parents' reports of socially appropriate behavior and popularity were substantially correlated, $r(184) = .43$, $p < .001$; as were teachers' reports, $r(180) = .59$, $p < .001$. Thus, the scales were averaged within reporter to form separate measures of parent- and teacher-reported social competence.

Externalizing problem behaviors. Mothers used the Child Behavior Checklist and teachers used the Teacher Report Form (Achenbach, 1991a, 1991b) at T2 to rate children's externalizing problem behaviors. Items were coded on a scale of 0 (*not true*) to 2 (*very true*) per standard procedures. Alphas for externalizing problems were $.89$ for mothers (30 items) and $.96$ for teachers (29 items).

Academic achievement. Children's T3 academic achievement was reported on by teachers and children (1 = C- or below, 2 = C, 3 = C+, 4 = B-, 5 = B, 6 = B+, 7 = A-, 8 = A, 9 = A+). This method of assessment is similar to Pierce, Hamm, and Vandell's (1999) "mock report card" for assessing academic competence, and we adapted it to reflect the plus/minus grading system used in many of the local schools. The validity of this index is supported by correlations of $.80$ and higher between students' self-reported grades and scores on report cards (Graham, Updegraff, Tomascik, & McHale, 1997).

RESULTS

We computed two t tests at T1 to explore the relations between children's sex and parent- and teacher-reported EC. At T2, because multiple measures were available per reporter (e.g., social competence and externalizing problems), we computed a multivariate analysis of variance to examine these relations, and at T3 we computed t tests for teacher- and then child-reported achievement. At T1, girls were higher on parent- and teacher-rated EC and

observed EC than boys, $t_s(207, 193, 210) = 3.26, 3.35, \text{ and } 3.20$, respectively, $p_s < .002$. There was a significant multivariate analysis of variance involving T2 teacher- but not T2 parent-reported data, multivariate $F_s(2, 177 \text{ and } 2, 180) = 5.05 \text{ and } 1.79$, $p < .007$ and ns , respectively. Teachers rated girls higher on social competence and lower on externalizing problems than boys, $F_s(1, 178) = 7.57 \text{ and } 9.28$, $p_s < .01$, respectively. Children and teachers reported higher levels of T3 academic achievement for girls than boys, $t_s(121 \text{ and } 134) = 2.43 \text{ and } 4.15$, $p_s < .02 \text{ and } .001$, respectively. In addition, age was positively related only to parent-reported and observed EC, $r_s(207 \text{ and } 210) = .16 \text{ and } .13$, respectively, $p_s < .05$. Variables did not exceed the cutoffs for skewness, kurtosis, and outliers identified by West, Finch, and Curran (1995). There were no multivariate outliers (Cook, 1977).

Table 1 contains descriptive statistics and the zero-order relations between the main study variables. We were interested in assessing whether the variables expected to load on latent constructs were correlated and whether the pattern of correlations supported the hypothesized process of mediation. The across-reporter relations within construct were always significant and moderate in magnitude (e.g., parents' reports of EC were significantly positively related to teachers' reports of EC), suggesting that latent variables could be created in the structural equation modeling context. In support of our predictions regarding mediation, both reported and observed EC were positively related to the measures of social competence, negatively related to externalizing problems, and positively related to the measures of academic achievement. In addition, social competence (positively) and externalizing problems (negatively) were prospectively related to academic achievement. Therefore, the zero-order correlations were consistent with the requirements for mediation.

We used MPlus (Version 5.2; Muthén & Muthén, 1998–2005) and full information maximum likelihood estimation to account for missing data when testing our hypothesis using structural equation modeling. We estimated the within-reporter covariances among the error terms of the indicators (e.g., the error term for parent-reported EC was allowed to correlate with the error term for parent-reported social competence) to reduce bias associated with using the same reporters for latent variables (Kenny & Kashy, 1992; Thomson & Williams, 1984). To simplify the presentation, we do not present these parameters in Figure 1.

It is noteworthy that the measures of social competence were consistently negatively related to externalizing problems. Therefore, and because both measures were related to achievement, we created a latent variable that was indicated by the measures of both social competence and externalizing problems. The model displayed in Figure 1 fit the data well, $\chi^2(59) = 76.27$, $p < .09$, $N = 214$; comparative fit index = .97; root mean square error

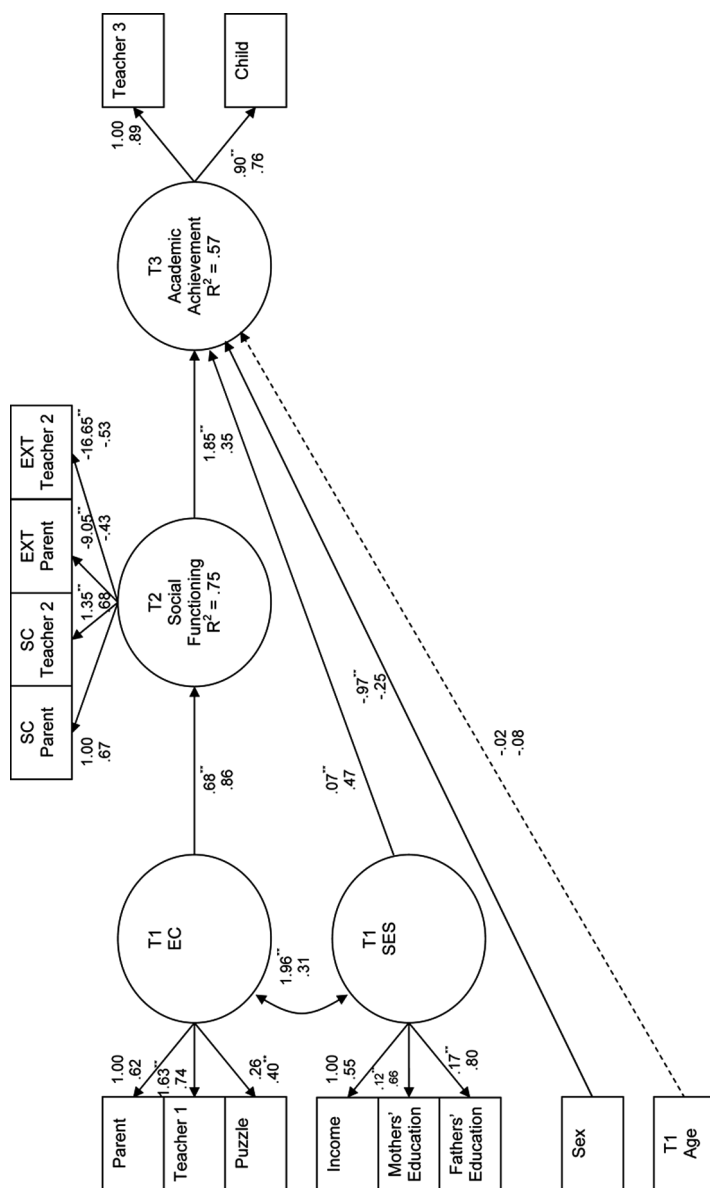


FIGURE 1 Estimated model. The mediated model with unstandardized estimates (standardized estimates are in parentheses). Estimated, but not included in the figure, covariances between age and SES, age and EC, and sex (1 = female, 2 = male) and SES were not significant. There was a significant covariance between sex and EC (unstandardized coefficient = $-.08^{**}$, standardized coefficient = $-.35$). Solid lines represent significant paths. SC = social competence; EXT = externalizing problems; T1 = Time 1; T2 = Time 2; T3 = Time 3; EC = effortful control; SES = socioeconomic status. * $p < .05$. ** $p < .01$.

of approximation = .04. Consistent with our hypotheses, EC was positively related to social functioning, and social functioning in turn was positively related to achievement, even when SES, age, and sex were used as covariates (i.e., as predictors of academic achievement).¹ To formally test mediation and to avoid problems associated with the nonnormal distribution of the indirect effect (e.g., the product of the coefficient from the independent variable to the mediator and the coefficient from the mediator to the dependent variable are generally nonnormally distributed), we used a confidence interval method recommended by MacKinnon and colleagues (2002). Both the upper and lower confidence limits are based on the product of two random variables from tables produced by Meeker, Cornwell, and Aroian (1981). Mediation is significant when the confidence intervals do not include zero. The confidence intervals based on the unstandardized coefficients shown in Figure 1 were 0.37 and 2.29, supporting the prediction that social functioning mediated the relation between EC and academic achievement.

We did not expect the findings to differ based on the child's sex, but we computed a Box's M as a first step in testing moderation. The Box's M statistic tests whether there are differences in the variance/covariance matrix; if Box's M is significant, one is justified in estimating multiple group models to examine the potential source of moderation (Winer, 1971). However, the nonsignificant Box's Ms indicated that sex and age did not moderate the pattern of findings, $F_s(91, 18,967 \text{ and } 91, 13,975) = 1.19 \text{ and } .830$, respectively, *ns*. In contrast, the Box's M for SES was significant, $F(66, 20,290) = 1.64, p < .001$. In follow-up analyses using multiple group models in which we compared chi-square based on freeing and releasing the paths displayed in Figure 1, we did not find evidence of moderation. Therefore, although Box's M was significant for SES (which is not surprising because it is a sensitive test), there was no evidence that the parameter estimates varied for children low versus high in SES.

DISCUSSION

A rapidly growing body of literature indicates that measures of EC are often concurrently related to academic achievement. In contrast, very few studies have explored the longitudinal relations between these variables using research designs that span more than 1 or 2 years (cf. Shoda, Mischel, &

¹We estimated an additional model in which we added paths from SES, age, and sex to social functioning. None was significant. In addition, when we estimated a model similar to the one in Figure 1 but with the social functioning measures assessed at T3, the significance of the paths was the same as shown in Figure 1.

Peake, 1990). In addition, only recently have investigators begun to specify the pathways and mechanisms through which EC influences academic achievement. The primary purpose of the present inquiry was to describe the longitudinal relations among EC, social functioning, and academic achievement. Based on theoretical (Eisenberg et al., 2005; Valiente & Eisenberg, 2008) and empirical (Ponitz et al., 2008, 2009; Valiente et al., 2007, 2008) findings, we predicted that EC would be positively related to academic achievement; we further expected quality of social functioning to mediate these relations. The results support our predictions.

Children who were rated by adults as having high levels of EC and who persisted on a mildly frustrating task when in early elementary school (i.e., kindergarten to third grade) achieved academically at relatively high levels when in middle school or high school (i.e., 6 years after T1). Our confidence in the findings is strengthened because the relations were found both within and across reporter when both reported and observed data for EC were used. The pattern of findings suggests that there is a robust relation between EC and academic achievement and supports the notion that attentional and inhibitory control are important contributors to school success (Blair, 2002; Ponitz et al., 2009). The data presented here complement findings of positive concurrent relations of behavioral regulation, working memory, inhibitory control, and attention with literacy and math skills when children are both in preschool and in the early elementary years (Bronson, Tivnan, & Seppanen, 1995; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; NICHD Early Child Care Research Network, 2003). Our findings also extend the limited number of prospective studies that span more than 1 to 2 years and are consistent with findings that preschoolers' regulatory abilities predict their SAT scores (Shoda et al., 1990).

Blair (2002) has argued that EC, and particularly attentional regulation, is relevant for academic performance because when students' attentional abilities are limited and focused on several tasks, students often experience difficulties integrating new material. The work of Posner and colleagues (Posner & Rothbart, 2007; Rothbart et al., 2007) on the executive attention system is consistent with Blair's predictions and highlights the importance of considering the contextual demands placed on young children's ability to frequently monitor and evaluate incoming stimuli. These explanations have roots in the cognitive literature (Ruff & Rothbart, 1996) and are supported by findings that children who have difficulty with attention often have poor reading and language skills (McGee, Partridge, Williams, & Silva, 1991; Tamis-LeMonda & Bornstein, 1989), perhaps because difficulties in focusing on tasks or moving from task to task as needed interfere with both learning and completing tasks.

In support of Eisenberg et al.'s (2005) model and our predictions, there is evidence that the relation between EC and academic achievement is mediated by students' social functioning. The longitudinal associations between EC and quality of social functioning replicate a robust body of literature (see Rothbart & Bates, 2006, for a review). Children's EC is believed to affect their social functioning by contributing to how emotion is modulated and how information is processed. When children are able to rein in their behavior and adhere to social standards, they are likely to avoid engaging in aversive or aggressive behaviors in social interactions and are more likely to act in socially appropriate ways.

The findings in this study support the hypothesis that part of the reason why children high in EC perform well in school is that they are relatively competent in terms of their social behavior. These data are consistent with cross-sectional findings that students' social competence partially mediates the associations between EC and grades (Valiente et al., 2008) and strengthen evidence that students' peer interactions are longitudinally related to their academic success (Welsh et al., 2001; Wentzel et al., 2009). When children are low in EC and, as a consequence, are disruptive and engage in aggressive activities, they are likely to receive less substantial support from their peers, which in turn is likely to negatively impact their academic performance. This is especially noteworthy given that many models of instruction require students to engage in social interactions in small-group settings; students who experience difficulty in the peer domain are relatively unlikely to benefit from peer collaboration or cooperative learning groups.

The associations between social functioning and achievement contradict Duncan et al.'s (2007) finding that externalizing problems and social skills are not related to later academic achievement. The lack of correspondence between findings may stem from differences in when externalizing problems and social skills were assessed. Duncan et al. (2007) measured these constructs prior to school entry, and we obtained these data during the early elementary years. Perhaps disruptive behavior is more problematic for learning and achievement during this developmental period, in part because such behavior would be less normative than during the preschool period.

Strengths and Limitations

This investigation has several methodological strengths. First, data were obtained from multiple informants (children, their parents, and teachers), and we also gathered data using questionnaires and observations. Moreover, the teachers who served as reporters differed at all three assessments.

Therefore, it is unlikely that the pattern of findings was inflated because of shared reporter or method variance. Second, in addition to documenting prospective associations between EC and achievement, we identified mechanisms that may underlie these relations. Third, we controlled for a number of potential covariates, and we examined whether SES, children's sex, or age moderated the hypothesized model. The lack of moderation suggests that this pattern can be generalized to children varying in SES, sex, and age. It is noteworthy that age was not a significant moderator. Students ranged in age from 55 to 97 months at T1 and 127 to 169 months age T3 (during which time they were in fifth to ninth grade), suggesting that similar processes operate across a range of development. Nevertheless, future work that more directly tests whether the hypothesized relations are similar for younger and older children is needed. Despite these strengths, there are key areas that could be improved in future research. First, the inclusion of indices of IQ in subsequent models would be valuable. It is possible that the magnitude of the relations between EC (or social functioning) and achievement would be reduced when IQ is in the model, but based on the extant literature it is very likely that relations would continue to be significant (Blair & Razza, 2007; Gottfried, 1990; Masten et al., 2005). Second, the findings reported here are for a primarily Caucasian sample; based on other work with more diverse samples (Valiente et al., 2008; Zhou et al., in press), we believe the processes will replicate cross-ethnically and cross-racially, but additional evidence is necessary before we are able to generalize the findings to other groups. Third, in future inquiries it would be quite valuable to consider reciprocal models. Hinshaw (1992) and others have argued that there are likely bidirectional relationships between externalizing problems and academic achievement. A better appreciation for how social functioning and academic achievement influence each other as children progress through early elementary school would provide a richer understanding of how to intervene and prevent further deterioration in the social and academic domains. Finally, there were some differences between families who completed data at all assessments (more than 75% of the families) and those who missed one or more assessments. Although we relied on the most current methods for imputing missing data, it would clearly be more advantageous to have obtained complete data. Finally, we could not control for grade point average at an earlier age to assess prediction of change in children's grade point average by EC and social functioning, which would have provided a stronger test of potential causal relations.

Notwithstanding these limitations, the pattern of findings presented here has educational implications. Our model highlights the value of considering students' social and emotional functioning in models of school success. There is mounting evidence that attentional abilities and inhibitory control

can be improved via training experiences and interventions and that growth in these domains positively impacts academic success (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Diamond, Barnett, Thomas, & Munro, 2007; Domitrovich, Cortes, & Greenberg, 2007). Based on the current findings, we believe a focused effort to improve EC is advantageous because growth in this area is likely to produce both social advantages (e.g., high levels of social competence and low levels of problem behaviors) and academic advantages. Many activities that can be used to improve self-regulation are relatively inexpensive or free and can be administered in the classroom. Given the many demands placed on teachers, it is likely that administrators need to provide clear messages supporting the modest amount of time needed to promote students' EC in order for teachers to engage in such activities.

REFERENCES

- Achenbach, T. M. (1991a). *Integrative guide for the 1991 CBCL/4-18, YSR, and TRF profiles*. Burlington: University of Vermont, Department of Psychiatry.
- Achenbach, T. M. (1991b). *Manual for the Child Behavior Checklist/4-18 and 1991 profile*. Burlington: University of Vermont, Department of Psychology.
- Arnold, D. H. (1997). Co-occurrence of externalizing behavior problems and emergent academic difficulties in young high-risk boys: A preliminary evaluation of patterns and mechanisms. *Journal of Applied Developmental Psychology, 18*, 317–330.
- 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.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–127.
- Blair, C., & Diamond, A. (2008). Biological processes in prevention and intervention: The promotion of self-regulation as a means of preventing school failure. *Development and Psychopathology, 20*, 899–911.
- Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*, 647–663.
- Bronson, M. B., Tivnan, T., & Seppanen, P. S. (1995). Relations between teacher and classroom activity variables and the classroom behaviors of prekindergarten children in Chapter 1 funded programs. *Journal of Applied Developmental Psychology, 16*, 253–282.
- Bureau of Labor Statistics. (2004). [Tabulations: 2004]. Retrieved from <ftp://ftp.bls.gov/pub/special.requests/lf/aat7.txt>
- Carlson, S. M. (2005). Developmentally sensitive measures of executive function in preschool children. *Developmental Neuropsychology, 28*, 595–616.
- Caspi, A., Elder, G. H., & Bem, D. J. (1987). Moving against the world: Life-course patterns of explosive children. *Developmental Psychology, 23*, 308–313.
- Coie, J. D., & Dodge, K. A. (1988). Multiple sources of data on social behavior and social status in the school: A cross-age comparison. *Child Development, 59*, 815–829.

- Cole, P. M., Armstrong, L. M., & Pemberton, C. K. (2010). The role of language in the development of emotion regulation. In S. D. Calkins & M. A. Bell (Eds.), *Child development at the intersection of emotion and cognition: Human brain development* (pp. 59–77). Washington, DC: American Psychological Association.
- Cook, R. D. (1977). Detection of influential observation in linear regression. *Technometrics*, *19*, 15–19.
- Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. *Journal of Family Psychology*, *19*, 294–304.
- Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology*, *111*, 225–236.
- Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007, November 30). Preschool program improves cognitive control. *Science*, *318*, 1387–1388.
- Dodge, K. A., Coie, J. D., & Lynam, D. (2006). Aggression and antisocial behavior in youth. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, personality development* (6th ed., pp. 719–788). Hoboken, NJ: Wiley.
- Domitrovich, C. E., Cortes, R. C., & Greenberg, M. T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool "PATHS" curriculum. *Journal of Primary Prevention*, *28*, 67–91.
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., . . . Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*, 1428–1446.
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., . . . Japel, C. (2008). "School readiness and later achievement": Correction to Duncan et al. (2007). *Developmental Psychology*, *44*, 232.
- Eisenberg, N., Cumberland, A. J., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M. et al. (2001). The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. *Child Development*, *72*, 1112–1134.
- Eisenberg, N., Fabes, R. A., Murphy, B., Maszk, P., Smith, M., & Karbon, M. (1995). The role of emotionality and regulation in children's social functioning: A longitudinal study. *Child Development*, *66*, 1360–1384.
- Eisenberg, N., Gershoff, E. T., Fabes, R. A., Shepard, S. A., Cumberland, A. J., Losoya, S. H., . . . Murphy, B. C. (2001). Mother's emotional expressivity and children's behavior problems and social competence: Mediation through children's regulation. *Developmental Psychology*, *37*, 475–490.
- Eisenberg, N., Pidada, S., & Liew, J. (2001). The relations of regulation and negative emotionality to Indonesian children's social functioning. *Child Development*, *72*, 1747–1763.
- Eisenberg, N., Sadovsky, A., & Spinrad, T. (2005). Associations among emotion-related regulation, language skills, emotion knowledge, and academic outcomes. *New Directions in Child and Adolescent Development*, *109*, 109–118.
- Eisenberg, N., Valiente, C., Spinrad, T. L., Cumberland, A., Liew, J., Reiser, M., . . . Lasoya, S. H. (2009). Longitudinal relations of children's effortful control, impulsivity, and negative emotionality to their externalizing, internalizing, and co-occurring behavior problems. *Developmental Psychology*, *45*, 988–1008.
- Ensminger, M. E., & Slusarcick, A. L. (1992). Paths to high school graduation or dropout: A longitudinal study of a first-grade cohort. *Sociology of Education*, *65*, 95–113.
- Eronen, S., Nurmi, J.-E., & Salmela-Aro, K. (1997). Planning-oriented, avoidant, and impulsive social reaction styles: A person-oriented approach. *Journal of Research in Personality*, *31*, 34–57.

- Frome, P. M., & Eccles, J. S. (1998). Parents' influence on children's achievement-related perceptions. *Journal of Personality and Social Psychology, 74*, 435–452.
- Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. *Journal of Educational Psychology, 82*, 525–538.
- Graham, J. E., Updegraff, K. A., Tomascik, C. A., & McHale, S. M. (1997). Someone who cares: Evaluation of school advisor programs in two community settings. *Applied Developmental Science, 1*, 28–42.
- Graziano, P. A., Reavis, R. D., Keane, S. P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology, 45*, 3–19.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development, 72*, 625–638.
- Harter, S. (1982). The Perceived Competence Scale for Children. *Child Development, 53*, 87–97.
- Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin, 111*, 127–155.
- Hoglund, W. L. G. (2007). School functioning in early adolescence: Gender-linked responses to peer victimization. *Journal of Educational Psychology, 99*, 683–699.
- Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003). Regulatory contributors to children's kindergarten achievement. *Early Education & Development, 14*, 101–119.
- Jerome, E. M., Hamre, B. K., & Pianta, R. C. (2009). Teacher-child relationships from kindergarten to sixth grade: Early childhood predictors of teacher-perceived conflict and closeness. *Social Development, 18*, 915–945.
- Jordan, N. C., Kaplan, D., Oláh, L. N., & Locuniak, M. N. (2006). Number sense growth in kindergarten: A longitudinal investigation of children at risk for mathematics difficulties. *Child Development, 77*, 153–175.
- Kenny, D. A., & Kashy, D. A. (1992). Analysis of the multitrait-multimethod matrix by confirmatory factor analysis. *Psychological Bulletin, 112*, 165–172.
- Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality, 71*, 1087–1112.
- Kochanska, G., Murray, K., & Coy, K. C. (1997). Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. *Child Development, 68*, 263–277.
- Kochanska, G., Murray, K., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*, 220–232.
- Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence? *Child Development, 70*, 1373–1400.
- Ladd, G. W., Herald, S. L., & Kochel, K. P. (2006). School readiness: Are there social prerequisites? *Early Education & Development, 17*, 115–150.
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*, 83–104.
- Martel, M. M., Nigg, J. T., Wong, M. M., Fitzgerald, H. E., Jester, J. M., Puttler, L. I., . . . Zucker, R. A. (2007). Childhood and adolescent resiliency, regulation, and executive functioning in relation to adolescent problems and competence in a high-risk sample. *Development and Psychopathology, 19*, 541–563.
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., . . . Tellegen, A. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41*, 733–746.

- McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*, 947–959.
- McGee, R., Partridge, F., Williams, S., & Silva, P. A. (1991). A twelve-year follow-up of preschool hyperactive children. *Journal of the American Academy of Child & Adolescent Psychiatry, 30*, 224–232.
- Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annual Review of Psychology, 57*, 487–503.
- Meeker, W. Q., Cornwell, L. W., & Aroian, L. A. (1981). *Selected tables in mathematical statistics: Vol. VII. The product of two normally distributed random variables*. Providence, RI: American Mathematical Society.
- Muris, P., Meesters, C., & Blijlevens, P. (2007). Self-reported reactive and regulative temperament in early adolescence: Relations to internalizing and externalizing problem behavior and “big three” personality factors. *Journal of Adolescence, 30*, 1035–1049.
- Muris, P., Meesters, C., & Rompelberg, L. (2007). Attention control in middle childhood: Relations to psychopathological symptoms and threat perception distortions. *Behaviour Research and Therapy, 45*, 997–1010.
- Muthén, L. K., & Muthén, B. O. (1998–2005). *Mplus user's guide* (3rd ed.). Los Angeles, CA: Author.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2003). Do children's attention processes mediate the link between family predictors and school readiness? *Developmental Psychology, 39*, 581–593.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2004). Trajectories of physical aggression from toddlerhood to middle childhood. *Monographs of the Society for Research in Child Development, 69*, 1–129.
- Pierce, K. M., Hamm, J. V., & Vandell, D. L. (1999). Experiences in after-school programs and children's adjustment in first-grade classrooms. *Child Development, 70*, 756–767.
- Ponitz, C. C., McClelland, M. M., Jewkes, A. M., Connor, C. M., Farris, C. L., & Morrison, F. J. (2008). Touch your toes! Developing a direct measure of behavioral regulation in early childhood. *Early Childhood Research Quarterly, 23*, 141–158.
- Ponitz, C. C., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology, 45*, 605–619.
- Posner, M. I., & Rothbart, M. K. (2007). Research on attention networks as a model for the integration of psychological science. *Annual Review of Psychology, 58*, 1–23.
- Raver, C. C. (2002). Emotions matter: Making the case for the role of young children's emotional development for early school readiness. *Social Policy Report, 16*(3), 3–18.
- Rimm-Kaufman, S. E., & Pianta, R. C. (2000). An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. *Journal of Applied Developmental Psychology, 21*, 491–511.
- Rimm-Kaufman, S. E., Pianta, R. C., & Cox, M. J. (2000). Teachers' judgments of problems in the transition to kindergarten. *Early Childhood Research Quarterly, 15*, 147–166.
- Rothbart, M. K., Ahadi, S. A., Hersey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development, 72*, 1394–1408.
- Rothbart, M. K., & Bates, J. E. (2006). Temperament. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, personality development* (6th ed., pp. 99–166). Hoboken, NJ: Wiley.
- Rothbart, M. K., Sheese, B. E., & Posner, M. I. (2007). Executive attention and effortful control: Linking temperament, brain networks, and genes. *Child Development Perspectives, 1*, 2–7.

- Ruff, H. A., & Rothbart, M. K. (1996). *Attention in early development: Themes and variations*. London, England: Oxford University Press.
- Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology, 26*, 978–986.
- Silk, J. S., Steinberg, L., & Morris, A. S. (2003). Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development, 74*, 1869–1880.
- Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006). Math and science motivation: A longitudinal examination of the links between choices and beliefs. *Developmental Psychology, 42*, 70–83.
- Spinrad, T. L., Eisenberg, N., Cumberland, A., Fabes, R. A., Valiente, C., Shepard, S. A., . . . Guthrie, I. K. (2006). Relation of emotion-related regulation to children's social competence: A longitudinal study. *Emotion, 6*, 498–510.
- Spinrad, T. L., Eisenberg, N., & Gaertner, B. M. (2007). Measures of effortful regulation for young children. *Infant Mental Health Journal, 28*, 606–626.
- Stipek, D., & Miles, S. (2008). Effects of aggression on achievement: Does conflict with the teacher make it worse? *Child Development, 79*, 1721–1735.
- Tamis-LeMonda, C. S., & Bornstein, M. H. (1989). Habituation and maternal encouragement of attention in infancy as predictors of toddler language, play, and representational competence. *Child Development, 60*, 738–751.
- Thomson, E., & Williams, R. (1984). A note on correlated measurement error in wife-husband data. *Journal of Marriage and Family, 46*, 643–649.
- U.S. Department of Education. (2004). *The condition of education 2004*. Washington, DC: U.S. Government Printing Office. Retrieved from <http://nces.ed.gov/pubs2006/dropout/ref.asp#ed>
- Valiente, C., & Eisenberg, N. (2008). Emotion regulation. In E. Anderman & L. Anderman (Eds.), *Psychology of classroom learning: An encyclopedia* (pp. 357–360). Detroit, MI: Macmillan Reference.
- Valiente, C., Lemery-Chalfant, K., & Castro, K. S. (2007). Children's effortful control and academic competence. Mediation through school liking. *Merrill-Palmer Quarterly, 53*, 1–25.
- Valiente, C., Lemery-Chalfant, K. S., & Swanson, J. (2010). Prediction of kindergartners' academic competence from their effortful control and negative emotionality: Evidence for direct and moderated relations. *Journal of Educational Psychology, 102*, 550–560.
- 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.
- Welsh, M., Parke, R. D., Widaman, K., & O'Neil, R. (2001). Linkages between children's social and academic competence: A longitudinal analysis. *Journal of School Psychology, 39*, 463–482.
- Wentzel, K. R., Baker, S., & Russell, S. (2009). Peer relationships and positive adjustment at school. In R. Gilman, E. S. Huebner, & M. J. Furlong (Eds.), *Handbook of positive psychology in schools* (pp. 229–243). New York, NY: Routledge.
- West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 56–75). Thousand Oaks, CA: Sage.
- Winer, B. J. (1971). *Statistical principles in experimental design*. New York, NY: McGraw-Hill.

- Zhou, Q., Hofer, C., Eisenberg, N., Reiser, M., Spinrad, T. L., & Fabes, R. A. (2007). The developmental trajectories of attention focusing, attentional and behavioral persistence, and externalizing problems during school-age years. *Developmental Psychology, 43*, 369–385.
- Zhou, Q., Lengua, L. J., & Wang, Y. (2009). The relations of temperament reactivity and effortful control to children's adjustment problems in China and the United States. *Developmental Psychology, 45*, 724–739.
- Zhou, Q., Main, A., & Wang, Y. (2010). The relations of temperamental effortful control and anger/frustration to Chinese children's academic achievement and social adjustment: A longitudinal study. *Journal of Educational Psychology, 102*, 180–196.
- Zimmerman, B. J. (1998). Developing self-fulfilling cycles of academic regulation: An analysis of exemplary instructional models. In D. H. Schunk (Ed.), *Self-regulated learning: From teaching to self-reflective practice* (pp. 1–19). New York, NY: Guilford Press.