INTRODUCTORY INTEGRATIVE STATEMENT

Overview

In this introductory integrative statement, I provide an overview of self-regulation research in the developmental literature, past and present. The objectives for each of the three dissertation papers are also presented. The concluding integrative statement complements the introduction by elaborating on themes that occur across the dissertation studies (contributions, unique aspects, limitations) and identifying a possible 40-year agenda for the field of self-regulation.

Self-regulation: The Past

The recent surge of interest in emotion regulation can be traced to the early 1980s (Campos, Barrett, Lamb, Goldsmith, & Stenberg, 1983; Kopp, 1982; Rothbart & Derryberry, 1981), but the roots of this literature took hold far more than a quarter century ago. The contemporary study of emotion regulation is anchored in the psychoanalytic and stress and coping traditions (see Eisenberg et al., 2004 and Gross, 1999 for reviews). In Freud's theory, (1923/1974) the ego regulates the impulses of the id and the internalized standards of the superego. Erikson's (1950/1963) psychosocial theory also addressed the emergence of self-regulation. One example is Erikson's initiative versus guilt stage, which is developmentally relevant for three- to six-year-olds. Children of caregivers who demand too much self-control at this stage may develop an inflexible, over-controlled response style or feelings of guilt.

Later in the twentieth century, researchers studying coping during the 1960s and 1970s also addressed the issue of regulation. Informed by his early coping work on stress and cognitive appraisals, Lazarus (e.g., Lazarus, Opton, Nomikos, & Rankin, 1965) focused on the management of emotion and behavior when a person experienced stress. Accordingly, Lazarus and Folkman (1984) defined coping as "constantly changing cognitive and behavioral efforts to manage specific external

and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p. 141). Thus broadly defined, coping includes attempts to modulate the effects of stressful situations that are appraised as relevant to one's well-being and as such are likely to be emotion-generating. As suggested by Gross (1999), coping comprises a broader category than emotion regulation although unique features of emotion regulation include modulating positive emotions coupled with an emphasis on modulating emotional expressions.

Self-regulation: The Present

Developmentalists have worked to both define self-regulation, also called emotion regulation, as a construct (e.g., Campos, Mumme, Kermoian, & Campos, 1994; Cicchetti, Ganiban, & Barnett, 1991; Cole, Michel, & Teti, 1994; Cole, Martin, & Dennis, 2004; Eisenberg, Champion, & Ma, 2004; Thompson, 1994) and to delineate the ways and conditions under which regulation is linked to children's social functioning (e.g., Cole et al., 2004; Eisenberg & Fabes, 1992; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Thompson & Calkins, 1996). As Langlois (2004) noted in her introduction to a special section of *Child Development,* which included eight commentaries in response to a lead article by Cole, Martin, and Dennis (2004) on refining the construct of emotion regulation, many questions about this area in developmental studies remain unanswered. This is somewhat surprising because, although researchers are far from reaching consensus on precisely where to place self-regulation on the conceptual map, there is general agreement about its importance in healthy development: "The growth of self-regulation is a cornerstone of early childhood development that cuts across all domains of behavior" (Shonkoff & Phillips, 2000, p. 3). Among those questions that Langlois mentions:

> How should one define emotion and emotion regulation? Is there a difference between emotion and emotion regulation, and if so, what exactly *is* that

> difference? Are emotions regulated or regulating? Is emotion physiological arousal, or is it cognitive appraisal, or is it both? And if it is both, which comes first? (Langlois, 2004, p. 315).

It is clear that Langlois' (2004) questions reflect ties between self-regulation studies and the stress and coping tradition (e.g., Lazarus, 1966). Although a general consensus on the definition of self-regulation has not yet been reached, there are at least three issues at the heart of this ongoing work: the role of intent, external agents, and physiology (Eisenberg, Champion, & Ma, 2004). In the following instances self-regulation is defined variously as:

> extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to achieve one's goals (Thompson, 1994, pp. 27-28);

> the intra- and extraorganismic factors by which emotional arousal is redirected, controlled, modulated, and modified to enable an individual to function adaptively in emotionally arousing situations (Cicchetti, Ganiban, & Barnett, 1991, p. 15);

> *changes associated with activated emotions.* These include changes in the emotion itself . . . or in other psychological processes (e.g., memory, social interaction) . . . . The term emotion regulation can denote two types of regulatory phenomena: emotion as regulating and as regulated . . . . *Emotion as regulating refers to changes that appear to result from the activated emotion . . . . Emotion as regulated refers to changes in the activated emotion.* These include changes in emotion valence, intensity or time course . . . and may occur within the individual (e.g., reducing stress through self-soothing) or between individuals (e.g., a child makes an unhappy parent smile) (Cole, Martin, & Dennis, 2004, pp. 320-321);

> the process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, or duration of internal feeling states, emotion-related physiological, attentional processes, motivational states, and/ or the behavioral concomitants of emotion in the service of accomplishing affect-related biological or social adaptation or achieving individual goals (Eisenberg & Spinrad, 2004, p. 338).

A less common definition—although it is more intuitive and appealing given its simplicity and elegance of design—is offered by Campos, Frankel, and Camras (2004, p. 380). The idea here is that emotion and emotion regulation co-occur and thus cannot be disaggregated:

> Emotion regulation is the modification of any process in the system that generates emotion or its manifestation in behavior. The processes that modify emotions come from the same set of processes as those that are involved in emotion in the first place. An exception is when a social agent, often mobilized by his or her own emotions, intervenes to address one's problem (as when a mother soothes a hungry or frightened baby, or when an adult breaks up a fight between children). Regulation takes place at all levels of the emotion process, at all times the emotion is activated, and is evident even before an emotion is manifested (Campos, Frankel, & Camras, 2004, p. 380).

The Present Dissertation Studies

The focus of developmental psychopathology research has expanded in the past two decades from identifying risk and protective factors to understanding how these factors operate as processes that lead to socioemotional and academic competence. Rather than studying which child, family, or environmental factors predict adjustment, researchers are increasingly asking how (*i.e.*, through mediation) and under what conditions (*i.e.*, through moderation) such factors influence adjustment. In the papers that comprise this dissertation, I focus on self-regulation in an attempt to understand how its different aspects relate to children's early adjustment.

Self-Regulation Defined

It may be possible to understand emotionality and self-regulation by examining their origins in temperament (Eisenberg, Fabes, Guthrie, & Reiser, 2000; Lengua, 2002; Rothbart & Bates, 1998; Rothbart, Ahadi, & Evans, 2000). In Rothbart's model, temperament is defined as a collection of relatively stable, physiologically

based individual differences in reactivity and self-regulation. Likewise, many researchers have suggested that temperament forms a core around which personality develops as a result of interactions with the environment (*e.g.*, Caspi, 2000; Caspi, Roberts, & Shiner, 2005; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Rothbart et al., 2000).

In the following set of dissertation papers, self-regulation is conceptualized in terms of behavioral and attentional regulation. Following Eisenberg and colleagues (1997) and Thompson (1994), self-regulation is defined as the process of modulating the occurrence, intensity, or duration of internal feelings through the redirection of behavior and attention. Attentional regulation is defined by the capacity to shift and focus attention as needed. Behavioral regulation refers to the ability to suppress or *initiate* the expression of appropriate responses as needed. It is possible to distinguish attentional from behavioral forms of regulation by the domain within which regulation is exercised. That is, attention regulation is an *internal* process involving *cognitions* whereas behavior regulation is an *overt* process involving the *expression* of behavior (Eisenberg, Guthrie et al., 2000, p. 1367).

Objectives

Dissertation Paper 1. The goal of Paper 1 was to understand the relationship between limit-setting and adjustment by examining the mediating role of children's self-regulatory skills among a sample of children from ethnically and geographically diverse, low-income families. Building from previous research, it was hypothesized that consistent limit-setting practices prior to children's entry in school would promote better attention and behavioral regulation skills, which in turn would contribute to greater socioemotional and academic competence at age six. Similarly, it was hypothesized that ineffective limit-setting, which is often brought about by stressors

associated with poverty, would undermine children's social and academic competence as first graders, in part through decrements to their self-regulatory skill development.

In an effort to understand how risk factors contribute to children's maladjustment, many developmental researchers have studied the extent to which parenting behaviors account for the relationship between sociodemographic risk factors and adjustment. This study *extends* this work by examining the degree to which children's self-regulatory skills explain the relationship between parenting and children's subsequent socioemotional development and academic success. Thus child processes are defined and tested as mediators between external limit-setting processes and outcomes.

While numerous studies have documented linkages between self-regulatory difficulties and childhood maladjustment in general (Eisenberg & Fabes, 1992; Shoda, Mischel, & Peake, 1990), very little research has been conducted to assess whether the pathways between self-regulation (of either type) and adjustment are similar specifically for young, economically disadvantaged children. Paper 1 thus aims to minimize a very real gap in our understanding of how self-regulation operates within high-risk contexts (Shields & Cicchetti, 1998).

Dissertation Paper 2. The primary goal of Paper 2 was to understand the relationship between children's inhibitory control and their subsequent adjustment within a low-income sample by examining the mediating role of children's behavior regulation skills measured both at Time 1 and Time 2. Building on the work of Block and Block (1980) and Eisenberg, Spinrad, Fabes et al. (2004), Paper 2 serves as one of the first studies to test whether inhibitory control operates through behavioral regulation and thereby delineate associations between inhibitory control (the capacity to effortfully suppress behaviors as appropriate) and behavior regulation (the capacity to effortfully suppress *and activate* behaviors as appropriate). Theoretically, there are

strong reasons for expecting inhibitory control to contribute to behavior regulation but not vice versa. That is, inhibitory control can contribute to behavior regulation (*e.g.*, by inhibiting emotion), but behavior regulation involves more than control (*e.g.*, it also includes the ability to activate behavior) (Eisenberg, Spinrad et al., in press). Thus, inhibitory control has traditionally been viewed exclusively as an expression of control whereas behavior regulation has been viewed as an expression of a flexible response style (this view parallels Block & Block's [1980] concepts of "ego control" and "ego resiliency").

It is critical that low-income children enter the first-grade classroom equipped to learn, because first-grade academic achievement is highly predictive of future academic performance (Blair, 2002). Reviews by Raver (2002) and Pianta and Walsh (1998) indicate that skills other than academic preparedness promote early academic success. In Paper 2, we identify one group of such skills, behavior regulation measured at Time 1 and Time 2, and delineate the pathways through which these skills contribute to early academic success and competent classroom functioning among low-income children. Related to this topic, Pianta and Walsh (1998) argue that the early school years warrant particular attention as a period in which to consider intervention, especially when coupled with a focus on processes and not products. Paper 2 focuses on processes *and* outcomes, so its results apply to this significant period, with the aforementioned focus on classroom outcomes for young children from low-income families.

Dissertation Paper 3. Paper 3 aims to inform research on the direct effects of self-regulation by testing whether variations in negative emotionality mitigate or exacerbate relations from attentional and behavioral forms of regulation to subsequent adjustment among a sample of low-income children who have been followed longitudinally. Until recently many researchers combined regulation and emotionality

measures. In the early 1980s, for example, anger and other negative emotions were thought to reflect low self-regulation and thus were included as components of some emotion regulation constructs (Caspi, Henry, McGee, Moffitt, & Silva, 1995). Today, most investigators agree that emotional lability should not be equated to self-regulatory difficulties (Cole, Dennis, & Martin, 2004). At the same time, research suggests that self-regulation is a stronger predictor of outcomes for children who frequently experience negative emotions than for those who do not (Eisenberg, Fabes et al., 1996).

Dissertation Paper 3 strives to reveal the role of negative emotionality in relation to child adjustment by focusing on its moderating effects, particularly the extent to which it attenuates or exacerbates the effects of self-regulation. The paper thus expands upon earlier work (Eisenberg, Guthrie et al., 2000) by examining the conditions under which some children are buffered from the risks associated with low self-regulation while other children appear to be more vulnerable to sequelae associated with self-regulatory difficulties. Tests of moderation are vital to our understanding of self-regulatory skill development because these analyses allow us to determine the extent to which risk factors, such as self-regulatory difficulties, may be mitigated and thereby pose a lesser threat to child adjustment.

Unique Contributions to the Literature

There are, to date, relatively few studies that examine whether the known relations between children's self-regulatory skills and subsequent adjustment also hold for economically disadvantaged children. Thus the goal of this dissertation was to understand the association between self-regulation and adjustment by examining the moderating role of child characteristics such as negative emotionality (anger/frustration) and the mediating role of self-regulatory skills. Within the familial context, this research examines whether self-regulation skills account for part of the

relations between parenting practices and children's adjustment. This study uses home and school interviews, which were completed with 163 economically disadvantaged families and their 4-year-old children enrolled in Head Start programs within rural and urban settings. Of the participating families at Time 2, longitudinal data are available for 100 of these families and their six-year-old children. These studies aim to further delineate the linkages between parenting behaviors, self-regulation, negative emotionality, socioemotional functioning, and early school success.

REFERENCES

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.

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Minnesota symposia on child psychology* (Vol. 13, pp. 39-101). Hillsdale, NJ: Erlbaum.

Campos, J. J., Barrett, K. C., Lamb, M. E., Goldsmith, H. H., & Stenberg, C. (1983). Socioemotional development. In P.H. Mussen (Ed.), *Handbook of Child Psychology* (4th ed., pp. 783-915). New York: Wiley.

Campos, J. J., Frankel, C. B., & Camras, L. (2004). On the nature of emotion regulation. *Child Development, 75*(2), 377-394.

Campos, J. J., Mumme, D. L., Kermoian, R. & Campos, R. G., (1994). A functionalist perspective on the nature of emotion. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations. *Monographs of the Society for Research in Child Development, 59* (2-3, Serial No. 240), 284-303.

Caspi, A. (2000). The child is the father of the man: Personality continuities from childhood to adulthood. *Journal of Personality and Social Psychology, 78*, 158-172.

Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E., & Silva, P. A. (1995). Temperamental origins of child and adolescent behavior problems: From age 3 to age 15. *Child Development*, *66*, 55-68.

Caspi, A., Roberts, B. W., & Shiner, R. L. (2005). Personality development: Stability and change. *Annual Review of Psychology, 56*, 453-484.

Cicchetti, D., Ganiban, J., & Barnett, D. (1991). Contributions from the study of high risk populations to understanding the development of emotion regulation. In K. Dodge & J. Garber (Eds.), *The development of emotion regulation* (pp. 15-48). New York: Cambridge University Press.

Cole, P. M., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. *Child Development*, *75*(2), 317-333.

Cole, P. M., Michel, M. K., & Teti, L. O. (1994). The development of emotion regulation and dysregulation: A clinical perspective. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations. *Monographs of the Society for Research in Child Development, 59* (2-3, Serial No. 240), 73-100.

Eisenberg, N., Champion, C., & Ma, Y. (2004). Emotion-related regulation: An emerging construct. *Merrill-Palmer Quarterly, 50*(3), 236–259.

Eisenberg, N., & Fabes, R. A. (1992). Emotion, regulation, and the development of social competence. In M. S. Clark (Ed.), *Review of personality and social psychology: Vol. 14, Emotion and social behavior* (pp. 119–150). Newbury Park, CA: Sage.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., Murhpy, B. C., Maszk, P., Holmgren, R., & Suh, K. (1996). The relations of regulation and emotionality to problem behavior in elementary school children. *Development and Psychopathology, 8*, 141-162.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology, 78*(1)*,* 136-157.

Eisenberg, N., Guthrie, I. K., Fabes, R. A., Reiser, M., Murphy, B. C., Holgren, R., Maszk, P., & Losoya, S. (1997). The relations of regulation and emotionality to resiliency and competent social functioning in elementary school children. *Child Development, 68*(2), 295–311.

Eisenberg, N., & Spinrad, T. L. (2004). Emotion-related regulation: Sharpening the definition. *Child Development, 75*(2), 334-339.

Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A. et al. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development*, *75*(1), 25-46.

Erikson, E. H. (1963). *Childhood and society.* New York: Norton. (Original work published 1950).

Freud, S. (1974). *The ego and the id*. London: Hogarth. (Original work published 1923).

Gross, J. J. (1999). Emotion regulation: Past, present, future. *Cognition and Emotion, 13*, 551-573.

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18*, 199-214.

Langlois, J. H. (2004). Emotion and emotion regulation: From another perspective. *Child Development, 75*(2), 315-316.

Lazarus, R. (1966). Psychological stress and the coping process. New York: McGraw-Hill.

Lazarus, R.S., & Folkman, S. (1984). Stress, appraisal, and coping (pp. 282-325). New York: Springer.

Lazarus, R. S., Opton, E. M., Nomikos, M. S., & Rankin, N. O. (1965). The principle of short-circuiting of threat – further evidence. *Journal of Personality, 33*(4), 622-635.

Lengua, L. J. (2002). The contribution of emotionality and self-regulation to the understanding of children's response to multiple risk. *Child Development, 73*(1), 144–161.

Pianta, R. C., & Walsh, D. J. (1998). Applying the construct of resilience in schools: Cautions from a developmental systems perspective. *School Psychology Review*, *27*(3), 407-417.

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*, 3-19.

Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*, 122-135.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In N. Eisenberg (Ed.), *Handbook of child psychology* (5th ed., Vol. 3, pp. 105-176). New York: John Wiley & Sons.

Rothbart, M. K., & Derryberry, D. (1981). Development of individual differences in temperament. In M.E. Lamb & A.L. Brown (Eds.), *Advances in developmental psychology* (Vol. 1, pp. 37-86). Hillsdale, NJ: Erlbaum.

Shields, A., & Cicchetti, D. (1998). Reactive aggression among maltreated children: The contributions of attentional and emotional dysregulation. *Journal of Child Clinical Psychology, 27*, 381-395.

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.

Shonkoff, J. P., & Phillips, D. A. (Eds.), & The Committee on Integrating the Science of Early Childhood Development (2000). *From neurons to neighborhoods: The science of early childhood development.* Washington DC: National Academy of Science.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 132-189). New York: Russell Sage Foundation.

Thompson, R. A. (1994). Emotion regulation: A theme in search of a definition. In N. A. Fox (Ed.), *The development of emotion regulation: Biological and behavioral considerations.* (Vol. 59, pp. 25-52). Chicago: The University of Chicago Press.

Thompson, R. A., & Calkins, S. D. (1996). The double edged-sword: Emotion regulation for children at risk. *Development and Psychopathology, 8*, 163-182.

SELF-REGULATION AS A MEDIATOR OF THE RELATIONSHIP BETWEEN CAREGIVERS' LIMIT-SETTING AND CHILDREN'S BEHAVIORS AND ACADEMIC PERFORMANCE

As the next generation enters adulthood, one in five American 18-year-olds will have lived in poverty for some portion of their lifetime (U.S. Bureau of the Census, 1999). Although low-income children are more likely to be exposed to multiple stressors, which increase the risk of self-regulatory difficulties, most of the research on young children's capacity for self-regulation has been limited to White, middle-income children (Cicchetti, Ackerman, & Izard, 1995; Eisenberg et al., 2000; Garner & Spears, 2000). While these studies are valuable, it is critical to investigate the self-regulatory skills of at-risk children because new research confirms that chronic economic hardship in early childhood leads to greater scholastic and socioemotional problems for these children relative to their middle-income peers (Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Yoshikawa & Seidman, 2000). Research on self-regulation represents one of the most promising pathways for furthering our understanding of how competence develops (Posner & Rothbart, 2000). The present study examined whether early self-regulation skills partially account for the relationship between limit-setting practices and adjustment among a sample of children from ethnically and geographically diverse, low-income families.

In an effort to understand how risk factors contribute to children's maladjustment, many developmental researchers have studied the extent to which parenting behaviors account for the relationship between sociodemographic risk factors and adjustment. This study *extends* this work by examining the degree to which children's self-regulatory skills explain the relationship between parenting and children's subsequent socioemotional development and academic success.

Research with middle-class samples indicates that children's self-regulatory skills are linked to positive socioemotional adjustment (Eisenberg & Fabes, 1992; Eisenberg et al., 1997, 2000). During stressful events, parents assist in self-regulatory skill development through cognitively reframing children's attention by using distraction and redirection to limit potentially upsetting information. Interactions with caregivers also influence children's appraisal of emotionally evocative events. As children acquire more complex concepts of emotion, their self-regulatory strategies increasingly involve the internal redirection of attention (Murphy & Eisenberg, 1997).

Parents who neglect to teach or model ways to regulate emotions may inadvertently socialize their children to engage in fewer prosocial behaviors when they become distressed. For example, Calkins and colleagues (1998) found that children of over-controlling mothers utilized non-adaptive strategies in situations in which they had to regulate their emotions. Repeated exposure to over-controlling parenting styles may encumber the development of internal, self-regulation strategies by fostering a child's dependence on external supports for self-control. For example, when parents are warm and supportive, children are unlikely to be overaroused and are better able to respond to parental efforts to focus their attention and guide behavior. As suggested by Eisenberg and Zhou et al. (2005) such a perspective on regulation is consistent with Vygotsky's (1978) argument that cognitive skills are socially constructed through interactions with supportive, responsive adults. Without the skills to shift attention away from distressing situations, in order to consider alternate perspectives or courses of action, children may come to rely on ineffective (*i.e.*, socially unacceptable) coping strategies.

The capacity to regulate attention and behavior is instrumental for children to form positive peer relationships during the preschool years (*e.g.*, Raver, Blackburn, Bancroft, & Torp, 1999). Children with good regulatory skills are better able to

manage basic interpersonal relations in early childhood, such as turn-taking, mutual regulation, and the sharing of internal states with others. Success in managing attention and behavior within social situations is associated with feelings of self-efficacy and high self-esteem during adolescence. These skills allow children to establish healthy peer relationships in later life.

Difficulties with self-regulation can carry a high price for young children and for the communities in which they live (Conduct Problems Prevention Research Group, 1999). Research on the stability of early problem behaviors suggests that young children who demonstrate great difficulty in regulating negative emotions go on to comprise a large percentage of chronic delinquent offenders during adolescence (Campbell, Shaw, & Gilliom, 2000). Because problem behaviors that occur in early childhood increase the likelihood of persistent antisocial behavior during adulthood (Moffitt, 1993), the inability to self-regulate during preschool appears to be a particularly critical contributor to the development of externalizing behaviors and maladjustment. These findings take on a new significance in light of the alarming rates of externalizing behaviors among Head Start boys and girls (Harden et al., 2000).

Interest in relations between self-regulatory skills and socioemotional adjustment among lower risk children has spawned a large body of research (*e.g.*, Eisenberg, 2001; Shoda, Mischel, & Peake, 1990), but comparatively few studies have been conducted on relations between self-regulatory processes and academic achievement for either low- or higher-risk children (Blair, 2002; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003a). This absence of empirical literature on young children is difficult to explain given the likely connections between self-regulatory skills (*i.e.*, learning to wait before acting, self-monitoring) and the cognitive and behavioral demands of the classroom. Self-regulatory skills such as attention and

behavioral control should influence the retrieval and recall of information, thereby forming a cornerstone for early reading, math, and writing achievement.

The handful of studies that have examined relations between emotion and achievement among young children have focused on emotional intensity, not its regulation, and found mixed results. Overall, emotional intensity does not seem to explain unique variance in children's achievement once other factors such as behavioral inhibition (*i.e.*, shyness), adaptability, and persistence were held constant (Newman, Noel, Chen, & Matsopoulos, 1998; Schoen & Nagle, 1994).

Howse and colleagues (2003a) conducted one of the few empirical studies to examine the regulation-achievement link with young children. They found that kindergarten teacher reports of behavioral regulation mediated the relationship between parental reports of regulation and kindergartners' achievement in literacy and math even after maternal education and child IQ were held constant. Unlike the parent- and teacher-reported measures of regulation, lab-based measures of preschoolers' self-regulatory behaviors observed during frustration tasks were unrelated to kindergarteners' achievement.

In a different study by Howse and colleagues (2003b) that included low-income children, kindergartners' attention regulation skills (as assessed by a computer based, resistance-to-distraction task) predicted reading achievement over and above the influence of children's vocabulary knowledge. Similar findings were not observed for the second graders who participated in the study. In sum, children who are better at managing emotional arousal in the classroom should be more likely to focus attention on learning, stay on task, engage in self-monitoring, and complete work, behaviors which fall under the umbrella of self-regulation.

Limit-setting. Numerous studies have documented that poverty affects children's socioemotional development indirectly through its influence on parenting

(Conger, Conger, & Elder, 1997; Duncan, Brooks-Gunn, & Klebanov, 1994; McLeod & Shanahan, 1993; McLoyd, 1990). Stressors associated with economic hardship place some children at risk for socioemotional problems, in part by attenuating caregivers' capacity to engage in consistent and age-appropriate limit-setting. Sroufe (1996) has argued that children's abilities to internalize control depend in large part on the availability of responsive and consistent parenting and on opportunities for children to practice self-regulating behaviors in response to parental expectations, conditions that may be missing in many low-income households.

Under great financial strain, many parents fall into more power-assertive and coercive patterns of discipline (Dodge, Pettit, & Bates, 1994; Elder, Eccles, Ardelt, & Lord, 1995). Coercive parental control and harsh discipline practices have been linked to the development of problem behaviors characterized by inadequate behavioral control (Pettit & Bates, 1989; Weiss, Dodge, Bates, & Pettit, 1992). Although harsh parenting seems to explain part of the reason why economic hardship is associated with children's problem behaviors, research has also shown that physical discipline and restrictiveness are not necessarily linked to maladjustment for some at-risk children (Deater-Deckard, Dodge, Bates & Petit, 1996). Similarly, more recent research suggests that firm limit-setting and high monitoring represent a normative form of "no-nonsense" parenting that is associated with positive adjustment, especially for African American children (Brody & Flor, 1998, p. 805; Deater-Deckard & Dodge, 1997).

Given that controlling parenting practices are not necessarily maladaptive for children who live in unsafe neighborhoods, it seems that context both informs parenting and influences how children respond to different styles of discipline and limit-setting (Garcia Coll & Pachter, 2002). Building from this corpus of work, the present study takes an inclusive perspective on parenting by focusing on mothers' use

of firm limit-setting versus coercive practices as they relate to children's self-regulatory skill development.

Self-Regulation Defined

In this study, self-regulation is conceptualized in terms of behavioral and attentional regulation. Following Eisenberg and colleagues (1997) and Thompson (1994), self-regulation is defined as the process of modulating the occurrence, intensity, or duration of internal feelings through the redirection of behavior and attention. Attentional regulation is defined by the capacity to shift and focus attention as needed. Behavioral regulation refers to the ability to suppress or initiate the expression of appropriate responses during unpleasant activities. A critical difference between the two types of self-regulation is that attentional regulation concerns internal states and behavioral regulation concerns overt behavior (Eisenberg et al., 2000).

Attentional regulation appears to be one of the most influential predictors of positive social adjustment because of its robust association with guilt and empathy during childhood (Rothbart, Ahadi, & Hershey, 1994). Behaviors that reduce frustration during delay-of-gratification tasks such as cognitive restructuring and attention deployment are key self-regulatory skills that foster socioemotional competence and, in turn, may reduce the likelihood of maladjustment. For example, 4- and 5-year-olds' capacity to deploy attention flexibly during delay-of-gratification tasks predicts cognitive and social competence in adolescence (Mischel, Shoda, & Peake, 1988) and better adjustment during adulthood within non-risk samples (Ayduk, Mendoza-Denton, & Downey, 2001). In contrast, difficulties during delay tasks indicate that a child has low attentional control, a major contributor to developmental psychopathology (Rothbart, Posner, & Hershey, 1995). Therefore children who are unable to shift or change perspectives from one part of a situation to another are more

susceptible to problem behaviors compared with children who have the skills to regulate attention effectively (Derryberry & Rothbart, 1988).

Related research with a sample of low-income children indicates that their attentional control mediated the association between histories of maltreatment and reactive aggression (Shields & Cicchetti, 1998). These findings highlight the potential explanatory role of attentional regulation within high-risk samples. In sum, as a component of self-regulation, attentional regulation exerts a direct effect on future social adjustment such that children who have acquired well-developed regulatory strategies in this domain are less likely to show aggression problems (Eisenberg et al., 2000; Rothbart et al., 1995). This study goes beyond analyzing the main effects of self-regulation by testing whether the influence of a risk factor, such as inconsistent limit-setting, on children's subsequent adjustment can be explained at least in part by children's capacity for attentional and behavioral regulation.

Although attentional and behavioral forms of regulation are correlated modestly, they each appear to make an independent contribution to risk processes linked to problem behaviors such as aggression (Derryberry & Rothbart, 1988; Eisenberg et al., 2000). Indeed, correlational analyses conducted by Eisenberg and colleagues (2000) suggest that the strongest relationship between contemporaneous and longitudinal measures of attentional and behavioral regulation fell below 0.28. Much like attentional regulation, low behavioral regulation is highly predictive of problem behaviors (Krueger, Caspi, Moffit, White, & Stouthamer-Loeber, 1996). Caspi's (2000) longitudinal study on behavioral regulatory problems among predominantly White children indicated that boys and girls were repeatedly rated as experiencing high levels of problem behaviors that persisted into adulthood, even after intelligence and social class were statistically controlled. While numerous studies have documented the linkages between self-regulatory difficulties and childhood

maladjustment (Eisenberg & Fabes, 1992; Shoda, Mischel, & Peake, 1990), very little research has been conducted to assess whether the pathways between both types of self-regulation and adjustment are similar for young, economically disadvantaged children.

Study Hypotheses

The goal of this study was to understand the relationship between limit-setting and adjustment by examining the mediating role of children's self-regulatory skills in a low-income sample. Building on previous research, we hypothesized that consistent limit-setting practices prior to children's school entry would promote better attention and behavioral regulation skills, which in turn would contribute to greater socioemotional and academic competence at age six. Similarly, we hypothesized that ineffective limit-setting, which is often brought about by the stressors associated with poverty, would undermine children's social and academic competence as first graders, in part through decrements to their self-regulatory skill development.

METHOD

Participants

At Time 1, 163 low-income, Head Start children ages 2.1 - 4.8 (*M* age = 4.20, *SD* = .44) and their caregivers were enrolled in a study on parenting and children's socioemotional development. Of these parents, 93% were mothers (*n* = 151), 4% were fathers (*n* = 7), and 3% were grandmothers (*n* = 5).[1] Low-income status was determined by Head Start eligibility guidelines. Within Upstate New York, 60% (*n* = 98) of the families resided in a medium-sized city and the remaining families resided in a rural area. Between-site comparisons suggest that the rural and urban samples

[1] Given the small number of grandmothers and fathers who participated in the study at Time 1 (*n* = 12), the terms "mother" and "caregiver" are used interchangeably in the paper.

were strongly racially segregated, with few African American children enrolled in the rural Head Start centers and few White children enrolled in the urban Head Start centers, $\chi^2(1, N = 163) = 68.57, p < .001$. Caregivers were, on average, 29 years of age and had completed high school. Most families reported incomes of $17,000 per year or less and median levels of yearly income were in the $13,000-$15,000 range. Rural families had incomes that were approximately $1,000 higher than those of rural families on average, $t(156) = 2.17, p < .05$ ($14,500 vs. $13,500).

Analyses of between-site differences among mothers suggest that rural and urban mothers differed on demographic characteristics. Rural mothers were slightly older, $t(160) = 1.75, p < .10$ (30.92 vs. 28.73 years), more educated, $\chi^2(7, N = 154) = 22.52, p < .01$ (some college vs. high school degree), more likely to be married, $\chi^2(1, N = 163) = 23.61, p < .001$ (55% rural vs. 22% urban, *n*s = 35 and 18), and experienced less depression as measured by the Center for Epidemiological Studies of Depression (CES-D) scale, $t(145) = -2.40, p < .05$ (11.22 vs. 14.76), than urban mothers. Surprisingly, the urban sample had a higher proportion of girls than the rural sample, $\chi^2(1, N = 162) = 3.95, p < .05$ (57% vs. 41%, *n*s = 56 and 26).

Two years later at Time 2, follow-up interviews were conducted with 100 of the 163 families that had participated at Time 1. Attrition analyses indicated that children who participated at both Time 1 and 2 had mothers who experienced fewer depressive symptoms $t(145) = -3.07, p < .01$ (11.70 vs. 16.22) and were slightly more likely to be from urban families, $\chi^2(1, N = 163) = 3.01, p < .10$ (67% vs. 53%, *n*s = 34 and 66). No differences were detected between followed and non-followed families on income, maternal education, caregiver age, ethnic minority status, or family size.

As at Time 1, between-site comparisons indicated that families were strongly racially segregated with more African American children in urban settings, $\chi^2(1, N = 100) = 41.41, p < .001$. Rural families had incomes that were approximately $2,000

higher than those of urban families, $t(96) = 2.61$, $p < .05$ ($15,000 vs. $13,000). Site differences also remained prevalent among rural and urban mothers. Specifically, rural mothers were more likely to have high school degrees or higher, $\chi^2(7, N = 95) = 19.93$, $p < .05$ (85% vs. 63%, *n*s = 28 and 39) more likely to be married $\chi^2(1, N = 100) = 25.99$, $p < .001$ (67% rural vs. 17% urban, *n*s = 23 and 11), and were less depressed, $t(91) = -2.23$, $p < .05$ (9.30 vs. 13.02) than their urban counterparts.[2]

Of the 100 children who participated at Time 2, 50 were female (*M* age = 4.20, *SD* = .44). Descriptive analyses on ethnicity showed that 52% of the children were African American (*n* = 52), 32% were Caucasian (*n* = 32), 11% were biracial (*n* = 11), 2% were Asian/Pacific Islander (*n* = 2), 2% were Hispanic/Latino/Latina (*n* = 2), and the remaining 1% were American Indian/Alaska Native (*n* = 1). The rural and urban subsamples were combined for all analyses because a consistent pattern of interactions was not detected between site location and predictor variables.[3]

Procedures

Time 1. During the fall of 1997 and 1998, two interviewers from the ESDS visited the parents' and study children's homes. Female caregivers reported on their own behavior, child adjustment, and family functioning. Parent-child interactions during specific tasks were also videotaped in order to assess the quality of mother-child relationships. About one month after the home interviews, children were visited in their Head Start classrooms where data were collected on their regulatory behaviors during a delay-of-gratification task. Six months after each wave of home interviews,

[2] When five grandmothers were excluded from the sample, rural mothers were slightly older than their urban counterparts, $t(93) = 1.86$, $p < .10$ (31.24 vs. 28.48 years).

[3] Although a consistent pattern of interactions was not detected between site location and the predictor variables, two interactions between behavior regulation (at both time points) and site were detected at the tend level for first-grade children's externalizing behaviors, βs = .69 and .66, *p*s = .08 and .05, respectively. Specifically, behavior regulation at both time points was associated with fewer externalizing behaviors for rural children and unrelated to externalizing behaviors for urban children. These analyses were not adjusted by covariates.

Head Start teachers were mailed the Social Competence and Behavior Evaluation scale (SCBE; LaFreniere, Dumas, Capuano, & Dubeau, 1992) and asked to rate children's classroom behaviors.

Time 2. A pair of interviewers visited the families' homes when most of the study children were in first grade, two years after the initial assessment. During these interviews, female caregivers completed extensive measures regarding family members and the study children. Parents signed consent forms allowing the investigative team to obtain first-grade academic records in addition to teacher ratings of the study children's adjustment. After each parental interview was completed, the parent was debriefed, thanked, and reimbursed $20. Six months after each wave of home interviews, teachers were mailed the SCBE and asked to rate children's classroom behaviors.

Measures

Attentional regulation. Caregivers' ratings on the attention-focusing subscale of the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001) were used to assess children's attentional regulation at Time 1. Designed for use with parents of 3- to 7-year-old children, the 9-item attention-focusing subscale measures children's tendency to maintain attentional focus upon tasks (*e.g.*, "has an easy time leaving play to come inside for school work" and "when picking up toys, usually keeps at the task until it's done"). Using 7-point scales, parents rate how true each statement is about their child during the past six months (1 = extremely untrue, 7 = extremely true).

Scores represent the mean score of the scale items. Psychometric properties for the current sample, Alpha = .64, $M = 4.53$, $SD = .86$, corresponded to overall scale norms reported by the CBQ authors (2001), Alpha = .74, as well as descriptive norms by child age: $M = 4.79$, $SD = .81$ for 4- and 5-year-olds, and $M = 4.51$, $SD = .81$ for 3-

year-olds (personal communication with Stephan Ahadi on December 13, 2003). As an assessment tool, the CBQ has demonstrated adequate reliability and validity across numerous US samples. In the current study, the attention regulation measure was only administered at Time 1.

Behavioral regulation at Time 1. Behavioral regulation in the classroom context was assessed during a standard delay-of-gratification task. Videotaped assessments were completed in a storage/office space adjoining the child's Head Start classroom. For the delay task, each child was invited by two interviewers to play a "story-telling game" with a small, wooden box that contained animal figures. Once seated, the "special" box was placed on the table in front of the child. After introducing the game, the box, and the idea that there was "something really neat" inside the box, one interviewer left the room for six minutes and asked the child not to touch the box until she returned. The remaining interviewer stayed in the room to videotape "the wait" under the pretense of wanting to videotape "the story" that was to follow.

The over-constrained nature of the delay task, which required children to wait in a room with a new adult pointing a video camera toward them, may have contributed to a ceiling effect. Specifically, 78% of the children (n = 97) did not touch the box and thus delayed for the entirety of the task. Insufficient variation in children's behavior during the task precluded the use of this measure in the present study.

Behavioral regulation at Time 2. To measure behavioral regulation, children participated in Kochanska's (1995) resistance-to-temptation task. This task has been used successfully over the past decade to tap aspects of children's behavioral regulation (see Kochanska, 1995; Kochanska & Aksan, 1995; Laible, 2004; & Laible & Thompson, 2000). To our knowledge, however, this was the first time the

resistance-to-temptation task has been used outside of a laboratory setting. About 60 minutes into the home visit, children were told that they had a job to do while their mothers were busy finishing paperwork in the other room. Approximately 3 to 4 feet away from the child, interviewers stacked two crates on top of each other to form shelves, which they proceeded to fill with attractive toys. The toys on the shelves included a musical keyboard, a gumball machine, dolls, a small football, action figures, and a fighter jet. Next to the shelves and directly in front of the child, interviewers placed mixed plastic cutlery and two empty silverware trays. The interviewer asked the child to sort the cutlery into separate spaces on two silverware trays. The child was told that, if the sorting task was completed before the interviewer returned, the cutlery should be put back into plastic bags, "forks in this bag, spoons in this one, and knives in this one." Interviewers told children "not to touch any of the toys on the shelves" while they were gone.

The study child was left alone in a room (typically the living room) with the cutlery, trays, toys, and a video camera placed on a tripod to record the task. After 3 minutes, the cameraperson (or interviewer if the home visit was conducted by one person) returned to the room for one minute. During this minute, the cameraperson walked over to the toys, played with them; turned on the electric keyboard, played with it; and then walked out of the room unobtrusively. While playing with the toys, the cameraperson avoided eye contact with the child and did not respond to any bids from the child for attention. If the child protested that the task was "too hard" at any point other than the 1-minute temptation interlude, the interviewer replied from an adjoining room "do your best." If the child continued to protest, the interviewer instructed the child to "just sit there" until time was up. Eight minutes after the cameraperson finished playing with the toys (*i.e.*, at the 12-minute mark), the interviewer entered the room, announced that the game was over, acknowledged the

child's performance, and said it was "now okay" to play with any of the toys on the shelves.

Child behavior was coded from videotapes. Episode start time was defined as the second after the interviewer gave the final instruction not to touch any of the toys on the shelves. Global codes were used to determine whether the child ever touched the shelves or the toys and the time that elapsed prior to touch. A touch was defined as contact between any part of the child's body and the prohibited objects/shelves while the child was facing the shelves.

Resistance-to-temptation data were available for 96 of the 100 participants at Time 2. Of the four tasks not included, one task was not videotaped because the home visit was too hectic, video camera malfunction rendered one task unusable, and the remaining two tasks deviated severely from task protocol (i.e., a sibling plays with prohibited objects). Behavioral regulation was defined as the number of minutes children were capable of persisting during the temptation task (M = 9.06, SD = 4.13). Twenty-one tasks were ended prior to 12 minutes (M = 10.49, SD = 1.04, range = 7.40-11.49). For 3 of the 21 tasks that ended early, the child clearly displayed behaviors associated with being upset; thus 18 tasks were adjusted to 12 minutes and the remaining 3 cases were not. Thirty-seven tasks ended after the 12 minute mark (M = 12.95, SD = 1.09, range = 12.01-17.04) and were adjusted down to 12 minutes.[4] Ten tapes were used to establish reliability between two coders. The intercoder agreement for time at first touch was perfect. Child location at the start of the episode (*i.e.*, on the floor or on the chair), adult presence, sibling presence, and whether the child left the room were also coded but not used in analyses.

Parental limit-setting. Limit-setting was defined as the ability to provide appropriate discipline. Parents' use of firm limit-setting practices was assessed using

[4] Of the 37 tasks that ended after 12 minutes, 35% (n = 13) ended prior to 12 minutes and 30 seconds.

the 12-item limit-setting scale of the Parent-Child Relationship Inventory (PCRI; Gerard, 1994). High scores on this scale reflect more positive attributes, such as consistent, democratic control and low scores reflect potential limit-setting difficulties (*e.g.*, a parent may feel besieged by a child's demands and does not set limits in a consistent and non-coercive manner). This self-report measure includes items such as "I have trouble disciplining my child" and "I often threaten to punish my child but never do." Each item was rated on a 4-point scale with high scores reflecting more effective limit-setting practices. Research suggests that the PCRI correlates well with other measures of childrearing and is a valid index of parenting among at-risk, ethnic minority populations (MacPhee, Fritz, & Miller-Heyl, 1996). The Cronbach's Alpha for the limit-setting scale in the present study was .77.

Child Outcomes

Socioemotional adjustment. Teacher report on the Social Competence and Behavior Evaluation scale (SCBE; LaFreniere, Dumas, Capuano, & Dubeau, 1992) was used to assess children's socioemotional adjustment at Time 1 and Time 2. The SCBE is an 80-item measure that includes separate subscales for socially competent, externalizing, and internalizing behaviors. Following Raver and Zigler (1997), the SCBE subscales were not combined to form a global index of socioemotional functioning because the empirical literature suggests that social competence and "problem behaviors," such as externalizing and internalizing behaviors, represent separate constructs (pp. 375-376). As an assessment instrument, the SCBE has demonstrated both reliability and validity as a measure of adaptive and maladaptive functioning among low-and middle-income children (Raver & Zigler, 1997).

Teachers rated the occurrence of behaviors on a 6-point scale (1 = never; 2 or 3 = sometimes; 4 or 5 = often; 6 = almost always). The social competence subscale (α_{T1} = .96, α_{T2} = 96) consists of 40 items (*e.g.*, is self-confident; cooperates with other

children in group activities). The externalizing subscale (α_{T1} = .94, α_{T2} = .95) consists of 20 items that are reverse-scored to reflect less externalizing behavior (*e.g.*, bullies weaker children; opposes the teacher's suggestions). The internalizing subscale (α_{T1} = .86, α_{T2} = .86) also consists of 20 items and is reverse-scored (*e.g.*, is sad, unhappy, or depressed). Subscale scores were converted to t-scores, with separate norms for child gender. For interpretive purposes, the externalizing and internalizing t-scores were multiplied by -1 so that higher values reflect higher levels of externalizing and internalizing behaviors. Complete SCBE data were available for 83 children. Thus some data were missing because fifteen questionnaires were not returned and two questionnaires were returned blank. Missing forms, compared with those that were returned, differed by child ethnic minority status, $t(161) = 2.76$, $p < .05$, and by geographic location, $t(161) = 2.85$, $p < .05$, resulting in fewer completed forms for White, rural children.

Academic achievement. Academic grades in reading, math, and writing were extracted from first-grade report cards to measure academic achievement. Letter grades for each child were averaged over all quarters and measured on a 5-point scale (0 = unsatisfactory progress; 1 = needs improvement; 2 = satisfactory progress; 3 = very good; 4 = excellent). To maintain a 5-point scale, grades with pluses were rounded up to the next grade and grades with minuses were rounded down. Information about the protocol used to code academic grades is presented in Dissertation Appendix A.

Complete academic data were available for 80 children. Of the missing data, 11 children were in schools that refused to release report cards. Of the 11 schools that did not release report cards, 4 were charter schools and all were from Rochester. Three children made residential moves and three children transferred to different schools, which precluded report card collection. Two children had written comments

on their report cards so it was not possible to assign letter grades in those cases. Also, the Principal Investigator of the Cornell Early Social Development Study determined that time constraints made it impossible to code one report card. Neither extracted report card data nor missing report card data differed by child ethnic minority status, child gender, family income, or geographic location.

Child and family covariates. Due to the well-established relationship between socioeconomic characteristics and child academic performance (*e.g.*, Brody, 1992; Duncan, Yeung, Brooks-Gunn, & Smith, 1998), Time 1 reports of maternal education and household income were statistically controlled in the prediction of academic achievement. To compare findings for academic outcomes with those for non-academic outcomes, maternal education and income were also statistically controlled in regression analyses where socially competent, externalizing, and internalizing behaviors were the outcome variables of interest.[5] Due to the low variation among these indicators in this sample, maternal education and household income were not expected to explain unique variance in child adjustment.

Other demographic factors at Time 1, such as maternal age, workforce entry, child age, and child race were also used as covariates. While these socioeconomic and demographic factors were peripheral to the study aims presented here, estimating their effects allowed us to assess whether the hypothesized effects were robust net of the potentially confounding influence of these factors.

Caregiver education at Time 1 was coded on an 8-point scale with higher values reflecting more education (*e.g.*, 0 = less than an 8th grade education; 1 = 9th-11th grade; 2 = GED receipt; 3 = High School degree; 4 = some college; 5 = Associates' degree; 6 = 4-year college degree; 7 = graduate study or greater). Caregivers' reported

[5] Compared with children's academic outcomes, the relations between social capital variables, such as family income and maternal education, and socioemotional outcomes are not considered to be well-established (Garmezy, 1991; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Raver, 2002; 2004).

their household income on a categorical, 6-point scale with higher values reflecting greater income (0 = less than $13,000; 1 = $13,001-$15,000; 2 = $15,001-$19,000; 3 = $19,001-$25,000; 4 = $25,001-$31,000; 5 = greater than $31,000). Maternal workforce entry was coded on a 2-point scale with 1 coded as entry into the workforce at least once since the study child's birth and 0 coded as no participation in the workforce since the study child's birth (*e.g.*, 0 = never entered, 1 = entered). In this sample, 26% of mothers had never entered the workforce and 74% had entered the workforce at least once (*n*s = 41 and 106 respectively).

Caregiver's age was coded continuously (M = 29.60, SD = 7.84). The ages of five grandmothers were included in this variable, thereby increasing the mean age for caregivers in this sample. On average, the grandmothers were 53 years old (range = 46- to 61-years, n = 5) and mothers were 29 years old (range = 18-51-years, n = 156). Child race was coded such that 0 = White or Asian and 1 = not White.

Statistical Procedures

Structural equation modeling. Structural Equation Modeling (SEM) with Amos 5.0 software (Arbuckle & Wothke, 1999) was used to estimate the mediation hypotheses. Currently, full information maximum likelihood estimation (FIMLE) in Amos is one of the only unbiased techniques for handling randomly missing data (Schafer & Graham, 2002). Typically, statistical packages with ordinary least squares (OLS) regression use listwise or pairwise deletion to eliminate observations where some of the data are missing. However, in the presence of randomly missing data, the Amos program computes FIMLEs, which allow the entire sample to be included in the analyses. Unlike imputation techniques, which replace missing data through various types of estimation, FIMLE is not an imputation method and therefore does not alter the distribution of variables. This is an important feature for the present study given the relatively small sample of 100 families who participated in the follow-up study at

Time 2. A technical description of the EM Algorithm, the method used by the Amos program to obtain FIMLE, is provided in Dissertation Appendix B.

With respect to the variables in the path diagrams, self-regulation and child adjustment were modeled as endogenous variables. Among the endogenous variables (*e.g.*, attentional regulation, behavioral regulation, and socioemotional and academic outcomes), there were no systematic deviations from multivariate normality in the present study.

To address the mediation hypothesis, two structural equation models were fit. In the first model, only the effect of limit-setting on children's adjustment was estimated. In the second model, the effect of (a) limit-setting on self-regulatory skills and the effect of (b) these skills on adjustment were estimated in order to confirm that limit-setting influenced the hypothesized mediators (attention regulation at Time 1 and behavior regulation at Time 2) and the hypothesized mediators significantly influenced the outcome variables (socioemotional adjustment and academic grades). Most central to the mediation hypothesis, we examined whether the direct effect of limit-setting on adjustment became attenuated or reduced to non-significance in Model 2 when the hypothesized mediators were included in the model. It was not possible to test the significance of the indirect effect of limit-setting on child adjustment in the present study given the amount of missing data (bootstrapping procedures in Amos do not allow for missing data).

Evidence for moderation of the limit-setting/adjustment relationship would indicate that a simple mediation model, which includes the self-regulation variables, does not fully explain the relationship between limit-setting and child adjustment because this relationship varies as a function of a different variable (*e.g.*, mothers' marital status). If moderator effects are detected, they will be explored by fitting nested structural equation models for two groups (*e.g.*, married vs. unmarried) to

determine whether the regression paths from limit-setting to the child outcomes differed based on some third variable (*e.g.*, Judd & Kenny, 1981; Holmbeck, 1997). For each of these two regression paths, one path was constrained to be equal across groups (*e.g.*, married = unmarried) while the other path will be permitted to vary across groups in order to assess fit. To test for significant differences across groups, a full information maximum likelihood estimate will be calculated to compare the difference between the χ^2 for the constrained model and the χ^2 for the varying effect model. In SEM, a χ^2 statistic also represents the interaction term. A significant difference in regression paths between the married and the unmarried groups would be interpreted as an interaction with (*i.e.*, moderation by) marital status.

Evaluation of model fit. Two goodness-of-fit indices were used to evaluate the overall fit for the models: the root mean square error of approximation (RMSEA) and the incremental fit index (IFI). As a measure of fit, the RMSEA does not penalize for model complexity. An RMSEA of .05 or less indicates a close fit, whereas an RMSEA of .08 or less indicates an acceptable fit in relation to the degrees of freedom (Arbuckle & Wothke, 1999). IFI values close to 1 indicate a very good fit (Arbuckle & Wothke, 1999). In the present study, statistical significance was defined as $p < .05$ and statistical trends were defined as $p < .10$.

RESULTS

Bivariate Analyses

Descriptive statistics are presented in Tables 1.2 and 1.2 and intercorrelations among the study variables are presented in Tables 1.3 and 1.4 for (a) the entire sample and (b) the sample split by maternal marital status, respectively. Key correlations and descriptive analyses are described below.

Table 1.1 Descriptive Data for the Entire Sample ($N = 163$)

Variable	*M* (*SD*)	Range	*N*
Limit-Setting T1	50.38 (8.94)	29.00-77.00	159
Attention regulation T1	4.53 (0.86)	2.25-6.44	161
Behavior regulation T2	9.06 (4.13)	0.04-12.00	96
Social competence T2	48.08 (9.50)	30.00-68.00	83
Externalizing T2	47.86 (10.33)	30.00-70.00	83
Internalizing T2	48.75 (9.68)	30.00-70.00	83
Reading	2.17 (1.08)	0.00-4.00	80
Math	2.44 (1.00)	0.00-4.00	80
Writing	1.91 (1.03)	0.00-4.00	80
Maternal age	29.60 (7.84)	18.00-61.00	162
Maternal education	3.19 (1.46)	0-7	154
Workforce entry	0.74 (0.44)	0-1	159
Income category	1.49 (1.61)	0-5	158
Marital status	0.33 (0.47)	0-1	163
Child age	4.20 (0.44)	2.07-4.81	161
Child race not White	0.65 (0.48)	0-1	163

Table 1.2 Descriptive Data for Married and Unmarried Mothers

Variable	Married			Unmarried		
	M (*SD*)	Range	*N*	*M* (*SD*)	Range	*N*
Limit-Setting T1	51.12 (8.16)	39.00-66.00	51	50.04 (9.30)	29.00-77.00	108
Attention regulation T1	4.67 (.90)	2.25-6.44	53	4.46 (.84)	2.67-6.22	108
Behavior regulation T2	10.01 (3.42)	0.04-12.00	33	8.56 (4.40)	0.05-12.00	63
Social competence T2	50.43 (9.30)	31.00-68.00	23	47.18 (9.50)	30.00-66.00	60
Externalizing T2	47.57 (11.59)	30.00-65.00	23	47.97 (9.91)	30.00-70.00	60
Internalizing T2	49.04 (9.54)	32.00-65.00	23	48.63 (9.82)	30.00-70.00	60
Reading	2.30 (1.14)	.00-4.00	26	2.11 (1.05)	.00-4.00	54
Math [a]	2.76 (1.12)	.00-4.00	26	2.28 (.90)	.00-4.00	54
Writing	1.98 (.95)	.00-3.67	26	1.87 (1.08)	.00-4.00	54
Maternal age [a]	31.87 (6.12)	22.00-48.00	53	28.50 (8.36)	18.00-61.00	109
Maternal education [a]	3.73 (1.58)	0-7	51	2.92 (1.33)	0-6	103
Workforce entry	.71 (.46)	0-1	52	.75 (.44)	0-1	107
Income category [a]	2.21 (1.75)	0-5	53	1.12 (1.41)	0-5	105
Child age	4.25 (3.66)	3.41-4.81	53	4.18 (.47)	2.07-4.81	108
Child race not White [a]	.47 (.50)	0-1	53	.74 (.44)	0-1	110

[a] Denotes a significant difference ($p < .10$) between the married and unmarried samples.

Table 1.3 Intercorrelations Among the Study Variables for the Entire Sample

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Limit-Setting T1	--														
2. Attention reg. T1	.32**	--													
3. Behavior reg. T2	.19+	.29**	--												
4. Social comp. T2	.12	.11	.11	--											
5. Externalizing T2	-.22*	-.07	-.08	-.56**	--										
6. Internalizing T2	.01	-.02	.08	-.63**	.45**	--									
7. Reading	.21+	.16	.30**	.49**	-.28*	-.39**	--								
8. Math	.20+	.16	.26*	.42**	-.31*	-.23+	.74**	--							
9. Writing	.03	.17	.21+	.54**	-.20	-.39**	.77**	.69**	--						
10. Maternal age	.22**	.10	.05	.05	-.05	-.01	.05	.02	.01	--					
11. Maternal educ.	.22**	.07	.12	.23*	-.34**	-.02	.08	.23+	.02	.19*	--				
12. Workforce entry	-.08	.03	.03	.06	.13	-.11	-.11	-.07	-.06	.23**	.13	--			
13. Income category	.11	.19*	.22*	.07	-.03	.07	.13	.26*	.14	.15+	.24**	.12	--		
14. Marital status	.06	.12	.17	.15	.02	-.02	.09	.23*	.05	.21**	.26**	-.04	.32**	--	
15. Child age	-.09	-.06	.27**	-.06	.21+	.23*	-.00	.02	-.01	.08	.13	.05	.10	.08	--
16. Child not White	-.12	-.01	-.10	-.02	.38**	.05	-.08	-.22+	-.06	-.15+	-.15+	.10	-.16*	-.26**	-.15+

Note. *n*s = 67 to 161.
+$p < .10$. *$p < .05$. **$p < .01$.

Table 1.4 Intercorrelations Among the Variables for Married (Below Diagonal) and Unmarried (Above Diagonal) Mothers

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Limit-Setting T1	--	.31**	.23+	-.06	-.16	.13	.11	.05	-.10	.22*	.17+	.02	.11	-.10
2. Attention reg. T1	.34*	--	.30*	.04	-.11	-.03	.25+	.18	.17	.03	-.01	.10	.14	-.01
3. Behavior reg. T2	.01	.19	--	.10	-.05	.08	.30*	.19	.15	-.07	.21	.20	.07	.27*
4. Social comp. T2	.53**	.21	.09	--	-.56**	-.64**	.51**	.46**	.55**	-.07	.00	.11	-.01	-.05
5. Externalizing T2	-.38+	.03	-.15	-.62**	--	.47**	-.17	-.20	-.08	.00	-.14	-.02	.01	.24+
6. Internalizing T2	-.31	.01	.11	-.60**	.41*	--	-.36*	-.26+	-.45**	.09	.25+	-.12	.10	.31*
7. Reading	.41*	-.06	.28	.38	-.52*	-.46+	--	.71**	.87**	.01	-.01	.04	.12	.05
8. Math	.45*	.06	.33+	.26	-.56*	-.17	.78**	--	.71**	-.08	.06	.11	.07	.03
9. Writing	.34+	.16	.39*	.44+	-.53*	-.20	.58**	.69**	--	.01	-.12	-.02	-.03	.04
10. Maternal age	.19	.20	.29	.28	-.24	-.35+	.10	.03	-.07	--	.13	-.22*	.02	.05
11. Maternal educ.	.29*	.11	-.14	.54*	-.71**	-.52*	.15	.32	.21	.19	--	.23*	.22*	.04
12. Workforce entry	-.31*	-.09	-.36*	-.03	.44*	-.10	-.36+	-.31	-.13	-.27+	-.00	--	.14	.03
13. Income category	.07	.19	.39*	.08	-.13	.03	.10	.33	.39+	.21	.13	.14	--	.03
14. Child age	-.09	-.23+	.22	-.09	.13	-.02	-.13	-.04	-.15	.11	.25+	.12	.19	--
15. Child not White	-.11	.03	-.19	-.26	.68**	.14	-.18	-.33+	-.25	.06	-.09	.16	-.05	-.10

Note. For Married Mothers, *n*s = 18 to 53; for Unmarried mothers *n*s = 45 to 108.
+$p < .10$. *$p < .05$. **$p < .01$.

Attention regulation to behavior regulation. Attention regulation at Time 1 was correlated with greater behavior regulation at Time 2, $r(95) = .29$, $p < .01$.

Limit-setting to child outcomes. Consistent limit-setting was associated with fewer externalizing behaviors, $r(83) = -.22$, $p < .05$ as well as higher reading and math grades at Time 2, rs(80) = .21 and .20, ps < .10 respectively. Limit-setting was unrelated to teacher-reported social competence, internalizing behaviors, and writing performance.

Limit-setting to attention and behavior regulation. Effective limit-setting was positively associated with children's attention and behavior regulation skills, rs(157 and 96) = .32 and .19, ps < .01 and .10.

Self-regulation to child outcomes. Attention regulation was unrelated to socioemotional and academic outcomes. Observed behavioral regulation was related to higher reading, math, and writing grades, rs(78) = .30, .26, and .21, ps < .01, .05, and .10, but unrelated to children's socioemotional outcomes.

Differences by maternal marital status. Preliminary analyses revealed differences among the study variables by maternal marital status for nearly all of the caregiver covariates and children's math achievement (see Table 1.1). Analyses of differences by marital status at Time 1 suggest that married households were characterized by higher incomes, $t(156) = -4.20$, $p < .01$ (2.21 vs. 1.12, $16,000 vs. $13,200), and the presence of older caregivers, $t(160) = -2.61$, $p < .01$ (31.87 vs. 28.50 years), who were more educated, $\chi^2(7, N = 154) = 21.09$, $p < .01$ (3.73 vs. 2.92, some college vs. high school degree) at Time 1. Children in these households received higher math grades, $t(78) = -2.06$, $p < .05$ (2.76 vs. 2.28) and were less likely to be African American, $\chi^2(1, N = 163) = 11.02$, $p < .01$ (47% of the married sample as compared with 74% of the unmarried sample were African American) compared with their peers from the unmarried sample.

Multivariate Analyses[6]

Moderation Analyses. Tests of moderation were conducted in order to determine whether maternal marital status moderated the relationship between limit-setting and child adjustment. Evidence for moderation would suggest that the influence of limit-setting on subsequent adjustment varied as a function of whether or not children's mothers were married or unmarried at Time 1. It is important to acknowledge that the larger study from which these data were drawn was not designed to examine differences between children from married and unmarried households. Any differences by marital status presented here must therefore be interpreted cautiously.

Total effect analyses revealed one interaction between limit-setting and marital status on children's externalizing behaviors, χ^2 (1, N = 163) = 2.89, $p < .10$, IFI = 1.00, RMSEA = 06.[7] Thus for models where externalizing behavior was the outcome variable of interest, analyses were conducted separately for children of mothers who were married at Time 1 and children of mothers' who were unmarried at Time 1. Interactions between limit-setting and marital status were not detected for the remaining five outcomes (reading, math, writing, social competence, and internalizing behaviors) and thus the mediation hypothesis was tested in the entire sample for models that included these outcomes. Stated differently, the married only vs. unmarried samples (n = 53 vs. n = 110) were used for the externalizing outcome

[6] There was some clustering of children—*i.e.*, in some cases children in the same classroom were included in the sample—which meant that teachers' reports of socioemotional and academic outcomes were non-independent. To account for this in our analyses, the "robust cluster" feature in Stata Release 9.0, statistical software (StataCorp, 2005), was used to adjust the standard errors accordingly. No differences were detected between analyses that did and analyses that did not account for this clustering. Thus unadjusted analyses were used in the current study.

[7] While statistically non-significant, a comparable interaction was detected for children's socially competent behaviors, χ^2 (1, N = 163) = 2.69, p = .10, IFI = 1.00, RMSEA = .04.

models and the entire sample ($N = 163$) was used for the academic, social competence, and internalizing outcome models.

With respect to the covariates, analyses that were estimated in the entire sample included statistical controls for maternal age, maternal education, workforce entry, family income category, marital status, child age, and child ethnic minority status at Time 1. Tests of moderation required that the sample be split by the moderating variable (i.e., marital status at Time 1) and thus Time 1 marital status was not included as a covariate for these tests. Thus models for the externalizing outcome included the same covariates as the models tested in the entire sample with the exception of marital status, which was omitted.

Mediation Analyses. Within the entire sample, one total effect (out of five possible total effects) was observed between limit-setting and children's reading performance such that firm limit-setting was linked to higher reading grades at Time 2, $\beta = .20$, $p < .10$, IFI = 1.00, RMSEA = .09. With respect to the mediation hypothesis, Figure 1.1 shows that firm limit-setting prior to school entry was associated with better attention regulation skills, $\beta = .31$, $p < .01$, which were linked to higher levels of observed behavioral regulation, $\beta = .23$, $p < .05$, which in turn were linked to higher reading grades at Time 2, $\beta = .26$, $p < .05$. Caregiver reports of both their own limit-setting practices and children's attention regulation were not directly related to reading performance in the full model. Most central to the mediation hypothesis, when the attention and behavior regulation variables were added to the model, the path between limit-setting and reading achievement was reduced to non-significance, $\beta = .13$, $p = .29$, IFI = 1.00, RMSEA = 09. These results suggest that attention and behavior regulation skills fully explained the positive relationship between caregiver's limit-setting practices and first-graders' reading performance even after controlling for factors that are known to influence academic achievement

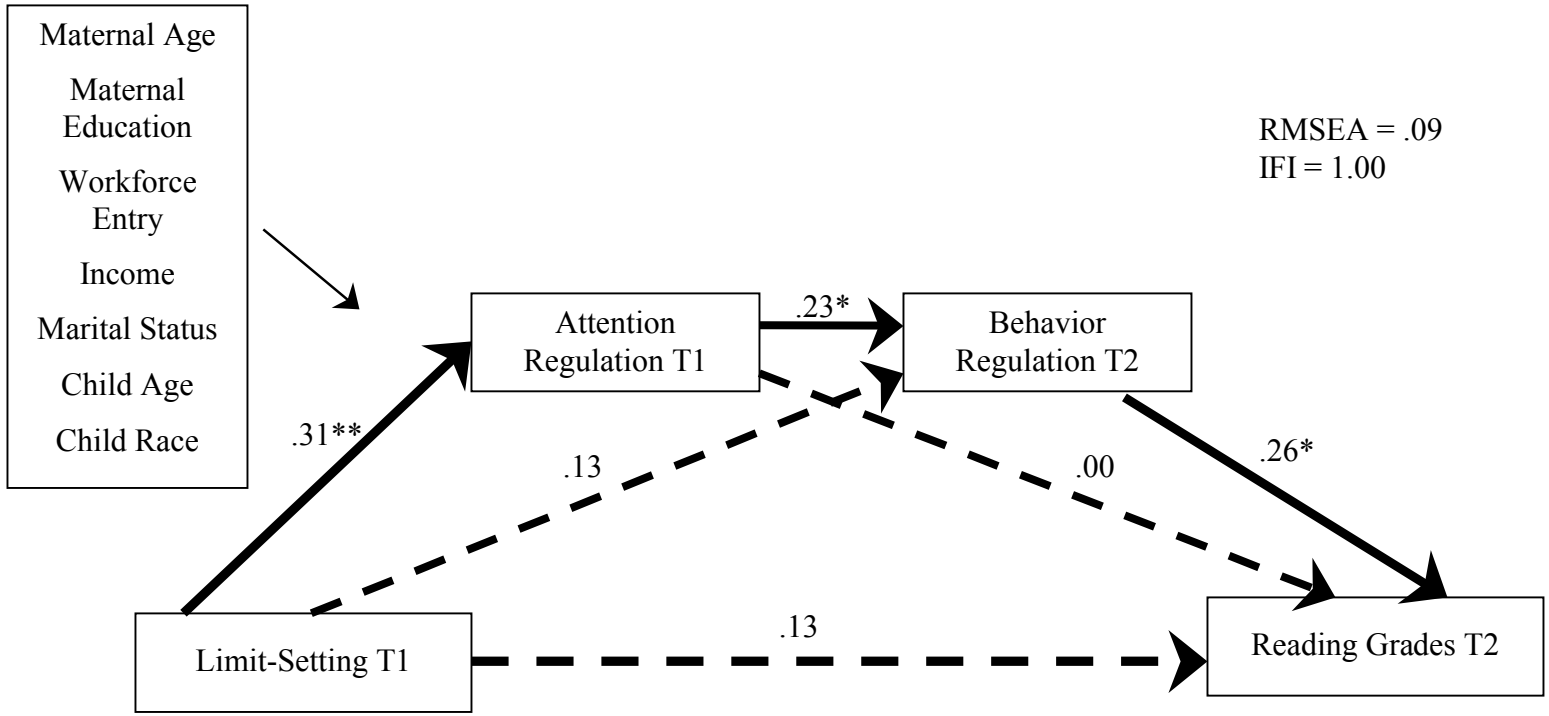

Figure 1.1. Path Model Depicting Attentional and Behavioral Regulatory Skills as Mediators of the Relations between Limit-Setting and Children's Reading Grades at Time 2 in the Entire Sample (N = 163)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid, dashed, and dotted lines represent paths that are statistically significant, non-significant, and statistical trends respectively.

+p < .10. *p < .05. **p < .01.

such as maternal age and education, family income, and child age. As mediators, attention and behavior regulatory skills accounted for 35% of the total effect of limit-setting on children's reading achievement at Time 2. Regression coefficients for all variables in the total effects and the full mediation models are presented in Appendices 1A and 1B, respectively.[8]

Total effects from limit-setting to externalizing symptoms were not observed for either the married or unmarried samples. The absence of a relationship between limit-setting and children's externalizing behaviors precluded additional mediation testing for this outcome.

DISCUSSION

The goal of this study was to understand the association between limit-setting and adjustment by examining the mediating role of children's attention and behavior regulatory skills. The hypothesized pathways through which limit-setting was expected to influence children's reading achievement were supported. Contrary to our hypothesis, attention and behavior regulation did not mediate the effect of limit-setting on children's socially competent, externalizing, and internalizing behaviors nor on their math and writing grades. Exploratory analyses revealed no support for mediation by these skills for externalizing outcomes. Both sets of findings for children in the married sample—pertaining to behavior and achievement respectively—are described below.

With respect to reading achievement, findings indicate that limit-setting was associated with better attention regulation prior to school entry, which was linked to greater levels of observed behavior regulation, which in turn was associated with

[8] Regression coefficients for all variables in the total effects and the full mediation models split by maternal marital status are presented in Appendices 1C and 1D respectively.

better reading performance in first grade independent of factors that are known to influence academic achievement such as maternal age, education, workforce entry, family income category, and child age. As hypothesized, when self-regulatory processes were added to the model, the direct effect of limit-setting on reading was fully mediated. Thus, the extent to which children were able to engage in attentional and behavioral forms of regulation appears to elucidate a central pathway through which limit-setting practices influence children's early reading success.

Possible reasons for the null findings for the other academic and socioemotional outcomes examined in this study are described below.

A considerable amount of research documents well-established relations between parenting and socioemotional adjustment among children from economically disadvantaged families (Conger, Conger, & Elder, 1997; Deater-Deckard, Dodge, Bates & Petit, 1996; Elder, Eccles, Ardelt, & Lord, 1995; McLeod & Shanahan, 1993). Thus the absence of effects between limit-setting and children's adjustment for five of the six outcomes examined in the present study is inconsistent with this prior research. One explanation why relations between limit-setting practices and children's adjustment were virtually non-existent in the current study is that information on parenting practices was based on parent self-reports, which may reflect parents' beliefs or attitudes about limit-setting in general rather than their actual behaviors.

Previous research has also demonstrated that other dimensions of the home and familial context are important for children's positive socioemotional and academic adjustment. For example, the quality of the home learning environment has consistently been shown to operate as a central pathway through which income exerts its influence on children's achievement (Duncan, Brooks-Gunn, & Klebanov, 1994; Smith, Brooks-Gunn, & Klebanov 1997). With respect to children's socioemotional adjustment, studies have documented the indirect effects of poverty on parenting and

subsequent child adjustment through maternal depression (Brody et al., 1994; Brody, Flor, & Gibson, 1999; Conger et al., 1994; Duncan et al., 1994). In sum, further research that examines the interplay of factors such as home learning environment quality and maternal depressive symptoms as they relate to the mediating role of self-regulatory skills may help elucidate the role of these skills within this higher risk sample.

Study limitations. The present study was limited to some extent by the small sample size. Structural equation modeling typically requires 5-10 cases per parameter estimated. The majority of analyses utilized the entire sample ($N = 163$) and thus it appears that the sample size was adequate to test the hypothesized mediation model with eight exogenous variables (limit-setting and seven covariates) and three endogenous variables (attention regulation, behavior regulation, and the outcome variable of interest). Additionally, IFI and RMSEA goodness-of-fit indices for the total effect, mediation, and moderation models consistently indicated acceptable model fit.

Other characteristics of the sample limit the study's generalizability as well. First, the sample was highly stratified by geographic location. At both Time 1 and Time 2 rural families had higher incomes. In comparison with their urban counterparts, rural mothers were older, more educated, more likely to be married with White children, and less likely to experience depression. While such heterogeneity is notable, it may also have hindered our ability to detect relationships within the small sample. A second limitation was the exploratory nature of the moderation analyses. We did not hypothesize differences by marital status, which emerged only at the analysis stage—but the issue may merit consideration, particularly for children's socioemotional outcomes. To address such a hypothesis adequately in future research, analyses with larger samples are necessary to determine whether the pathways through

which limit-setting influences first-grade adjustment differ among low-income children from single- and two-parent families.

Finally, anomalies remain in the data. It is possible that behavioral regulation as measured by latency-to-touch during one resistance-to-temptation task failed to capture the full range of children's behavioral regulation strategies. In contrast, parents' ratings of attention regulation were based on hundreds of events. The global qualities of the attention regulation measure, when compared with the specific qualities of the behavior regulation measure, may shed some light on the magnitude of their association.

Study contributions. Results from the current study demonstrate the importance of attentional and behavioral regulatory skill development as a mechanism through which parents' limit-setting practices influence first-grade reading achievement within low-income households. No support was found for the mediating role of attentional and behavior regulation skills for the other academic and socioemotional outcomes examined in this study.

In this study, we examined self-regulation as one pathway through which effective limit-setting prior to school entry influences subsequent adjustment among Head Start children. It is our hope that the multimethod measures, contrasting geographical locations, and longitudinal design offered here serve to inform the emerging literature on self-regulatory processes in the context of economic disadvantage and incite additional work in this important area of research. Insofar as these self-regulatory processes relate to early reading performance, we expect that future studies will bear important policy implications for school readiness legislation. In that regard this research represents a first step forward in addressing a very real gap in our understanding of how self-regulation operates within high-risk contexts.

APPENDIX 1A

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's social competence

	To Social Competence T2			
	b	B	SE	p
Path From				
Maternal age	0.01	0.00	0.14	0.97
Maternal education	1.05	0.16	0.78	0.18
Workforce entry	1.05	0.05	2.47	0.67
Income category	0.03	0.01	0.69	0.97
Marital status	2.11	0.10	2.39	0.38
Child age	-1.62	-0.07	2.42	0.50
Child race not White	0.35	0.02	2.24	0.88
Limit-setting	0.05	0.04	0.12	0.69

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's externalizing behaviors

	To Externalizing T2			
	b	B	SE	p
Path From				
Maternal age	0.02	0.02	0.13	0.87
Maternal education	-1.95	-0.28	0.74	0.01
Workforce entry	0.82	0.04	2.35	0.73
Income category	-0.20	-0.03	0.66	0.76
Marital status	3.97	0.18	2.27	0.08
Child age	5.53	0.24	2.29	0.02
Child race not White	7.60	0.36	2.13	0.00
Limit-setting	-0.09	-0.08	0.11	0.41

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's internalizing behaviors

	To Internalizing T2			
	b	B	SE	p
Path From				
Maternal age	-0.16	-0.13	0.14	0.26
Maternal education	0.09	0.01	0.79	0.91
Workforce entry	-4.03	-0.18	2.48	0.10
Income category	0.32	0.05	0.70	0.64
Marital status	-0.58	-0.03	2.41	0.81
Child age	6.11	0.27	2.43	0.01
Child race not White	2.37	0.12	2.26	0.29
Limit-setting	0.05	0.05	0.12	0.68

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's reading grades

	To Reading Grades T2			
	b	B	SE	p
Path From				
Maternal age	-0.01	-0.06	0.02	0.63
Maternal education	0.00	0.01	0.09	0.96
Workforce entry	-0.28	-0.12	0.28	0.32
Income category	0.07	0.10	0.08	0.39
Marital status	0.05	0.02	0.28	0.86
Child age	-0.03	-0.01	0.28	0.92
Child race not White	-0.01	-0.01	0.26	0.96
Limit-setting	0.02	0.20	0.01	0.08

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's math grades

	To Math Grades T2			
	b	B	SE	p
Path From				
Maternal age	-0.02	-0.15	0.01	0.18
Maternal education	0.09	0.13	0.08	0.25
Workforce entry	-0.20	-0.09	0.25	0.43
Income category	0.08	0.13	0.07	0.25
Marital status	0.26	0.12	0.24	0.29
Child age	-0.05	-0.02	0.25	0.84
Child race not White	-0.25	-0.12	0.23	0.28
Limit-setting	0.02	0.16	0.01	0.15

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's writing grades

	To Writing Grades T2			
	b	B	SE	p
Path From				
Maternal age	0.00	-0.02	0.02	0.85
Maternal education	-0.01	-0.02	0.09	0.89
Workforce entry	-0.17	-0.07	0.28	0.55
Income category	0.09	0.14	0.08	0.27
Marital status	0.00	0.00	0.27	0.99
Child age	-0.07	-0.03	0.27	0.81
Child race not White	-0.03	-0.01	0.25	0.90
Limit-setting	0.00	0.01	0.01	0.94

APPENDIX 1B.1

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's social competence via attention regulation at T1 and behavior regulation at T2

	To Attention Regulation T1				To Behavior Regulation T2				To Social Competence T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	0.00	0.02	0.01	0.80	-0.05	-0.09	0.05	0.35	0.03	0.02	0.14	0.85
Maternal education	-0.04	-0.06	0.05	0.43	0.05	0.02	0.29	0.87	1.22	0.19	0.78	0.12
Workforce entry	0.10	0.05	0.15	0.54	-0.25	-0.03	0.92	0.79	0.84	0.04	2.46	0.73
Income category	0.08	0.15	0.04	0.06	0.11	0.04	0.26	0.68	-0.12	-0.02	0.69	0.87
Marital status	0.15	0.08	0.15	0.31	0.63	0.07	0.90	0.49	1.84	0.09	2.39	0.44
Child age	-0.06	-0.03	0.15	0.68	2.83	0.30	0.91	0.00	-2.02	-0.09	2.53	0.43
Child race not White	0.10	0.05	0.14	0.50	-0.19	-0.02	0.85	0.83	0.58	0.03	2.23	0.79
Limit-setting	0.03	0.31	0.01	0.00	0.06	0.14	0.05	0.19	-0.03	-0.03	0.13	0.83
Attention regulation T1					1.09	0.23	0.48	0.02	0.88	0.08	1.30	0.49
Behavior regulation T2									0.24	0.11	0.28	0.38

APPENDIX 1B.2

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's externalizing behaviors via attention regulation at T1 and behavior regulation at T2

	To Attention Regulation T1				To Behavior Regulation T2				To Externalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	0.00	0.02	0.01	0.78	-0.05	-0.09	0.05	0.37	0.02	0.01	0.13	0.91
Maternal education	-0.04	-0.07	0.05	0.40	0.06	0.02	0.29	0.82	-1.98	-0.29	0.73	0.01
Workforce entry	0.10	0.05	0.15	0.52	-0.20	-0.02	0.92	0.82	0.82	0.04	2.33	0.73
Income category	0.08	0.15	0.04	0.06	0.10	0.04	0.26	0.70	-0.21	-0.03	0.66	0.75
Marital status	0.15	0.08	0.15	0.30	0.63	0.07	0.90	0.48	4.05	0.19	2.27	0.07
Child age	-0.06	-0.03	0.15	0.67	2.86	0.30	0.91	0.00	6.30	0.27	2.40	0.01
Child race not White	0.10	0.05	0.14	0.50	-0.19	-0.02	0.85	0.82	7.58	0.36	2.12	0.00
Limit-setting	0.03	0.31	0.01	0.00	0.06	0.13	0.05	0.20	-0.07	-0.06	0.12	0.56
Attention regulation T1					1.09	0.23	0.48	0.02	0.21	0.02	1.23	0.86
Behavior regulation T2									-0.26	-0.11	0.26	0.33

APPENDIX 1B.3

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's internalizing behaviors via attention regulation at T1 and behavior regulation at T2

	To Attention Regulation T1				To Behavior Regulation T2				To Internalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	0.00	0.02	0.01	0.77	-0.05	-0.10	0.05	0.33	-0.16	-0.13	0.14	0.27
Maternal education	-0.04	-0.06	0.05	0.45	0.07	0.02	0.29	0.82	0.08	0.01	0.79	0.92
Workforce entry	0.09	0.05	0.15	0.54	-0.27	-0.03	0.92	0.77	-4.04	-0.18	2.49	0.10
Income category	0.08	0.15	0.04	0.06	0.12	0.05	0.26	0.64	0.35	0.06	0.70	0.62
Marital status	0.15	0.08	0.15	0.31	0.61	0.07	0.90	0.50	-0.63	-0.03	2.42	0.80
Child age	-0.06	-0.03	0.15	0.68	2.81	0.30	0.91	0.00	6.02	0.27	2.56	0.02
Child race not White	0.10	0.05	0.14	0.49	-0.18	-0.02	0.85	0.83	2.41	0.12	2.26	0.29
Limit-setting	0.03	0.31	0.01	0.00	0.06	0.14	0.05	0.19	0.05	0.05	0.13	0.67
Attention regulation T1					1.08	0.23	0.48	0.02	-0.08	-0.01	1.31	0.95
Behavior regulation T2									-0.01	0.00	0.28	0.97

APPENDIX 1B.4

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's reading grades via attention regulation at T1 and behavior regulation at T2

	To Attention Regulation T1				To Behavior Regulation T2				To Reading Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	0.00	0.02	0.01	0.79	-0.05	-0.09	0.05	0.38	0.00	-0.02	0.02	0.87
Maternal education	-0.04	-0.06	0.05	0.46	0.07	0.02	0.29	0.81	-0.01	-0.01	0.09	0.94
Workforce entry	0.10	0.05	0.15	0.52	-0.18	-0.02	0.92	0.84	-0.27	-0.11	0.27	0.33
Income category	0.08	0.15	0.04	0.07	0.11	0.04	0.26	0.67	0.05	0.08	0.08	0.49
Marital status	0.15	0.08	0.15	0.31	0.59	0.07	0.90	0.51	-0.02	-0.01	0.27	0.94
Child age	-0.06	-0.03	0.15	0.67	2.81	0.30	0.91	0.00	-0.10	-0.04	0.28	0.73
Child race not White	0.10	0.05	0.14	0.49	-0.21	-0.02	0.85	0.81	-0.02	-0.01	0.25	0.94
Limit-setting	0.03	0.31	0.01	0.00	0.06	0.13	0.05	0.20	0.01	0.13	0.01	0.29
Attention regulation T1					1.09	0.23	0.48	0.02	0.00	0.00	0.15	1.00
Behavior regulation T2									0.07	0.26	0.03	0.03

APPENDIX 1B.5

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's math grades via attention regulation at T1 and behavior regulation at T2

	To Attention Regulation T1				To Behavior Regulation T2				To Math Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	0.00	0.02	0.01	0.80	-0.04	-0.08	0.05	0.41	-0.02	-0.13	0.01	0.25
Maternal education	-0.04	-0.06	0.05	0.45	0.06	0.02	0.29	0.84	0.09	0.13	0.08	0.26
Workforce entry	0.10	0.05	0.15	0.53	-0.17	-0.02	0.92	0.85	-0.19	-0.09	0.25	0.43
Income category	0.08	0.15	0.04	0.07	0.12	0.05	0.26	0.65	0.07	0.11	0.07	0.34
Marital status	0.15	0.08	0.15	0.31	0.59	0.07	0.90	0.52	0.22	0.10	0.24	0.37
Child age	-0.06	-0.03	0.15	0.67	2.80	0.30	0.91	0.00	-0.06	-0.03	0.26	0.80
Child race not White	0.10	0.05	0.14	0.50	-0.20	-0.02	0.85	0.81	-0.25	-0.12	0.23	0.27
Limit-setting	0.03	0.31	0.01	0.00	0.06	0.13	0.05	0.20	0.01	0.10	0.01	0.39
Attention regulation T1					1.09	0.23	0.48	0.02	0.03	0.03	0.13	0.79
Behavior regulation T2									0.04	0.16	0.03	0.17

APPENDIX 1B.6

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's writing grades via attention regulation at T1 and behavior regulation at T2

	To Attention Regulation T1				To Behavior Regulation T2				To Writing Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	0.00	0.02	0.01	0.81	-0.05	-0.09	0.05	0.38	0.00	0.01	0.02	0.96
Maternal education	-0.04	-0.06	0.05	0.45	0.07	0.02	0.29	0.82	0.00	0.00	0.09	1.00
Workforce entry	0.10	0.05	0.15	0.53	-0.18	-0.02	0.92	0.85	-0.18	-0.08	0.27	0.51
Income category	0.08	0.15	0.04	0.07	0.11	0.04	0.26	0.68	0.05	0.08	0.08	0.52
Marital status	0.15	0.08	0.15	0.31	0.60	0.07	0.90	0.51	-0.06	-0.03	0.26	0.81
Child age	-0.06	-0.03	0.15	0.68	2.82	0.30	0.91	0.00	-0.09	-0.04	0.28	0.74
Child race not White	0.10	0.05	0.14	0.50	-0.20	-0.02	0.85	0.81	-0.04	-0.02	0.25	0.88
Limit-setting	0.03	0.31	0.01	0.00	0.06	0.13	0.05	0.19	-0.01	-0.11	0.01	0.38
Attention regulation T1					1.10	0.23	0.48	0.02	0.16	0.13	0.14	0.27
Behavior regulation T2									0.05	0.20	0.03	0.11

APPENDIX 1C.1

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's social competence split by mothers' marital status

	To Social Competence T2			
	b	B	SE	p
Path From		Married		
Maternal age	0.42	0.30	0.25	0.09
Maternal education	1.89	0.34	1.00	0.06
Workforce entry	2.66	0.14	3.53	0.45
Income category	0.00	0.00	0.84	1.00
Child age	-7.18	-0.30	4.14	0.08
Child race not White	0.33	0.02	2.87	0.91
Limit-setting	0.36	0.33	0.20	0.07
		Unmarried		
Maternal age	0.00	0.00	0.16	0.99
Maternal education	0.04	0.01	1.00	0.97
Workforce entry	1.75	0.08	3.03	0.56
Income category	0.02	0.00	0.91	0.98
Child age	-0.99	-0.05	2.71	0.71
Child race not White	2.01	0.09	2.85	0.48
Limit-setting	-0.05	-0.05	0.14	0.69

APPENDIX 1C.2

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's externalizing behaviors split by mothers' marital status

	To Externalizing T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.03	-0.02	0.18	0.85
Maternal education	-3.95	-0.65	0.69	0.00
Workforce entry	4.69	0.22	2.52	0.06
Income category	-2.11	-0.38	0.61	0.00
Child age	9.49	0.35	3.00	0.00
Child race not White	8.12	0.42	2.08	0.00
Limit-setting	0.23	0.19	0.14	0.10
		Unmarried		
Maternal age	0.02	0.02	0.15	0.89
Maternal education	-0.74	-0.10	0.98	0.45
Workforce entry	-1.05	-0.05	2.95	0.72
Income category	0.28	0.04	0.89	0.75
Child age	5.79	0.27	2.63	0.03
Child race not White	5.88	0.26	2.78	0.03
Limit-setting	-0.13	-0.12	0.13	0.32

APPENDIX 1C.3

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's internalizing behaviors split by mothers' marital status

	To Internalizing T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.75	-0.50	0.25	0.00
Maternal education	-2.52	-0.44	1.01	0.01
Workforce entry	-5.85	-0.29	3.59	0.10
Income category	1.13	0.22	0.86	0.19
Child age	3.75	0.15	4.25	0.38
Child race not White	-0.44	-0.02	2.93	0.88
Limit-setting	-0.06	-0.05	0.20	0.77
		Unmarried		
Maternal age	-0.12	-0.10	0.15	0.43
Maternal education	1.88	0.25	0.94	0.05
Workforce entry	-4.37	-0.19	2.85	0.12
Income category	0.38	0.05	0.85	0.65
Child age	7.82	0.37	2.54	0.00
Child race not White	1.65	0.07	2.68	0.54
Limit-setting	0.09	0.09	0.13	0.48

APPENDIX 1C.4

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's reading grades split by mothers' marital status

	To Reading Grades T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.02	-0.10	0.03	0.60
Maternal education	0.09	0.13	0.14	0.50
Workforce entry	-0.63	-0.25	0.49	0.19
Income category	0.08	0.12	0.12	0.50
Child age	-0.47	-0.15	0.57	0.41
Child race not White	-0.12	-0.05	0.40	0.77
Limit-setting	0.04	0.30	0.03	0.11
		Unmarried		
Maternal age	0.00	0.01	0.02	0.97
Maternal education	-0.07	-0.08	0.12	0.57
Workforce entry	0.08	0.03	0.35	0.83
Income category	0.09	0.12	0.11	0.40
Child age	0.14	0.06	0.31	0.67
Child race not White	0.07	0.03	0.33	0.84
Limit-setting	0.01	0.13	0.02	0.36

APPENDIX 1C.5

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's math grades split by mothers' marital status

	To Math Grades T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.04	-0.22	0.03	0.17
Maternal education	0.18	0.25	0.11	0.12
Workforce entry	-0.62	-0.26	0.40	0.13
Income category	0.21	0.33	0.10	0.03
Child age	-0.56	-0.18	0.47	0.24
Child race not White	-0.33	-0.15	0.33	0.32
Limit-setting	0.04	0.32	0.02	0.05
		Unmarried		
Maternal age	-0.01	-0.10	0.02	0.48
Maternal education	0.02	0.03	0.10	0.82
Workforce entry	0.20	0.10	0.30	0.51
Income category	0.01	0.01	0.09	0.95
Child age	0.10	0.05	0.27	0.72
Child race not White	-0.18	-0.09	0.28	0.53
Limit-setting	0.00	0.05	0.01	0.75

APPENDIX 1C.6

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of limit-setting on children's writing grades split by mothers' marital status

	To Writing Grades T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.03	-0.20	0.03	0.21
Maternal education	0.12	0.20	0.10	0.21
Workforce entry	-0.18	-0.09	0.36	0.61
Income category	0.25	0.46	0.09	0.00
Child age	-1.09	-0.41	0.42	0.01
Child race not White	-0.20	-0.11	0.29	0.49
Limit-setting	0.03	0.23	0.02	0.16
		Unmarried		
Maternal age	0.01	0.06	0.02	0.67
Maternal education	-0.09	-0.11	0.12	0.45
Workforce entry	0.03	0.01	0.36	0.92
Income category	-0.01	-0.01	0.11	0.96
Child age	0.12	0.05	0.33	0.71
Child race not White	0.10	0.04	0.34	0.78
Limit-setting	-0.01	-0.07	0.02	0.62

APPENDIX 1D.1

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's social competence via attention regulation at T1 and behavior regulation at T2, split by mothers' marital status

	To Attention Regulation T1				To Behavior Regulation T2				To Social Competence T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	0.02	0.15	0.02	0.27	-0.01	-0.01	0.08	0.95	0.48	0.32	0.24	0.04
Maternal education	0.04	0.06	0.08	0.64	-0.39	-0.19	0.33	0.23	2.35	0.42	0.95	0.01
Workforce entry	0.11	0.06	0.28	0.69	-3.31	-0.45	1.16	0.00	5.18	0.26	3.69	0.16
Income category	0.09	0.18	0.07	0.16	0.66	0.34	0.29	0.02	-0.57	-0.11	0.87	0.51
Child age	-0.68	-0.28	0.33	0.04	2.12	0.23	1.43	0.14	-9.42	-0.38	4.15	0.02
Child race not White	0.04	0.02	0.23	0.87	-0.63	-0.10	0.95	0.51	1.60	0.09	2.69	0.55
Limit-setting	0.03	0.27	0.02	0.06	-0.04	-0.10	0.07	0.53	0.36	0.33	0.19	0.06
Attention regulation T1					0.61	0.16	0.58	0.29	0.10	0.01	1.66	0.95
Behavior regulation T2									0.83	0.31	0.50	0.10
						Unmarried						
Maternal age	0.00	-0.01	0.01	0.92	-0.09	-0.18	0.06	0.13	0.04	0.03	0.16	0.81
Maternal education	-0.07	-0.11	0.06	0.26	0.58	0.17	0.39	0.14	0.01	0.00	1.02	1.00
Workforce entry	0.16	0.09	0.19	0.38	1.10	0.11	1.17	0.35	1.02	0.05	3.04	0.74
Income category	0.08	0.13	0.06	0.17	-0.27	-0.09	0.36	0.44	0.01	0.00	0.92	0.99
Child age	0.09	0.05	0.17	0.58	3.34	0.35	1.05	0.00	-1.60	-0.08	2.92	0.58
Child race not White	0.11	0.06	0.18	0.54	0.16	0.02	1.11	0.89	2.18	0.10	2.84	0.44
Limit-setting	0.03	0.32	0.01	0.00	0.10	0.21	0.06	0.07	-0.13	-0.13	0.15	0.37
Attention regulation T1					1.14	0.22	0.61	0.06	0.71	0.06	1.60	0.66
Behavior regulation T2									0.28	0.13	0.33	0.40

APPENDIX 1D.2

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's externalizing behaviors via attention regulation at T1 and behavior regulation at T2, split by mothers' marital status

	To Attention Regulation T1				To Behavior Regulation T2				To Externalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	0.02	0.16	0.02	0.24	0.00	0.01	0.08	0.95	-0.09	-0.06	0.18	0.62
Maternal education	0.01	0.03	0.08	0.85	-0.38	-0.18	0.32	0.24	-3.80	-0.63	0.69	0.00
Workforce entry	0.17	0.09	0.28	0.54	-3.27	-0.45	1.16	0.00	3.59	0.17	2.75	0.19
Income category	0.09	0.18	0.07	0.17	0.71	0.37	0.29	0.01	-2.05	-0.37	0.66	0.00
Child age	-0.66	-0.27	0.33	0.04	1.86	0.20	1.43	0.19	11.36	0.43	3.10	0.00
Child race not White	0.02	0.01	0.23	0.93	-0.53	-0.08	0.96	0.58	8.15	0.42	2.03	0.00
Limit-setting	0.03	0.29	0.02	0.04	-0.05	-0.12	0.07	0.46	0.13	0.11	0.14	0.37
Attention regulation T1					0.56	0.15	0.58	0.34	1.91	0.18	1.25	0.13
Behavior regulation T2									-0.25	-0.09	0.38	0.50
						Unmarried						
Maternal age	0.00	-0.01	0.01	0.93	-0.09	-0.17	0.06	0.13	0.02	0.02	0.16	0.90
Maternal education	-0.07	-0.11	0.06	0.27	0.57	0.17	0.39	0.14	-0.77	-0.10	1.00	0.44
Workforce entry	0.17	0.09	0.19	0.38	1.15	0.11	1.17	0.33	-0.58	-0.03	2.97	0.85
Income category	0.08	0.13	0.06	0.17	-0.28	-0.09	0.36	0.43	0.28	0.04	0.90	0.75
Child age	0.09	0.05	0.17	0.59	3.39	0.36	1.05	0.00	6.30	0.30	2.85	0.03
Child race not White	0.11	0.06	0.18	0.54	0.14	0.01	1.11	0.90	5.93	0.26	2.77	0.03
Limit-setting	0.03	0.32	0.01	0.00	0.10	0.21	0.06	0.07	-0.08	-0.08	0.14	0.57
Attention regulation T1					1.13	0.21	0.61	0.06	-0.48	-0.04	1.56	0.76
Behavior regulation T2									-0.19	-0.09	0.33	0.56

APPENDIX 1D.3

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's internalizing behaviors via attention regulation at T1 and behavior regulation at T2, split by mothers' marital status

	To Attention Regulation T1				To Behavior Regulation T2				To Internalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	0.02	0.15	0.02	0.26	0.00	0.00	0.08	0.98	-0.78	-0.53	0.25	0.00
Maternal education	0.05	0.09	0.08	0.52	-0.38	-0.19	0.33	0.24	-2.63	-0.47	1.01	0.01
Workforce entry	0.11	0.06	0.28	0.69	-3.29	-0.45	1.17	0.00	-6.86	-0.34	3.96	0.08
Income category	0.10	0.18	0.07	0.15	0.67	0.35	0.29	0.02	1.29	0.25	0.94	0.17
Child age	-0.70	-0.28	0.33	0.03	2.03	0.22	1.44	0.16	5.40	0.22	4.49	0.23
Child race not White	0.04	0.02	0.23	0.85	-0.60	-0.09	0.96	0.53	-0.89	-0.05	2.90	0.76
Limit-setting	0.03	0.26	0.02	0.07	-0.04	-0.11	0.07	0.51	-0.11	-0.10	0.21	0.58
Attention regulation T1					0.58	0.16	0.58	0.32	1.15	0.11	1.79	0.52
Behavior regulation T2									-0.34	-0.12	0.54	0.53
						Unmarried						
Maternal age	0.00	0.00	0.01	0.96	-0.10	-0.19	0.06	0.11	-0.14	-0.12	0.15	0.35
Maternal education	-0.07	-0.11	0.06	0.27	0.59	0.18	0.39	0.13	1.93	0.26	0.96	0.04
Workforce entry	0.17	0.09	0.19	0.37	1.02	0.10	1.17	0.38	-4.09	-0.18	2.87	0.15
Income category	0.08	0.13	0.06	0.17	-0.27	-0.09	0.36	0.44	0.33	0.05	0.87	0.71
Child age	0.09	0.05	0.17	0.58	3.34	0.35	1.05	0.00	8.30	0.39	2.75	0.00
Child race not White	0.11	0.06	0.18	0.53	0.17	0.02	1.11	0.88	1.61	0.07	2.68	0.55
Limit-setting	0.03	0.32	0.01	0.00	0.10	0.22	0.06	0.07	0.13	0.13	0.14	0.34
Attention regulation T1					1.12	0.21	0.61	0.06	-0.18	-0.02	1.51	0.91
Behavior regulation T2									-0.18	-0.08	0.32	0.57

APPENDIX 1D.4

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's reading grades via attention regulation at T1 and behavior regulation at T2, split by mothers' marital status

	To Attention Regulation T1				To Behavior Regulation T2				To Reading Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	0.02	0.15	0.02	0.26	0.01	0.01	0.08	0.94	-0.01	-0.04	0.03	0.81
Maternal education	0.04	0.06	0.08	0.64	-0.38	-0.18	0.33	0.24	0.08	0.11	0.13	0.54
Workforce entry	0.14	0.07	0.28	0.62	-3.26	-0.45	1.17	0.01	-0.02	-0.01	0.51	0.96
Income category	0.09	0.18	0.07	0.17	0.72	0.38	0.29	0.01	0.05	0.08	0.12	0.68
Child age	-0.68	-0.28	0.33	0.04	1.81	0.20	1.42	0.20	-0.72	-0.23	0.56	0.20
Child race not White	0.03	0.02	0.23	0.89	-0.50	-0.08	0.95	0.60	-0.23	-0.10	0.37	0.53
Limit-setting	0.03	0.28	0.02	0.05	-0.05	-0.13	0.07	0.43	0.06	0.46	0.03	0.01
Attention regulation T1					0.58	0.16	0.58	0.32	-0.47	-0.37	0.23	0.04
Behavior regulation T2									0.12	0.34	0.07	0.09
						Unmarried						
Maternal age	0.00	-0.01	0.01	0.90	-0.09	-0.17	0.06	0.13	0.01	0.12	0.02	0.40
Maternal education	-0.07	-0.11	0.06	0.26	0.60	0.18	0.39	0.13	-0.11	-0.13	0.11	0.35
Workforce entry	0.16	0.08	0.19	0.39	1.13	0.11	1.16	0.33	0.01	0.00	0.33	0.98
Income category	0.08	0.13	0.06	0.17	-0.28	-0.09	0.35	0.43	0.08	0.10	0.10	0.44
Child age	0.09	0.05	0.17	0.58	3.34	0.35	1.04	0.00	0.04	0.02	0.32	0.90
Child race not White	0.11	0.06	0.18	0.55	0.15	0.01	1.11	0.89	0.04	0.01	0.31	0.91
Limit-setting	0.03	0.32	0.01	0.00	0.10	0.21	0.06	0.07	-0.01	-0.08	0.02	0.60
Attention regulation T1					1.16	0.22	0.60	0.05	0.20	0.16	0.18	0.26
Behavior regulation T2									0.08	0.32	0.04	0.04

APPENDIX 1D.5

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's math grades via attention regulation at T1 and behavior regulation at T2, split by mothers' marital status

	To Attention Regulation T1				To Behavior Regulation T2				To Math Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	0.02	0.15	0.02	0.26	0.01	0.01	0.08	0.93	-0.03	-0.19	0.03	0.19
Maternal education	0.04	0.06	0.08	0.64	-0.38	-0.18	0.33	0.24	0.19	0.26	0.11	0.08
Workforce entry	0.14	0.07	0.28	0.62	-3.26	-0.45	1.17	0.01	-0.03	-0.01	0.42	0.95
Income category	0.09	0.18	0.07	0.17	0.72	0.38	0.29	0.01	0.14	0.22	0.10	0.16
Child age	-0.68	-0.28	0.33	0.04	1.81	0.20	1.42	0.20	-0.72	-0.24	0.46	0.12
Child race not White	0.03	0.02	0.23	0.89	-0.50	-0.08	0.95	0.60	-0.45	-0.20	0.30	0.14
Limit-setting	0.03	0.28	0.02	0.05	-0.05	-0.13	0.07	0.43	0.06	0.46	0.02	0.00
Attention regulation T1					0.58	0.16	0.58	0.32	-0.29	-0.24	0.19	0.12
Behavior regulation T2									0.12	0.35	0.06	0.04
						Unmarried						
Maternal age	0.00	-0.01	0.01	0.88	-0.09	-0.17	0.06	0.15	-0.01	-0.05	0.02	0.73
Maternal education	-0.07	-0.11	0.06	0.26	0.59	0.18	0.39	0.13	0.02	0.03	0.10	0.82
Workforce entry	0.16	0.08	0.19	0.40	1.14	0.11	1.17	0.33	0.16	0.08	0.30	0.59
Income category	0.08	0.13	0.06	0.16	-0.28	-0.09	0.36	0.44	-0.02	-0.03	0.09	0.81
Child age	0.10	0.05	0.17	0.57	3.34	0.35	1.05	0.00	0.14	0.07	0.29	0.63
Child race not White	0.11	0.06	0.18	0.55	0.16	0.02	1.11	0.89	-0.19	-0.09	0.28	0.50
Limit-setting	0.03	0.32	0.01	0.00	0.10	0.21	0.06	0.08	-0.01	-0.10	0.01	0.49
Attention regulation T1					1.17	0.22	0.60	0.05	0.21	0.19	0.16	0.18
Behavior regulation T2									0.02	0.12	0.03	0.46

APPENDIX 1D.6

Coefficients, standard errors, and p-values for all variables included in the model estimating the effect of limit-setting on children's writing grades via attention regulation at T1 and behavior regulation at T2, split by mothers' marital status

	To Attention Regulation T1				To Behavior Regulation T2				To Writing Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	0.02	0.15	0.02	0.27	0.01	0.01	0.08	0.93	-0.03	-0.19	0.02	0.16
Maternal education	0.03	0.05	0.08	0.70	-0.39	-0.19	0.33	0.23	0.16	0.26	0.09	0.07
Workforce entry	0.12	0.06	0.28	0.67	-3.24	-0.44	1.17	0.01	0.52	0.24	0.34	0.13
Income category	0.09	0.18	0.07	0.16	0.71	0.37	0.29	0.01	0.14	0.24	0.08	0.09
Child age	-0.67	-0.27	0.33	0.04	1.84	0.20	1.42	0.20	-1.23	-0.46	0.38	0.00
Child race not White	0.03	0.02	0.23	0.88	-0.55	-0.08	0.95	0.57	-0.33	-0.17	0.25	0.19
Limit-setting	0.03	0.28	0.02	0.05	-0.05	-0.12	0.07	0.47	0.05	0.41	0.02	0.01
Attention regulation T1					0.53	0.14	0.58	0.36	-0.17	-0.16	0.16	0.27
Behavior regulation T2									0.14	0.48	0.05	0.00
						Unmarried						
Maternal age	0.00	-0.01	0.01	0.90	-0.09	-0.18	0.06	0.12	0.02	0.16	0.02	0.26
Maternal education	-0.07	-0.11	0.06	0.26	0.60	0.18	0.39	0.12	-0.11	-0.13	0.12	0.34
Workforce entry	0.16	0.08	0.19	0.40	1.16	0.11	1.16	0.32	-0.03	-0.01	0.34	0.93
Income category	0.08	0.14	0.06	0.16	-0.28	-0.09	0.35	0.43	-0.04	-0.05	0.10	0.73
Child age	0.09	0.05	0.17	0.58	3.35	0.35	1.04	0.00	0.07	0.03	0.33	0.83
Child race not White	0.11	0.06	0.18	0.55	0.13	0.01	1.10	0.90	0.07	0.03	0.32	0.82
Limit-setting	0.03	0.32	0.01	0.00	0.10	0.22	0.06	0.07	-0.03	-0.29	0.02	0.04
Attention regulation T1					1.16	0.22	0.60	0.05	0.31	0.24	0.18	0.09
Behavior regulation T2									0.06	0.23	0.04	0.13

REFERENCES

Arbuckle, J. L., & Wothke, W. (1999). *Amos 4.0 user's guide*. Chicago: SmallWaters Corporation.

Ayduk, O., Mendoza-Denton, R. & Downey, G. (2001). *The role of attentional control in regulating the interpersonal self.* Paper presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

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.

Brody, N. (1992). *Intelligence* (2nd ed.). San Diego: Academic Press.

Brody, G. H., & Flor, D. L. (1998). Maternal resources, parenting practices, and child competence in rural, single-parent African American families. *Child Development*, *69*, 803-816.

Brody, G. H., Flor, D. L., & Gibson, N. M. (1999). Linking maternal efficacy beliefs, developmental goals, parenting practices, and child competence in rural single-parent African American families. *Child Development, 70*, 1197-1208.

Brody, G. H., Stoneman, Z., Flor, D., McCrary, C., Hastings, L., & Conyers, O. (1994). Financial resources, parent psychological functioning, parent co-caregiving, and early adolescent competence in rural two-parent African-American families. *Child Development, 65*, 590-605.

Calkins, S. D., Smith, C. L., Gill, K. L., & Johnson, M. C. (1998). Maternal interactive style across contexts: Relations to emotional, behavioral and physiological regulation during toddlerhood. *Social Development, 7*(3), 350–369.

Campbell, S. B., Shaw, D. S., & Gilliom, M. (2000). Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. *Development and Psychopathology*, *12*, 467-488.

Caspi, A. (2000). The child is the father of the man: Personality continuities from childhood to adulthood. *Journal of Personality and Social Psychology, 78*, 158-172.

Cicchetti, D., Ackerman, B. P., & Izard, C. E. (1995). Emotions and emotion regulation in developmental psychopathology. *Development and Psychopathology, 7*, 1-10.

Conduct Problems Prevention Research Group (1999). Initial impact of the Fast Track Trial for Conduct Problems: 1. The high-risk sample. *Journal of Consulting and Clinical Psychology, 67*, 631-647.

Conger, R. D., Conger, K. J., & Elder, G. H., Jr. (1997). Family economic hardship and adolescent adjustment: Mediating and moderating processes. In G. J. Duncan, & Brooks-Gunn, J. (Eds.), *Consequences of growing up poor* (pp. 288-310). New York: Russell Sage Foundation.

Conger, R. D., Ge, Xiaojia, Elder, G. H., Jr., Lorenz, F. O., & Simons, R. L. (1994). Economic stress, coercive family processes, and developmental problems of adolescents. *Child Development, 65*(2), 541-561.

Deater-Deckard, K. & Dodge, K. A. (1997). Externalizing behavior problems and discipline revisited: Nonlinear effects and variations by culture, context and gender. *Psychological Inquiry, 8*, 161-175.

Deater-Deckard, K., Dodge, K. A., Bates, J., & Pettit, G. (1996). Physical discipline among African American and European American mothers: Links to children's externalizing behaviors. *Developmental Psychology, 32*, 1065-1072.

Derryberry, D., & Rothbart, M. K. (1988). Arousal, affect, and attention as components of temperament. *Journal of Personality and Social Psychology, 6*, 958-966.

Dodge, K. A., Pettit, G. S., & Bates, J. E. (1994). Socialization mediators of the relation between socioeconomic status and child conduct problems. *Child Development, 65*, 649-665.

Duncan, G. J., Brooks-Gunn, & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development, 65*(2), 296-318.

Duncan, G. J., Yeung, W. J., Brooks-Gunn, J., & Smith, J. R. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review, 63*(3), 406-423.

Eisenberg, N., & Fabes, R. A. (1992). Emotion, regulation, and the development of social competence. In M. S. Clark (Ed.), *Review of personality and social psychology: Vol. 14. Emotion and social behaviors* (pp. 119-150). Newbury Park, CA: Sage.

Eisenberg, N., Fabes, R. A., Shepard, S. A., Murphy, B. C., Guthrie, I. K., Jones, S., Friedman J., Poulin, R., & Maszk, P. (1997). Contemporaneous and longitudinal

prediction of children's social functioning from regulation and emotionality. *Child Development, 68*, 642-664.

Eisenberg, N., Guthrie, I. K., Fabes, R. A., Shepard, S., Losya, S., Murphy, B. C., Jones, S., Poulin, R., & Reiser, M. (2000). Prediction of elementary school children's externalizing problem behaviors from attentional and behavioral regulation and negative emotionality. *Child Development, 71*, 1367-1382.

Eisenberg, N., Zhou, Q., Spinrad, T. L., Valiente, C., Fabes, R. A., & Liew, J. (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development*, *76*(5), 1055-1071.

Elder, G. H., Eccles, J. S., Ardelt, M., & Lord, S. (1995). Inner-city parents under economic pressure: Perspectives on the strategies of parenting. *Journal of Marriage and Family, 57*, 771-784.

Garcia Coll, C., & Pachter, L. M. (2002). Ethnic and minority parenting. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 4. Social conditions and applied parenting* (2nd ed., pp. 1-20). Mahwah, NJ: Erlbaum.

Garner, P. W., & Spears, F. M. (2000). Emotion regulation in low-income preschoolers. *Social Development, 9*, 246-264.

Gerard, A. B. (1994). *The Parent-Child Relationship Inventory: Manual*. Los Angeles: Western Psychological Services.

Harden, B. J., Winslow, M. B., Kendziora, K. T., Shahinfar, A., Rubin, K. H., Fox, N. A., Crowley, M. J., & Zahn-Waxler, C. (2000). Externalizing problems in Head Start children: An ecological exploration. *Early Education and Development, 11*, 357-385.

Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*(4), 599-610.

Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003a). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*(1), 101-119.

Howse, R. B., Lange, G., Farran, C. D., & Boyles, D. C. (2003b). Motivation and self-regulation as predictors of achievement in economically disadvantaged young children. *The Journal of Experimental Education, 71*(2), 151-174.

Judd, C. M., & Kenny, D. A. (1981). Process Analysis: Estimating mediation in treatment evaluations. *Evaluation Review, 5*, 602-619.

Kochanska, G. (1995). Children's temperament, mothers' discipline, and security of attachment: Multiple pathways to emerging internalization. *Child Development, 66*, 597-615.

Kochanska, G., & Aksan, N. (1995). Mother-child mutually positive affect, the quality of child competence to requests and prohibitions, and maternal control as correlates of early internalization. *Child Development, 66*, 236-254.

Krueger, R. F., Caspi, A., Moffitt, T. E., White, J., & Stouthamer-Loeber, M. (1996). Delay of gratification, psychopathology, and personality: Is low self-control specific to externalizing problems? *Journal of Personality, 64*, 107-129.

Laible, D. J. (2004). Mother-child discourse in tow contexts: Links with child temperament, attachment security, and socioemotional competence. *Developmental Psychology, 40*(6), 979-992.

Laible, D. J., & Thompson, R. A. (2000). Mother-child discourse, attachment security, shared positive affect, and early conscience development. *Child Development, 71*(5), 1424-1440.

Laible, D. J., & Thompson, R. A. (2002). Early parent-child conflict: Lessons in emotion, morality, and relationships. *Child Development, 73*(4), 1187-1203.

LaFreniere, P. J., Dumas, J. E., Capuano, F., & Dubeau, D. (1992). Development and validation of the preschool socioaffective profile. *Psychological Assessment, 4*, 442-450.

MacPhee, D., Fritz, J., & Miller-Heyl, J. (1996). Ethnic variations in personal social networks and parenting. *Child Development, 67*, 3278-3295.

McLeod, J. D., & Shanahan, M. J. (1993). Poverty, parenting, and children's mental health. *American Sociological Review, 58*, 351-366.

McLoyd, V. C. (1990). The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development. *Child Development, 61*, 311-346.

Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology, 54*, 687-696.

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 100*, 674-701.

Murphy, B. C., & Eisenberg, N. (1997). Young children's emotionality, regulation and social functioning and their responses when they are targets of a peer's anger. *Social Development, 6*, 18-36.

Newman, J., Noel, A., Chen, R., & Matsopoulos, A. S. (1998). Temperament, selecting moderating variables and early reading achievement. *Journal of School Psychology, 36*(2), 215-232.

Pettit, G. S., & Bates, J. E. (1989). Family interaction patterns and children's behavior problems from infancy to four years. *Developmental Psychology, 25*, 413-420.

Posner, M. I., & Rothbart, M. K. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology, 12*, 427-441.

Raver, C. C., Blackburn, E. K., Bancroft, M., & Torp, N. (1999). Relations between effective emotional self-regulation, attentional control, and low-income preschoolers' social competence with peers. *Early Education and Development, 10*, 333-350.

Raver, C. C., & Zigler, E. F. (1997). Social competence: An untapped dimension in evaluating Head Start's success. *Early Childhood Research Quarterly*, *12*, 263-285.

Rothbart, M. K., Ahadi, S.A., & Hershey, K. L. (1994). Temperament and social behavior in childhood. *Merrill-Palmer Quarterly, 40*, 21-39.

Rothbart, M. K., Ahadi, S. A., Hershey, 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., Posner, M. I., & Hershey, K. L. (1995). Temperament, attention, and developmental psychopathology. In D. Cicchetti, & D. Cohen (Eds.), *Manual of developmental psychopathology* (Vol. 1, pp. 315-340). New York: Wiley.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177.

Schoen, M. J., & Nagle, R. J. (1994). Prediction of school readiness from kindergarten temperament scores. *Journal of School Psychology*, *32*(2), 135-147.

Shields, A., & Cicchetti, D. (1998). Reactive aggression among maltreated children: The contributors of attention and emotion dysregulation. *Journal of Clinical Child Psychology, 27*, 381-395.

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.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 132-189). New York: Russell Sage Foundation.

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years*. New York: Cambridge University Press.

StataCorp (2005). Stata statistical software: Release 9.0. College Station, TX: Statacorp.

Thompson, R. A. (1994). Emotion regulation: A theme in search of a definition. In N. A. Fox (Ed.), *Emotion regulation: Behavioral and biological considerations. Monographs of the Society for Research in Child Development, 59*(2-3, Serial No. 240), 25-52.

U. S. Bureau of the Census (1999). *Current Population Reports: Consumer Income* (Series P-60). Washington, DC: U. S. Government Printing Office.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Weiss, B., Dodge, K. A., Bates, J. E., & Pettit, G. S. (1992). Some consequences of early harsh discipline: Child aggression and a maladaptive social information processing style. *Child Development, 63*, 1321-1335.

Yoshikawa, H., & Seidman, E. (2000). Competence among urban adolescents in poverty: Multiple forms, contexts and developmental processes. In R. Montemayor, Adams, G. R., & Gullotta, R. P. (Eds.), *Advances in adolescent development: Vol. 10. Cultural and economic diversity in adolescent development* (pp. 9-42). Newbury Park, CA: Sage.

BEHAVIOR REGULATION: ITS STABILITY AND ROLE AS A MEDIATOR OF EARLY INHIBITORY CONTROL AND FIRST GRADERS' ADJUSTMENT

For over half a century, the study of emotion regulation has been grounded in the use of delay-of-gratification tasks to assess children's ability to regulate their emotions under potentially frustrating experimental conditions (Mischel, Shoda, & Rodriguez, 1989; Funder, Block, & Block, 1983). In these experiments (see Metcalfe & Mischel, 1999), emotion regulation is typically measured by children's capacity to inhibit their own behavior (*e.g.*, duration of time elapsed prior to touching a prohibited reward) and effective attention deployment (*e.g.*, shifting attention away from the more stimulating features of a desired reward).

Much of the focus on children's emotion-related regulation has centered upon its relationship to problems with externalizing behavior (Eisenberg et al., 2005; Eisenberg & Fabes, 1992; Krueger, Caspi, Moffitt, White, & Stouthamer-Loeber, 1996; Oosterlaan & Sergeant, 1996). Tremblay (1999) has argued that learning to delay gratification may be one of "the most important protective factors for chronic physical aggression and antisocial behavior" (p. 69). The long-standing focus on the regulation-externalizing link is interesting considering that, among American children, rates of physical aggression increase after the first year of birth and decline steadily after age 3 for both boys and girls (Brame, Nagin, & Tremblay, 2001). Those boys who persistently engage in physical aggression, a form of externalizing behavior, throughout their youth represent a small group, their numbers comprising perhaps as few as 4% of all boys (Tremblay, 2000; Nagin & Tremblay, 1999).

Beyond such a focus on externalizing outcomes, examining relations between regulation and other indices of adjustment might well prove fruitful. It is likely that

the same factors that cause children to struggle with modulating arousal and controlling impulses during these tasks would—in addition to signaling potential academic difficulties—also place children at risk for socioemotional difficulties. Indeed, longitudinal studies have demonstrated that a child's ability to control behaviors (*e.g.*, delay gratification) at an early age is predictive of positive peer relations and healthy socioemotional adjustment even after the influence of IQ has been statistically controlled (Mischel, Shoda, & Rodriguez, 1989). Moreover, behavior regulation measured in childhood appears to be correlated with higher SAT scores in adolescence (Shoda, Mischel, & Peake, 1990).

The present study examined the mediating role of behavior regulation assessed both at Time 1 and Time 2 (longitudinally and concurrently) on the relationship between children's inhibitory control and subsequent adjustment as measured by children's socially competent, externalizing, and internalizing behaviors and their academic achievement. We hypothesized that difficulty with inhibitory control would be associated with fewer regulation skills at two time points, which in turn would contribute to decrements in child functioning at age six. A secondary goal of this study was to examine the stability of behavior regulation over time within a low-income sample.

Inhibitory control and regulation. In this study, inhibitory control is defined as the capacity to effortfully suppress behaviors as needed. Behavior regulation is defined as the ability to effortfully suppress *and initiate* behaviors as needed. There are strong theoretical and developmental reasons for expecting inhibitory control to contribute to behavior regulation but not vice versa.

Theoretically, inhibitory control can contribute to behavior regulation (*e.g.*, by inhibiting emotion), but behavior regulation involves more than control (*e.g.*, it also includes the ability to activate behavior; see Eisenberg, Spinrad et al., 2004).

Similarly, a factor analyses by Olson and colleagues (1999) indicated that inhibitory control among 6-year-old children is qualitatively distinct from other aspects of behavioral persistence as observed during resistance-to-temptation and delay-of-gratification tasks.

Building on Block & Block's (1980) concepts of "ego control" and "ego resiliency," inhibitory control has traditionally been viewed exclusively as an expression of control whereas behavior regulation has been viewed as an expression of a flexible response style. As Block and Kremen (1996) stated, "adaptability in the long-term requires more than the replacement of unbridled impulsivity or under-control, with categorical, pervasive, rigid impulse control" (p. 351). Thus, not all aspects of control would contribute to regulation. Indeed, several theorists have argued that it is important to differentiate between emotion-related control that is flexible and adaptive and that which is rigid and less adaptive (e.g., Block & Block, 1980; Thompson & Calkins, 1996). Taken together, teasing "ego-resilient" regulation apart from the more rigid and impulse-suppression-focused aspects of ego control may lead to fruitful areas of inquiry within the larger body of self-regulation research.

Building on the work of Derryberry and Rothbart (1997), Eisenberg and Morris (2002) differentiated between control that is voluntarily modulated and, thus, relatively flexible—labeled *effortful control*—and control that is more reactive (e.g., based more on reactive motivational systems), less voluntary, and less flexible—labeled *reactive control*. Eisenberg and Morris (2002) argued that only the former is truly part of emotion-related regulation. Reactive overcontrol is believed to be reflected in behavioral inhibition (i.e., the tendency to react to novelty, uncertainty, or stressful situations with slow, inhibited behavior) and in inhibited, rigid behavior more generally (Block & Block, 1980). Even positive emotions require regulation; exuberance is appropriate on the playground but not in a hospital. Therefore, the task

of emotion regulation is not simply a matter of learning to suppress emotions. It is more broadly one of deploying emotions effectively in relationships.

In terms of *neurobiological* maturation, Rothbart (1989) has argued that the regulatory ability to inhibit an act may precede the regulatory abilities necessary to sustain a prolonged flow of behavior. Kochanska and Aksan (1995) contribute additional developmental evidence for the inhibitory control-behavior regulation distinction. Their results suggest strongly that, compared with "Don't" demands, which require the type of regulation that underlies inhibitory control, "Do" requests, which require a higher-order form of regulatory skills like those underlying behavior regulation skills, are more challenging for young children and require more situational maintenance of compliance from the parent. Thus, for toddlers it is "easier to 'embrace' maternal prohibitions regarding touching attractive objects than to have similar wholehearted feelings about a task requiring a sustained mundane activity" (Kochanska & Aksan, 1995, p .252). To our knowledge, the present study is the first to test whether inhibitory control operates through behavioral regulation and thereby delineates temporal associations between inhibitory control and behavior regulation as they relate longitudinally to subsequent child adjustment.

Previous research with this same sample (see Marcynyszyn, 2006a) examined the role of behavioral and attentional forms of regulation as explanatory processes of the relations between caregivers' limit-setting practices and children's subsequent adjustment. As described within this prior study, it is possible to distinguish attentional from behavioral forms of regulation by the domain within which regulation is exercised. That is, attention regulation is an internal process involving *cognitions* whereas behavior regulation is an overt process involving the *expression* of behavior (Eisenberg, Guthrie et al., 2000). The present study focuses on the stability of

behavior regulation over time, not on attention regulation, which was assessed at only one time point.

Behavioral genetic studies have established that individual differences in temperament, measured even during early childhood, are only partially heritable and are influenced by environmental experiences (Emde & Hewitt, 2001). For example, while experimentally induced stressors may lead to elevated neuroendocrine levels, sensitive caregiving has been found to moderate these effects (Gunnar & Donzella, 2002). Environmental methods of transmission occur during infancy, a period during which there is almost complete reliance on caregivers as "regulators of emotion" (Fox & Calkins, 2003, p. 18). Caregiving practices related to inhibitory control and behavior regulation are likely to become internalized (Kopp, 1982). As described in detail by Garcia Coll and Magnuson (2000), cultural values strongly influence how young children learn to understand and display their emotions (*i.e.*, what they internalize). For example, cultures such as that of the Yoruba of Nigeria emphasize self-reliance and responsibility from a young age and thus have different expectations for children's regulatory behavior, in terms of both what is controlled and the regulatory strategies used, compared with Western cultural standards for these same processes (Zeitlan, 1996).

There is now considerable evidence to suggest that, in addition to the influence of parenting and cultural influences, individuals under chronic stressors have smaller hippocampal volume (Sapolsky, 1996). The hippocampus is a region of the brain involved in self-regulation (Metcalfe & Mischel, 1999). As a result of the selective vulnerability of low-income children to chronic stress (Evans & Marcynyszyn, 2004), this research has implications for the self-regulatory functioning of economically disadvantaged children. Thus, inhibitory control, behavior regulation, and child

adjustment are influenced in part by genetic and environmental factors, by neurophysiological processes, and by cultural norms.

Behavior regulation and achievement. Compared with the considerable amount of research that has been conducted to study the relationship between self-regulatory skills and socioemotional adjustment among lower-risk children, little research has been conducted on the relationship between self-regulatory processes and academic achievement for either low- or higher-risk children (Blair, 2002; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003).

Howse and colleagues (2003) conducted one of the few empirical studies to examine the regulation-achievement link in young children. They found that kindergarten teacher reports of behavioral regulation mediated the relationship between parental reports of regulation and kindergartner achievement in literacy and math, even after maternal education and child IQ were held constant. Unlike the parent- and teacher-reported measures of regulation, lab-based measures of preschoolers' self-regulatory behaviors observed during frustration tasks were unrelated to kindergarteners' achievement. In sum, children who are better at behavioral inhibition in the classroom should be more likely to focus attention on learning, engage in self-monitoring, and complete work, all of which behaviors fall under the umbrella of self-regulation.

Reviews by Raver (2002) and Pianta and Walsh (1998) indicate that skills other than academic preparedness promote early academic success. If cognitive skills prior to school entry constitute only part of the foundation for academic achievement, we must begin to identify the other skills that contribute to early academic success among low-income children. It is critical that low-income children enter the first-grade classroom equipped to learn because first-grade academic achievement is highly predictive of future academic performance (Blair, 2002).

Moreover, Pianta and Walsh (1998) argue that the early school years warrant particular attention as a period in which to consider intervention, especially when coupled with a focus on processes and not products. The present paper focuses on processes *and* outcomes, by investigating pathways that contribute to competent functioning in the classroom among young children from low-income families.

Consistency of behavioral regulation over time. Recent studies suggest that forms of effortful control such as behavioral regulation are moderately stable during childhood (at a magnitude of 0.41), especially after age three (Caspi, Roberts, & Shiner, 2005). Research by Eisenberg and colleagues (2005) provides evidence of considerable continuity in behavioral regulation during childhood. In their longitudinal study, behavior regulation in 9-year-olds, as measured by persistence on a puzzle task (without cheating), was correlated at 0.58 with their performance on the same task when it was repeated two years later. Behavioral regulation assessed by persistence on an origami task during early adolescence was, however, unrelated to either of the earlier behavior regulation measures. The absence of a relationship between behavior regulation during early adolescence and the earlier indices of behavior regulation (assessed at ages 9 and 11) most likely reflects a change in the way regulation was measured rather than instability in children's behavior regulation over a 6-year period.

Long-term stability between children's behavior regulation as assessed during delay tasks and adolescents' regulatory capacities has been observed in several studies by Mischel and colleagues (Mischel, 1983; Mischel, Shoda, & Rodriguez, 1989; Shoda, Mischel, & Peake, 1990). In reference to this connection, it is important to note that "stability" refers to consistency in self-regulatory behaviors over time as measured by personality inventories, parent report of functioning, and test scores—not stability of child or adolescent behaviors as assessed during delay or resistance-to-

temptation tasks. The present study examines the continuity of behavior regulation, a process known for its enduring association with positive outcomes for children and adolescents, by examining the stability of behavior regulation as assessed during two delay-of-gratification-type tasks, in addition to examining its role as a predictor of subsequent child functioning.

Study Hypotheses

The primary goal of the present study was to understand the relationship between children's inhibitory control and their subsequent adjustment within a low-income sample by examining the mediating role of children's behavior regulation skills measured both at Time 1 and Time 2. We hypothesized that the association between inhibitory control at Time 1 and children's socioemotional and academic outcomes at Time 2 would be partially mediated by children's capacity for behavior regulation. Difficulty with inhibitory control, which may have physiological, environmental, or cultural underpinnings, was expected to be associated with fewer regulation skills at two time points, which in turn would contribute to decrements in child functioning at age six. A secondary goal of this study was to examine the stability of behavior regulation over time within a low-income sample. Studies of middle- to upper-income children suggest moderate stability in observational measures of behavior regulation over a two-year period (Eisenberg et al., 2000).

METHOD

Participants

At Time 1, 163 low-income, Head Start children ages 2.1 - 4.8 (*M* age = 4.20, *SD* = .44) and their caregivers were enrolled in a study on parenting and children's socioemotional development. Of these parents, 93% were mothers (*n* = 151), 4% were

fathers (n = 7), and 3% were grandmothers (n = 5).[9] Low-income status was determined by Head Start eligibility guidelines. Within Upstate New York, 60% (n = 98) of the families resided in a medium-sized city and the remaining families resided in a rural area. Between-site comparisons suggest that the rural and urban samples were strongly racially segregated, with few African American children enrolled in the rural Head Start centers and few White children enrolled in the urban Head Start centers, $\chi^2(1, N = 163) = 68.57$, $p < .001$. Caregivers were, on average, 29 years of age and had completed high school. Most families reported incomes of $17,000 per year or less and median levels of yearly income were in the $13,000-$15,000 range. Rural families had incomes that were approximately $1,000 higher than rural families on average, $t(156) = 2.17$, $p < .05$ ($14,500 vs. $13,500).

Analyses of between-site differences among mothers suggest that rural and urban mothers differed on demographic characteristics. Rural mothers were slightly older, $t(160) = 1.75$, $p < .10$ (30.92 vs. 28.73 years), more educated, $\chi^2(7, N = 154) = 22.52$, $p < .01$ (some college vs. high school degree), more likely to be married, $\chi^2(1, N = 163) = 23.61$, $p < .001$ (55% rural vs. 22% urban, ns = 35 and 18), and experienced less depression as measured by the Center for Epidemiological Studies of Depression (CES-D) scale, $t(145) = -2.40$, $p < .05$ (11.22 vs. 14.76), than urban mothers. Surprisingly, the urban sample had a higher proportion of girls than the rural sample, $\chi^2(1, N = 162) = 3.95$, $p < .05$ (57% vs. 41%, ns = 56 and 26).

Two years later at Time 2, follow-up interviews were conducted with 100 of the 163 families that had participated at Time 1. Attrition analyses indicated that children who participated at both Time 1 and 2 had mothers who experienced fewer depressive symptoms $t(145) = -3.07$, $p < .01$ (11.70 vs. 16.22) and were slightly more

[9] Given the small number of grandmothers and fathers who participated in the study at Time 1 (n = 12), the terms "mother" and "caregiver" are used interchangeably in the paper.

likely to be from urban families, $\chi^2(1, N = 163) = 3.01$, $p < .10$ (67% vs. 53%, *n*s = 34 and 66). No differences were detected between followed and non-followed families on income, maternal education, caregiver age, ethnic minority status, or family size.

As at Time 1, between-site comparisons indicated that families were strongly racially segregated with more African American children in urban settings, $\chi^2(1, N = 100) = 41.41$, $p < .001$. Rural families had incomes that were approximately $2,000 higher than those of urban families, $t(96) = 2.61$, $p < .05$ ($15,000 vs. $13,000). Site differences also remained prevalent among rural and urban mothers. Specifically, rural mothers were more likely to have high school degrees or higher, $\chi^2(7, N = 95) = 19.93$, $p < .05$ (85% vs. 63%, *n*s = 28 and 39) more likely to be married $\chi^2(1, N = 100) = 25.99$, $p < .001$ (67% rural vs. 17% urban, *n*s = 23 and 11), and were less depressed, $t(91) = -2.23$, $p < .05$ (9.30 vs. 13.02) than their urban counterparts.[10]

Of the 100 children who participated at Time 2, 50 were female (*M* age = 4.20, *SD* = .44). Descriptive analyses on ethnicity showed that 52% of the children were African American (*n* = 52), 32% were Caucasian (*n* = 32), 11% were biracial (*n* = 11), 2% were Asian/Pacific Islander (*n* = 2), 2% were Hispanic/Latino/Latina (*n* = 2), and the remaining 1% were American Indian/Alaska Native (*n* = 1). The rural and urban subsamples were combined for all analyses because a consistent pattern of interactions was not detected between site location and predictor variables.[11]

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[10] When five grandmothers were excluded from the sample, rural mothers were slightly older than their urban counterparts, $t(93) = 1.86$, $p < .10$ (31.24 vs. 28.48 years).

[11] Although a consistent pattern of interactions was not detected between site location and the predictor variables, two interactions between behavior regulation (at both time points) and site were detected at the tend level for first-grade children's externalizing behaviors, βs = .69 and .66, *p*s = .08 and .05, respectively. Specifically, behavior regulation at both time points was associated with fewer externalizing behaviors for rural children and unrelated to externalizing behaviors for urban children. These analyses were not adjusted by covariates.

Procedures

Time 1. During the fall of 1997 and 1998, two interviewers from the ESDS visited the parents' and study children's homes. Female caregivers reported on their own behavior, child adjustment, and family functioning. Parent-child interactions during specific tasks were also videotaped in order to assess the quality of mother-child relationships. About one month after the home interviews, children were visited in their Head Start classrooms where data were collected on their regulatory behaviors during a delay-of-gratification task. Six months after each wave of home interviews, Head Start teachers were mailed the Social Competence and Behavior Evaluation scale (SCBE; LaFreniere, Dumas, Capuano, & Dubeau, 1992) and asked to rate children's classroom behaviors.

Time 2. A pair of interviewers visited the families' homes when most of the study children were in first grade, two years after the initial assessment. During these interviews, female caregivers completed extensive measures regarding family members and the study children. Parents signed consent forms allowing the investigative team to obtain first-grade academic records in addition to teacher ratings of the study children's adjustment. After each parental interview was completed, the parent was debriefed, thanked, and reimbursed $20. Six months after each wave of home interviews, teachers were mailed the SCBE and asked to rate children's classroom behaviors.

Measures

Inhibitory control. Children's inhibitory control at Time 1 was assessed by caregivers' ratings on the inhibitory control subscale of the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001). Designed for use with parents of 3- to 7-year-old children, the 13-item inhibitory control subscale measures children's ability "to plan and to suppress inappropriate approach responses

under instructions or in novel or uncertain situations" (Rothbart, Ahadi, Hershey, & Fisher, 2001, p. 1406). Sample items include: "Can wait before entering into new activities if asked to do so" and "Can lower his/her voice when asked to do so." Items that comprise the subscale tap the suppression rather than the activation of behavior and thus aligned with the definition of inhibitory control used in the current study.

Using 7-point scales, parents rate the degree of truth for each statement about their children during the past six months (1 = extremely untrue, 7 = extremely true). Scores represent the mean score of the scale items. Psychometric properties for the current sample, Alpha = .70, M = 4.62, SD = .80, corresponded well to the overall scale norms reported by the CBQ authors (2001), Alpha = .76, as well as descriptive norms by child age: M = 4.75, SD = .83 for 4- and 5-year-olds, and M = 4.23, SD = .73 for 3-year-olds (personal communication with Stephan Ahadi on December 13, 2003). As an assessment tool, the CBQ has demonstrated adequate reliability and validity across numerous US samples.

Behavioral regulation at Time 1. Behavioral regulation in the classroom context was assessed during a standard delay-of-gratification task. Videotaped assessments were completed in a storage/office space adjoining the child's Head Start classroom. For the delay task, each child was invited by two interviewers to play a "story-telling game" with a small wooden box that contained animal figures. Once seated, the "special" box was placed on the table in front of the child. After introducing the game, the box, and the idea that there was "something really neat" inside the box, one interviewer left the room for six minutes and asked the child not to touch the box until she returned. The remaining interviewer stayed in the room to videotape "the wait" under the pretense of wanting to videotape "the story" that was to follow.

The Time 1 behavioral regulation measure was based on the number of seconds prior to touching the desired object during the six-minute delay task (Cohen's Kappa = .89). Those children who did not touch the object received scores of 360 (*e.g.*, 6 minutes x 60 seconds). On average, children waited 5 minutes prior to touching the object with nearly 80% of the sample (n = 97) waiting for 360 seconds, the entirety of the task. The over-constrained nature of the delay task, which required children to wait in a room with a new adult pointing a video camera toward them, may have contributed to this ceiling effect. Task performance did not vary significantly by child gender, age, or race.

Behavioral regulation at Time 2. To measure behavioral regulation, children participated in Kochanska's (1995) resistance-to-temptation task. This task has been used successfully over the past decade to tap aspects of children's behavioral regulation (see Kochanska, 1995; Kochanska & Aksan, 1995; Laible, 2004; & Laible & Thompson, 2000). To our knowledge, however, this was the first time the resistance-to-temptation task has been used outside of a laboratory setting. About 60 minutes into the home visit, children were told that they had a job to do while their mothers were busy finishing paperwork in the other room. Approximately 3 to 4 feet away from the child, interviewers stacked two crates on top of each other to form shelves, which they proceeded to fill with attractive toys. The toys on the shelves included a musical keyboard, a gumball machine, dolls, a small football, action figures, and a fighter jet. Next to the shelves and directly in front of the child, interviewers placed mixed plastic cutlery and two empty silverware trays. The interviewer asked the child to sort the cutlery into separate spaces on two silverware trays. The child was told that, if the sorting task was completed before the interviewer returned, the cutlery should be put back into plastic bags, "forks in this bag, spoons in

this one, and knives in this one." Interviewers told children "not to touch any of the toys on the shelves" while they were gone.

The study child was left alone in a room (typically the living room) with the cutlery, trays, toys, and a video camera placed on a tripod to record the task. After 3 minutes, the cameraperson (or interviewer if the home visit was conducted by one person) returned to the room for one minute. During this minute, the cameraperson walked over to the toys, played with them; turned on the electric keyboard, played with it; and then walked out of the room unobtrusively. While playing with the toys, the cameraperson avoided eye contact with the child and did not respond to any bids from the child for attention. If the child protested that the task was "too hard" at any point other than the 1-minute temptation interlude, the interviewer replied from an adjoining room "do your best." If the child continued to protest, the interviewer instructed the child to "just sit there" until time was up. Eight minutes after the cameraperson finished playing with the toys (*i.e.*, at the 12-minute mark), the interviewer entered the room, announced that the game was over, acknowledged the child's performance, and said it was "now okay" to play with any of the toys on the shelves.

Child behavior was coded from videotapes. Episode start time was defined as the second after the interviewer gave the final instruction not to touch any of the toys on the shelves. Global codes were used to determine whether the child ever touched the shelves or the toys and the time that elapsed prior to touch. A touch was defined as contact between any part of the child's body and the prohibited objects/shelves while the child was facing the shelves.

Resistance-to-temptation data were available for 96 of the 100 participants at Time 2. Of the four tasks not included, one task was not videotaped because the home visit was too hectic, video camera malfunction rendered one task unusable, and the

remaining two tasks deviated severely from task protocol (i.e., a sibling plays with prohibited objects). Behavioral regulation was defined as the number of minutes children were capable of persisting during the temptation task (M = 9.06, SD = 4.13). Twenty-one tasks were ended prior to 12 minutes (M = 10.49, SD = 1.04, range = 7.40-11.49). For 3 of the 21 tasks that ended early, the child clearly displayed behaviors associated with being upset; thus 18 tasks were adjusted to 12 minutes and the remaining 3 cases were not. Thirty-seven tasks ended after the 12 minute mark (M = 12.95, SD = 1.09, range = 12.01-17.04) and were adjusted down to 12 minutes.[12] Ten tapes were used to establish reliability between two coders. The intercoder agreement for time at first touch was perfect. Child location at the start of the episode (*i.e.*, on the floor or on the chair), adult presence, sibling presence, and whether the child left the room were also coded but not used in analyses.

Child Outcomes

Socioemotional adjustment. Teacher report on the Social Competence and Behavior Evaluation scale (SCBE; LaFreniere, Dumas, Capuano, & Dubeau, 1992) was used to assess children's socioemotional adjustment at Time 1 and Time 2. The SCBE is an 80-item measure that includes separate subscales for socially competent, externalizing, and internalizing behaviors. Following Raver and Zigler (1997), the SCBE subscales were not combined to form a global index of socioemotional functioning because the empirical literature suggests that social competence and "problem behaviors," such as externalizing and internalizing behaviors, represent separate constructs (pp. 375-376). As an assessment instrument, the SCBE has demonstrated both reliability and validity as a measure of adaptive and maladaptive functioning among low-and middle-income children (Raver & Zigler, 1997).

[12] Of the 37 tasks that ended after 12 minutes, 35% (n = 13) ended prior to 12 minutes and 30 seconds.

Teachers rated the occurrence of behaviors on a 6-point scale (1 = never; 2 or 3 = sometimes; 4 or 5 = often; 6 = almost always). The social competence subscale (α_{T1} = .96, α_{T2} = 96) consists of 40 items (*e.g.*, is self-confident; cooperates with other children in group activities). The externalizing subscale (α_{T1} = .94, α_{T2} = .95) consists of 20 items that are reverse-scored to reflect less externalizing behavior (*e.g.*, bullies weaker children; opposes the teacher's suggestions). The internalizing subscale (α_{T1} = .86, α_{T2} = .86) also consists of 20 items and is reverse-scored (*e.g.*, is sad, unhappy, or depressed). Subscale scores were converted to t-scores, with separate norms for child gender. For interpretive purposes, the externalizing and internalizing t-scores were multiplied by -1 so that higher values reflect higher levels of externalizing and internalizing behaviors. Complete SCBE data were available for 83 children. Thus some data were missing because fifteen questionnaires were not returned and two questionnaires were returned blank. Missing forms, compared with those that were returned, differed by child ethnic minority status, $t(161) = 2.76$, $p < .05$, and by geographic location, $t(161) = 2.85$, $p < .05$, resulting in fewer completed forms for White, rural children.

Academic achievement. Academic grades in reading, math, and writing were extracted from first-grade report cards to measure academic achievement. Letter grades for each child were averaged over all quarters and measured on a 5-point scale (0 = unsatisfactory progress; 1 = needs improvement; 2 = satisfactory progress; 3 = very good; 4 = excellent). To maintain a 5-point scale, grades with pluses were rounded up to the next grade and grades with minuses were rounded down. Information about the protocol used to code academic grades is presented in Dissertation Appendix A.

Complete academic data were available for 80 children. Of the missing data, 11 children were in schools that refused to release report cards. Of the 11 schools that

did not release report cards, 4 were charter schools and all were from Rochester. Three children made residential moves and three children transferred to different schools, which precluded report card collection. Two children had written comments on their report cards so it was not possible to assign letter grades in those cases. Also, the Principal Investigator of the Cornell Early Social Development Study determined that time constraints made it impossible to code one report card. Neither extracted report card data nor missing report card data differed by child ethnic minority status, child gender, family income, or geographic location.

Child and family covariates. Due to the well-established relationship between socioeconomic characteristics and child academic performance (*e.g.*, Brody, 1992; Duncan, Yeung, Brooks-Gunn, & Smith, 1998), Time 1 reports of maternal education and household income were statistically controlled in the prediction of academic achievement. To compare findings for academic outcomes with those for non-academic outcomes, maternal education and income were also statistically controlled in regression analyses where socially competent, externalizing, and internalizing behaviors were the outcome variables of interest.[13] Due to the low variation among these indicators in this sample, maternal education and household income were not expected to explain unique variance in child adjustment.

Other demographic factors at Time 1, such as maternal age, workforce entry, child age, and child race were also used as covariates. While these socioeconomic and demographic factors were peripheral to the study aims presented here, estimating their effects allowed us to assess whether the hypothesized effects were robust net of the potentially confounding influence of these factors.

[13] Compared with children's academic outcomes, the relations between social capital variables, such as family income and maternal education, and socioemotional outcomes are not considered to be well-established (Garmezy, 1991; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Raver, 2002; 2004).

Caregiver education at Time 1 was coded on an 8-point scale with higher values reflecting more education (*e.g.*, 0 = less than an 8th grade education; 1 = 9th-11th grade; 2 = GED receipt; 3 = High School degree; 4 = some college; 5 = Associates' degree; 6 = 4-year college degree; 7 = graduate study or greater). Caregivers' reported their household income on a categorical, 6-point scale with higher values reflecting greater income (0 = less than $13,000; 1 = $13,001-$15,000; 2 = $15,001-$19,000; 3 = $19,001-$25,000; 4 = $25,001-$31,000; 5 = greater than $31,000). Maternal workforce entry was coded on a 2-point scale with 1 coded as entry into the workforce at least once since the study child's birth and 0 coded as no participation in the workforce since the study child's birth (*e.g.*, 0 = never entered, 1 = entered). In this sample, 26% of mothers had never entered the workforce and 74% had entered the workforce at least once (*n*s = 41 and 106 respectively).

Caregiver's age was coded continuously (M = 29.60, SD = 7.84). The ages of five grandmothers were included in this variable, thereby increasing the mean age for caregivers in this sample. On average, the grandmothers were 53 years old (range = 46- to 61-years, n = 5) and mothers were 29 years old (range = 18-51-years, n = 156). Child race was coded such that 0 = White or Asian and 1 = not White.

Statistical Procedures

Structural Equation Modeling. Structural Equation Modeling (SEM) with Amos 5.0 software (Arbuckle & Wothke, 1999) was used to estimate the mediation hypotheses. Currently, full information maximum likelihood estimation (FIMLE) in Amos is one of the only unbiased techniques for handling randomly missing data (Schafer & Graham, 2002). Typically, statistical packages with ordinary least squares (OLS) regression use listwise or pairwise deletion to eliminate observations where some of the data are missing. However, in the presence of randomly missing data, the Amos program computes FIMLEs, which allow the entire sample to be included in the

analyses. Unlike imputation techniques, which replace missing data through various types of estimation, FIMLE is not an imputation method and thus does not alter the distribution of variables. This is an important feature for the present study given the relatively small sample of 100 families who participated in the follow-up study at Time 2. A technical description of the EM Algorithm, the method used by the Amos program to obtain FIMLE, is provided in Dissertation Appendix B. In our path analyses, behavior regulation at Time 1, behavior regulation at Time 2, and child outcome were modeled as endogenous variables.

To address the mediation hypothesis, two structural equation models were fit. In the first model, only the effect of inhibitory control on child adjustment was estimated. In the second model, the effects of (a) inhibitory control on behavior regulatory skills and (b) self-regulatory behavior regulatory skills on adjustment were estimated in order to confirm that inhibitory control influenced the hypothesized mediators (behavior regulation at Time 1 and behavior regulation at Time 2) and the hypothesized mediators significantly influenced the outcome variables (socioemotional adjustment and academic grades). Most central to the mediation hypothesis, we examined whether the direct effect of inhibitory control on adjustment was reduced to non-significance in Model 2 when the hypothesized mediators were included in the model. If mediation occurs, the strength of the relationship between inhibitory control and child adjustment that was observed in Model 1 should become attenuated when the behavioral regulation variables, which measure child capacity to persist during delay tasks, are added to the model. It was not possible to test the significance of the indirect effect of inhibitory control on child adjustment in the present study given the amount of missing data (bootstrapping procedures in Amos do not allow for missing data).

Evidence for moderation (*e.g.,* interaction) would indicate that a simple mediation model, which includes the self-regulation variables, does not adequately explain the relationship between inhibitory control and child adjustment because this relationship varies as a function of a different variable (*e.g.*, mothers' marital status). If moderator effects are detected, they will be explored by fitting nested structural equation models for two groups (*e.g.*, married vs. unmarried) to determine whether the regression paths from inhibitory control to child outcomes differed based on some third variable (*e.g.*, Judd & Kenny, 1981; Holmbeck, 1997). For each of these two regression paths, one path was constrained to be equal across groups (*e.g.*, married = unmarried) while the other path will be permitted to vary across groups in order to assess fit. To test for significant differences across groups, a full information maximum likelihood estimate will be calculated to compare the difference between the χ^2 for the constrained model and the χ^2 for the varying effect model. In SEM, a χ^2 statistic also represents the interaction term. A significant difference in regression paths between the married and the unmarried groups would be interpreted as an interaction with (*i.e.*, moderation by) marital status.

Evaluation of model fit. Two goodness-of-fit indices were used to evaluate the overall fit for the models: the root mean square error of approximation (RMSEA) and the incremental fit index (IFI). As a measure of fit, the RMSEA does not penalize for model complexity. An RMSEA of .05 or less indicates a close fit, whereas an RMSEA of .08 or less indicates an acceptable fit in relation to the degrees of freedom (Arbuckle & Wothke, 1999). IFI values close to 1 indicate a very good fit (Arbuckle & Wothke, 1999). In the present study, statistical significance was defined as $p < .05$ and statistical trends were defined as $p < .10$.

RESULTS

Bivariate Analyses

Stability of behavior regulation across time. Descriptive statistics are presented in Tables 2.1 and 2.2 and intercorrelations among the study variables are presented in

Table 2.1 Descriptive Data ($N = 163$)

Variable	*M* (*SD*)	Range	*N*
Inhibitory Control T1	4.62 (0.80)	2.46-6.69	161
Behavior Regulation T1	300.07 (118.68)	0.34-360.00	125
Behavioral regulation T2	9.06 (4.13)	0.04-12.00	96
Social competence T2	48.08 (9.50)	30.00-68.00	83
Externalizing T2	47.86 (10.33)	30.00-70.00	83
Internalizing T2	48.75 (9.68)	30.00-70.00	83
Reading	2.17 (1.08)	0.00-4.00	80
Math	2.44 (1.00)	0.00-4.00	80
Writing	1.91 (1.03)	0.00-4.00	80
Maternal age	29.60 (7.84)	18.00-61.00	162
Maternal education	3.19 (1.46)	0-7	154
Workforce entry	0.74 (0.44)	0-1	159
Income category	1.49 (1.61)	0-5	158
Marital status	0.33 (0.47)	0-1	163
Child age	4.20 (0.44)	2.07-4.81	161
Child race not White	0.65 (0.48)	0-1	163

Tables 2.3 and 2.4 for the (a) entire sample and the (b) sample split by maternal marital status respectively. Bivariate correlations demonstrated reasonable stability between the observational measures of behavior regulation over a two-year period, $r(74) = .38$, $p < .01$. Other key correlations are described below.

Inhibitory control to child outcomes. Inhibitory control at Time 1 was associated with higher reading, $r(79) = .21$, $p < .10$, math, $r(79) = .23$, $p < .05$, and writing grades at

Table 2.2 Descriptive Data for Married and Unmarried Mothers

	Married			Unmarried		
Variable	*M* (*SD*)	Range	*N*	*M* (*SD*)	Range	*N*
Inhibitory Control T1	4.45 (0.86)	2.46-5.82	48	4.66 (0.76)	2.64-6.42	99
Behavior Regulation T1	299.17 (118.72)	0.34-360.00	38	318.44 (102.37)	5.00-360.00	75
Behavioral regulation T2	10.49 (2.82)	2.54-12.00	30	8.93 (4.17)	0.05-12.00	60
Social competence T2	50.90 (9.14)	31.00-68.00	20	47.25 (9.55)	30.00-66.00	56
Externalizing T2	48.90 (11.06)	30.00-65.00	20	47.89 (10.14)	30.00-70.00	56
Internalizing T2	50.10 (9.20)	32.00-65.00	20	49.11 (9.84)	30.00-70.00	56
Reading	2.51 (1.04)	0.96-4.00	23	2.14 (1.04)	0.00-4.00	51
Math [a]	2.95 (0.99)	1.00-4.00	23	2.29 (0.88)	0.00-4.00	51
Writing	2.10 (0.90)	0.00-3.67	23	1.89 (1.09)	0.00-4.00	51
Maternal age	31.87 (6.12)	22.00-48.00	53	28.50 (8.36)	18.00-61.00	109
Maternal education	3.73 (1.58)	0-7	51	2.92 (1.33)	0-6	103
Workforce entry	0.71 (0.46)	0-1	52	0.75 (0.44)	0-1	107
Income category	2.21 (1.75)	0-5	53	1.12 (1.41)	0-5	105
Child age	4.25 (3.66)	3.41-4.81	53	4.18 (0.47)	2.07-4.81	108
Child race not White	0.47 (0.50)	0-1	53	0.74 (0.44)	0-1	110

[a] Denotes a significant difference ($p < .10$) between the married and unmarried samples.

Table 2.3 Intercorrelations Among the Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Inhibitory control T1	--														
2. Behavior reg. T1	.17+	--													
3. Behavior reg. T2	.20+	.38**	--												
4. Social comp. T2	.05	-.17	.11	--											
5. Externalizing T2	-.15	.14	-.08	-.56**	--										
6. Internalizing T2	-.07	.04	.08	-.63**	.45**	--									
7. Reading	.21+	.07	.30**	.49**	-.28*	-.39**	--								
8. Math	.23*	-.05	.26*	.42**	-.31*	-.23+	.74**	--							
9. Writing	.24*	-.03	.21+	.54**	-.20	-.39**	.77**	.69**	--						
10. Maternal age	.08	.01	.05	.05	-.05	-.01	.05	.02	.01	--					
11. Maternal educ.	.02	-.11	.12	.23*	-.34**	-.02	.08	.23+	.02	.19*	--				
12. Workforce entry	-.03	-.13	.03	.06	.13	-.11	-.11	-.07	-.06	-.23**	.13	--			
13. Income category	.09	-.06	.22*	.07	-.03	.07	.13	.26*	.14	.15+	.24**	.12	--		
14. Marital status	-.13	-.11	.17	.15	.02	-.02	.09	.23*	.05	.21**	.26**	-.04	.32**	--	
15. Child age	-.02	-.07	.27**	-.05	.21+	.23*	-.00	.02	-.01	.08	.13	.05	.10	.08	--
16. Child not White	.02	.04	-.10	-.02	.38**	.05	-.08	-.22+	-.06	-.15+	-.15+	.10	-.16*	-.26**	-.15+

Note. *n*s = 62 to 161.
+$p < .10$. *$p < .05$. **$p < .01$.

Table 2.4 Intercorrelations Among the Variables for Married (Below Diagonal) and Unmarried (Above Diagonal) Mothers

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Inhibitory control T1	--	.02	.18	-.08	-.02	.02	.26+	.26+	.20	-.01	-.01	.04	.09	.02
2. Behavior reg. T1	.37*	--	.38**	-.21	.24	-.03	-.04	-.19	-.14	-.01	.07	-.15	-.03	-.11
3. Behavior reg. T2	.34+	.52**	--	.10	-.05	.08	.30*	.19	.15	-.07	.21	.20	.07	.27*
4. Social comp. T2	.49*	-.01	.09	--	-.56**	-.64**	.51**	.46**	.55**	-.07	-.00	.11	-.01	-.05
5. Externalizing T2	-.48*	.01	-.15	-.62**	--	.47**	-.17	-.20	-.08	.00	-.14	-.02	.01	.24+
6. Internalizing T2	-.31	.14	.11	-.60**	.41*	--	-.36*	-.26+	-.45**	.09	.25+	-.12	.10	.31*
7. Reading	.14	.26	.28	.38	-.52*	-.46+	--	.71**	.87**	.01	-.01	.04	.12	.05
8. Math	.27	.22	.33+	.26	-.56*	-.17	.78**	--	.71**	-.08	.06	.11	.07	.03
9. Writing	.37+	.22	.39*	.44+	-.53*	-.20	.58**	.69**	--	.01	-.12	-.02	-.03	.04
10. Maternal age	.37**	.16	.29	.28	-.24	-.35+	.10	.03	-.07	--	.13	-.22*	.02	.05
11. Maternal educ.	.15	-.27+	-.14	.54*	-.71**	-.52*	.15	.32	.21	.19	--	.23*	.22*	.04
12. Workforce entry	-.15	-.10	-.36*	-.03	.44*	-.10	-.36+	-.31	-.13	-.27+	-.00	--	.14	.03
13. Income category	.22	-.03	.39*	.08	-.13	.03	.10	.33	.39+	.21	.13	.14	--	.03
14. Child age	-.08	.02	.22	-.09	.13	-.02	-.13	-.04	-.15	.11	.25+	.12	.19	--
15. Child race not White	-.03	-.06	-.19	-.26	.68**	.14	-.18	-.33+	-.25	.06	-.09	.16	-.05	-.10

Note. For Married Mothers, *n*s = 16 to 53; for Unmarried mothers *n*s = 43 to 107.
+$p < .10$. *$p < .05$. **$p < .01$.

Time 2, $r(79) = .24$, $p < .05$, but was unrelated to child socioemotional adjustment (*i.e.*, social competence, externalizing behaviors, and internalizing behaviors).

Inhibitory control to behavior regulation. As hypothesized, parent report of inhibitory control was positively associated with observational measures of Time 1 and Time 2 behavior regulation at the trend level, rs(124 and 95) = .17 and .20, ps = .07 and .06, respectively.

Behavior regulation to child outcomes. Behavioral regulation at Time 1 was uncorrelated with all six measures of child adjustment. In contrast, observed behavior regulation at Time 2 was positively correlated with teacher reports of reading, $r(78) = .30$, $p < .01$, math, $r(78) = .26$, $p < .05$, and writing grades at Time 2, $r(79) = .21$, $p < .10$, but unrelated to child socioemotional adjustment (*i.e.*, socially competent, externalizing, and internalizing behaviors).

Multivariate Analyses

Moderation Analyses. Previous research with this sample revealed differences in the pattern of relationships among the study variables as a function of maternal marital status at Time 1 (see Marcynyszyn, 2006a). Thus tests of moderation were conducted in order to determine whether maternal marital status moderated the relationship between inhibitory control and child adjustment. Evidence for moderation would suggest that the influence of inhibitory control on subsequent adjustment varied as a function of whether or not children's mothers were married or unmarried at Time 1. It is important to acknowledge that the larger study from which these data were drawn was not designed to examine differences between children from married and unmarried households. Any differences by marital status presented here must therefore be interpreted cautiously.

Results revealed one interaction between inhibitory control and marital status on child socially competent behaviors, χ^2 (1, $N = 163$) = 6.56, $p < .05$, IFI = 1.00,

RMSEA = .02. Thus for models where social competence was the outcome variable of interest, analyses were conducted separately for children of mothers who were married at Time 1 and children of mothers who were unmarried at Time 1. Interactions between inhibitory control and marital status were not detected for the remaining five outcomes (reading, math, writing, externalizing, and internalizing) and thus the hypotheses were tested in the entire sample for models that included academic and problem behavior (externalizing and internalizing) outcomes. Stated differently, the married only vs. unmarried samples (n = 53 vs. n = 110) were used for models with the social competence outcome and the entire sample (N = 163) was used for models with the academic and problem behavior outcomes.

With respect to the covariates, tests of moderation required that the sample be split by the moderating variable (*i.e.*, marital status at Time 1) and thus Time 1 marital status was not included as a covariate for these tests. The academic and problem behavior outcome models included the same covariates as the social competence outcome models in addition to controlling for mother's marital status at Time 1. Thus these models statistically controlled for maternal age, maternal education, workforce entry, family income category, child age, child ethnic minority status, and marital status at Time 1.

Academic outcomes. Regression coefficients for all variables in the total effects and the full mediation models are presented in Appendices 2A and 2B, respectively. Inhibitory control prior to school entry was linked to higher reading grades, $\beta = .21$, $p < .10$. As shown in Figure 2.1, inhibitory control at Time 1 was associated with better behavior regulation skills, $\beta = .16$, $p < .10$, which were linked to better behavior regulation skills at Time 2, $\beta = .46$, $p < .01$, which in turn were linked to higher reading grades at Time 2, $\beta = .28$, $p < .05$. Inhibitory control was also associated with

better behavior regulation skills at Time 2, β = .17, $p < .10$. As at the bivariate level, behavioral regulation skills at Time 1 were unrelated to reading achievement.

Most relevant to the mediation hypothesis, the path between inhibitory control and reading grades was reduced to non-significance, β = .14, $p > .10$, when behavior regulation skills were included in the model. As mediators, behavior regulation skills accounted for 33% of the total effect of inhibitory control on first graders' reading achievement.

Parent report of inhibitory control was associated with better math achievement in first grade, β = .26, $p < .01$. Figure 2.2 shows that inhibitory control was associated with better behavior regulation skills at Time 1, β = .16, $p < .10$, which in turn were linked to better behavior regulation skills at Time 2, β = .46, $p < .01$. Inhibitory control was also associated with better behavior regulation skills at Time 2, β = .17, $p < .10$. Although statistically significant at the bivariate level, $r(78) = .26$, $p < .05$, behavior regulation at Time 2 was unrelated to math achievement. Similar to what was observed at the bivariate level, behavior regulation at Time 1 continued to be unrelated to first graders' math performance. The absence of a relationship between behavior regulation at Time 2 and math grades precluded additional mediation testing for this outcome.

Following the pattern observed for reading achievement, inhibitory control prior to school entry also predicted first-graders' writing achievement, β = .25, $p < .05$. As shown in Figure 2.3, inhibitory control was associated with better behavior regulation skills at Time 1, β = .16, $p < .10$, which were linked to better behavior regulation skills at Time 2, β = .45, $p < .01$, which in turn were linked to higher writing grades at Time 2, β = .23, $p < .10$. In addition to being associated with behavior regulation skills at Time 1, inhibitory control was also associated with better behavior regulation skills at Time 2, β = .17, $p < .10$. Behavioral regulation skills at

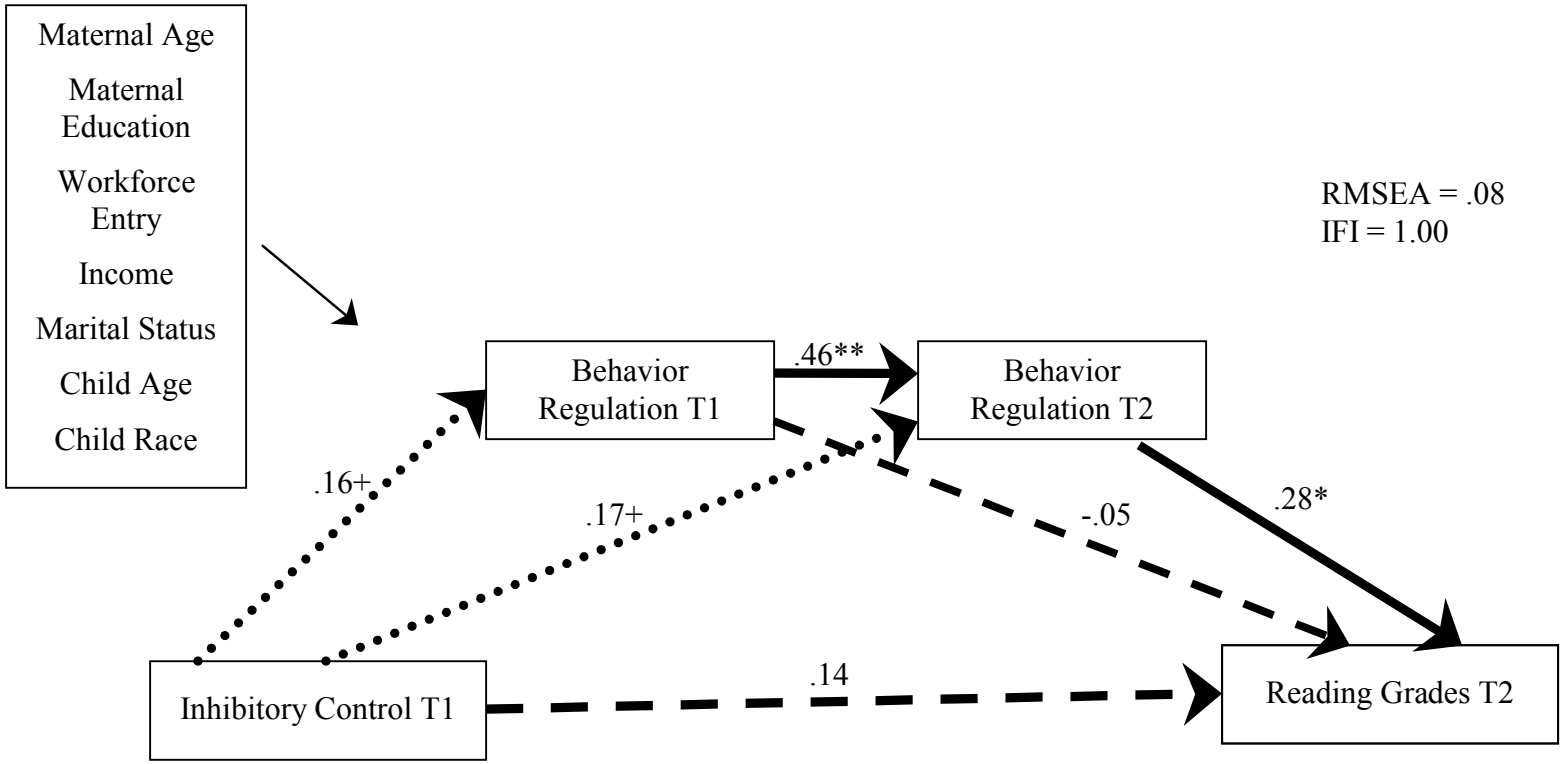

Figure 2.1. Path Model Depicting Behavioral Regulatory Skills at Time 1 and Time 2 as Mediators of the Relations Between Inhibitory Control and Children's Reading Performance at Time 2 in the Entire Sample (N = 163)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid, dashed, and dotted lines represent paths that are statistically significant, non-significant, and statistical trends respectively.

+p < .10. *p < .05. **p < .01.

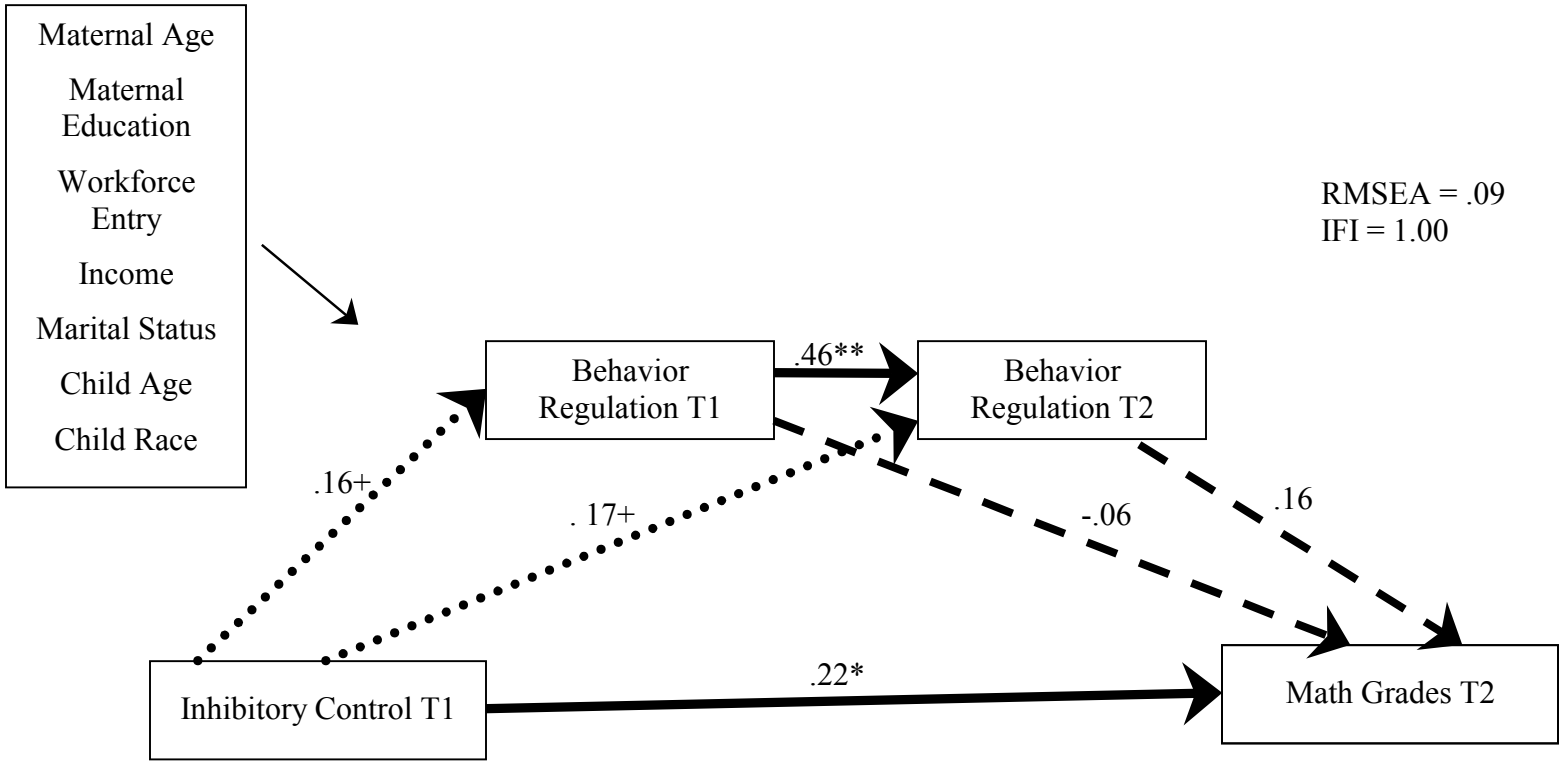

Figure 2.2. Path Model Depicting Behavioral Regulatory Skills at Time 1 and Time 2 as Mediators of the Relations Between Inhibitory Control and Children's Math Performance at Time 2 in the Entire Sample (N = 163)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid, dashed, and dotted lines represent paths that are statistically significant, non-significant, and statistical trends respectively.

$+p < .10$. $*p < .05$. $**p < .01$.

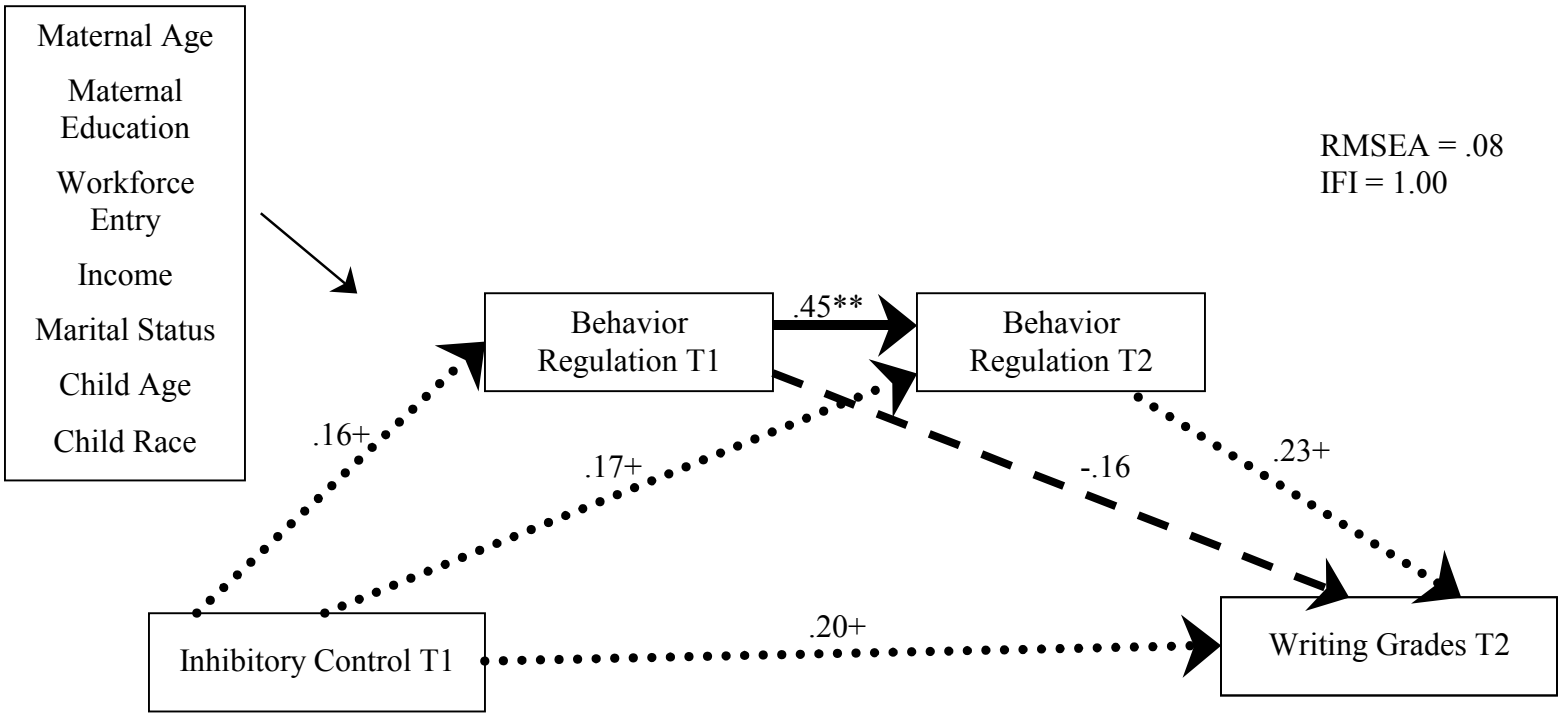

Figure 2.3. Path Model Depicting Behavioral Regulatory Skills at Time 1 and Time 2 as Mediators of the Relations Between Inhibitory Control and Children's Writing Performance at Time 2 in the Entire Sample (N = 163)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid, dashed, and dotted lines represent paths that are statistically significant, non-significant, and statistical trends respectively.

+p < .10. *p < .05. **p < .01.

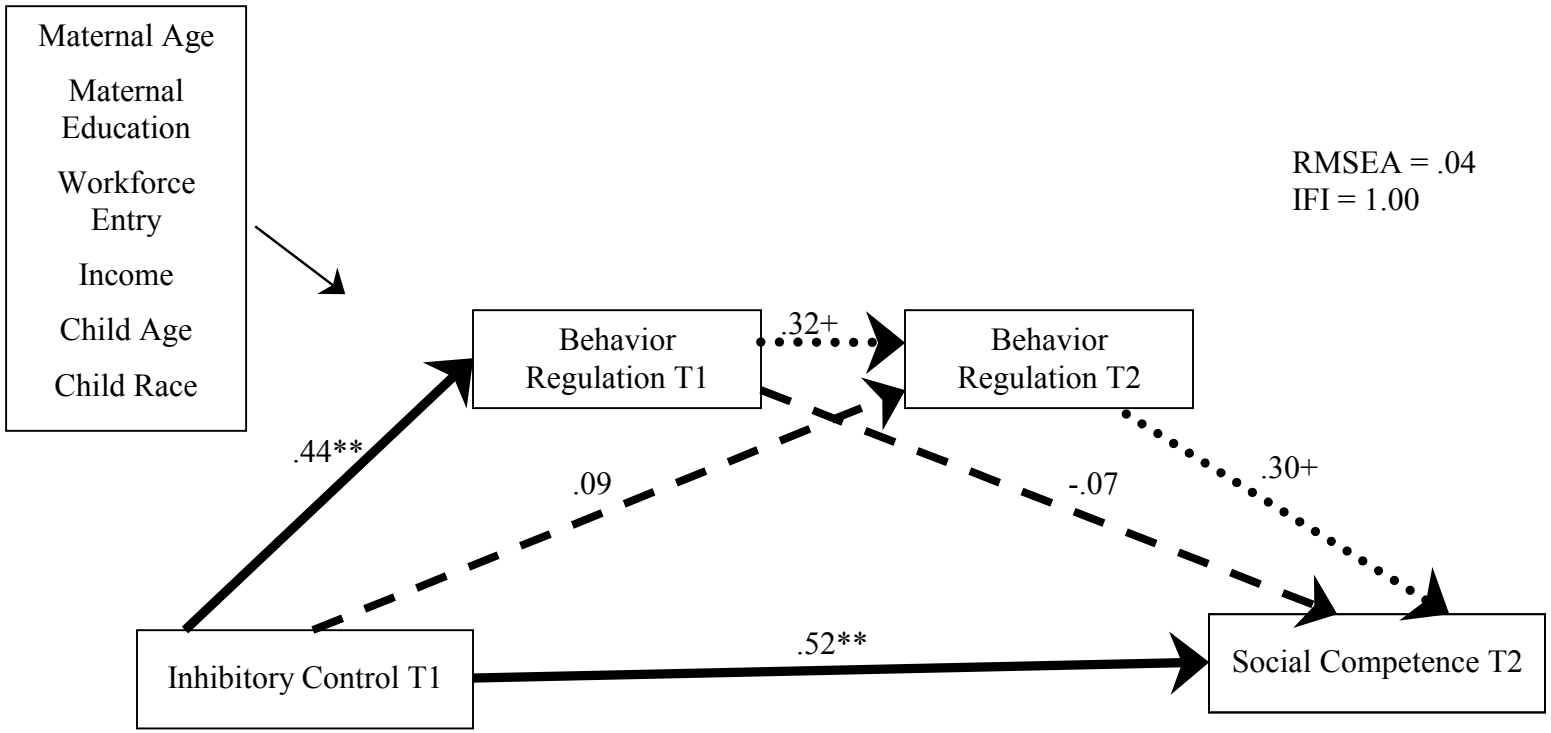

Figure 2.4. Path Model Depicting Behavioral Regulatory Skills at Time 1 and Time 2 as Mediators of the Relations Between Inhibitory Control and Children's Social Competence at Time 2 in the Married Sample (n = 53)

Note. Analyses adjusted for maternal age, maternal education, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid, dashed, and dotted lines represent paths that are statistically significant, non-significant, and statistical trends respectively.

+p < .10. *p < .05. **p < .01.

Time 1 were unrelated to writing achievement in the full model. Most relevant to the mediation hypothesis, the relationship between inhibitory control and writing grades became partially attenuated, $\beta = .20$, $p < .10$, when behavior regulatory skills were included in the model. As mediators, self-regulatory skills accounted for 20% of the total effect of inhibitory control on first graders' writing grades.

Fit indices for children's academic grades in the total effect and mediation models were as follows: reading, IFI = 1.00, RMSEA = .08, math, IFI = 1.00, RMSEA = .09, and writing grades, IFI = 1.00, RMSEA = .08. To summarize, in an effort to unpack significant relations between inhibitory control and academic outcomes, mediation tests were conducted to assess the degree to which behavior regulation at Time 1 and behavior regulation at Time 2 explained the relationship between inhibitory control and children's reading, math, and writing grades at Time 2. Our results suggest that behavior regulation skills fully explained the positive relationship between inhibitory control and reading performance and partially explained this relationship for writing performance. The absence of a relationship between behavior regulation at Time 2 and children's math performance precluded additional mediation testing for this outcome.

Socioemotional outcomes. Total effects of inhibitory control on externalizing and internalizing symptoms were not observed, which precluded additional mediation testing for the problem behavior outcomes. In contrast, parental report of inhibitory control prior to school entry was linked to greater levels of teacher-reported social competence, $\beta = .53$, $p < .01$, IFI = 1.00, RMSEA = .02, for children of married mothers but not for children of unmarried mothers. In an effort to explain this total effect, mediation tests were conducted within the married sample to assess whether behavior regulation at Time 1 and behavior regulation at Time 2 explained part of the

relationship between inhibitory control and children's socially competent behaviors at Time 2.

Given the absence of a total effect between inhibitory control and social competence within the unmarried sample, the mediation results below are presented only for children of married mothers at Time 1 (n = 53). For the social competence outcome, regression coefficients for all variables in the total effects and the full mediation models (split by marital status) are presented in Appendices 2C and 2D, respectively. For the problem behavior outcomes, regression coefficients for all variables in the total effects and the full mediation models (not split by marital status) are presented in Appendices 2A and 2B, respectively.

As shown for the married sample in Figure 2.4, inhibitory control was associated with better behavior regulation skills at Time 1, $\beta = .44$, $p < .01$, but not at Time 2. Behavior regulation at Time 1 was associated with greater behavior regulation at Time 2, $\beta = .32$, $p < .10$. Behavior regulation at Time 1 was not linked to social competence at Time 2, but behavior regulation at Time 2 was related to social competence at Time 2, $\beta = .30$, $p < .10$. Most central to the mediation hypothesis, when the behavior regulation variables were added to the model, the path between inhibitory control and first-grade social competence was attenuated weakly, $\beta = .52$, $p < .01$, IFI = 1.00, RMSEA = .04. Although the magnitude of the relations from inhibitory control and social competence remained virtually unchanged, behavior regulatory skills accounted for 2% of the total effect of inhibitory control on children's socially competent behaviors at Time 2.

DISCUSSION

The current study makes four contributions to the literature. First, it addresses a population that has received little attention in the emotion regulation literature (cf.

Garner, Jones, & Miner, 1994; Garner & Spears, 2000) by examining pathways between inhibitory control, behavior regulation, and adjustment among children from low-income families. Second, it serves as one of the first studies to *empirically* link difficulties in regulating behavior to academic difficulties experienced by young children in the classroom independent of factors that are known to influence achievement such as maternal education and family income. Third, it is one of the first studies to test whether inhibitory control operates through behavioral regulation and thereby delineates temporal associations between inhibitory control and behavior regulation. Fourth, the study contributes to a large body of research that examines the long-term effects of behavior regulation skill development (Metcalfe & Mischel, 1999; Mischel, Shoda, & Peake, 1988; Mischel, Shoda, & Rodriguez, 1989) by examining the continuity of such skills over a two-year period, in addition to examining its influence on later adjustment.

The primary goal of the present study was to understand the association between children's inhibitory control and subsequent adjustment by examining the mediating role of children's behavior regulation skills measured at both Time 1 and Time 2. The hypothesized pathways through which inhibitory control was expected to influence children's academic achievement were supported for children's reading and writing grades but not for children's socioemotional outcomes. Drawing from previous research with this sample (Marcynyszyn, 2006a), interactions between inhibitory control and mothers' marital status were tested for all outcomes. These tests revealed moderation by maternal marital status when child social competence was the outcome variable of interest (evidence for moderation was detected for *one* of the *six* outcomes tested in this study). More specifically, for social competence, a different pattern of results emerged for the children of mothers who were married at Time 1 compared with the pattern that emerged for their counterparts with unmarried

mothers at Time 1. With respect to the three socioemotional outcomes examined in this study, it is important to note that the results observed for children's social competence were not comparable to the results observed for children's problem behaviors (externalizing and internalizing). Results for the academic models in the entire sample, social competence models in the married sample, and problem behaviors models in the entire sample are therefore summarized in turn below.

In general, a consistent pattern of mediation findings emerged for children's academic performance. Inhibitory control prior to school entry was linked to higher reading and writing grades. Inhibitory control was associated with better behavior regulation skills at Time 1, these skills were linked to better behavior regulation skills at Time 2, and these in turn were linked to higher reading and writing grades at Time 2. Inhibitory control was also associated with better behavior regulation skills at Time 2. Most relevant to the mediation hypothesis, the paths between inhibitory control and reading and writing grades became attenuated when the behavior regulation variables were included in the models. Thus, parents' reports of inhibitory control on children's reading and writing performance appear to be filtered, at least in part, through children's capacity for behavior regulation.

Findings for math achievement followed the same structure that was observed for reading and writing achievement—with one exception. Contrary to what was observed for the other academic outcomes, behavior regulation at Time 2 was unrelated to math achievement. The absence of an effect of behavior regulation at Time 2 is not belabored here, considering that it is likely to reflect a byproduct of the small sample size rather than differential effects of behavior regulation as a function of the academic subject under investigation. Recall that behavior regulation at Time 2 *was* correlated with higher math grades at the bivariate level, $r(78) = .26$, $p < .05$. It is also worth noting that the math achievement findings are comparable to prior research

by Howse and colleagues (2003). In their study, parent reports of regulation predicted achievement while the observational measures of children's regulation skills during a frustration task did not.

With respect to the system of relationships in the entire math model, parent report of inhibitory control was associated with better math achievement in first grade. Inhibitory control was associated with better behavior regulation skills at Time 1, and these skills again were linked to better behavior regulation skills at Time 2. Inhibitory control was also associated with better behavior regulation skills at Time 2.

Taken together, academic findings from the present study suggest how we might begin to address gaps in the developmental literature by demonstrating that inhibitory control prior to school entry is associated with better behavior regulation during preschool and first grade, which in turn contributes to greater reading and writing achievement above and beyond factors that are known to influence academic performance such as maternal age and education, family income category, and child age.

Overall, a different pattern of mediation findings emerged for children's socioemotional adjustment. Pertaining to the relationship between inhibitory control and children's social competence in the married sample, the hypothesized mediational role of the behavior regulation variables was supported—albeit weakly. In this model, a modest, positive association was detected between the Time 1 and Time 2 measures of behavior regulation. Moderate positive relations were observed between inhibitory control and behavior regulation at Time 1 but not at Time 2 such that inhibitory control was associated with better behavior regulation prior to school entry but not during first grade. Likewise, behavior regulation at Time 2, but not at Time 1, was concurrently (but not longitudinally) predictive of children's social competence at the trend level. When the behavior regulation variables were added to the model, the path

between inhibitory control and first-grade social competence was attenuated ever so slightly, indicating cautious support of the mediational role of behavior regulatory skills for this outcome.

Pertaining to the relationship between inhibitory control and children's problem behaviors in the entire sample, total effects of inhibitory control on externalizing and internalizing symptoms were not detected, which precluded additional mediation testing for these outcomes. With respect to the mediation results overall, it is important to note that our findings held only for children's classroom competencies (i.e., social competence as well as reading and writing grades), all adaptive rather than maladaptive teacher-reported outcomes (although we did expect the hypothesized mediation role of behavior regulation to hold for problem behaviors as well). These findings suggest that the hypothesized relations between inhibitory control and adjustment through behavior regulation are particularly salient for influencing adaptive outcomes. Moreover, these findings provide additional support for Raver and Zigler's (1997) argument that social competence and problem behaviors comprise separate constructs. That is, our findings suggest that it would be ill-advised to view positive adjustment and adjustment problems as opposite poles between which most children's self-regulatory capacities are expressed.

For example, consider the well-liked child who displays disruptive or trouble-making behavior in the classroom. We could say this child is both socially competent and prone to externalizing behaviors. Focusing on a good/bad dichotomy (e.g., the more a child demonstrates positive adjustment through effective behavior regulation, the fewer adjustment problems that child has) may therefore lead researchers down a less productive path. In sum, our results indicate that childhood inhibitory control is a factor in the degree to which a child displays positive adjustment, although not to the exclusion of adjustment problems.

Continuity of behavior regulation over time. Similar to Eisenberg and colleagues' (2000) findings for middle-income children, the present study suggested moderate stability in behavior regulation over a two-year period in the entire sample. In particular, behavior regulation skills at the bivariate level assessed at Time 1 and Time 2 were correlated at .38, $p < .01$, a magnitude comparable to results for children who are well above the poverty level (Eisenberg et al., 2000).[14] In analyses that examined the inhibitory control-achievement link through behavior regulation with controls for maternal age, maternal education, workforce entry, family income category, marital status, child age, and child ethnic minority status, the stability of behavior regulation between Time 1 and Time 2 remained moderate across the entire sample (βs ranged from .45 to .46, ps < .01).

When the sample was split by marital status, behavior regulation at Time 1 and at Time 2 was also correlated moderately at the bivariate level, $r = .52$, $p < .01$, for children with mothers who were married at Time 1.[15] In analyses that examined the inhibitory control-social competence link through behavior regulation with the aforementioned covariates minus marital status, stability of behavior regulation between Time 1 and Time 2 was reduced to a non-significant trend in the married sample ($\beta = .32$, $p = .06$).[16]

One possible explanation for the modest relationship between behavior regulation at Time 1 and Time 2 for the married sample once covariates were added to the models is the restricted range of delay behaviors associated with these types of

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[14] In a study conducted by Eisenberg and colleagues (2000), observational measures of behavior regulation assessed across two consecutive time points with elementary school-aged children were correlated at .40 for children low in negative emotionality and at .46 for children high in negative emotionality (p. 1374). Correlations for the entire sample (not split by negative emotionality) were not presented.

[15] For children with mothers who were unmarried at Time 1, behavior regulation at Time 1 and at Time 2 was correlated moderately at the bivariate level, $r = .38$, $p < .05$.

[16] Within the unmarried sample, stability of behavior regulation between Time 1 and Time 2 remained moderate when the inhibitory control-social competence link through behavior regulation was tested with all covariates minus marital status ($\beta = .46$, $p < .01$).

measures. Funder and Block (1989) acknowledge that most children typically hit a ceiling in delay-of-gratification tasks. In particular, they argue that delay studies tell us more about children who do not delay compared with the large number of children who do (Funder & Block, 1989, p. 1049). In order to better understand those children who were unable to delay in the present study, analyses with dichotomous behavior regulation variables at Time 1 and Time 2 were conducted. The regulation variables were dichotomized and scored such that 0 = touched prohibited object and 1 = never touched. Three factors distinguished those children who were able to delay at Time 1 versus those who were not able to delay. Compared with children who were unable to delay at Time 1, children who delayed had higher parent-reported inhibitory control, $t(122) = -2.02$, $p < .05$ (4.66 vs. 4.33); experienced less peer rejection in preschool as measured by peer preference nominations, $t(123) = 2.28$, $p < .05$ (-.15 vs. .34); and displayed higher levels of observed behavior regulation at Time 2, $t(72) = -2.63$, $p < .05$ (9.60 vs. 6.49 minutes). No variation by child gender and mothers' marital status was detected.

In contrast to the handful of differences that distinguished delayers from non-delayers at Time 1, children who were able to persist at the delay task at Time 2 were older, $t(92) = -1.89$, $p < .10$ (6.29 vs. 6.12 years); more likely to be female, $\chi^2(1, N = 96) = 6.89$, $p < .05$ (70% vs. 43%); and had higher parent-reported inhibitory control, $t(93) = -2.83$, $p < .01$ (4.81 vs. 4.36). Children who were able to persist at the delay task at Time 2 were also distinguished by factors measured within the context of the Head Start classroom. Specifically, in preschool they experienced lower levels of peer rejection, $t(81) = 1.77$, $p < .10$ (-.16 vs. .23); fewer teacher-reported externalizing behaviors, $t(81) = -2.25$, $p < .05$ (47.21 vs. 42.67);[17] and greater teacher-reported

[17] In order to examine mean differences in externalizing behaviors, the original (*i.e.*, non-reversed) externalizing t-scores were used. For this t-test, higher values reflect *lower* levels of externalizing behaviors.

social competence, $t(81) = -1.84$, $p < .10$ (49.32 vs. 45.75). In first grade, these children had higher reading, math, and writing grades: ts(76) = -2.48, -1.69, and 1.87, ps < .05, .10, and .10, respectively.[18] Children who were able to delay at Time 2 also came from demographically advantaged family environments in comparison with those among their peers who seemed to struggle with the task. The delayers' households were characterized by slightly higher incomes, $t(92) = -1.66$, $p = .10$ (1.65 vs. 1.10, $14,400 vs. $13,150); and the presence of older caregivers, $t(93) = -1.81$, $p < .10$ (31.22 vs. 28.25 years), who scored higher on a self-report measure of effective limit-setting practices, $t(94) = -2.26$, $p < .05$ (52.96 vs. 48.80), at Time 1. Similar to the dichotomized Time 1 measure of behavior regulation, the ability to delay was unrelated to maternal marital status at Time 1.

Differences described above seem to signal the emergence of different life course trajectories as early as age seven. Simply put, children who were unable to persist at the Time 2 delay task appear to experience a greater number of risk factors compared with those among their peers who were also from low-income families but were able to persist at the task. It is important however to stress that, in and of itself, children who were unable to delay are not necessarily at risk for negative outcomes. For example, children who looked inside the prohibited box at Time 1 might tend to display greater curiosity by nature and thus might excel in investigative subjects like science. During the resistance-to-temptation task at Time 2, children who began playing with the prohibited toys in tandem with the cameraperson might tend towards more gregarious and sociable interactions, qualities valued in Western cultures.

While there may be much intrinsic interest in assessing differences between those children who delayed and those who didn't, the present study was not designed

[18] Mean differences for those children who delayed at Time 2 vs. those children who did not were as follows: 2.43 vs. 1.83 for reading, 2.60 vs. 2.22 for math, and 2.10 vs. 1.66 for writing achievement.

to make such an assessment. Instead, it examined whether the regulation skills displayed in the delay tasks linked parent reports of inhibitory control to subsequent child adjustment. The evidence presented here is mixed. [i]

Another possible explanation for the moderate magnitude of the Time 1 and Time 2 relationship is the variation in content from Time 1 to Time 2. First, the two instances of the task were conducted in different contexts—in a school setting at Time 1 and in a home setting at Time 2. It is well documented that children behave differently in school and home contexts (Gresham & Stuart, 1992). Second, variations in the adult presence and role in the tasks varied considerably across the measures. For the Time 1 measure, the study child was alone with an unfamiliar adult who pointed a video camera at the study child's face throughout the duration of the task. For the Time 2 measure, the study child was alone, with the exception of a 60-second period when the cameraperson played with the prohibited toys. Differences in the measures are readily apparent in children's responses to the tasks, with most children hitting a ceiling in the more restrictive school-based version of the task at Time 1, compared with the observed heterogeneity of delay times in the home-based version of the task at Time 2. That the tasks were conducted under different circumstances may explain the modest trend-level association between the two behavior regulation measures in the married sample.

Findings from the present study are aligned with previous research on relationships between family structure and poverty. For example, Smith and colleagues (1997) found that virtually every effect of family structure on 2- to 8-year-olds' IQ scores dropped out once income was statistically controlled. Similarly, findings from low-income families enrolled in the Early Head Start Research and Evaluation Project suggest that once maternal demographic characteristics were held constant, children of single parents did not differ consistently on cognitive outcomes at

14 months, 24 months, or 36 months (Ryan, Brady-Smith, & Brooks-Gunn, 2004, p. 605).

Study limitations. The present study was limited to some extent by the small sample size. Structural equation modeling typically requires 5-10 cases per parameter. The majority analyses utilized the entire sample ($N = 163$) and thus it appears that the sample size was adequate to test the hypothesized mediation model with eight exogenous variables (inhibitory control and seven covariates) and three endogenous variables (behavior regulation at Time 1, behavior regulation at Time 2, and the outcome variable of interest). Additionally, IFI and RMSEA goodness-of-fit indices for the total effect, mediation, and moderation models consistently indicated acceptable model fit.

Other characteristics of the sample limit the study's generalizability as well. Prior to dividing the sample into married and unmarried families for the social competence analyses, the sample was already highly stratified by geographic location. At both Time 1 and Time 2 rural families had higher incomes. In comparison with their urban counterparts, rural mothers were older, more educated, more likely to be married with White children, and less likely to experience depression. While such heterogeneity is notable, it may also have hindered our ability to detect relationships within the small sample. Another caveat pertaining to the current study is the exploratory nature of the moderation analyses. We did not hypothesize differences by marital status, which emerged only at the analysis stage—but the issue merits consideration, particularly for children's socioemotional outcomes. To address such a hypothesis adequately in future research, analyses with larger samples are necessary to determine whether the pathways through which inhibitory control influence first-grade adjustment differ among low-income children from single- and two-parent families.

Implications for policy. During the summer of 2003 the House of Representatives passed a resolution, backed by the Bush Administration, to emphasize the development of pre-literacy and pre-math skills in Head Start classrooms (U.S. Dept. of Health and Human Services, 2003). Three years prior to this resolution, a meta-analysis conducted by La Paro and Pianta (2000) had indicated that, on average, 25% of the variance in first- and second-graders' academic outcomes could be predicted on the basis of pre-literacy, pre-math, or other cognitive competencies assessed one to three years earlier, at ages appropriate to participation in Head Start.

The moderate estimates of early achievement stability offered by La Paro and Pianta (2000) indicate that policy on school readiness would benefit from not only defining but also assessing readiness in terms other than those that refer exclusively to children's cognitive skills and academic abilities (La Paro & Pianta, 2000; Pianta & Walsh, 1998; Raver, 2002; Raver & Zigler, 1997). Thus there is considerable room for the identification and application of effective ways of intervening during early childhood development to improve later achievement. The question is: When it comes to promoting school readiness, where do policymakers put their money? While the long-term benefits of Head Start are unclear, the present study sheds some light on the benefits of developing behavior regulation skills as a pathway through which inhibitory control influences the first-grade reading and writing achievement of Head Start graduates. The findings suggest that policymakers would be well advised to consider funding further research on the role of behavior regulation as a mechanism, an area that has the potential to yield effective intervention strategies.

Not only has research with at-risk populations indicated that interventions targeting the highest risk groups yield the greatest effects (Olds, Henderson et al., 1998), research on child development in the context of economic disadvantage have marked early childhood (0-5-years) as a period in which poverty interferes with the

stage-salient tasks most central to academic performance and school completion—factors that are critical for competence in early adulthood (Duncan, Yeung, Brooks-Gunn, & Smith, 1998).

The hypotheses investigated here also meet the aims established at the National Infant Mental Health Forum (U.S. Dept. of Health and Human Services, 2000): to conduct research that demonstrates the integral nature of self-regulatory skills for healthy social and emotional development. To do this we must consider longitudinal data that permit us to study the effects of processes over time. Longitudinal findings from the present study indicate that the constellation of processes that influence the role of behavior regulation in affecting social competence (but not problem behavior or achievement) for low-income children may operate differently for children who reside with mothers who are married compared with those whose mothers are unmarried prior to school entry—even after a host of demographic factors are held constant.

In this study, we examined the role and continuity of behavior regulation as a central pathway through which inhibitory control prior to school entry influences subsequent adjustment among Head Start children. To our knowledge, the present study is the first to test whether inhibitory control operates through behavioral regulation and thereby traces temporal associations between inhibitory control and behavior regulation as they relate longitudinally to child adjustment. Results indicate support for the mediating role of behavior regulation for relations between inhibitory control and children's reading and writing achievement. Comparable support was not found for children's socioemotional outcomes. Limited support was detected for the indirect effect of inhibitory control through behavior regulation on social competence but only for those children from married families at Time 1. Similar findings were not detected for either externalizing or internalizing behaviors in either the married or

entire sample. The small sample size and the incompatibility of behavior regulation measures underscore the need for additional research in order to better understand how self-regulation operates within high-risk contexts.

APPENDIX 2A

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's social competence

	To Social Competence T2			
	b	B	SE	p
Path From				
Maternal age	0.01	0.01	0.14	0.95
Maternal education	1.08	0.17	0.77	0.16
Workforce entry	1.21	0.06	2.47	0.62
Income category	-0.02	0.00	0.70	0.98
Marital status	2.43	0.12	2.43	0.32
Child age	-1.57	-0.07	2.39	0.51
Child race not White	0.22	0.01	2.24	0.92
Inhibitory control	0.72	0.06	1.30	0.58

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's externalizing behaviors

	To Externalizing T2			
	b	B	SE	p
Path From				
Maternal age	0.01	0.01	0.13	0.92
Maternal education	-2.07	-0.30	0.72	0.00
Workforce entry	0.50	0.02	2.34	0.83
Income category	-0.11	-0.02	0.66	0.87
Marital status	3.42	0.16	2.30	0.14
Child age	5.41	0.23	2.26	0.02
Child race not White	7.85	0.37	2.12	0.00
Inhibitory control	-1.35	-0.11	1.23	0.27

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's internalizing behaviors

	To Internalizing T2			
	b	B	SE	p
Path From				
Maternal age	-0.14	-0.11	0.14	0.33
Maternal education	0.20	0.03	0.77	0.79
Workforce entry	-4.03	-0.18	2.48	0.10
Income category	0.39	0.06	0.70	0.58
Marital status	-0.98	-0.05	2.44	0.69
Child age	6.01	0.27	2.39	0.01
Child race not White	2.16	0.11	2.25	0.34
Inhibitory control	-0.89	-0.07	1.30	0.50

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's reading grades

	To Reading Grades T2			
	b	B	SE	p
Path From				
Maternal age	-0.01	-0.04	0.02	0.74
Maternal education	0.03	0.04	0.09	0.75
Workforce entry	-0.25	-0.10	0.28	0.38
Income category	0.06	0.09	0.08	0.47
Marital status	0.13	0.06	0.28	0.64
Child age	-0.04	-0.02	0.27	0.89
Child race not White	-0.06	-0.03	0.26	0.82
Inhibitory control	0.28	0.21	0.15	0.06

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's math grades

	To Math Grades T2			
	b	B	SE	p
Path From				
Maternal age	-0.02	-0.15	0.01	0.17
Maternal education	0.10	0.15	0.08	0.17
Workforce entry	-0.16	-0.07	0.24	0.52
Income category	0.06	0.10	0.07	0.35
Marital status	0.36	0.17	0.24	0.14
Child age	-0.03	-0.01	0.24	0.89
Child race not White	-0.29	-0.14	0.22	0.19
Inhibitory control	0.32	0.26	0.13	0.01

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's writing grades

	To Writing Grades T2			
	b	B	SE	p
Path From				
Maternal age	-0.01	-0.06	0.02	0.59
Maternal education	-0.02	-0.03	0.08	0.81
Workforce entry	-0.13	-0.05	0.27	0.64
Income category	0.06	0.10	0.08	0.43
Marital status	0.11	0.05	0.27	0.67
Child age	-0.01	0.00	0.26	0.97
Child race not White	-0.06	-0.03	0.25	0.81
Inhibitory control	0.33	0.25	0.14	0.02

APPENDIX 2B.1

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on social competence via behavior regulation at T1 and T2

	To Behavior Regulation T1				To Behavior Regulation T2				To Social Competence T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	-0.68	-0.04	1.39	0.63	0.00	-0.01	0.05	0.93	-0.02	-0.02	0.14	0.87
Maternal education	-9.66	-0.12	7.70	0.21	0.28	0.10	0.27	0.30	0.80	0.12	0.77	0.30
Workforce entry	-31.28	-0.12	24.63	0.20	0.62	0.06	0.87	0.48	0.61	0.03	2.46	0.80
Income category	-0.24	0.00	7.00	0.97	0.15	0.06	0.25	0.53	-0.19	-0.03	0.69	0.78
Marital status	-15.16	-0.06	24.27	0.53	1.56	0.17	0.86	0.07	1.40	0.07	2.44	0.57
Child age	-12.64	-0.05	23.63	0.59	2.43	0.25	0.84	0.00	-2.53	-0.12	2.47	0.30
Child race not White	-3.59	-0.01	22.40	0.87	-0.19	-0.02	0.79	0.81	-0.13	-0.01	2.20	0.95
Inhibitory control	21.88	0.15	12.96	0.09	0.96	0.18	0.46	0.04	0.43	0.04	1.32	0.75
Behavior regulation T1					0.02	0.46	0.00	0.00	-0.02	-0.25	0.01	0.08
Behavior regulation T2									0.50	0.22	0.31	0.11

APPENDIX 2B.2

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on externalizing behaviors via behavior regulation at T1 and T2

	To Behavior Regulation T1				To Behavior Regulation T2				To Externalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	-0.67	-0.04	1.39	0.63	0.00	-0.01	0.05	0.94	0.05	0.04	0.13	0.71
Maternal education	-8.90	-0.11	7.67	0.25	0.27	0.10	0.27	0.31	-1.83	-0.27	0.72	0.01
Workforce entry	-31.62	-0.12	24.58	0.20	0.64	0.07	0.88	0.46	1.25	0.05	2.33	0.59
Income category	-0.70	-0.01	6.98	0.92	0.16	0.06	0.25	0.50	0.04	0.01	0.65	0.95
Marital status	-15.82	-0.06	24.22	0.51	1.58	0.18	0.86	0.07	4.43	0.21	2.31	0.06
Child age	-13.88	-0.05	23.57	0.56	2.48	0.26	0.84	0.00	6.37	0.27	2.34	0.01
Child race not White	-2.08	-0.01	22.35	0.93	-0.22	-0.03	0.79	0.78	8.10	0.38	2.09	0.00
Inhibitory control	22.85	0.15	12.93	0.08	0.91	0.17	0.47	0.05	-1.05	-0.08	1.25	0.40
Behavior regulation T1					0.02	0.45	0.00	0.00	0.02	0.21	0.01	0.09
Behavior regulation T2									-0.45	-0.19	0.29	0.12

APPENDIX 2B.3

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on internalizing behaviors, via behavior regulation at T1 and T2

	To Behavior Regulation T1				To Behavior Regulation T2				To Internalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	-0.55	-0.04	1.39	0.69	-0.01	-0.01	0.05	0.88	-0.14	-0.11	0.14	0.32
Maternal education	-8.88	-0.11	7.71	0.25	0.28	0.10	0.27	0.31	0.18	0.03	0.78	0.82
Workforce entry	-31.53	-0.12	24.67	0.20	0.60	0.06	0.88	0.50	-4.17	-0.19	2.50	0.10
Income category	0.39	0.01	7.01	0.96	0.17	0.06	0.25	0.50	0.35	0.06	0.70	0.62
Marital status	-15.55	-0.06	24.34	0.52	1.54	0.17	0.86	0.07	-1.40	-0.07	2.49	0.57
Child age	-11.83	-0.04	23.68	0.62	2.36	0.24	0.84	0.01	5.69	0.25	2.51	0.02
Child race not White	-1.25	-0.01	22.43	0.96	-0.22	-0.02	0.79	0.78	2.10	0.10	2.25	0.35
Inhibitory control	24.43	0.16	12.98	0.06	0.89	0.17	0.47	0.06	-1.03	-0.08	1.35	0.44
Behavior regulation T1					0.02	0.46	0.00	0.00	-0.01	-0.07	0.01	0.60
Behavior regulation T2									0.13	0.05	0.32	0.69

APPENDIX 2B.4

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on reading grades via behavior regulation at T1 and T2

	To Behavior Regulation T1				To Behavior Regulation T2				To Reading Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	-0.59	-0.04	1.39	0.67	0.00	0.00	0.05	0.97	0.00	-0.02	0.02	0.88
Maternal education	-9.21	-0.11	7.70	0.23	0.28	0.10	0.27	0.30	0.00	-0.01	0.09	0.97
Workforce entry	-31.41	-0.12	24.63	0.20	0.69	0.07	0.88	0.43	-0.27	-0.11	0.28	0.33
Income category	0.01	0.00	7.01	1.00	0.16	0.06	0.25	0.52	0.05	0.07	0.08	0.55
Marital status	-14.85	-0.06	24.29	0.54	1.50	0.17	0.86	0.08	0.03	0.01	0.28	0.92
Child age	-11.52	-0.04	23.63	0.63	2.37	0.25	0.84	0.00	-0.10	-0.04	0.28	0.71
Child race not White	-1.46	-0.01	22.40	0.95	-0.26	-0.03	0.79	0.75	-0.06	-0.03	0.25	0.82
Inhibitory control	23.89	0.16	12.95	0.07	0.90	0.17	0.47	0.05	0.19	0.14	0.15	0.21
Behavior regulation T1					0.02	0.46	0.00	0.00	0.00	-0.05	0.00	0.72
Behavior regulation T2									0.07	0.28	0.03	0.04

APPENDIX 2B.5

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on math grades via behavior regulation at T1 and T2

	To Behavior Regulation T1				To Behavior Regulation T2				To Math Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	-0.57	-0.04	1.39	0.68	0.00	0.00	0.05	0.98	-0.02	-0.14	0.01	0.19
Maternal education	-9.10	-0.11	7.70	0.24	0.27	0.09	0.27	0.32	0.08	0.12	0.08	0.27
Workforce entry	-30.69	-0.11	24.64	0.21	0.68	0.07	0.88	0.44	-0.18	-0.08	0.25	0.47
Income category	-0.02	0.00	7.01	1.00	0.16	0.06	0.25	0.51	0.06	0.09	0.07	0.41
Marital status	-14.66	-0.06	24.29	0.55	1.50	0.17	0.86	0.08	0.30	0.14	0.24	0.22
Child age	-11.82	-0.04	23.64	0.62	2.37	0.25	0.84	0.00	-0.05	-0.02	0.25	0.85
Child race not White	-1.50	-0.01	22.41	0.95	-0.25	-0.03	0.79	0.75	-0.29	-0.14	0.22	0.18
Inhibitory control	23.52	0.16	12.95	0.07	0.91	0.17	0.47	0.05	0.27	0.22	0.13	0.04
Behavior regulation T1					0.02	0.46	0.00	0.00	0.00	-0.06	0.00	0.68
Behavior regulation T2									0.04	0.16	0.03	0.21

APPENDIX 2B.6

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on writing grades via behavior regulation at T1 and T2

	To Behavior Regulation T1				To Behavior Regulation T2				To Writing Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From												
Maternal age	-0.70	-0.05	1.39	0.62	0.00	0.00	0.05	1.00	-0.01	-0.07	0.02	0.57
Maternal education	-9.24	-0.11	7.68	0.23	0.29	0.10	0.27	0.29	-0.06	-0.08	0.08	0.49
Workforce entry	-30.88	-0.12	24.59	0.21	0.67	0.07	0.88	0.44	-0.18	-0.08	0.27	0.50
Income category	-0.40	-0.01	6.99	0.95	0.17	0.06	0.25	0.50	0.05	0.08	0.08	0.52
Marital status	-13.51	-0.05	24.24	0.58	1.47	0.16	0.86	0.09	0.03	0.01	0.27	0.91
Child age	-11.38	-0.04	23.58	0.63	2.36	0.25	0.84	0.01	-0.06	-0.03	0.27	0.83
Child race not White	-1.28	-0.01	22.36	0.95	-0.25	-0.03	0.80	0.75	-0.07	-0.03	0.24	0.78
Inhibitory control	23.96	0.16	12.93	0.06	0.90	0.17	0.47	0.05	0.26	0.20	0.15	0.07
Behavior regulation T1					0.02	0.45	0.00	0.00	0.00	-0.16	0.00	0.26
Behavior regulation T2									0.06	0.23	0.03	0.09

APPENDIX 2C.1

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's social competence split by mothers' marital status

	To Social Competence T2			
	b	B	SE	p
Path From		Married		
Maternal age	0.25	0.16	0.24	0.30
Maternal education	2.23	0.36	0.88	0.01
Workforce entry	6.33	0.29	3.12	0.04
Income category	0.41	0.07	0.79	0.60
Child age	-7.16	-0.26	3.83	0.06
Child race not White	0.27	0.01	2.66	0.92
Inhibitory control	6.02	0.53	1.68	0.00
		Unmarried		
Maternal age	-0.01	-0.01	0.15	0.93
Maternal education	-0.08	-0.01	0.99	0.94
Workforce entry	1.80	0.08	3.02	0.55
Income category	0.10	0.01	0.91	0.91
Child age	-0.99	-0.05	2.67	0.71
Child race not White	2.27	0.11	2.83	0.42
Inhibitory control	-1.22	-0.10	1.60	0.45

APPENDIX 2C.2

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's externalizing behaviors split by mothers' marital status

	To Externalizing T2			
	b	B	SE	p
Path From		Married		
Maternal age	0.16	0.10	0.19	0.39
Maternal education	-3.52	-0.58	0.65	0.00
Workforce entry	3.20	0.15	2.42	0.19
Income category	-1.71	-0.31	0.62	0.01
Child age	7.67	0.29	2.95	0.01
Child race not White	7.12	0.37	2.07	0.00
Inhibitory control	-2.93	-0.26	1.29	0.02
		Unmarried		
Maternal age	-0.02	-0.01	0.15	0.91
Maternal education	-0.94	-0.13	0.98	0.33
Workforce entry	-1.36	-0.06	2.97	0.65
Income category	0.30	0.04	0.89	0.73
Child age	5.83	0.27	2.62	0.03
Child race not White	6.24	0.28	2.79	0.03
Inhibitory control	-0.39	-0.03	1.58	0.81

APPENDIX 2C.3

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's internalizing behaviors split by mothers' marital status

	To Internalizing T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.64	-0.41	0.26	0.01
Maternal education	-2.33	-0.39	0.94	0.01
Workforce entry	-8.06	-0.39	3.34	0.02
Income category	1.05	0.19	0.85	0.22
Child age	3.39	0.13	4.11	0.41
Child race not White	-0.56	-0.03	2.85	0.84
Inhibitory control	-3.31	-0.30	1.80	0.07
		Unmarried		
Maternal age	-0.07	-0.06	0.15	0.62
Maternal education	2.00	0.27	0.94	0.03
Workforce entry	-4.11	-0.18	2.86	0.15
Income category	0.40	0.06	0.86	0.64
Child age	7.68	0.36	2.51	0.00
Child race not White	1.45	0.06	2.69	0.59
Inhibitory control	0.36	0.03	1.52	0.81

APPENDIX 2C.4

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's reading grades split by mothers' marital status

	To Reading Grades T2			
	b	B	SE	p
Path From		Married		
Maternal age	0.00	0.00	0.04	0.99
Maternal education	0.13	0.18	0.13	0.32
Workforce entry	-1.01	-0.40	0.48	0.04
Income category	0.17	0.26	0.12	0.17
Child age	-0.77	-0.24	0.58	0.19
Child race not White	0.03	0.01	0.41	0.94
Inhibitory control	-0.23	-0.17	0.26	0.37
		Unmarried		
Maternal age	0.00	0.02	0.02	0.90
Maternal education	-0.05	-0.07	0.11	0.64
Workforce entry	0.09	0.04	0.34	0.80
Income category	0.07	0.10	0.10	0.47
Child age	0.12	0.05	0.30	0.69
Child race not White	-0.02	-0.01	0.32	0.96
Inhibitory control	0.34	0.25	0.18	0.06

APPENDIX 2C.5

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's math grades split by mothers' marital status

	To Math Grades T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.04	-0.23	0.03	0.20
Maternal education	0.21	0.30	0.11	0.06
Workforce entry	-0.92	-0.39	0.41	0.02
Income category	0.26	0.42	0.10	0.01
Child age	-0.59	-0.20	0.50	0.23
Child race not White	-0.14	-0.07	0.35	0.68
Inhibitory control	0.11	0.09	0.22	0.61
		Unmarried		
Maternal age	-0.01	-0.11	0.01	0.43
Maternal education	0.02	0.03	0.10	0.84
Workforce entry	0.18	0.09	0.29	0.52
Income category	-0.01	-0.01	0.09	0.94
Child age	0.10	0.05	0.26	0.71
Child race not White	-0.23	-0.11	0.27	0.40
Inhibitory control	0.30	0.26	0.15	0.05

APPENDIX 2C.6

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the total effect of inhibitory control on children's writing grades split by mothers' marital status

	To Writing Grades T2			
	b	B	SE	p
Path From		Married		
Maternal age	-0.05	-0.33	0.03	0.04
Maternal education	0.13	0.21	0.09	0.17
Workforce entry	-0.28	-0.13	0.33	0.41
Income category	0.24	0.42	0.08	0.00
Child age	-0.80	-0.30	0.41	0.05
Child race not White	-0.05	-0.02	0.28	0.86
Inhibitory control	0.47	0.41	0.18	0.01
		Unmarried		
Maternal age	0.00	0.03	0.02	0.85
Maternal education	-0.12	-0.14	0.12	0.32
Workforce entry	-0.01	0.00	0.35	0.98
Income category	-0.02	-0.03	0.11	0.85
Child age	0.14	0.06	0.31	0.65
Child race not White	0.08	0.03	0.33	0.81
Inhibitory control	0.29	0.21	0.19	0.12

APPENDIX 2D.1

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on social competence via behavior regulation at T1 and T2, split by mothers' marital status

	To Behavior Regulation T1				To Behavior Regulation T2				To Social Competence T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	1.29	0.06	3.38	0.70	-0.04	-0.07	0.08	0.66	0.30	0.18	0.23	0.18
Maternal education	-22.34	-0.26	12.19	0.07	-0.31	-0.15	0.32	0.33	2.45	0.37	0.86	0.00
Workforce entry	1.08	0.00	42.76	0.98	-2.61	-0.36	1.07	0.01	9.74	0.44	3.11	0.00
Income category	-7.82	-0.10	10.96	0.48	0.62	0.33	0.28	0.02	-0.18	-0.03	0.80	0.82
Child age	49.28	0.14	52.96	0.35	1.74	0.19	1.34	0.19	-9.34	-0.33	3.63	0.01
Child race not White	-24.21	-0.09	36.72	0.51	-0.33	-0.05	0.92	0.72	0.65	0.03	2.45	0.79
Inhibitory control	67.34	0.44	23.17	0.00	0.33	0.09	0.65	0.61	6.25	0.52	1.73	0.00
Behavior regulation T1					0.01	0.32	0.00	0.06	-0.01	-0.07	0.01	0.69
Behavior regulation T2									0.93	0.30	0.49	0.06
						Unmarried						
Maternal age	-1.36	-0.10	1.48	0.36	0.00	0.00	0.06	0.98	-0.07	-0.06	0.15	0.64
Maternal education	7.83	0.09	9.66	0.42	0.59	0.18	0.38	0.12	-0.46	-0.06	0.96	0.63
Workforce entry	-42.55	-0.17	29.13	0.14	1.54	0.15	1.15	0.18	1.00	0.04	2.95	0.74
Income category	-2.93	-0.04	8.79	0.74	0.00	0.00	0.34	0.99	-0.07	-0.01	0.86	0.93
Child age	-26.50	-0.11	25.36	0.30	2.92	0.31	1.01	0.00	-2.57	-0.12	2.73	0.35
Child race not White	2.26	0.01	27.35	0.93	-0.30	-0.03	1.08	0.78	2.31	0.11	2.69	0.39
Inhibitory control	0.49	0.00	15.47	0.97	1.07	0.18	0.61	0.08	-2.16	-0.17	1.56	0.17
Behavior regulation T1					0.02	0.46	0.00	0.00	-0.04	-0.47	0.01	0.00
Behavior regulation T2									0.67	0.31	0.34	0.05

APPENDIX 2D.2

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on externalizing behaviors via behavior regulation at T1 and T2, split by mothers' marital status

	To Behavior Regulation T1				To Behavior Regulation T2				To Externalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	1.40	0.06	3.43	0.68	-0.01	-0.02	0.09	0.88	0.18	0.11	0.19	0.35
Maternal education	-19.14	-0.23	11.91	0.11	-0.38	-0.19	0.31	0.21	-3.65	-0.60	0.69	0.00
Workforce entry	-12.91	-0.04	43.73	0.77	-2.38	-0.33	1.09	0.03	2.17	0.10	2.59	0.40
Income category	-6.99	-0.09	11.11	0.53	0.69	0.37	0.28	0.01	-1.42	-0.25	0.68	0.04
Child age	43.58	0.12	53.01	0.41	1.47	0.16	1.33	0.27	7.86	0.29	2.99	0.01
Child race not White	-22.75	-0.09	37.28	0.54	-0.35	-0.05	0.93	0.71	7.11	0.37	2.06	0.00
Inhibitory control	63.02	0.41	23.25	0.01	0.29	0.08	0.64	0.65	-3.12	-0.27	1.43	0.03
Behavior regulation T1					0.01	0.27	0.00	0.12	0.00	0.03	0.01	0.84
Behavior regulation T2									-0.31	-0.10	0.41	0.45
						Unmarried						
Maternal age	-1.27	-0.10	1.48	0.39	0.00	-0.01	0.06	0.94	0.03	0.03	0.15	0.82
Maternal education	7.25	0.09	9.67	0.45	0.59	0.18	0.38	0.11	-0.66	-0.09	0.96	0.49
Workforce entry	-43.43	-0.17	29.12	0.14	1.63	0.16	1.15	0.16	-0.55	-0.02	2.96	0.85
Income category	-2.69	-0.03	8.79	0.76	-0.03	-0.01	0.34	0.93	0.41	0.06	0.86	0.63
Child age	-26.48	-0.11	25.35	0.30	2.97	0.31	1.01	0.00	7.42	0.35	2.73	0.01
Child race not White	5.74	0.02	27.35	0.83	-0.42	-0.04	1.08	0.69	6.09	0.27	2.69	0.02
Inhibitory control	3.82	0.03	15.46	0.81	1.01	0.17	0.61	0.10	0.34	0.03	1.56	0.83
Behavior regulation T1					0.02	0.46	0.00	0.00	0.03	0.38	0.01	0.01
Behavior regulation T2									-0.59	-0.27	0.34	0.08

APPENDIX 2D.3

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on internalizing behaviors via behavior regulation at T1 and T2, split by mothers' marital status

	To Behavior Regulation T1				To Behavior Regulation T2				To Internalizing T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	1.43	0.07	3.40	0.67	-0.03	-0.05	0.08	0.74	-0.67	-0.41	0.26	0.01
Maternal education	-20.83	-0.25	12.26	0.09	-0.32	-0.16	0.32	0.30	-2.55	-0.40	1.00	0.01
Workforce entry	-8.31	-0.03	43.34	0.85	-2.50	-0.35	1.07	0.02	-9.25	-0.42	3.62	0.01
Income category	-5.86	-0.08	11.03	0.60	0.65	0.35	0.27	0.02	1.23	0.22	0.93	0.19
Child age	49.64	0.14	53.28	0.35	1.51	0.17	1.33	0.26	4.24	0.16	4.21	0.31
Child race not White	-23.98	-0.09	36.96	0.52	-0.25	-0.04	0.92	0.78	-1.47	-0.07	2.85	0.61
Inhibitory control	64.95	0.42	23.32	0.01	0.29	0.08	0.64	0.65	-3.03	-0.26	2.00	0.13
Behavior regulation T1					0.01	0.32	0.00	0.06	-0.01	-0.15	0.01	0.45
Behavior regulation T2									-0.17	-0.06	0.58	0.77
						Unmarried						
Maternal age	-1.30	-0.10	1.49	0.38	0.00	-0.01	0.06	0.95	-0.06	-0.05	0.15	0.68
Maternal education	7.08	0.09	9.72	0.47	0.61	0.18	0.38	0.10	2.09	0.28	0.96	0.03
Workforce entry	-44.02	-0.17	29.34	0.13	1.55	0.15	1.16	0.18	-4.06	-0.18	2.96	0.17
Income category	-1.97	-0.03	8.84	0.82	-0.01	0.00	0.34	0.97	0.38	0.05	0.86	0.66
Child age	-23.59	-0.10	25.53	0.36	2.81	0.29	1.01	0.01	7.85	0.37	2.72	0.00
Child race not White	6.66	0.03	27.54	0.81	-0.42	-0.04	1.08	0.70	1.46	0.07	2.69	0.59
Inhibitory control	4.13	0.03	15.57	0.79	1.02	0.17	0.61	0.09	0.38	0.03	1.56	0.81
Behavior regulation T1					0.02	0.46	0.00	0.00	0.00	0.01	0.01	0.93
Behavior regulation T2									-0.08	-0.04	0.35	0.81

APPENDIX 2D.4

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on reading grades via behavior regulation at T1 and T2, split by mothers' marital status

	To Behavior Regulation T1				To Behavior Regulation T2				To Reading Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	1.58	0.07	3.35	0.64	-0.02	-0.03	0.09	0.83	0.00	0.00	0.04	0.98
Maternal education	-23.53	-0.28	11.99	0.05	-0.31	-0.15	0.32	0.33	0.24	0.33	0.14	0.08
Workforce entry	-16.56	-0.06	42.69	0.70	-2.34	-0.33	1.09	0.03	-0.76	-0.30	0.51	0.13
Income category	-4.63	-0.06	10.85	0.67	0.69	0.37	0.28	0.01	0.15	0.23	0.13	0.24
Child age	50.29	0.14	51.80	0.33	1.33	0.15	1.33	0.32	-1.08	-0.34	0.58	0.07
Child race not White	-22.18	-0.08	36.28	0.54	-0.20	-0.03	0.93	0.83	0.18	0.08	0.40	0.65
Inhibitory control	63.62	0.41	22.72	0.01	0.26	0.07	0.64	0.69	-0.34	-0.25	0.28	0.22
Behavior regulation T1					0.01	0.32	0.00	0.07	0.00	0.38	0.00	0.09
Behavior regulation T2									0.00	0.01	0.08	0.95
						Unmarried						
Maternal age	-1.43	-0.11	1.48	0.34	0.00	0.01	0.06	0.95	0.01	0.04	0.02	0.76
Maternal education	7.64	0.09	9.70	0.43	0.60	0.18	0.38	0.11	-0.13	-0.17	0.11	0.24
Workforce entry	-44.33	-0.18	29.25	0.13	1.65	0.16	1.16	0.15	-0.06	-0.02	0.34	0.86
Income category	-2.54	-0.03	8.83	0.77	-0.01	0.00	0.35	0.98	0.08	0.10	0.10	0.44
Child age	-23.34	-0.10	25.43	0.36	2.80	0.29	1.02	0.01	-0.01	0.00	0.31	0.98
Child race not White	6.42	0.03	27.46	0.82	-0.44	-0.04	1.08	0.69	0.02	0.01	0.31	0.94
Inhibitory control	4.79	0.03	15.50	0.76	0.99	0.17	0.61	0.10	0.22	0.16	0.18	0.22
Behavior regulation T1					0.02	0.45	0.00	0.00	0.00	-0.17	0.00	0.30
Behavior regulation T2									0.09	0.40	0.04	0.02

APPENDIX 2D.5

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on math grades via behavior regulation at T1 and T2, split by mothers' marital status

	To Behavior Regulation T1				To Behavior Regulation T2				To Math Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	2.58	0.12	3.33	0.44	-0.03	-0.05	0.09	0.73	-0.05	-0.28	0.03	0.07
Maternal education	-21.01	-0.24	11.94	0.08	-0.34	-0.16	0.31	0.28	0.34	0.47	0.11	0.00
Workforce entry	-20.39	-0.07	42.48	0.63	-2.36	-0.33	1.08	0.03	-0.71	-0.28	0.40	0.07
Income category	-4.91	-0.06	10.80	0.65	0.70	0.37	0.28	0.01	0.27	0.42	0.10	0.01
Child age	48.91	0.13	51.59	0.34	1.33	0.15	1.33	0.32	-0.99	-0.31	0.46	0.03
Child race not White	-34.52	-0.13	36.11	0.34	-0.08	-0.01	0.93	0.93	0.21	0.09	0.32	0.51
Inhibitory control	67.40	0.43	22.62	0.00	0.23	0.06	0.64	0.72	-0.07	-0.05	0.22	0.74
Behavior regulation T1					0.01	0.32	0.00	0.07	0.00	0.57	0.00	0.00
Behavior regulation T2									-0.01	-0.04	0.06	0.82
						Unmarried						
Maternal age	-1.37	-0.10	1.48	0.35	0.00	0.00	0.06	1.00	-0.02	-0.15	0.01	0.26
Maternal education	8.54	0.10	9.65	0.38	0.58	0.17	0.38	0.13	0.00	-0.01	0.10	0.96
Workforce entry	-43.04	-0.17	29.08	0.14	1.60	0.16	1.17	0.17	0.05	0.02	0.29	0.87
Income category	-2.84	-0.04	8.78	0.75	-0.01	0.00	0.35	0.98	-0.02	-0.04	0.09	0.77
Child age	-24.57	-0.10	25.29	0.33	2.86	0.30	1.03	0.01	0.07	0.04	0.27	0.80
Child race not White	5.47	0.02	27.32	0.84	-0.37	-0.04	1.09	0.73	-0.18	-0.09	0.27	0.49
Inhibitory control	3.00	0.02	15.41	0.85	1.05	0.18	0.62	0.09	0.23	0.20	0.15	0.13
Behavior regulation T1					0.02	0.43	0.00	0.00	0.00	-0.29	0.00	0.07
Behavior regulation T2									0.05	0.23	0.03	0.15

APPENDIX 2D.6

Unstandardized and standardized coefficients, standard errors, and p-values for all variables included in the model estimating the effect of inhibitory control on writing grades via behavior regulation at T1 and T2, split by mothers' marital status

	To Behavior Regulation T1				To Behavior Regulation T2				To Writing Grades T2			
	b	B	SE	p	b	B	SE	p	b	B	SE	p
Path From						Married						
Maternal age	1.65	0.08	3.37	0.62	-0.02	-0.04	0.08	0.81	-0.06	-0.32	0.02	0.02
Maternal education	-21.62	-0.25	12.09	0.07	-0.32	-0.15	0.31	0.30	0.24	0.36	0.09	0.01
Workforce entry	-23.01	-0.08	42.99	0.59	-2.21	-0.31	1.08	0.04	0.14	0.06	0.32	0.66
Income category	-3.08	-0.04	10.92	0.78	0.65	0.35	0.27	0.02	0.18	0.31	0.08	0.03
Child age	47.27	0.13	52.25	0.37	1.36	0.15	1.32	0.30	-1.09	-0.38	0.37	0.00
Child race not White	-31.38	-0.12	36.54	0.39	-0.11	-0.02	0.92	0.90	0.12	0.06	0.26	0.63
Inhibitory control	61.49	0.40	22.90	0.01	0.30	0.08	0.63	0.64	0.40	0.33	0.17	0.02
Behavior regulation T1					0.01	0.35	0.00	0.04	0.00	0.36	0.00	0.02
Behavior regulation T2									0.05	0.16	0.05	0.29
						Unmarried						
Maternal age	-1.60	-0.12	1.48	0.28	0.01	0.01	0.06	0.90	0.00	-0.02	0.02	0.89
Maternal education	8.21	0.10	9.66	0.40	0.60	0.18	0.38	0.12	-0.17	-0.21	0.12	0.14
Workforce entry	-44.69	-0.18	29.15	0.13	1.68	0.16	1.17	0.15	-0.20	-0.08	0.35	0.57
Income category	-2.92	-0.04	8.80	0.74	0.01	0.00	0.35	0.97	-0.04	-0.05	0.10	0.68
Child age	-23.09	-0.10	25.35	0.36	2.78	0.29	1.02	0.01	0.05	0.02	0.33	0.87
Child race not White	5.46	0.02	27.37	0.84	-0.41	-0.04	1.09	0.71	0.14	0.06	0.32	0.67
Inhibitory control	4.38	0.03	15.46	0.78	1.01	0.17	0.61	0.10	0.18	0.13	0.19	0.32
Behavior regulation T1					0.02	0.44	0.00	0.00	0.00	-0.32	0.00	0.05

REFERENCES

Arbuckle, J. L., & Wothke, W. (1999). *Amos 4.0 user's guide*. Chicago: SmallWaters Corporation.

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.

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Minnesota symposia on child psychology.* (Vol. 13, pp. 39-101). Hillsdale, NJ: Lawrence Erlbaum Associates (Wiley).

Block, J., & Kremen, A. (1996). IQ and ego-resiliency: Clarifying their conceptual and empirical linkage and separateness. *Journal of Personality and Social Psychology, 70*, 349-361.

Brame, B., Nagin, D. S., & Tremblay, R. E. (2001). Developmental trajectories of physical aggression from school entry to late adolescence. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 42*, 503-512.

Brody, N. (1992). *Intelligence* (2nd ed.). San Diego: Academic Press.

Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E., & Silva, P. A. (1995). Temperamental origins of child and adolescent behavior problems: From age 3 to age 15. *Child Development*, *66*, 55-68.

Derryberry, D., & Rothbart, M. K. (1997). Reactive and effortful processes in the organization of temperament. *Development and Psychopathology, 9,* 633-652.

Duncan, G. J., Yeung, W. J., Brooks-Gunn, J., & Smith, J. R. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review, 63*(3), 406-423.

Eisenberg, N., & Fabes, R. A. (1992). Emotion, regulation, and the development of social competence. In M. S. Clark (Ed.), *Review of personality and social psychology: Vol. 14, Emotion and social behavior* (pp. 119–150). Newbury Park, CA: Sage.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology, 78*(1)*,* 136-157.

Eisenberg, N., Guthrie, I. K, Fabes, R. A., Shepard, S., Losoya, S., Murphy, B. C., Jones, S., Poulin, R., & Reiser, M. (2000). Prediction of elementary school children's externalizing problem behaviors from attentional and behavioral regulation and negative emotionality. *Child Development, 71*(5)*,* 1367-1387.

Eisenberg, N., & Morris, A. S. (2002). Children's emotion-related regulation. In R. Kail (Ed.), *Advances in child development and behavior* (Vol. 30, pp. 190-229). Amsterdam: Academic Press.

Eisenberg, N., & Spinrad, T. L. (2004). Emotion-related regulation: Sharpening the definition. *Child Development, 75*(2), 334-339.

Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A. et al. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development*, *75*(1), 25-46.

Eisenberg, N., Zhou, Q., Spinrad, T. L., Valiente, C., Fabes, R. A., & Liew, J. (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development*, *76*(5), 1055-1071.

Emde, R. N., & Hewitt J. K. (Eds.) (2001). *Infancy to early childhood: Genetic and environmental influences on developmental change*. London: Oxford University Press.

Evans, G. W., & Marcynyszyn, L. A. (2004). Environmental justice, cumulative environmental risk, and health among low- and middle-income children in upstate New York. *American Journal of Public Health, 94*(11), 1942-1944.

Fox, N. A., & Calkins, S. D. (2003). The development of self-control of emotion: Intrinsic and extrinsic influences. *Motivation and Emotion, 27*(1), 7-26.

Garcia Coll, C., & Magnuson, K. (2000). Cultural differences as sources of developmental vulnerabilities and resources. In J. P. Shonkoff, & Meisels, S. J. (Eds.), *Handbook of Early Childhood Intervention, Second Edition* (pp. 94-114). New York: Cambridge University Press.

Gunnar, M. R., & Donzella, B. (2002). Social regulation of the cortisol levels in early human development. *Psychoneuroendocrinology, 27*, 199-220.

Hamre, B. K., & Pianta, R. C. (2005). Can Instructional and emotional support in the first-grade classroom make a difference for children at risk of school failure*? Child Development, 76*(5) 949-967.

Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*(4), 599-610.

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 and Development, 14*(1), 101-119.

Judd, C. M., & Kenny, D. A. (1981). Process Analysis: Estimating mediation in treatment evaluations. *Evaluation Review, 5*, 602-619.

Kochanska, G., & Aksan, N. (1995). Mother-child mutually positive affect, the quality of child competence to requests and prohibitions, and maternal control as correlates of early internalization. *Child Development, 66*, 236-254.

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18*, 199-214.

Krueger, R. F., Caspi, A., Moffitt, T. E., White, J., & Stouthamer-Loeber, M. (1996). Delay of gratification, psychopathology, and personality: Is low self-control specific to externalizing problems? *Journal of Personality, 64*, 107-129.

LaFreniere, P. J., Dumas, J. E., Capuano, F., & Dubeau, D. (1992). Development and validation of the preschool socioaffective profile. *Psychological Assessment, 4*, 442-450.

Laible, D. (2004). Mother-child discourse in tow contexts: Links with child temperament, attachment security, and socioemotional competence. *Developmental Psychology, 40*(6), 979-992.

Laible, D. J., & Thompson, R. A. (2000). Mother-child discourse, attachment security, shared positive affect, and early conscience development. *Child Development, 71*(5), 1424-1440.

Marcynyszyn, L. A. (2006a). *Self-Regulation as a mediator of the relationship between caregivers' limit-setting and children's behaviors and academic performance*. Unpublished doctoral dissertation, Cornell University, NY.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Bulletin, 106*(1), 3-19.

Mischel, W. (1983). Alternatives in the pursuit of the predictability and consistency of persons: Stable data that yield unstable interpretations. *Journal of Personality [special issue on prediction], 51*, 578-604.

Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology, 54*, 687-696.

Nagin, D., & Tremblay, R. E. (1999). Trajectories of boys' physical aggression, opposition, and hyperactivity on the path to physically violent and nonviolent juvenile delinquency. *Child Development, 70,* 1181-1196.

Olds, D., Henderson, C. R., Cole, R., Eckenrode, J., Kitzman, H., Luckey, D., Pettitt, L., Sidora, K., Morris, P., & Powers, J. (1998). Long-term effects of nurse home visitation on children's criminal and antisocial behavior: 15-year follow-up of a randomized controlled trial. *Journal of the American Medical Association, 280*(14), 1238-1244.

Olson, S. L., Schilling, E. M., & Bates, J. E. (1999). Measurement of impulsivity: Construct coherence, longitudinal stability, and relationship with externalizing problems in middle childhood and adolescence. *Journal of Abnormal Child Psychology, 27*, 151-165.

Oosterlaan, J., & Sergeant, J. A. (1996). Inhibition in ADHD, aggressive, and anxious children: A biologically based model of child psychopathology. *Journal of Abnormal Child Psychology, 24*, 19-36.

Pianta, R. C., & Walsh, D. J. (1998). Applying the construct of resilience in schools: Cautions from a developmental systems perspective. *School Psychology Review*, *27*(3), 407-417.

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*, 3-19.

Raver, C. C., & Zigler, E. F. (1997). Social competence: An untapped dimension in evaluating Head Start's success. *Early Childhood Research Quarterly, 12*, 363-385.

Rothbart, M. K., Ahadi, S. A., Hershey, 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. (1998). Temperament. In N. Eisenberg (Ed.), *Handbook of child psychology* (5th ed., Vol. 3, pp. 105-176). New York: John Wiley & Sons.

Ryan, R. M., Brady-Smith, C., & Brooks-Gunn, J. (2004, June). *Associations between family structure and child cognitive outcomes in the first 3 years of life*. Poster session presented at Head Start's Seventh National Research Conference, "Promoting Positive Development in Young Children: Designing Strategies that Work," Washington, DC.

Sapolsky, R. M. (1996). Why stress is bad for your brain. *Science, 273*, 749-750.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177.

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.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 132-189). New York: Russell Sage Foundation.

Thompson, R. A., & Calkins, S. D. (1996). The double edged-sword: Emotion regulation for children at risk. *Development and Psychopathology, 8*, 163-182.

Tremblay, R. E. (1999). When children's social development fails. In D. P. Keating , & Hertzman, C. (Eds.), *Developmental health and the wealth of nations: Social, biological, and educational dynamics* (pp. 55-71). New York: The Guilford Press.

Tremblay, R. E. (2000). The development of aggressive behaviour during childhood: What have we learned in the past century? *International Journal of Behavioral Development, 24*(2), 129-141.

U. S. Department of Health and Human Services (2000, October). *Report of the Infant Mental Health Forum*. Washington DC: Author.

U.S. Department of Health and Human Services (2003, July 25). *Regarding Passage of the School Readiness Act of 2003 (H.R. 2210)*. Retrieved October 2, 2005, from http://www.hhs.gov/news/press/2003pres/20030725a.html

Zeitlin, M. (1996). My child is my crown: Yoruba parental theories and practices in early childhood. In S. Harkness & Super, C. M. (Eds.), *Parents' Cultural Belief Systems* (pp. 407-427). New York: Guilford Press.

ENDNOTE

[i] Exploratory analyses were conducted to gain leverage on the present findings by examining whether inhibitory control predicted children who behaved consistently across the two behavior regulation tasks (*i.e.*, those children who consistently touched, $n = 11$, and those children who consistently did not touch, $n = 38$) from those children who displayed inconsistent behaviors across the two tasks (*i.e.*, touched at Time 1 but not Time 2, $n = 3$, and touched at Time 2 but not at Time 1, $n = 22$). A dichotomous variable was constructed and coded such that 1 = consistent and 0 = inconsistent (*N*s = 49 and 25 respectively). Logistic regression results with controls for the aforementioned, [seven] covariates indicated that early levels of inhibitory control significantly predict those children who displayed stable behaviors across the two tasks from those who did not, $B = .85$, $SE = .43$, Wald $\chi^2 = 3.91$, OR = 2.34, $p < .05$. Thus children with greater, parent-reported, inhibitory control skills were more likely to display consistent behaviors across the two tasks (inhibitory control *M*s = 4.74 and 4.35, *SD*s = .72 and .68 for consistent and inconsistent touchers respectively). These findings must be interpreted cautiously not only for their exploratory nature but because the overall model for this logistic regression was not statistically significant, $\chi^2(8, N = 69) = 11.66$, $p = .17$.

NEGATIVE EMOTIONALITY AS A MODERATOR OF THE RELATIONSHIP BETWEEN SELF-REGULATION AND CHILD ADJUSTMENT

Previous research has demonstrated that self-regulatory skills are linked to positive adjustment during childhood (Eisenberg, 2000), adolescence (Kobak, Cole, Ferenz-Gillies, & Fleming, 1993), and early adulthood (Shoda, Mischel, & Peake, 1990). These findings have spurred programmatic interest in how educators can help strengthen socioemotional functioning (*i.e.*, positive adjustment) by building self-regulatory skills. Children who are emotionally well-adjusted have a significantly greater likelihood of early school success, while children who experience emotional difficulty face increased risk of early school difficulty (Raver, 2002). Even though adjustment problems among young children are costly to their chances of achieving school readiness and subsequent academic success, self-regulatory problems that are identified early are often amenable to change. This study expands upon earlier work (Eisenberg, Guthrie et al., 2000) by testing whether variations in negative emotionality influence associations between self-regulation and adjustment among a sample of low-income children who have been followed longitudinally.

Until recently many researchers combined regulation and emotionality measures, a practice which made it difficult to tease apart the independent contribution of each factor in predicting child adjustment (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Eisenberg, Guthrie et al., 2000). Partitioning these factors is important, as emotionality is another dimension of temperament that predicts unique variance in the emergence of adaptive and maladaptive behaviors (Calkins, Gill, Johnson, & Smith, 1999; Eisenberg et al., 1995; 1997a; Lengua, 2002; 2003; Rubin, Coplan, Fox, & Calkins, 1995). Thus, growing evidence supports the utility of examining

emotionality and self-regulation as separate constructs. Moreover, individual differences in temperamental tendencies, particularly those reflecting variations in negative emotionality, may allow us to understand the conditions under which some children are buffered from the risks associated with low self-regulation while other children appear to be more vulnerable to sequelae associated with self-regulatory difficulties. In the present study, negative emotionality was defined as a temperamental disposition toward anger or frustration.

It may be possible to understand emotionality and self-regulation by examining their origins in temperament (Eisenberg, Fabes, Guthrie, & Reiser, 2000; Lengua, 2002; Rothbart & Bates, 1998; Rothbart, Ahadi, & Evans, 2000). In Rothbart's model, temperament is defined as a collection of relatively stable, physiologically based individual differences in reactivity and self-regulation. Likewise, many researchers have suggested that temperament forms a core around which personality develops as a result of interactions with the environment (*e.g.*, Caspi, Roberts, & Shiner, 2005; Caspi, Taylor, Moffitt, & Plomin, 2000; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Rothbart et al., 2000). Indeed, studies in behavioral genetics have established that individual differences in temperament, measured even during early childhood, are only partially heritable and thus are also influenced by environmental experiences (Emde & Hewitt, 2001).

Similarly, research by Goldsmith, Buss, and Lemery (1997) indicates that environmental factors contributed to the lion's share of variance in effortful control (sometimes labeled as emotion regulation) in 3- to 8-year-old twins. In sum, childhood emotionality and self-regulation can influence the development of adjustment problems and positive adjustment through children's reactions to socialization and contextual experiences, the selection or elicitation of experiences

(*e.g.*, Eisenberg & Spinrad, 2004), or the moderation of other predictors of adjustment (Rothbart & Bates, 1998).

Negative emotionality defined. According to Eisenberg (2000), child negative emotionality is "usually operationalized as a mix of different negative emotions such as dysphoria, anger, and anxiety" (p. 684). Following recommendations by Lengua, West, and Sandler (1998), the negative emotionality construct in the present study does not contain items measuring fearful, depressive, or conduct-problem symptoms (*i.e.*, items in the negative emotionality variable—the predictor—do not overlap with the externalizing and internalizing *outcome* variables). As described in the method section, we focused on one subtype of negative emotionality—children's susceptibility to anger and frustration.

Although negative emotionality has been implicated as a risk factor for externalizing behaviors (Eisenberg, Guthrie et al., 2000; Eisenberg et al., 2001; Lengua & Long, 2002; Rubin et al., 1995), not all negative emotions are associated with conduct problems. Only those components of negative emotionality that manifest irritability, such as anger or hostility, are apt to be linked to externalizing behaviors, whereas fear and sadness are not (Rothbart et al., 1994; Rothbart, Ahadi, Hershey, & Fisher, 2001). Negative reactions to novel situations during early childhood are a risk factor for internalizing problems more often than for externalizing problems even after accounting for family demographics and parenting practices (although the magnitude of the fear-internalizing link is weaker than the irritability-externalizing link; see Bates et al., 1991, for more on the internalizing-externalizing comparison). Thus, as suggested by Derryberry and Rothbart (1997), emotions such as anger/frustration likely tap the functions of the approach system and tend to predict externalizing symptoms, whereas sadness, anxiety, and fear likely tap the functions of

the withdrawal system or the behavioral inhibition system and tend to predict internalizing symptoms.

Main effects of negative emotionality. Negative emotionality may interfere with the attainment of stage-salient tasks (*e.g.*, secure attachment, autonomy, and self-regulation) in ways that affect later socioemotional development and achievement. As early as the preschool years, children exhibiting negative emotionality are more likely to respond with irritation to others' distress (Eisenberg et al., 1996; 1997a, 1997b) and are more likely to be overwhelmed by negative emotion, a response that interferes with prosocial behavior and peer acceptance. With respect to achievement, Fox and Calkins (2003) have argued that negative emotionality may interfere with a child's ability to explore and learn about the environment, which in turn may lead to later difficulty in the classroom. Additionally, it seems reasonable to assume that negative emotionality would also make it difficult for them to engage in on-task behaviors in the context of the classroom. For example, Gerardi and colleagues (1996) found that children who struggled on a cognitive Stroop-like test also displayed higher levels of reported anger and frustration, indicating co-occurring undercontrol of both attention and negative emotionality.

Similarly, Blair (2002, p. 119) contends that "young children characterized by negative emotionality are likely to experience difficulty in the application of higher-order cognitive processes simply because their emotional responses do not call for reflective planning and problem solving, and these skills are underused and consequently underdeveloped."

While high levels of negative emotionality may undermine early learning by limiting exposure to new experiences, a study by Howse and colleagues (2003a) suggests that the effects of negative emotionality on achievement in young children are inconsistent. In particular, after controlling for maternal education and child IQ in

their study, parent-reported negativity was found to be associated with lower math and listening comprehension scores, while it was unrelated to children's literacy achievement scores. Such inconsistencies in outcomes suggest that negative emotionality is not understood well enough. This study strives to reveal the role of negative emotionality in relation to child outcomes by focusing on its moderating effects, particularly the extent to which it attenuates or exacerbates the effects of self-regulation.

Self-regulation defined. In this study, self-regulation is conceptualized in terms of attentional and behavioral regulation. Following Eisenberg and colleagues (1997a) and Thompson (1994), self-regulation is defined as the process of modulating the occurrence, intensity, or duration of internal feelings through the redirection of attention and behavior. Attentional regulation is defined as the capacity to shift and focus attention as needed. Behavioral regulation refers to the ability to suppress or *initiate* the expression of appropriate responses as needed. It is possible to distinguish attentional from behavioral forms of regulation by the domain within which regulation is exercised. That is, attention regulation is an internal process involving *cognitions* whereas behavior regulation is an overt process involving the *expression* of behavior (Eisenberg, Guthrie et al., 2000, p. 1367). Prior research (Eisenberg, Guthrie et al., 2000) also supports the utility of differentiating between attentional and behavioral forms of regulation given their unique effects for children prone to negative emotionality. Thus attention and behavior regulation are examined as distinct constructs in the present study.

Main effects of self-regulation. The capacity to regulate attention and behavior is instrumental in helping children to form positive peer relationships during the preschool years (*e.g.*, Raver, Blackburn, Bancroft, & Torp, 1999). Children with good regulatory skills are better able to manage basic interpersonal relations in early

childhood, such as turn-taking, mutual regulation, and the sharing of internal states with others. Success in managing attention and behavior within social situations is associated with feelings of self-efficacy and self-esteem during adolescence. These skills allow children to establish healthy peer relationships later in life.

Interest in relations between self-regulatory skills and socioemotional adjustment among lower risk children has spawned a large body of research (*e.g.*, Eisenberg, 2001; Shoda, Mischel, & Peake, 1990), but comparatively few studies have been conducted on relations between self-regulatory processes and academic achievement for either low- or higher-risk children (Blair, 2002; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003a). The few studies that have been conducted on this topic indicate that children who are better at managing emotional arousal in the classroom should be more likely to focus attention on learning, stay on task, engage in self-monitoring, and complete work—behaviors that fall under the umbrella of self-regulation (Howse et al., 2003a, 2003b).

Although examining the direct effects of emotionality and self-regulation on children's outcomes is intrinsically interesting, the potential role of negative emotionality as a moderator of the relations between self-regulation and adjustment has important conceptual and applied implications. The current study goes beyond analyzing the direct effects of self-regulation and negative emotionality by testing whether the influence of a risk factor, such as negative emotionality, mitigates or exacerbates relations between attentional and behavioral forms of regulation and subsequent child adjustment.

Moderation by negative emotionality. The focus of child developmental research has expanded in the past two decades from identifying risk and protective factors to understanding how these factors operate as processes that lead to socioemotional and academic competence. Rather than studying which child, family,

or environmental factors predict adjustment, researchers are increasingly asking how (*i.e.*, through mediation) and under what conditions (*i.e.*, through moderation) such factors influence adjustment. The present study is geared toward addressing the moderation question by investigating whether variations in negative emotionality alter the relationship between self-regulation and child adjustment.

Research indicates that toddlers prone to negative affect are much less likely to utilize regulatory strategies such as distraction and redirection of attention (Calkins & Dedmon, 2000; Calkins & Johnson, 1998). Children who bring underdeveloped self-regulatory skills and high levels of negative emotionality into the classroom are at greater risk of encountering socioemotional and academic difficulties compared with those among their counterparts who also have problems with self-regulation but are low in negative emotionality (Eisenberg et al., 2000). The influence of a developmental process like self-regulation may therefore differ substantially across a sample of children based on the degree to which they are prone to negative emotionality.

There are mixed findings as to whether negative emotionality moderates the linkage between self-regulation and externalizing behaviors within lower-risk samples (Eisenberg, Fabes et al., 1996; Eisenberg, Guthrie et al., 1997a; Eisenberg et al., 2000). Four studies (Eisenberg, Fabes et al., 1996; Eisenberg, Guthrie et al., 2000; Lengua & Long, 2002, and Denham et al., 2003) are described below to illustrate this point. Eisenberg, Fabes, et al. (1996) found that child regulation (a composite of persistence and resistance to cheating on a puzzle-box task, parent and teacher reports of attention shifting/focusing, ego resiliency, and ego control) was most strongly associated with teacher and parent reports of externalizing behaviors among 8-year-old children that teachers rated as high in negative emotionality.

In contrast to these findings, a two-year follow-up with this same sample (Eisenberg, Guthrie et al., 2000) indicated that, while decrements in both behavioral and attentional regulation may compromise child adjustment, only the relationship between attentional regulation and adjustment was moderated by negative emotionality. That is, low attentional regulation (the average of parent and teacher reports of attention shifting/focusing) was linked to problem behaviors only if children were also high in negative emotionality, whereas behavior regulation (a composite of persistence and resistance to cheating on a puzzle-box task and parent and teacher reports of ego control) was predictive of problem behaviors for children both low and high in negative emotionality. Thus the inverse relationship between behavioral regulation and externalizing did not vary as a function of children's negative emotionality levels. In contrast, the inverse relationship between attentional regulation and externalizing was significant among children prone to negative emotionality.

A study by Lengua and Long (2002) examined whether self-regulation moderated associations between emotionality and adjustment among a community sample of third- through fifth-grade children. In their study, negative emotionality was assessed as a composite of maternal and child ratings on the fear and irritability subscales of the Early Adolescent Temperament Questionnaire (EATQ; Capaldi & Rothbart, 1992), the companion measure to the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001). Self-regulation was assessed via a composite measure of maternal and child ratings on the EATQ attention-regulation subscale and the CBQ impulsivity and inhibitory control subscales. Evidence for moderation by self-regulation was not detected in their study.[19]

[19] Lengua and Long (2002) acknowledged that the small sample size and analytic method, which focused on children at the middle of the self-regulation distribution instead of examining children with extreme values on self-regulation, may have contributed to these null findings.

A study by Denham and colleagues (2003) examined whether negative emotionality as measured by naturalistic observations in the preschool classroom moderated the relationship between emotion regulation and teacher-reported social competence. They assessed negative emotionality and emotion regulation during preschool as well as social competence during both preschool and a year later in kindergarten. In their study, emotion regulation was defined as the absence of dysregulated venting in response to situational problems experienced during free play with preschool peers. Their results revealed that concurrent relations between emotion regulation and preschoolers' social competence were stronger for children *high* in negative emotionality. In contrast to these cross-sectional findings, longitudinal relations between emotion regulation and kindergarteners' social competence were stronger for children *low* in negative emotionality. Thus, moderation by negative emotionality was observed for teacher-reported social competence at Time 1 and at Time 2 but for different groups of children (high negative emotionality at Time 1 and low negative emotionality at Time 2).

Denham et al. (2003) believe that the observed difference by level of emotionality may be attributable to experiential learning. In particular, preschoolers who experience fewer negative outbursts when they do feel negative (*i.e.*, children low in negative emotionality and high in emotion regulation) become more skilled in using emotion regulation strategies during their second year in a classroom setting as kindergartners. Cognitive maturation is likely to play a role here as well, but this was not assessed in their study. Denham's (2003) findings for preschool children's social competence are comparable in structure to research by Eisenberg and colleagues (Eisenberg, Fabes et al., 1996; Eisenberg, Fabes et al., 1997a), which also showed interactions between negative emotionality and regulation whereby regulation

buffered the effects of negative emotionality on problem behaviors among children with higher levels of negative emotionality.

Prior research thus indicates mixed findings for the role of negative emotionality when it is examined as a predictor of adjustment (*e.g.*, Howse et al., 2003a) or as a moderator of relations from attentional and behavioral forms of regulation to adjustment (*e.g.*, Eisenberg, Fabes et al., 1996; Eisenberg et al., 2000). This holds even if we disaggregate results among children who are high in negative emotionality (Eisenberg, Fabes et al., 1996), both low and high in negative emotionality (Denham et al., 2003), or exhibit all levels of negative emotionality (Lengua & Long, 2002). The current study sought to unravel these seemingly disparate findings pertaining to its moderating role for the relations between attentional and behavioral regulation and child adjustment.

Study Hypotheses

The present investigation aims to inform research on the effects of self-regulation by examining the conditions under which some children are buffered from the risks associated with low self-regulation while other children appear to be more vulnerable to sequelae associated with self-regulatory difficulties. Research such as this is particularly important given longitudinal findings, which suggest that early differences in the intensity and frequency of negative emotionality predict delinquent behaviors like substance abuse in adolescence (Chassin et al., 1993; Stice & Gonzales, 1998). It is therefore essential that tests of moderation are conducted because these analyses allow us to determine the extent to which risk factors, such as self-regulatory difficulties, may be mitigated and thereby pose a lesser threat to child adjustment.

In this spirit, we hypothesized that the relationship between attentional regulation and adjustment will be moderated by children's negative emotionality such that the relationship between low attentional and behavioral regulation and

maladjustment will be exacerbated for children with high negative emotionality and attenuated for children with low negative emotionality.

METHOD

Participants

At Time 1, 163 low-income, Head Start children ages 2.1 - 4.8 (*M* age = 4.20, *SD* = .44) and their caregivers were enrolled in a study on parenting and children's socioemotional development. Of these parents, 93% were mothers (*n* = 151), 4% were fathers (*n* = 7), and 3% were grandmothers (*n* = 5).[20] Low-income status was determined by Head Start eligibility guidelines. Within Upstate New York, 60% (*n* = 98) of the families resided in a medium-sized city and the remaining families resided in a rural area. Between-site comparisons suggest that the rural and urban samples were strongly racially segregated, with few African American children enrolled in the rural Head Start centers and few White children enrolled in the urban Head Start centers, $\chi^2(1, N = 163) = 68.57, p < .001$. Caregivers were, on average, 29 years of age and had completed high school. Most families reported incomes of $17,000 per year or less and median levels of yearly income were in the $13,000-$15,000 range. Rural families had incomes which were approximately $1,000 higher than rural families on average, $t(156) = 2.17, p < .05$ ($14,500 vs. $13,500).

Analyses of between-site differences among mothers suggest that rural and urban mothers differed on demographic characteristics. Rural mothers were slightly older, $t(160) = 1.75, p < .10$ (30.92 vs. 28.73 years), more educated, $\chi^2(7, N = 154) = 22.52, p < .01$ (some college vs. high school degree), more likely to be married, $\chi^2(1, N = 163) = 23.61, p < .001$ (55% rural vs. 22% urban, *n*s = 35 and 18), and

[20] Given the small number of grandmothers and fathers who participated in the study at Time 1 (*n* = 12), the terms "mother" and "caregiver" are used interchangeably in the paper.

experienced less depression as measured by the Center for Epidemiological Studies of Depression (CES-D) scale, $t(145) = -2.40$, $p < .05$ (11.22 vs. 14.76), than urban mothers. Surprisingly, the urban sample had a higher proportion of girls than the rural sample, $\chi^2(1, N = 162) = 3.95$, $p < .05$ (57% vs. 41%, *n*s = 56 and 26).

Two years later at Time 2, follow-up interviews were conducted with 100 of the 163 families that had participated at Time 1. Attrition analyses indicated that children who participated at both Time 1 and 2 had mothers who experienced fewer depressive symptoms $t(145) = -3.07$, $p < .01$ (11.70 vs. 16.22) and were slightly more likely to be from urban families, $\chi^2(1, N = 163) = 3.01$, $p < .10$ (67% vs. 53%, *n*s = 34 and 66). No differences were detected between followed and non-followed families on income, maternal education, caregiver age, ethnic minority status, or family size.

As at Time 1, between-site comparisons indicated that families were strongly racially segregated with more African American children in urban settings, $\chi^2(1, N = 100) = 41.41$, $p < .001$. Rural families had incomes that were approximately $2,000 higher than those of urban families, $t(96) = 2.61$, $p < .05$ ($15,000 vs. $13,000). Site differences also remained prevalent among rural and urban mothers. Specifically, rural mothers were more likely to have high school degrees or higher, $\chi^2(7, N = 95) = 19.93$, $p < .05$ (85% vs. 63%, *n*s = 28 and 39) more likely to be married $\chi^2(1, N = 100) = 25.99$, $p < .001$ (67% rural vs. 17% urban, *n*s = 23 and 11), and were less depressed, $t(91) = -2.23$, $p < .05$ (9.30 vs. 13.02) than their urban counterparts.[21]

Of the 100 children who participated at Time 2, 50 were female (*M* age = 4.20, *SD* = .44). Descriptive analyses on ethnicity showed that 52% of the children were African American (*n* = 52), 32% were Caucasian (*n* = 32), 11% were biracial (*n* = 11), 2% were Asian/Pacific Islander (*n* = 2), 2% were Hispanic/Latino/Latina (*n* = 2),

[21] When five grandmothers were excluded from the sample, rural mothers were slightly older than their urban counterparts, $t(93) = 1.86$, $p < .10$ (31.24 vs. 28.48 years).

and the remaining 1% were American Indian/Alaska Native (n = 1). The rural and urban subsamples were combined for all analyses because a consistent pattern of interactions was not detected between site location and predictor variables.[22]

Procedures

Time 1. During the fall of 1997 and 1998, two interviewers from the ESDS visited the parents' and study children's homes. Female caregivers reported on their own behavior, child adjustment, and family functioning. Parent-child interactions during specific tasks were also videotaped in order to assess the quality of mother-child relationships. About one month after the home interviews, children were visited in their Head Start classrooms where data were collected on their regulatory behaviors during a delay-of-gratification task. Six months after each wave of home interviews, Head Start teachers were mailed the Social Competence and Behavior Evaluation scale (SCBE; LaFreniere, Dumas, Capuano, & Dubeau, 1992) and asked to rate children's classroom behaviors.

Time 2. A pair of interviewers visited the families' homes when most of the study children were in first grade, two years after the initial assessment. During these interviews, female caregivers completed extensive measures regarding family members and the study children. Parents signed consent forms allowing the investigative team to obtain first-grade academic records in addition to teacher ratings of the study children's adjustment. After each parental interview was completed, the parent was debriefed, thanked, and reimbursed $20. Six months after each wave of

[22] Although a consistent pattern of interactions was not detected between site location and the predictor variables, two interactions between behavior regulation (at both time points) and site were detected at the tend level for first-grade children's externalizing behaviors, βs = .69 and .66, ps = .08 and .05, respectively. Specifically, behavior regulation at both time points was associated with fewer externalizing behaviors for rural children and unrelated to externalizing behaviors for urban children. These analyses were not adjusted by covariates.

home interviews, teachers were mailed the SCBE and asked to rate children's classroom behaviors.

Measures

Attentional regulation. Caregivers' ratings on the attention-focusing subscale of the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001) were used to assess children's attentional regulation at Time 1. Designed for use with parents of 3- to 7-year old children, the 9-item attention-focusing subscale measures children's tendency to maintain attentional focus upon tasks (*e.g.*, "has an easy time leaving play to come inside for school work" and "when picking up toys, usually keeps at the task until it's done"). Using 7-point scales, parents rate how true each statement is about their child during the past six months (1 = extremely untrue, 7 = extremely true).

Scores represent the mean score of the scale items. Psychometric properties for the current sample, Alpha = .64, M = 4.53, SD = .86, corresponded to overall scale norms reported by the CBQ authors (2001), Alpha = .74, as well as descriptive norms by child age: M = 4.79, SD = .81 for 4- and 5-year-olds, and M = 4.51, SD = .81 for 3-year-olds (personal communication with Stephan Ahadi on December 13, 2003). As an assessment tool, the CBQ has demonstrated adequate reliability and validity across numerous US samples. In the current study, the attention regulation measure was only administered at Time 1.

Negative emotionality. Children's disposition toward negative emotionality was assessed by caregivers' rating on the anger/frustration subscale of the CBQ (Rothbart, Ahadi, Hershey, & Fisher, 2001) at Time 1. The 13-item anger/frustration subscale measures the amount of negative emotionality related to the interruption of ongoing tasks or goals. Sample items include: "Gets mad when even mildly criticized" and "Has temper tantrums when s/he doesn't get what s/he wants." This

subscale is scored in the same manner as the attention-focusing subscale. Psychometric properties for the current sample, Alpha = .80, *M* = 4.88, *SD* = .95, corresponded well to the overall scale norms reported by the CBQ authors (2001), Alpha = .76, as well as descriptive norms by child age: *M* = 4.51, *SD* = .79 for 4- and 5-year-olds, and *M* = 4.68, *SD* = .83 for 3-year-olds (personal communication with Stephan Ahadi on December 13, 2003). In some analyses a dichotomous negative emotionality variable was used. Based on the median split, 53% (*n* = 85) of the sample was low in negative emotionality and 47% (*n* = 76) was high in negative emotionality.

Behavioral regulation at Time 1. Behavioral regulation in the classroom context was assessed during a standard delay-of-gratification task. Videotaped assessments were completed in a storage/office space adjoining the child's Head Start classroom. For the delay task, each child was invited by two interviewers to play a "story-telling game" with a small, wooden box that contained animal figures. Once seated, the "special" box was placed on the table in front of the child. After introducing the game, the box, and the idea that there was "something really neat" inside the box, one interviewer left the room for six minutes and asked the child not to touch the box until she returned. The remaining interviewer stayed in the room to videotape "the wait" under the pretense of wanting to videotape "the story" that was to follow.

The Time 1 behavioral regulation measure was based on the number of seconds prior to touching the desired object during the 6-minute delay task (Cohen's Kappa = .89). Those children who did not touch the object received scores of 360 (*e.g.*, 6 minutes x 60 seconds). On average, children waited 5 minutes prior to touching the object with nearly 80% of the sample (*n* = 97) waiting for 360 seconds, the entirety of the task. The over-constrained nature of the delay task, which required

children to wait in a room with a new adult pointing a video camera toward them, may have contributed to this ceiling effect. Task performance did not vary significantly by child gender, age, or race.

Behavioral regulation at Time 2. To measure behavioral regulation, children participated in Kochanska's (1995) resistance-to-temptation task. This task has been used successfully over the past decade to tap aspects of children's behavioral regulation (see Kochanska, 1995; Kochanska & Aksan, 1995; Laible, 2004; & Laible & Thompson, 2000). To our knowledge, however, this was the first time the resistance-to-temptation task has been used outside of a laboratory setting. About 60 minutes into the home visit, children were told that they had a job to do while their mothers were busy finishing paperwork in the other room. Approximately 3 to 4 feet away from the child, interviewers stacked two crates on top of each other to form shelves, which they proceeded to fill with attractive toys. The toys on the shelves included a musical keyboard, a gumball machine, dolls, a small football, action figures, and a fighter jet. Next to the shelves and directly in front of the child, interviewers placed mixed plastic cutlery and two empty silverware trays. The interviewer asked the child to sort the cutlery into separate spaces on two silverware trays. The child was told that, if the sorting task was completed before the interviewer returned, the cutlery should be put back into plastic bags, "forks in this bag, spoons in this one, and knives in this one." Interviewers told children "not to touch any of the toys on the shelves" while they were gone.

The study child was left alone in a room (typically the living room) with the cutlery, trays, toys, and a video camera placed on a tripod to record the task. After 3 minutes, the cameraperson (or interviewer if the home visit was conducted by one person) returned to the room for one minute. During this minute, the cameraperson walked over to the toys, played with them; turned on the electric keyboard, played

with it; and then walked out of the room unobtrusively. While playing with the toys, the cameraperson avoided eye contact with the child and did not respond to any bids from the child for attention. If the child protested that the task was "too hard" at any point other than the 1-minute temptation interlude, the interviewer replied from an adjoining room "do your best." If the child continued to protest, the interviewer instructed the child to "just sit there" until time was up. Eight minutes after the cameraperson finished playing with the toys (*i.e.*, at the 12-minute mark), the interviewer entered the room, announced that the game was over, acknowledged the child's performance, and said it was "now okay" to play with any of the toys on the shelves.

Child behavior was coded from videotapes. Episode start time was defined as the second after the interviewer gave the final instruction not to touch any of the toys on the shelves. Global codes were used to determine whether the child ever touched the shelves or the toys and the time that elapsed prior to touch. A touch was defined as contact between any part of the child's body and the prohibited objects/shelves while the child was facing the shelves.

Resistance-to-temptation data were available for 96 of the 100 participants at Time 2. Of the four tasks not included, one task was not videotaped because the home visit was too hectic, video camera malfunction rendered one task unusable, and the remaining two tasks deviated severely from task protocol (i.e., a sibling plays with prohibited objects). Behavioral regulation was defined as the number of minutes children were capable of persisting during the temptation task (M = 9.06, SD = 4.13). Twenty-one tasks were ended prior to 12 minutes (M = 10.49, SD = 1.04, range = 7.40-11.49). For 3 of the 21 tasks that ended early, the child clearly displayed behaviors associated with being upset; thus 18 tasks were adjusted to 12 minutes and the remaining 3 cases were not. Thirty-seven tasks ended after the 12 minute mark (*M*

= 12.95, *SD* = 1.09, range = 12.01-17.04) and were adjusted down to 12 minutes.[23] Ten tapes were used to establish reliability between two coders. The intercoder agreement for time at first touch was perfect. Child location at the start of the episode (*i.e.*, on the floor or on the chair), adult presence, sibling presence, and whether the child left the room were also coded but not used in analyses.

Child Outcomes

Socioemotional adjustment. Teacher report on the Social Competence and Behavior Evaluation scale (SCBE; LaFreniere, Dumas, Capuano, & Dubeau, 1992) was used to assess children's socioemotional adjustment at Time 1 and Time 2. The SCBE is an 80-item measure that includes separate subscales for socially competent, externalizing, and internalizing behaviors. Following Raver and Zigler (1997), the SCBE subscales were not combined to form a global index of socioemotional functioning because the empirical literature suggests that social competence and "problem behaviors," such as externalizing and internalizing behaviors, represent separate constructs (pp. 375-376). As an assessment instrument, the SCBE has demonstrated both reliability and validity as a measure of adaptive and maladaptive functioning among low-and middle-income children (Raver & Zigler, 1997).

Teachers rated the occurrence of behaviors on a 6-point scale (1 = never; 2 or 3 = sometimes; 4 or 5 = often; 6 = almost always). The social competence subscale (α_{T1} = .96, α_{T2} = 96) consists of 40 items (*e.g.*, is self-confident; cooperates with other children in group activities). The externalizing subscale (α_{T1} = .94, α_{T2} = .95) consists of 20 items that are reverse-scored to reflect less externalizing behavior (*e.g.*, bullies weaker children; opposes the teacher's suggestions). The internalizing subscale (α_{T1} = .86, α_{T2} = .86) also consists of 20 items and is reverse-scored (*e.g.*, is sad, unhappy, or depressed). Subscale scores were converted to t-scores, with separate norms for child

[23] Of the 37 tasks that ended after 12 minutes, 35% (*n* = 13) ended prior to 12 minutes and 30 seconds.

gender. For interpretive purposes, the externalizing and internalizing t-scores were multiplied by -1 so that higher values reflect higher levels of externalizing and internalizing behaviors. Complete SCBE data were available for 83 children. Thus some data were missing because fifteen questionnaires were not returned and two questionnaires were returned blank. Missing forms, compared with those that were returned, differed by child ethnic minority status, $t(161) = 2.76$, $p < .05$, and by geographic location, $t(161) = 2.85$, $p < .05$, resulting in fewer completed forms for White, rural children.

Academic achievement. Academic grades in reading, math, and writing were extracted from first-grade report cards to measure academic achievement. Letter grades for each child were averaged over all quarters and measured on a 5-point scale (0 = unsatisfactory progress; 1 = needs improvement; 2 = satisfactory progress; 3 = very good; 4 = excellent). To maintain a 5-point scale, grades with pluses were rounded up to the next grade and grades with minuses were rounded down. Information about the protocol used to code academic grades is presented in Dissertation Appendix A.

Complete academic data were available for 80 children. Of the missing data, 11 children were in schools that refused to release report cards. Of the 11 schools that did not release report cards, 4 were charter schools and all were from Rochester. Three children made residential moves and three children transferred to different schools, which precluded report card collection. Two children had written comments on their report cards so it was not possible to assign letter grades in those cases. Also, the Principal Investigator of the Cornell Early Social Development Study determined that time constraints made it impossible to code one report card. Neither extracted report card data nor missing report card data differed by child ethnic minority status, child gender, family income, or geographic location.

Child and family covariates. Due to the well-established relationship between socioeconomic characteristics and child academic performance (*e.g.*, Brody, 1992; Duncan, Yeung, Brooks-Gunn, & Smith, 1998), Time 1 reports of maternal education and household income were statistically controlled in the prediction of academic achievement. To compare findings for academic outcomes with those for non-academic outcomes, maternal education and income were also statistically controlled in regression analyses where socially competent, externalizing, and internalizing behaviors were the outcome variables of interest.[24] Due to the low variation among these indicators in this sample, maternal education and household income were not expected to explain unique variance in child adjustment.

Other demographic factors at Time 1, such as maternal age, workforce entry, child age, and child race were also used as covariates. While these socioeconomic and demographic factors were peripheral to the study aims presented here, estimating their effects allowed us to assess whether the hypothesized effects were robust net of the potentially confounding influence of these factors.

Caregiver education at Time 1 was coded on an 8-point scale with higher values reflecting more education (*e.g.*, 0 = less than an 8th grade education; 1 = 9th-11th grade; 2 = GED receipt; 3 = High School degree; 4 = some college; 5 = Associates' degree; 6 = 4-year college degree; 7 = graduate study or greater). Caregivers' reported their household income on a categorical, 6-point scale with higher values reflecting greater income (0 = less than $13,000; 1 = $13,001-$15,000; 2 = $15,001-$19,000; 3 = $19,001-$25,000; 4 = $25,001-$31,000; 5 = greater than $31,000). Maternal workforce entry was coded on a 2-point scale with 1 coded as entry into the workforce at least once since the study child's birth and 0 coded as no participation in the

[24] Compared with children's academic outcomes, the relations between social capital variables, such as family income and maternal education, and socioemotional outcomes are not considered to be well-established (Garmezy, 1991; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Raver, 2002; 2004).

workforce since the study child's birth (*e.g.*, 0 = never entered, 1 = entered). In this sample, 26% of mothers had never entered the workforce and 74% had entered the workforce at least once (*n*s = 41 and 106 respectively).

Caregiver's age was coded continuously (M = 29.60, SD = 7.84). The ages of five grandmothers were included in this variable, thereby increasing the mean age for caregivers in this sample. On average, the grandmothers were 53 years old (range = 46- to 61-years, n = 5) and mothers were 29 years old (range = 18-51-years, n = 156). Child race was coded such that 0 = White or Asian and 1 = not White.

Statistical Procedures

Structural equation modeling. Structural Equation Modeling (SEM) with Amos 5.0 software (Arbuckle & Wothke, 1999) was used to estimate the moderation hypotheses. Currently, full information maximum likelihood estimation (FIMLE) in Amos is one of the only unbiased techniques for handling randomly missing data (Schafer & Graham, 2002). Typically, statistical packages with ordinary least squares (OLS) regression use listwise or pairwise deletion to eliminate observations where some of the data are missing. However, in the presence of randomly missing data, the Amos program computes FIMLEs, which allow the entire sample to be included in the analyses. Unlike imputation techniques, which replace missing data through various types of estimation, FIMLE is not an imputation method and therefore does not alter the distribution of variables. This is an important feature for the present study given the relatively small sample of 100 families who participated in the follow-up study at Time 2. A technical description of the EM Algorithm, the method used by the Amos program to obtain FIMLE, is provided in Dissertation Appendix B. In our path analyses, behavior regulation at Time 1, behavior regulation at Time 2, and the child outcomes were modeled as endogenous variables. Systematic deviations from

multivariate normality were not detected among the endogenous variables in the present study.

It was expected that the paths from attentional regulation and behavioral regulation to child adjustment would be moderated by negative emotionality. To test this, nested structural equation models were fit for two groups (*i.e.,* low vs. high negative emotionality) to determine whether the paths from regulation to each outcome differed as a function of negative emotionality levels (*e.g.*, Judd & Kenny, 1981; Holmbeck, 1997; Lengua & Long, 2002). For each of these two paths, one path was constrained to be equal across groups (low emotionality = high emotionality) while the other path was permitted to vary across the groups in order to assess fit. To test for significant differences across groups, a full information maximum likelihood estimate was calculated to compare the difference between the χ^2 for the constrained model and the χ^2 for the varying effect model. In SEM, a χ^2 statistic also represents the interaction term. A significant difference in regression paths between the low and the high groups was interpreted as an interaction with (*i.e.*, moderation by) negative emotionality. If the parameters were found to be equivalent across groups (*i.e.*, if the same model fit the data for children low and high in negative emotionality), then evidence for moderation was not present (Baron & Kenny, 1986; Eisenberg, Guthrie et al., 2000).

Evaluation of model fit. Two goodness-of-fit indices were used to evaluate the overall fit for the models: the root mean square error of approximation (RMSEA) and the incremental fit index (IFI). As a measure of fit, the RMSEA does not penalize for model complexity. An RMSEA of .05 or less indicates a close fit, whereas an RMSEA of .08 or less indicates an acceptable fit in relation to the degrees of freedom (Arbuckle & Wothke, 1999). IFI values close to 1 indicate a very good fit (Arbuckle

& Wothke, 1999). In the present study, statistical significance was defined as $p < .05$ and statistical trends were defined as $p < .10$.

RESULTS

Descriptive statistics are presented in Table 3.1 and intercorrelations among the study variables are presented in Table 3.2. Corresponding descriptive and correlation tables not split by negative emotionality are presented in Appendices 3A and 3B, respectively. Differences by negative emotionality and key correlations are described below.

As shown in Table 3.1, four effects by negative emotionality were detected among the study variables. Children with lower negative emotionality had better attention regulation skills, $t(159) = 4.52$, $p < .01$ (4.80 vs. 4.22) and *fewer* behavior regulation skills at Time 2, $t(93) = -2.37$, $p < .05$ (8.23 vs. 10.18). Head Start teachers rated children low in negative emotionality as more socially competent at Time 1, $t(131) = 2.30$, $p < .05$ (49.72 vs. 46.03) with fewer externalizing behaviors at Time 1, $t(131) = 2.44$, $p < .05$ (47.08 vs. 43.19).[25]

Correlations among the self-regulation variables. For children *low* in negative emotionality, attention regulation was related to greater behavior regulation at Time 2, $r(51) = .36$, $p < .01$, and unrelated to behavior regulation at Time 1. For children low in negative emotionality, comparable levels of behavior regulation were observed across the two time points, $r(39) = .43$, $p < .01$.

For children *high* in negative emotionality, attention regulation was associated with greater behavior regulation at Time 2, $r(44) = .42$, $p < .01$, and unrelated to behavior regulation at Time 1. Compared with their peers who were low in negative

[25] In order to examine mean differences in externalizing behaviors, the original (*i.e.*, non-reversed) externalizing t-scores were used. For this t-test, higher values reflect *lower* levels of externalizing behaviors.

Table 3.1 Descriptive Data Split by Children's Negative Emotionality (*N*s = 85 and 76 Respectively)

	Low			High		
Variable	*M* (*SD*)	Range	*N*	*M* (*SD*)	Range	*N*
Attention regulation [a]	4.80 (0.83)	2.88-6.44	85	4.22 (0.80)	2.25-6.33	76
Behavior regulation T1	286.96 (128.62)	0.67-360.00	64	313.06 (107.31)	0.34-360.00	60
Behavior regulation T2 [a]	8.23 (4.55)	0.04-12.00	51	10.18 (3.22)	1.27-12.00	44
Social competence T1 [a]	49.72 (9.54)	30.00-70.00	71	46.03 (8.84)	30.00-70.00	62
Social competence T2	48.80 (9.89)	30.00-68.00	44	47.66 (8.92)	30.00-66.00	38
Externalizing T1 [a]	47.08 (9.06)	30.00-70.00	71	43.19 (9.31)	30.00-70.00	62
Externalizing T2	49.57 (10.34)	32.00-70.00	44	45.82 (10.21)	30.00-65.00	38
Internalizing T1	47.35 (9.91)	30.00-70.00	71	45.76 (7.85)	30.00-70.00	62
Internalizing T2	49.07 (9.45)	34.00-67.00	44	48.66 (10.04)	30.00-70.00	38
Reading	2.15 (1.13)	0.00-4.00	41	2.25 (0.99)	0.00-4.00	38
Math	2.57 (1.09)	0.00-4.00	41	2.35 (0.85)	0.50-4.00	38
Writing	1.94 (1.00)	0.00-3.67	41	1.91 (1.06)	0.00-4.00	38
Maternal age	29.40 (7.74)	19.00-61.00	84	29.64 (7.98)	18.00-55.00	76
Maternal education	3.25 (1.53)	1-7	80	3.11 (1.40)	0-7	73
Workforce entry	0.73 (0.45)	0-1	84	0.74 (0.44)	0-1	74
Income category	1.53 (1.55)	0-5	83	1.48 (1.69)	0-5	73
Marital status	0.32 (0.47)	0-1	85	0.34 (0.48)	0-1	76
Child age	4.18 (0.42)	2.86-4.81	85	4.21 (0.45)	2.07-4.81	75
Child race not White	0.62 (0.49)	0-1	85	0.67 (0.47)	0-1	76

[a] Denotes a significant difference ($p < .05$) between children low and high negative emotionality.

Table 3.2 Intercorrelations Among the Variables for Low (Below Diagonal) and High (Above Diagonal) Negative Emotionality

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Attention reg.	--	-.08	.42**	.13	.08	-.08	-.00	-.13	-.02	-.05	-.02	-.05	-.12	.11	.09
2. Behavior reg. T1	.18	--	.19	-.01	.12	-.19	-.15	.07	-.21	-.03	-.11	-.02	-.04	-.03	-.17
3. Behavior reg. T2	.36**	.43**	--	.14	-.05	-.03	.03	.23	.20	.13	.20	-.02	.05	.24	.10
4. Social comp. T1	-.06	.01	.35*	--	.30	-.65**	-.12	-.68**	-.22	.14	.22	-.08	-.02	.38**	.05
5. Social comp. T2	.10	-.27	.18	.29+	--	-.56**	-.65**	-.14	-.73**	.61**	.47**	.50**	.17	.15	-.14
6. Externalizing T1	-.05	-.15	-.34*	-.52**	-.03	--	.48**	.45**	.40*	-.28	-.33+	-.06	-.16	-.42**	.20
7. Externalizing T2	.00	.22	-.21	-.28+	-.52**	.43**	--	-.10	.59**	-.16	-.17	-.01	-.07	-.29+	.22
8. Internalizing T1	.17	-.02	-.24	-.76**	-.27+	.48**	.24	--	.23	.18	.23	.14	.03	-.23+	-.15
9. Internalizing T2	-.01	.14	.06	.03	-.53**	-.00	.34*	.24	--	-.43*	-.16	-.42*	-.14	.12	.09
10. Reading	.38*	.13	.35*	.28	.37*	-.12	-.41*	-.42*	-.31+	--	.72**	.80**	-.03	.03	.10
11. Math	.25	.02	.29+	.25	.35*	-.16	-.41*	-.37*	-.26	.75**	--	.65**	-.11	.24	.18
12. Writing	.40*	-.01	.35*	.23	.54**	-.08	-.37*	-.22	-.34*	.75**	.71**	--	-.12	-.05	.19
13. Maternal age	.32**	.05	.09	.09	-.02	-.19	-.04	-.03	.10	.21	.20	.23	--	.11	-.37**
14. Maternal educ.	.01	-.16	.10	.40**	.33*	-.15	-.37*	-.30*	-.17	.16	.25	.10	.23*	--	.20+
15. Workforce entry	.00	-.09	.00	.04	.23	.02	.06	.11	-.32*	-.25	-.23	-.28+	-.12	.07	--
16. Income category	.21+	.12	.20	-.02	.10	-.18	-.03	-.04	-.04	.27+	.35*	.31+	.33**	.18	-.00
17. Marital status	.13	.01	.14	-.11	.30*	.09	-.03	.03	-.17	.26	.29+	.18	.22*	.35**	-.04
18. Child age	.07	-.12	.29*	.29*	.02	-.17	.19	-.06	.26+	-.06	.08	-.03	.07	.26*	-.02
19. Child not White	.07	-.03	-.13	-.22+	.01	.16	.26+	.21+	.05	-.25	-.29+	-.21	-.26*	-.22*	.19+

Note. For low negativity *n*s = 31 to 85; for high negativity *n*s = 30 to 76.
+$p < .10$. *$p < .05$. **$p < .01$.

Table 3.2 (CONTINUED)

Variable	16	17	18
1. Attention reg.	.17	.14	-.18
2. Behavior reg. T1	-.25+	-.27*	-.05
3. Behavior reg. T2	.24	.24	.16
4. Social comp. T1	.03	.18	.11
5. Social comp. T2	.01	-.07	-.14
6. Externalizing T1	-.04	-.01	-.01
7. Externalizing T2	-.06	.08	.21
8. Internalizing T1	-.23+	-.14	.02
9. Internalizing T2	.18	.17	.19
10. Reading	-.06	-.17	.07
11. Math	.13	.09	-.06
12. Writing	-.05	-.12	.02
13. Maternal age	-.03	.21+	.10
14. Maternal educ.	.32**	.16	-.01
15. Workforce entry	.26*	-.04	.13
16. Income category	--	.33**	.02
17. Marital status	.30**	--	.09
18. Child age	.20+	.08	--
19. Child not White	-.24*	-.30**	-.23*

Note. For low negativity *n*s = 31 to 85; for high negativity *n*s = 30 to 76.
+$p < .10$. *$p < .05$. **$p < .01$.

emotionality, children high in negative emotionality displayed inconsistent levels of behavior regulation across the two time points, $r(35) = .19$, $p = .28$. Taken together, attention regulation prior to school entry was associated with greater behavior regulation at Time 2, irrespective of parent-reported negative emotionality. In contrast, zero-order correlations between behavior regulation at Time 1 and behavior regulation at Time 2 did differ by parent-reported negative emotionality (*i.e.*, stability across behavior regulation measures was observed only for children low in negative emotionality).

Correlations between self-regulation and child outcomes. For children low in negative emotionality, attention regulation was positively correlated with reading and writing grades, rs(41) = .38 and .40, ps < .05, but not with math grades, $r(41) = .25$, $p = .11$. Attention regulation was also unrelated to children's socioemotional adjustment. Among children low in negative emotionality, behavior regulation at Time 1 was unrelated to the outcome variables. In contrast, behavior regulation at Time 2 was positively correlated with children's reading, math, and writing grades, rs(40) = .35, .29, and .35, ps < .05, .10, and .05, respectively. The pattern of correlations among children high in negative emotionality was in stark contrast to the pattern observed for children low in negative emotionality. Specifically, for children high in negative emotionality, attention regulation, behavior regulation at Time 1, and behavior regulation at Time 2 were uncorrelated with all six measures of child adjustment.

Multivariate Analyses

Regression coefficients for all variables in the moderation models estimating the paths from attention regulation, behavior regulation at Time 1, and behavior regulation at Time 2 to child adjustment are presented in Appendices 3C, 3D, and 3E respectively.

Academic outcomes. The path from attention regulation to children's reading achievement was moderated by negative emotionality even after the effects of child age, child race, maternal age, maternal education, workforce entry, marital status, and income category were statistically controlled.[26] As depicted in Figure 3.1, negative emotionality moderated the relationship between children's attention regulation and their reading, χ^2 (1, N = 161) = 3.32, $p < .10$, IFI = 1.00, RMSEA = .06. These findings indicate that children who displayed attention regulation skills and were low in negative emotionality earned higher reading grades compared with those among their peers who also displayed attention regulation skills but were high in negative emotionality. As hypothesized, attention regulation skills predicted reading achievement for children who experienced low levels of negative emotionality. Similar relations were not observed for children who experienced high levels of negative emotionality. In contrast to the attention regulation-achievement findings, the paths from behavioral regulation (assessed at Time 1 and 2) to achievement did not vary as a function of negative emotionality. Therefore, the path from attentional regulation to reading achievement appears to be more important for children low in negative emotionality, whereas the paths from behavioral regulation to achievement do not appear to differ by children's negative emotionality.

Socioemotional outcomes. The paths from attentional and behavioral regulation (both assessed at Time 1) to children's socioemotional adjustment were not moderated by negative emotionality. With respect to the relations between behavior regulation and socioemotional adjustment, one interaction was detected for children's externalizing behaviors. As depicted in Figure 3.4, behavior regulation observed in

[26] As depicted in Figures 3.2 and 3.3, comparable, although statistically non-significant, moderation findings were observed for the relations between attention regulation and children's math, χ^2 (1, N = 161) = 2.48, p = .12, and writing, χ^2 (1, N = 161) = 2.59, p = .11, grades. Fit indices for children's math and writing grades were as follows: math, IFI = 1.00, RMSEA = .06, and writing grades, IFI = 1.00, RMSEA = .06.

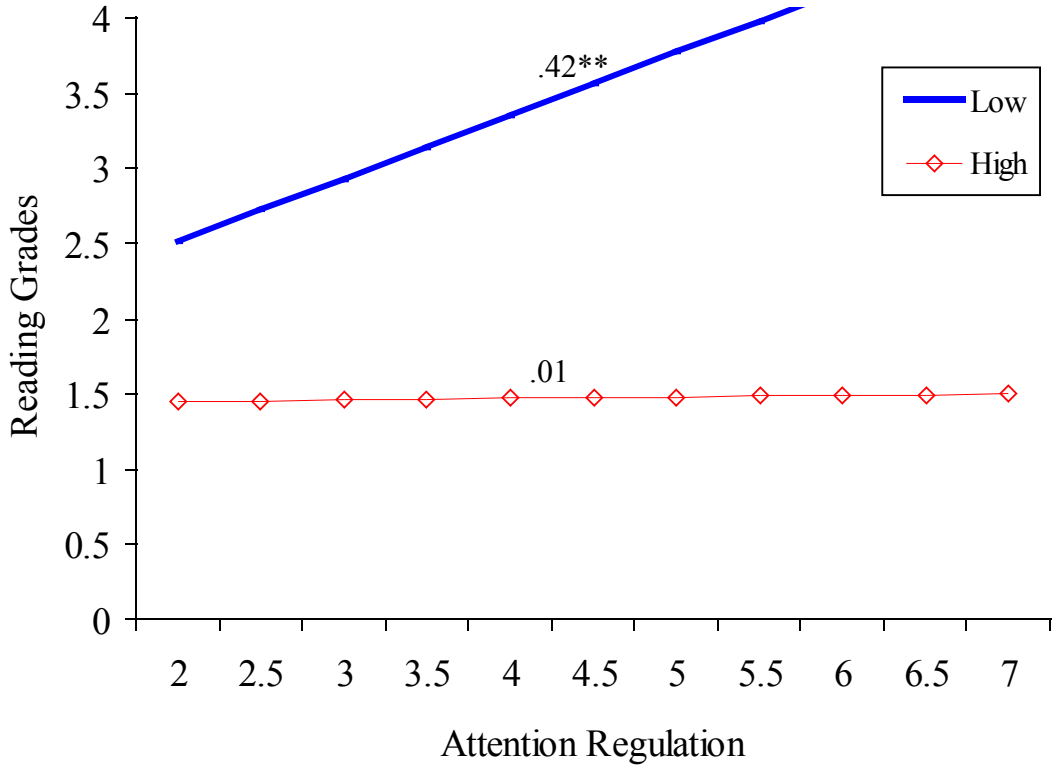

Figure 3.1. Effect of Attention Regulation on Reading Performance at Time 2 Split by Negative Emotionality at Time 1 (N = 161)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid line represents slope for children low in negative emotionality. Dotted line represents slope for children high in negative emotionality.

+p < .10. *p < .05. **p < .01.

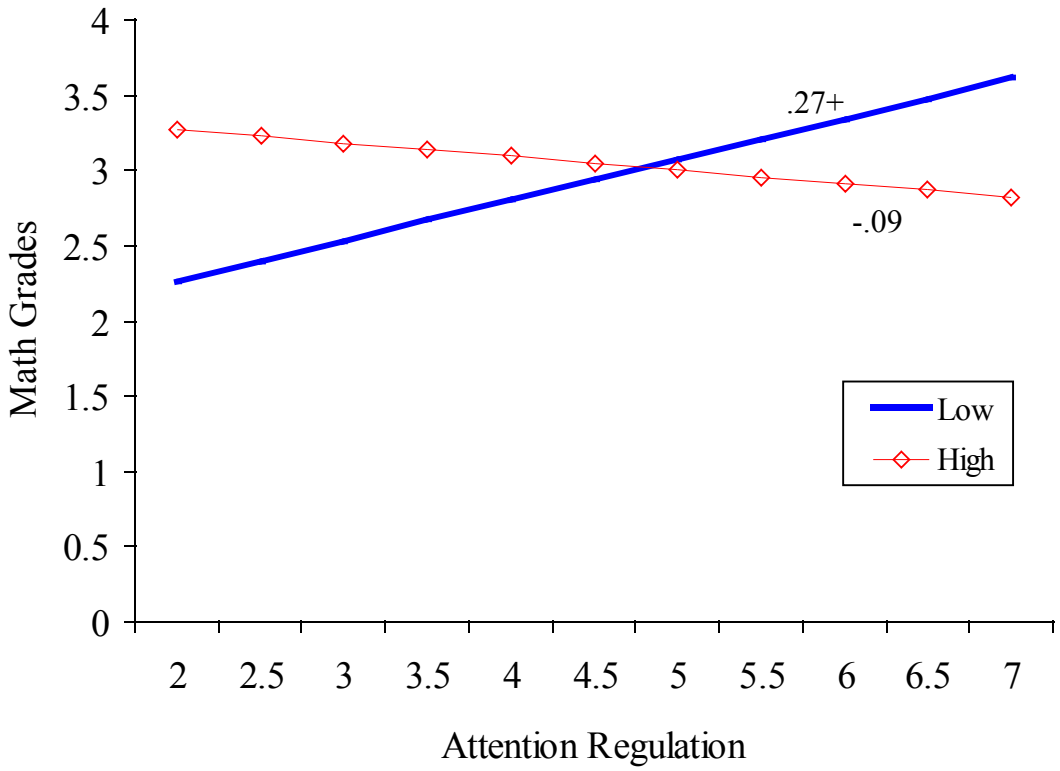

Figure 3.2. Effect of Attention Regulation on Math Performance at Time 2 Split by Negative Emotionality at Time 1 ($N = 161$)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid line represents slope for children low in negative emotionality. Dotted line represents slope for children high in negative emotionality.

$+p < .10$. $*p < .05$. $**p < .01$.

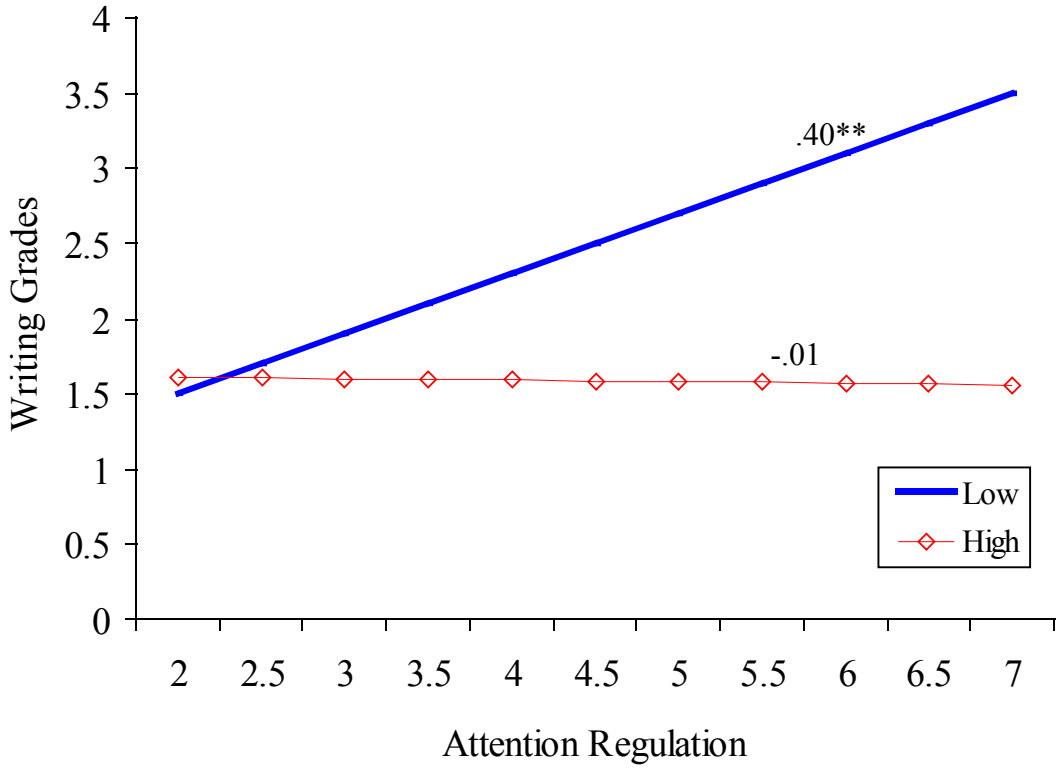

Figure 3.3. Effect of Attention Regulation on Writing Performance at Time 2 Split by Negative Emotionality at Time 1 ($N = 161$)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid line represents slope for children low in negative emotionality. Dotted line represents slope for children high in negative emotionality.

$+p < .10$. $*p < .05$. $**p < .01$.

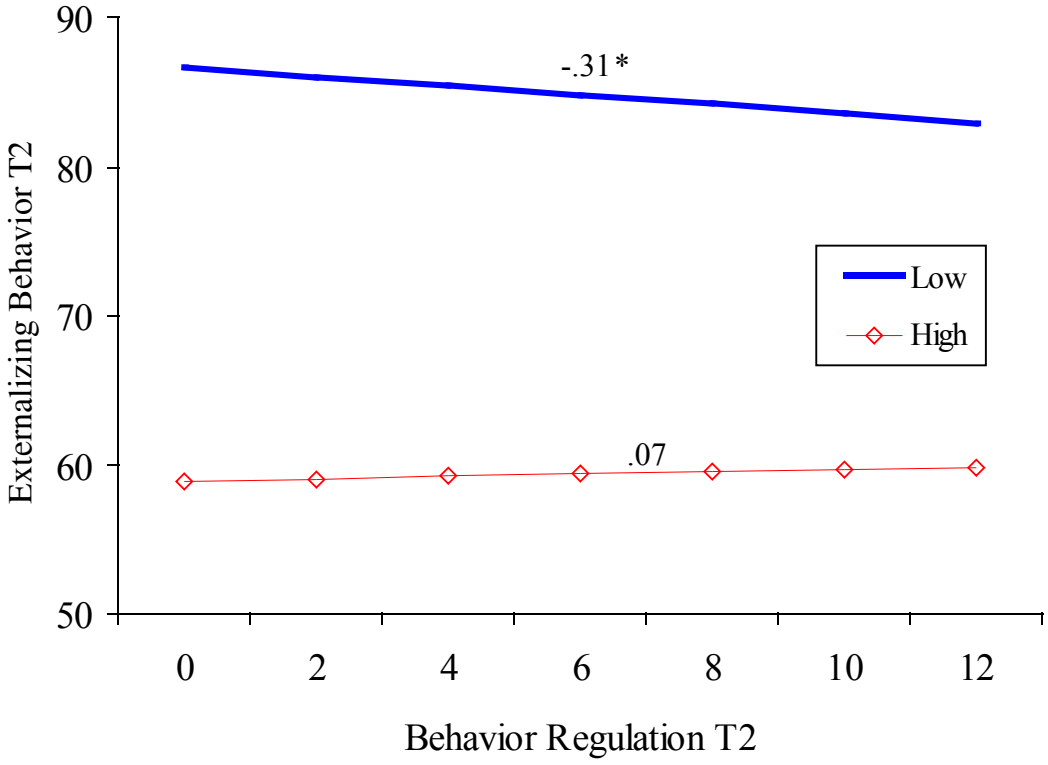

Figure 3.4. Effect of Behavior Regulation on Externalizing Behaviors (Both Measured at Time 2) Split by Negative Emotionality at Time 1 ($N = 161$)

Note. Analyses adjusted for maternal age, maternal education, marital status, workforce entry, family income category, child age, and child ethnic minority status. Standardized regression coefficients are shown. Solid line represents slope for children low in negative emotionality. Dotted line represents slope for children high in negative emotionality.

$+p < .10$. $*p < .05$. $**p < .01$.

the home, at Time 2, was concurrently related to fewer teacher-reported externalizing behaviors at Time 2 for those children low in negative emotionality, χ^2 (1, N = 161) = 2.96, $p < .10$, IFI = 1.00, RMSEA = .07. In sum, negative emotionality operated as a moderator of the relations between attention regulation and reading achievement and the relations between behavior regulation at Time 2 and externalizing behaviors, to the exclusion of the other measures of regulation and adjustment. [ii]

Exploratory Analyses

Because SEM analyses indicated that there was no consistent moderation of the effects of behavior regulation by negative emotionality, exploratory analyses were conducted to ascertain whether unequal cell sizes contributed to these null findings. A 2 x 2 crosstabulation table showing behavior regulation-negative emotionality values at Time 1 revealed that the combination of behavior regulation and negative emotionality that occurred with the greatest frequency among children was *high* behavior regulation and *high* negative emotionality (n = 49), followed by *high* behavior regulation and *low* negative emotionality (n = 47), *low* behavior regulation and *low* negative emotionality (n = 17), and *low* behavior regulation and *high* negative emotionality (n = 11).

Cell frequencies for negative emotionality and behavior regulation at Time 2 followed the same order as they did at Time 1, but they were more balanced across the four possible categories. The highest frequency combination among children was for *high* behavior regulation and *high* negative emotionality (n = 28), followed by *high* behavior regulation and *low* negative emotionality (n = 27), *low* behavior regulation and *low* negative emotionality (n = 24), and *low* behavior regulation and *high* negative emotionality (n = 16).

Given the lower levels of equality among the cells for negative emotionality by behavior regulation at Time 1, univariate analyses with Type III Sums of Squares were

conducted to compare children across the three groups with the greatest frequency of children. Thus the group with the lowest frequency, children high in negative emotionality and low in behavior regulation (n = 11), was omitted from these analyses. With the inclusion of the aforementioned covariates, none of the univariate tests for the six outcomes indicated group differences. However, the statistically non-significant results for reading are described below.

For reading, the overall test for differences between the three higher-frequency groups of children was not statistically significant, $F(2, 38) = 2.25$, $p = .12$. The non-significant main effects of emotionality and behavior regulation in the Time 1 group were further analyzed by using pairwise comparisons with Fisher LSD. It is important to note that as a post-hoc test the Fisher LSD does not correct for multiple comparisons. As in the univariate analyses, post-hoc comparisons also included covariates. Compared with reading performance for children both *low* in negative emotionality and *low* in behavior regulation at Time 1 ($M = 1.38$, SE = .58), reading performance was better for children *low* in negative emotionality and *high* in behavior regulation at Time 1 ($M = 2.67$, SE = .39, $p < .05$). The non-significant main effect for reading precludes discussion of this difference here. Taken together, these exploratory analyses indicate that the presence of unequal cell sizes for behavior regulation by negative emotionality do not appear to pose a problem in the current study.

DISCUSSION

In this study, children's negative emotionality moderated the relationship between attention regulation and reading grades such that greater attention regulation was linked to better reading achievement—but only for those children who were low in negative emotionality at Time 1. Comparable, although statistically non-significant, moderation findings were observed for relations between attention regulation and the

other academic outcomes such that attention regulation was linked more weakly to higher math and writing grades—but only for those children who were low in negative emotionality at Time 1. On the other hand, negative emotionality did not moderate the relations between attention regulation and children's socioemotional outcomes. Thus the role of negative emotionality as a moderator of the attention regulation-adjustment link appears to be concentrated for academic outcomes rather than socioemotional outcomes within this low-income sample.

With respect to the behavior regulation-adjustment paths, negative emotionality did not moderate the relations between behavior regulation (at Time 1 *or* Time 2) and children's *academic* outcomes. For the relations between behavior regulation (measured at both Time 1 *and* Time 2) and children's *socioemotional* outcomes, an interaction was detected in only one of the six analyses. Specifically, higher levels of observed behavior regulation at Time 2 were associated with fewer externalizing behaviors among children low in negative emotionality. These differential findings for attention regulation and behavior regulation are discussed in turn below.

Attention regulation findings. The findings pertaining to negative emotionality as a moderator of attention regulation presented here appear to contradict previous research by Eisenberg and colleagues (Eisenberg, Fabes et al., 1996; Eisenberg, Guthrie et al., 1997b; 2000). In their studies, attention regulation was linked to resilient outcomes and problem behaviors, but only for those children who were *high* in negative emotionality. In the current study, attention regulation was linked to reading achievement but only for those children who were *low* in negative emotionality. It is important to address why the moderating effects of negative emotionality for the attention regulation-adjustment paths were stronger for children with different levels of negative emotionality across the two samples.

One explanation may lie in the degree of variability for negative emotionality. Notably, in the present study, standard deviations among the study variables were generally lower in the *high* negative emotionality group compared with the *low* negative emotionality group (see Table 3.1 for *SD*s). This pattern is the opposite of what Eisenberg and colleagues (Eisenberg, Fabes et al., 1996; Eisenberg, Guthrie et al., 1997b; 2000) observed in their sample of eight-year-old children.[27] In their studies, teacher reported child adjustment were generally lower in the *low* negative emotionality compared with the *high* negative emotionality group. As depicted in Table 3.1 for the present study, differences by negative emotionality were not observed for any of the six, Time 2, outcome variables.

Two differences by negative emotionality were detected for children's attentional regulation skills at Time 1 and behavior regulation skills at Time 2 (however the difference for behavior regulation at Time 2 was not in the expected direction). The difference for behavior regulation at Time 2 is described in the next section on behavior regulation findings. Similar to Eisenberg and colleagues' findings (Eisenberg, Guthrie et al., 1997b), univariate tests of differences for the outcome variables revealed no differences by negative emotionality. Thus, it is unlikely the moderational effects were due to less variability in the low compared with the high negative emotionality group. Taken together, it appears that children in the high negative emotionality group were not all that different from children in the low negative emotionality group in the current study.

It is not immediately clear why moderating effects were detected for relations between attention regulation and *academic* outcomes but not for relations between attention regulation and *socioemotional* outcomes. In the current study, negative

[27] Eisenberg, Fabes et al. (1996) do not present means and standard deviations for problem behaviors (or any of the study variables) split by negative emotionality.

emotionality moderated the attention regulation-adjustment linkage for reading achievement, one of the four positive outcomes examined.[28] Of the two negative (socioemotional) outcomes examined (externalizing and internalizing), moderating effects by negative emotionality were not detected. As Eisenberg and her colleagues (1996) suggest, elementary school children who are low in negative emotionality also tend to be low in problem behaviors. Within the larger body of self-regulation literature, stronger relations between attention regulation *difficulties* and negative outcomes occur with greater consistency than for relations between attention regulation *difficulties* and positive outcomes--but only for children high in negative emotionality (*e.g.*, Eisenberg, Fabes et al., 1996; 1997a; Eisenberg, Guthrie et al., 1997b; 2000). Relations assessed between attention regulation *skills* and positive (academic) outcomes in the current study were detected, for children low in negative emotionality, in contrast to relations between attention regulation *skills* and negative outcomes, which were not. Thus our findings cohere with research by Eisenberg, Guthrie and colleagues (1997b) in suggesting that negative emotionality and attention regulation interact in their influence on child behavior and this interaction may be *most* important in the prediction of positive outcomes such as academic achievement or social competence compared with negative outcomes such as externalizing and internalizing problem behaviors.

A second reason moderating effects of negative emotionality were observed for attentional regulation on academic outcomes but not on socioemotional outcomes is that academic performance was more stable as a measure compared with socioemotional outcomes. In all cases, academic grades were averaged over three or four quarters, whereas socioemotional adjustment was assessed at one point in time

[28] It could be argued that negative emotionality moderated the attention regulation-adjustment linkage for reading achievement and nearly moderated this linkage for math and writing achievement, *three* of the four positive outcomes examined.

(typically at the end of the school year). It is plausible that the multiple assessments of academic achievement decreased levels of measurement error for the academic outcomes relative to the single assessment of children's socioemotional functioning. Overall, findings from the present study indicate that greater specificity in the attention regulation-adjustment linkage is warranted in future investigations of the conditions under which attention regulation contributes to child adjustment.

Behavior regulation findings. Contrary to our hypothesis, limited support was detected for the role of negative emotionality as a moderator of the relationship between behavioral regulation and adjustment in the current study. These mostly null findings for negative emotionality as a moderator of the behavior regulation-adjustment link are consistent with a prior study by Eisenberg and colleagues (2000). In that study, Eisenberg and colleagues (2000) did not detect interactions between behavior regulation (a composite of persistence and resistance to cheating on a puzzle-box task, and parent and teacher reports of ego control) and negative emotionality on elementary school children's externalizing behaviors.

As suggested by the findings in the current study, *low* behavioral regulation seems more likely to co-occur with *low* rather than high levels of negative emotionality. In particular, for those children who displayed low levels of behavior regulation at Time 1 ($N = 28$), low behavior regulation co-occurred with low negative emotionality for 17 children, while it co-occurred with high negative emotionality for 11 children. The same pattern emerged for low behavior regulation at Time 2 ($N = 40$) with low behavior regulation co-occurring with low negative emotionality for 24 children while co-occurring with high negative emotionality for 16 children. This pattern of findings is the opposite of what we would expect to observe based on the literature: low levels of behavior regulation co- occurring with high levels of negative emotionality. Indeed, as noted previously, one of the two differences by negative

emotionality among the key study variables (attention regulation at Time 1, behavior regulation at Time 1 and Time 2, and adjustment measures at Time 2) was found in an unexpected direction: lower levels of negative emotionality co-occurred with fewer behavior regulation skills at Time 2. Yet, as expected, lower levels of negative emotionality co-occurred with more socially competent and fewer externalizing behaviors for these same children at Time 1. Recall that while no differences were detected between followed and non-followed families on income, maternal education, caregiver age, ethnic minority status, or family size, children who participated in the study at both Time 1 and 2 had mothers who experienced fewer depressive symptoms. Thus the context in which negative emotionality assessments are made is relevant – particularly when mothers' report on their children's proclivity toward negative emotionality as in the current study.

Another possible explanation for the absence of interactions between behavior regulation at Time 1 and Time 2 and negative emotionality may be the restricted range of delay responses. Recall that, at Time 1, children waited 5 minutes on average prior to touching the prohibited object, with nearly 80% of the sample (n = 97) waiting for 6 minutes, the entirety of the task. Similarly, at Time 2, 57% (n = 55) of the sample waited for the entirety of the 12-minute task without touching the prohibited toys. Notably, square-root transformations conducted to address the skewed quality of the behavior regulation variables yielded comparable results for the moderating role of negative emotionality.

While variability was constrained for the behavior regulation measures, excellent variability was observed for the negative emotionality measure. Given the range in negative emotionality, the overall results indicate that negative emotionality does not necessarily undermine the relationship between behavioral self-regulatory skills and adjustment among the children in this sample. Specifically, for 11 of the 12

outcomes tested, high negative emotionality did not undermine the relations between behavior regulation measured at Time 1 and Time 2 and adjustment (both socioemotional and academic) in this sample.[29] The one exception was for children's externalizing behaviors. Negative emotionality does appear to matter for the relationship between behavior regulation (observed in the home at Time 2) and the presence of children's externalizing behaviors in first grade. That is, children who displayed greater behavior regulation in the home at Time 2 also displayed fewer externalizing behaviors in the classroom but only if parents reported that they were low in negative emotionality during preschool. Results from the present study further support the importance of distinguishing between attentional and behavioral forms of regulation as they relate to children's adjustment.

Study limitations. Currently, nearly all temperament theorists agree that environment influences children's temperamental tendencies such as their proclivity toward negative emotionality. In view of this, one limitation of the present study is that it does not focus on parenting or children's exposure to multiple risk factors. While all children in the current study were from low-income households and thus at greater risk for adverse developmental outcomes, prior research with this same sample reveals considerable heterogeneity in social capital among the study families (Marcynyszyn, 2006a). Second, the narrow range of negative emotionality examined in the present study clearly limits the generalizability of our findings to children who experience anger or frustration. It is important to acknowledge that fearfulness and sadness were not assessed in the present study so it was not possible to test whether

[29] The 12 tests referred to here are the (a) behavior regulation at Time 1 by negative emotionality interaction tested for the 6 outcomes and the (b) behavior regulation at Time 2 by negative emotionality interaction tested for the 6 outcomes (socially competent, externalizing, and internalizing behaviors; reading, math, and writing achievement).

these features of negative emotionality operate as moderators of the regulation-adjustment linkage.

Implications for policy. Policymakers and educators are currently engaged in an overall effort to close the achievement gap between higher- and lower-income children. The current legislative focus, as evidenced in the Bush Administration's "Good Start, Grow Smart" Initiative, prioritizes pre-reading and pre-math skills over social and emotional skill development for federal Head Start participants nationally—approximately 500,000, four-year-old children (Children's Defense Fund, 2005). As acknowledged by many researchers (Fantuzzo et al., 1999; Raver, 2002; Raver & Zigler, 1997), competencies in both cognitive and socioemotional development are necessary for future academic success and thus a hierarchical approach to what Head Start teachers emphasize seems unwise.

Findings from this study could inform these efforts, as they suggest that expected associations between child attention regulation and early reading performance do not hold for children high in negative emotionality. This implies that policymakers hoping to close the achievement gap among America's schoolchildren in the primary grades may need to supplement their efforts to fine-tune pedagogical practices by providing comprehensive services that address children's emotional well-being.

In this study, we examined whether negative emotionality moderated the relationship between attentional and behavioral regulation and children's subsequent socioemotional adjustment and academic achievement. Our findings suggest that negative emotionality moderated the relationship between attention regulation and children's reading grades such that greater attention regulation was linked to better reading achievement—but only for those children who were low in negative emotionality at Time 1. Comparable, although statistically non-significant,

moderation findings were observed for the relations between attention regulation and the other academic outcomes such that attention regulation was linked to higher math and writing grades—but only for those children who were low in negative emotionality at Time 1. Similar interactions between attention regulation and negative emotionality were not detected for children's socioemotional adjustment. Overall, negative emotionality did not moderate the relationship between behavior regulation (at Time 1 or Time 2) and children's outcomes. With the exception of the linkages between attention regulation and reading achievement, these results suggest limited support for the role of negative emotionality as a moderator of the relations between self-regulation and first-grade adjustment.

APPENDIX 3A

Descriptive Data ($N = 163$)

Variable	*M* (*SD*)	Range	*N*
Negative emotionality	4.88 (0.95)	1.38-7.00	161
Attention regulation	4.53 (0.86)	2.25-6.44	161
Behavior Regulation T1	300.07 (118.68)	0.34-360.00	125
Behavior regulation T2	9.06 (4.13)	0.04-12.00	96
Social competence T1	47.91 (9.44)	30.00-70.00	135
Social competence T2	48.08 (9.50)	30.00-68.00	83
Externalizing T1	45.29 (9.32)	30.00-70.00	135
Externalizing T2	47.86 (10.33)	30.00-70.00	83
Internalizing T1	46.59 (8.97)	30.00-70.00	135
Internalizing T2	48.75 (9.68)	30.00-70.00	83
Reading	2.17 (1.08)	0.00-4.00	80
Math	2.44 (1.00)	0.00-4.00	80
Writing	1.91 (1.03)	0.00-4.00	80
Maternal age	29.60 (7.84)	18.00-61.00	162
Maternal education	3.19 (1.46)	0-7	154
Workforce entry	0.74 (0.44)	0-1	159
Income category	1.49 (1.61)	0-5	158
Marital status	0.33 (0.47)	0-1	163
Child age	4.20 (0.44)	2.07-4.81	161
Child race not White	0.65 (0.48)	0-1	163

Appendix 3B

Intercorrelations Among the Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Negative emotion T1	--														
2. Attention reg. T1	-.36**	--													
3. Behavior reg. T1	.08	.03	--												
4. Behavior reg. T2	.11	.29**	.38**	--											
5. Social comp. T1	-.16+	.08	-.01	.26*	--										
6. Social comp. T2	.10	.11	-.17	.11	.33**	--									
7. Externalizing T1	.19*	-.13	-.15	-.18+	-.60**	-.29*	--								
8. Externalizing T2	.11	-.07	.14	-.08	-.23*	-.56**	.48**	--							
9. Internalizing T1	.05	.02	.02	-.07	-.70**	-.21+	.46**	.12	--						
10. Internalizing T2	.02	-.02	.04	.08	-.13	-.63**	.21+	.45**	.23+	--					
11. Reading	-.06	.16	.07	.30**	.28*	.49**	-.21+	-.28*	-.20	-.39**	--				
12. Math	-.19	.16	-.06	.26*	.32**	.42**	-.28*	-.31*	-.17	-.23+	.74**	--			
13. Writing	-.06	.17	-.03	.21+	.15	.54**	-.11	-.20	-.07	-39**	.77**	.69**	--		
14. Maternal age	-.07	.10	.01	.05	.01	.05	-.15+	-.05	-.01	-.01	.05	.02	.01	--	
15. Maternal educ.	-.02	.07	-.11	.12	.38**	.23*	-.28**	-.34**	-.28**	-.02	.08	.23+	.02	.19*	--
16. Workforce entry	.04	.03	-.13	.03	.00	.06	.10	.13	-.00	-.11	-.11	-.07	-.06	-.23**	.13
17. Income category	-.00	.19*	-.06	.22*	.02	.07	-.12	-.03	-.12	.07	.13	.26*	.14	.15+	.24**
18. Marital status	-.02	.12	-.11	.17	.02	.15	.05	.02	-.04	-.02	.09	.23*	.05	.21**	.26**
19. Child age	.10	-.06	-.07	.27**	.20*	-.05	-.09	.21+	-.01	.23*	-.00	.02	-.01	.08	.13
20. Child not White	.09	-.01	.04	-.10	-.17+	-.02	.14+	.38**	.12	.05	-.08	-.22+	-.06	-.15+	-.15+

Note. *N*s range from 80 to 162.
+$p < .10$. *$p < .05$. **$p < .01$.

Appendix 3B (CONTINUED)

Variable	16	17	18	19
1. Negative emotion T1				
2. Attention reg. T1				
3. Behavior reg. T1				
4. Behavior reg. T2				
5. Social comp. T1				
6. Social comp. T2				
7. Externalizing T1				
8. Externalizing T2				
9. Internalizing T1				
10. Internalizing T2				
11. Reading				
12. Math				
13. Writing				
14. Maternal age				
15. Maternal educ.				
16. Workforce entry	--			
17. Income category	.12	--		
18. Marital status	-.04	.32**	--	
19. Child age	.05	.10	.08	--
20. Child not White	.10	-.16*	-.26**	-.15+

Note. *N*s range from 80 to 162.
+$p < .10$. *$p < .05$. **$p < .01$.

APPENDIX 3C.1

Nested Interactions Between Attention Regulation and Social Competence Split by Negative Emotionality

	To Social Competence T2			
	b	B	SE	p
Path From		Low		
Maternal age	-0.35	-0.26	0.20	0.09
Maternal education	1.12	0.16	1.07	0.30
Workforce entry	6.69	0.29	3.11	0.03
Income category	0.90	0.13	0.97	0.36
Marital status	5.75	0.26	3.20	0.07
Child age	-0.30	-0.01	3.38	0.93
Child race not White	-2.79	-0.13	3.11	0.37
Attention Regulation	1.39	0.11	1.75	0.43
		High		
Maternal age	0.18	0.16	0.20	0.36
Maternal education	0.40	0.06	1.11	0.72
Workforce entry	-2.60	-0.13	3.70	0.48
Income category	0.23	0.04	0.96	0.81
Marital status	-3.21	-0.17	3.25	0.32
Child age	-4.17	-0.21	3.19	0.19
Child race not White	2.52	0.13	2.97	0.40
Attention Regulation	1.29	0.11	1.80	0.47

APPENDIX 3C.2

Nested Interactions Between Attention Regulation and Externalizing Behaviors Split by Negative Emotionality

	To Externalizing T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.07	0.05	0.21	0.75
Maternal education	-2.59	-0.37	1.08	0.02
Workforce entry	-1.40	-0.06	3.19	0.66
Income category	-1.01	-0.15	1.00	0.31
Marital status	3.64	0.16	3.27	0.27
Child age	9.08	0.36	3.45	0.01
Child race not White	7.47	0.34	3.19	0.02
Attention Regulation	-0.76	-0.06	1.80	0.67
		High		
Maternal age	0.07	0.05	0.19	0.72
Maternal education	-1.20	-0.17	1.05	0.25
Workforce entry	5.38	0.24	3.51	0.13
Income category	-1.24	-0.21	0.91	0.17
Marital status	6.05	0.29	3.09	0.05
Child age	1.08	0.05	3.03	0.72
Child race not White	11.42	0.54	2.82	0.00
Attention Regulation	0.88	0.07	1.72	0.61

APPENDIX 3C.3

Nested Interactions Between Attention Regulation and Internalizing Behaviors Split by Negative Emotionality

	To Internalizing T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.23	0.18	0.19	0.21
Maternal education	-0.05	-0.01	0.99	0.96
Workforce entry	-9.27	-0.41	2.86	0.00
Income category	-1.53	-0.24	0.89	0.09
Marital status	-4.07	-0.19	2.96	0.17
Child age	7.47	0.31	3.13	0.02
Child race not White	4.64	0.22	2.87	0.11
Attention Regulation	-0.21	-0.02	1.61	0.90
		High		
Maternal age	-0.37	-0.30	0.21	0.08
Maternal education	1.20	0.17	1.19	0.31
Workforce entry	-2.13	-0.09	3.99	0.59
Income category	0.44	0.07	1.04	0.67
Marital status	4.17	0.20	3.50	0.23
Child age	5.67	0.26	3.44	0.10
Child race not White	2.66	0.13	3.20	0.41
Attention Regulation	-1.13	-0.09	1.94	0.56

APPENDIX 3C.4

Nested Interactions Between Attention Regulation and Reading Grades Split by Negative Emotionality

	To Reading Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	-0.01	-0.08	0.02	0.60
Maternal education	0.04	0.05	0.12	0.73
Workforce entry	-0.38	-0.15	0.35	0.27
Income category	0.05	0.07	0.11	0.63
Marital status	0.50	0.21	0.36	0.16
Child age	-0.43	-0.16	0.38	0.26
Child race not White	-0.40	-0.17	0.35	0.24
Attention Regulation	0.57	0.42	0.20	0.00
		High		
Maternal age	0.01	0.04	0.02	0.81
Maternal education	0.02	0.03	0.12	0.87
Workforce entry	0.18	0.08	0.42	0.66
Income category	-0.01	-0.02	0.11	0.90
Marital status	-0.29	-0.14	0.37	0.43
Child age	0.08	0.04	0.36	0.82
Child race not White	0.27	0.13	0.34	0.43
Attention Regulation	0.01	0.01	0.20	0.97

APPENDIX 3C.5

Nested Interactions Between Attention Regulation and Math Grades Split by Negative Emotionality

	To Math Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	-0.02	-0.13	0.02	0.42
Maternal education	0.09	0.13	0.12	0.43
Workforce entry	-0.34	-0.14	0.35	0.32
Income category	0.10	0.15	0.11	0.33
Marital status	0.42	0.18	0.36	0.23
Child age	-0.10	-0.04	0.38	0.79
Child race not White	-0.37	-0.17	0.35	0.28
Attention Regulation	0.35	0.27	0.20	0.07
		High		
Maternal age	-0.01	-0.06	0.02	0.73
Maternal education	0.15	0.25	0.10	0.13
Workforce entry	0.42	0.21	0.34	0.23
Income category	-0.04	-0.09	0.09	0.63
Marital status	0.30	0.17	0.31	0.33
Child age	-0.29	-0.15	0.30	0.34
Child race not White	-0.06	-0.03	0.28	0.82
Attention Regulation	-0.10	-0.09	0.17	0.56

APPENDIX 3C.6

Nested Interactions Between Attention Regulation and Writing Grades Split by Negative Emotionality

	To Writing Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.01	0.04	0.02	0.78
Maternal education	-0.10	-0.15	0.11	0.34
Workforce entry	-0.35	-0.16	0.31	0.25
Income category	0.06	0.09	0.10	0.54
Marital status	0.41	0.19	0.32	0.20
Child age	-0.19	-0.08	0.34	0.58
Child race not White	-0.23	-0.11	0.31	0.47
Attention Regulation	0.48	0.40	0.17	0.01
		High		
Maternal age	0.00	-0.02	0.02	0.91
Maternal education	0.01	0.01	0.13	0.96
Workforce entry	0.53	0.22	0.44	0.23
Income category	-0.09	-0.14	0.12	0.45
Marital status	-0.01	0.00	0.39	0.99
Child age	0.00	0.00	0.39	1.00
Child race not White	0.20	0.09	0.36	0.57
Attention Regulation	-0.01	-0.01	0.22	0.96

APPENDIX 3D.1

Nested Interactions Between Behavior Regulation T1 and Social Competence Split by Negative Emotionality

	To Social Competence T2			
	b	B	SE	p
Path From		Low		
Maternal age	-0.32	-0.24	0.19	0.09
Maternal education	0.70	0.10	1.06	0.51
Workforce entry	6.97	0.30	3.08	0.02
Income category	0.92	0.14	0.96	0.34
Marital status	5.85	0.26	3.15	0.06
Child age	-0.25	-0.01	3.36	0.94
Child race not White	-3.32	-0.16	3.01	0.27
Behavior Regulation T1	-0.02	-0.19	0.01	0.21
		High		
Maternal age	0.29	0.23	0.19	0.14
Maternal education	0.13	0.02	1.07	0.90
Workforce entry	-1.18	-0.05	3.62	0.74
Income category	0.97	0.17	0.93	0.30
Marital status	-0.52	-0.03	3.22	0.87
Child age	-5.38	-0.25	3.03	0.08
Child race not White	2.99	0.14	2.88	0.30
Behavior Regulation T1	0.04	0.45	0.01	0.00

APPENDIX 3D.2

Nested Interactions Between Behavior Regulation T1 and Externalizing Behaviors Split by Negative Emotionality

	To Externalizing T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.04	0.03	0.20	0.85
Maternal education	-2.21	-0.31	1.08	0.04
Workforce entry	-1.62	-0.07	3.17	0.61
Income category	-0.98	-0.14	0.99	0.32
Marital status	3.53	0.16	3.23	0.27
Child age	9.11	0.37	3.44	0.01
Child race not White	7.83	0.36	3.09	0.01
Behavior Regulation T1	0.01	0.15	0.01	0.32
		High		
Maternal age	0.08	0.07	0.19	0.66
Maternal education	-1.25	-0.18	1.05	0.23
Workforce entry	5.95	0.26	3.55	0.09
Income category	-1.10	-0.19	0.92	0.23
Marital status	6.40	0.30	3.15	0.04
Child age	0.59	0.03	2.98	0.84
Child race not White	11.29	0.53	2.82	0.00
Behavior Regulation T1	0.00	0.05	0.01	0.76

APPENDIX 3D.3

Nested Interactions Between Behavior Regulation T1 and Internalizing Behaviors Split by Negative Emotionality

	To Internalizing T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.26	0.20	0.18	0.14
Maternal education	0.19	0.03	0.98	0.84
Workforce entry	-9.45	-0.42	2.83	0.00
Income category	-1.50	-0.23	0.88	0.09
Marital status	-4.26	-0.20	2.91	0.14
Child age	7.40	0.31	3.11	0.02
Child race not White	5.22	0.25	2.77	0.06
Behavior Regulation T1	0.01	0.13	0.01	0.37
		High		
Maternal age	-0.52	-0.39	0.20	0.01
Maternal education	1.56	0.21	1.13	0.17
Workforce entry	-4.35	-0.18	3.83	0.26
Income category	-0.33	-0.05	0.99	0.74
Marital status	1.32	0.06	3.41	0.70
Child age	6.50	0.27	3.22	0.04
Child race not White	2.27	0.10	3.05	0.46
Behavior Regulation T1	-0.05	-0.49	0.01	0.00

APPENDIX 3D.4

Nested Interactions Between Behavior Regulation T1 and Reading Grades Split by Negative Emotionality

	To Reading Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.01	0.06	0.02	0.72
Maternal education	0.10	0.13	0.13	0.42
Workforce entry	-0.36	-0.14	0.37	0.33
Income category	0.15	0.21	0.12	0.18
Marital status	0.32	0.13	0.38	0.39
Child age	-0.72	-0.26	0.40	0.07
Child race not White	-0.20	-0.08	0.36	0.58
Behavior Regulation T1	0.00	0.22	0.00	0.16
		High		
Maternal age	0.00	0.01	0.02	0.98
Maternal education	0.02	0.03	0.12	0.89
Workforce entry	0.07	0.03	0.42	0.87
Income category	-0.02	-0.03	0.11	0.87
Marital status	-0.31	-0.15	0.37	0.40
Child age	0.08	0.04	0.35	0.83
Child race not White	0.30	0.14	0.33	0.37
Behavior Regulation T1	0.00	-0.19	0.00	0.32

APPENDIX 3D.5

Nested Interactions Between Behavior Regulation T1 and Math Grades Split by Negative Emotionality

	To Math Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	-0.01	-0.04	0.02	0.79
Maternal education	0.11	0.16	0.12	0.36
Workforce entry	-0.32	-0.13	0.36	0.37
Income category	0.17	0.24	0.11	0.13
Marital status	0.32	0.14	0.36	0.38
Child age	-0.26	-0.10	0.39	0.50
Child race not White	-0.27	-0.12	0.35	0.44
Behavior Regulation T1	0.00	0.10	0.00	0.56
		High		
Maternal age	-0.01	-0.10	0.02	0.57
Maternal education	0.16	0.27	0.10	0.11
Workforce entry	0.34	0.17	0.35	0.33
Income category	-0.07	-0.13	0.09	0.44
Marital status	0.27	0.15	0.31	0.38
Child age	-0.27	-0.14	0.29	0.35
Child race not White	-0.04	-0.02	0.28	0.89
Behavior Regulation T1	0.00	-0.19	0.00	0.28

APPENDIX 3D.6

Nested Interactions Between Behavior Regulation T1 and Writing Grades Split by Negative Emotionality

	To Writing Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.02	0.19	0.02	0.25
Maternal education	-0.08	-0.11	0.12	0.51
Workforce entry	-0.38	-0.17	0.33	0.26
Income category	0.14	0.21	0.10	0.19
Marital status	0.23	0.11	0.34	0.50
Child age	-0.38	-0.16	0.36	0.30
Child race not White	-0.11	-0.05	0.33	0.74
Behavior Regulation T1	0.00	-0.01	0.00	0.97
		High		
Maternal age	-0.01	-0.04	0.02	0.82
Maternal education	0.01	0.01	0.13	0.96
Workforce entry	0.46	0.19	0.45	0.30
Income category	-0.09	-0.15	0.12	0.43
Marital status	-0.03	-0.01	0.40	0.94
Child age	-0.02	-0.01	0.38	0.95
Child race not White	0.23	0.10	0.36	0.53
Behavior Regulation T1	0.00	-0.12	0.00	0.53

APPENDIX 3E.1

Nested Interactions Between Behavior Regulation T2 and Social Competence Split by Negative Emotionality

	To Social Competence T2			
	b	B	SE	p
Path From		Low		
Maternal age	-0.33	-0.24	0.19	0.08
Maternal education	1.16	0.16	1.04	0.27
Workforce entry	7.31	0.31	3.03	0.02
Income category	1.11	0.16	0.94	0.24
Marital status	5.67	0.25	3.11	0.07
Child age	-1.77	-0.07	3.38	0.60
Child race not White	-2.92	-0.13	2.97	0.33
Behavior Regulation T2	0.45	0.19	0.30	0.14
		High		
Maternal age	0.49	0.08	1.13	0.67
Maternal education	-2.12	-0.10	3.74	0.57
Workforce entry	0.33	0.06	0.97	0.73
Income category	-2.83	-0.15	3.31	0.39
Marital status	-4.38	-0.22	3.22	0.17
Child age	2.09	0.11	2.99	0.48
Child race not White	-0.03	-0.01	0.49	0.95
Behavior Regulation T2				

APPENDIX 3E.2

Nested Interactions Between Behavior Regulation T2 and Externalizing Behaviors Split by Negative Emotionality

	To Externalizing T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.06	0.04	0.19	0.75
Maternal education	-2.81	-0.39	1.00	0.00
Workforce entry	-1.65	-0.07	2.99	0.58
Income category	-1.13	-0.16	0.92	0.22
Marital status	4.04	0.18	3.04	0.18
Child age	11.53	0.45	3.30	0.00
Child race not White	7.53	0.34	2.92	0.01
Behavior Regulation T2	-0.75	-0.31	0.30	0.01
		High		
Maternal age	0.04	0.03	0.19	0.83
Maternal education	-1.27	-0.18	1.06	0.23
Workforce entry	5.16	0.23	3.51	0.14
Income category	-1.19	-0.20	0.91	0.19
Marital status	6.13	0.29	3.12	0.05
Child age	0.23	0.01	3.04	0.94
Child race not White	11.53	0.54	2.82	0.00
Behavior Regulation T2	0.21	0.07	0.46	0.65

APPENDIX 3E.3

Nested Interactions Between Behavior Regulation T2 and Internalizing Behaviors Split by Negative Emotionality

	To Internalizing T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.26	0.20	0.18	0.14
Maternal education	-0.03	0.00	0.98	0.98
Workforce entry	-9.44	-0.41	2.84	0.00
Income category	-1.59	-0.24	0.89	0.07
Marital status	-4.22	-0.19	2.93	0.15
Child age	7.62	0.31	3.18	0.02
Child race not White	4.85	0.23	2.79	0.08
Behavior Regulation T2	-0.07	-0.03	0.28	0.82
		High		
Maternal age	-0.37	-0.30	0.21	0.08
Maternal education	1.04	0.15	1.19	0.38
Workforce entry	-3.36	-0.15	3.97	0.40
Income category	0.24	0.04	1.04	0.82
Marital status	3.32	0.16	3.51	0.34
Child age	5.07	0.23	3.41	0.14
Child race not White	3.73	0.18	3.17	0.24
Behavior Regulation T2	0.45	0.14	0.52	0.38

APPENDIX 3E.4

Nested Interactions Between Behavior Regulation T2 and Reading Grades Split by Negative Emotionality

	To Reading Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.01	0.10	0.02	0.52
Maternal education	0.00	0.00	0.12	0.99
Workforce entry	-0.33	-0.13	0.35	0.35
Income category	0.12	0.17	0.11	0.27
Marital status	0.34	0.14	0.36	0.35
Child age	-0.68	-0.25	0.39	0.08
Child race not White	-0.27	-0.12	0.34	0.43
Behavior Regulation T2	0.08	0.34	0.04	0.02
		High		
Maternal age	0.01	0.05	0.02	0.79
Maternal education	-0.01	-0.02	0.12	0.91
Workforce entry	0.13	0.06	0.41	0.75
Income category	-0.02	-0.03	0.11	0.87
Marital status	-0.43	-0.21	0.37	0.24
Child age	0.05	0.02	0.36	0.89
Child race not White	0.29	0.14	0.33	0.38
Behavior Regulation T2	0.06	0.21	0.05	0.23

APPENDIX 3E.5

Nested Interactions Between Behavior Regulation T2 and Math Grades Split by Negative Emotionality

	To Math Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.00	-0.02	0.02	0.89
Maternal education	0.06	0.08	0.12	0.64
Workforce entry	-0.30	-0.12	0.35	0.39
Income category	0.15	0.22	0.11	0.16
Marital status	0.33	0.14	0.35	0.35
Child age	-0.26	-0.10	0.38	0.50
Child race not White	-0.30	-0.14	0.34	0.37
Behavior Regulation T2	0.06	0.25	0.03	0.08
		High		
Maternal age	-0.01	-0.06	0.02	0.73
Maternal education	0.15	0.24	0.10	0.16
Workforce entry	0.40	0.21	0.34	0.24
Income category	-0.06	-0.13	0.09	0.47
Marital status	0.22	0.12	0.31	0.47
Child age	-0.27	-0.14	0.30	0.37
Child race not White	-0.05	-0.03	0.28	0.85
Behavior Regulation T2	0.03	0.10	0.04	0.54

APPENDIX 3E.6

Nested Interactions Between Behavior Regulation T2 and Writing Grades Split by Negative Emotionality

	To Writing Grades T2			
	b	B	SE	p
Path From		Low		
Maternal age	0.03	0.22	0.02	0.14
Maternal education	-0.13	-0.19	0.11	0.23
Workforce entry	-0.33	-0.15	0.31	0.28
Income category	0.12	0.18	0.10	0.22
Marital status	0.26	0.12	0.32	0.42
Child age	-0.43	-0.18	0.34	0.21
Child race not White	-0.11	-0.05	0.30	0.73
Behavior Regulation T2	0.08	0.35	0.03	0.01
		High		
Maternal age	0.00	-0.02	0.02	0.92
Maternal education	0.00	0.00	0.13	0.99
Workforce entry	0.57	0.24	0.44	0.20
Income category	-0.10	-0.17	0.12	0.38
Marital status	0.00	0.00	0.40	0.99
Child age	-0.08	-0.04	0.39	0.83
Child race not White	0.20	0.09	0.36	0.57
Behavior Regulation T2	0.01	0.03	0.06	0.85

REFERENCES

Arbuckle, J. L., & Wothke, W. (1999). *Amos 4.0 user's guide*. Chicago: SmallWaters Corporation.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Bates, J. E., Bayles, K., Bennett, D. S., Ridge, B., & Brown, M. M. (1991). Origins of externalizing behavior problems at eight years of age. In D. Pepler & K. Rubin (Eds.), *Development and treatment of childhood aggression* (pp. 93-120). Mahwah, NJ: Erlbaum.

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.

Brody, N. (1992). *Intelligence* (2nd ed.). San Diego: Academic Press.

Calkins, S. D., & Dedmon, S. E. (2000). Physiological and behavioral regulation in two-year-old children with aggressive/destructive behavior problems. *Journal of Abnormal Child Psychology, 28*(2), 103-118.

Calkins, S. D., Gill, K. L., Johnson, M. C., & Smith, C. L. (1999). Emotional reactivity and emotional regulation strategies as predictors of social behavior with peers during toddlerhood. *Social Development*, *8*(3), 310–334.

Calkins, S. D., & Johnson, M. C. (1998). Toddler regulation of distress to frustrating events: Temperamental and maternal correlates. *Infant Behavior and Development*, *21*, 379–395.

Capaldi, D. M., & Rothbart, M. K. (1992). Development and validation of an early adolescent temperament measure. *Journal of Early Adolescence, 12*, 153-173.

Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E., & Silva, P. A. (1995). Temperamental origins of child and adolescent behavior problems: From age 3 to age 15. *Child Development*, *66*, 55-68.

Caspi, A., Roberts, B. W., & Shiner, R. L. (2005). Personality development: Stability and change. *Annual Review of Psychology, 56*, 453-484.

Caspi, A., Taylor, A., Moffitt, T. E., & Plomin, R. (2000). Neighborhood deprivation affects children's mental health: Environmental risks identified in a genetic design. *Psychological Science, 11*(4), 338-342.

Chassin, L., Pillow, D. R., Curran, P. J., Molina, B. S. G., & Barrera, M. (1993). Relations of parental alcoholism to early adolescent substance use: A test of three mediating mechanisms. *Journal of Abnormal Psychology, 102*, 3-19.

Children's Defense Fund (2005). *Using child assessments in Head Start*. Retrieved October 8, 2005, from http://www.childrensdefense.org/earlychildhood/headstart/using_child_assessments.pdf

Denham, S. A., Blair, K. A., DeMulder, E., Levitas, J., Sawyer, K., Auerbach-Major, S., & Queenan, P. (2003). Preschool emotional competence: Pathway to social competence? *Child Development*, *74*(1) 238-256.

Derryberry, D., & Rothbart, M. K. (1997). Reactive and effortful processes in the organization of temperament. *Development and Psychopathology, 9,* 633-652.

Duncan, G. J., Yeung, W. J., Brooks-Gunn, J., & Smith, J. R. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review, 63*(3), 406-423.

Eisenberg, N. (2000). Emotion, regulation, and moral development. *Annual Review of Psychology, 51*, 665-697.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., Murhpy, B. C., Maszk, P., Holmgren, R., & Suh, K. (1996). The relations of regulation and emotionality to problem behavior in elementary school children. *Development and Psychopathology, 8*, 141-162.

Eisenberg, N., Fabes, R. A., Shepard, S. A., Murphy, B. C., Guthrie, I. K., Jones, S., Friedman J., Poulin, R., & Maszk, P. (1997a). Contemporaneous and longitudinal prediction of children's social functioning from regulation and emotionality. *Child Development, 68*, 642-664.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology, 78*(1)*,* 136-157.

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., Guthrie, I. K., & Murphy, B. C. (2001). Mothers' emotional expressivity and children's behavior problems and social competence: Mediation through children's regulation. *Developmental Psychology, 37*(4)*,* 475-490.

Eisenberg, N., Guthrie, I. K., Fabes, R. A., Reiser, M., Murphy, B. C., Holgren, R., Maszk, P., & Losoya, S. (1997b). The relations of regulation and emotionality to resiliency and competent social functioning in elementary school children. *Child Development, 68*(2), 295–311.

Eisenberg, N., Guthrie, I. K, Fabes, R. A., Shepard, S., Losoya, S., Murphy, B. C., Jones, S., Poulin, R., & Reiser, M. (2000). Prediction of elementary school children's externalizing problem behaviors from attentional and behavioral regulation and negative emotionality. *Child Development, 71*(5)*,* 1367-1387.

Eisenberg, N., & Spinrad, T. L. (2004). Emotion-related regulation: Sharpening the definition. *Child Development, 75*(2), 334-339.

Emde, R. N., & Hewitt, J. K. (Eds.) (2001). *Infancy to early childhood: Genetic and environmental influences on developmental change*. London: Oxford University Press.

Fantuzzo, J., Stolzfus, J., Lutz, M. N., Hamlet, H., Balraj, V., Turner, C., & Mosca, S. (1999). An evaluation of special needs referral process for low-income preschool children with emotional and behavioral problems. *Early Childhood Research Quarterly, 4*, 465-482.

Fox, N. A., & Calkins, S. D. (2003). The development of self-control of emotion: Intrinsic and extrinsic influences. *Motivation and Emotion, 27*(1), 7-26.

Garmezy, N. (1991). Resilience and vulnerability to adverse developmental outcomes associated with poverty. *American Behavioral Scientist, 34*, 416-430.

Gerardi, G., Rothbart, M. K., Posner, M. I., & Kepler, S. (1996, April). *The development of attentional control: Performance on a spatial Stroop-like task at 24, 30, and 36-38-months-of-age*. Poster presented at the annual meeting of the International Society for Infant Studies, Providence, RI.

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.

Goldsmith, H. H., Buss, K. A., & Lemery, K. S. (1997). Toddler and childhood temperament: Expanded content, stronger genetic evidence, new evidence for the importance of environment. *Developmental Psychology, 33*, 891-905.

Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*(4), 599-610.

Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003a). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*(1), 101-119.

Howse, R. B., Lange, G., Farran, C. D., & Boyles, D. C. (2003b). Motivation and self-regulation as predictors of achievement in economically disadvantaged young children. *The Journal of Experimental Education, 71*(2), 151-174.

Judd, C. M., & Kenny, D. A. (1981). Process Analysis: Estimating mediation in treatment evaluations. *Evaluation Review, 5*, 602-619.

Kobak, R., Cole, H., Ferenz-Gillies, R., & Fleming, W. (1993). Attachment and emotional regulation during mother-teen problem solving: A control theory analysis. *Child Development, 64*, 231-245.

Kochanska, G. (1995). Children's temperament, mothers' discipline, and security of attachment: Multiple pathways to emerging internalization. *Child Development, 66*, 597-615.

Kochanska, G., & Aksan, N. (1995). Mother-child mutually positive affect, the quality of child competence to requests and prohibitions, and maternal control as correlates of early internalization. *Child Development, 66*, 236-254.

Kopp, C. B. (2002, June). *Self-regulation: Why does it matter?* Paper presented at Head Start's Sixth National Research Conference, "The First Eight Years: Pathways to the Future," Washington, DC.

LaFreniere, P. J., Dumas, J. E., Capuano, F., & Dubeau, D. (1992). Development and validation of the preschool socioaffective profile. *Psychological Assessment, 4*, 442-450.

Laible, D. J. (2004). Mother-child discourse in tow contexts: Links with child temperament, attachment security, and socioemotional competence. *Developmental Psychology, 40*(6), 979-992.

Laible, D. J., & Thompson, R. A. (2000). Mother-child discourse, attachment security, shared positive affect, and early conscience development. *Child Development, 71*(5), 1424-1440.

Lengua, L. J. (2002). The contribution of emotionality and self-regulation to the understanding of children's response to multiple risk. *Child Development, 73*(1), 144–161.

Lengua, L. J. (2003). Associations among emotionality, self-regulation, adjustment problems, and positive adjustment in middle childhood. *Journal of Applied Developmental Psychology*, *24*(5), 595-618.

Lengua, L. J., & Long, A. C. (2002). The role of emotionality and self-regulation in the appraisal-coping process: Tests of direct and moderating effects. *Journal of Applied Developmental Psychology, 23*, 471-493.

Lengua, L. J., West, S. G., & Sandler, I. N. (1998). Temperament as a predictor of symptomatology in children: Addressing contamination of measures. *Child Development, 69*, 164-181.

Marcynyszyn, L. A. (2006a). *Self-Regulation as a mediator of the relationship between caregivers' limit-setting and children's behaviors and academic performance*. Unpublished doctoral dissertation, Cornell University, NY.

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*, 3-19.

Raver, C. C. (2004). Placing emotional self-regulation in sociocultural and socioeconomic contexts. *Child Development*, *75*(2), 346-353.

Raver, C. C., Blackburn, E. K., Bancroft, M., & Torp, N. (1999). Relations between effective emotional self-regulation, attentional control, and low-income preschoolers' social competence with peers. *Early Education and Development, 10*, 333-350.

Raver, C. C., & Zigler, E. F. (1997). Social competence: An untapped dimension in evaluating Head Start's success. *Early Childhood Research Quarterly, 12*, 363-385.

Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*, 122-135.

Rothbart, M. K., Ahadi, S. A., & Hershey, K. L. (1994). Temperament and social behavior in childhood. *Merrill-Palmer Quarterly, 40*, 21-39.

Rothbart, M. K., Ahadi, S. A., Hershey, 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. (1998). Temperament. In N. Eisenberg (Ed.), *Handbook of child psychology.* (5th ed., Vol. 3, pp. 105-176). New York: John Wiley & Sons.

Rubin, K. H., Coplan, R. J., Fox, N. A., & Calkins, S. D. (1995). Emotionality, emotion regulation, and preschoolers' social adaptation. *Development and Psychopathology, 7*, 49–62.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177.

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.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 132-189). New York: Russell Sage Foundation.

Stice, E., & Gonzales, N. (1998). Adolescent temperament moderates the relation of parenting to antisocial behavior and substance use. *Journal of Adolescent Research, 13*, 5-31.

Thompson, R. A. (1994). Emotion regulation: A theme in search of a definition. In N. A. Fox (Ed.), *The development of emotion regulation: Biological and behavioral considerations.* (Vol. 59, pp. 25-52). Chicago: The University of Chicago Press.

ENDNOTE

[i] For comparative purposes, two sets of moderation analyses were conducted using OLS regression. The first set of analyses examined whether negative emotionality moderated the relationship between (a) attention regulation, (b) behavior regulation at Time 1, and (c) behavior regulation at Time 2 and children's adjustment while statistically controlling for the aforementioned covariates. None of the 18 interaction tested were significant indicating that when listwise deletion is used, the relations between attentional and behavioral forms of regulation and child outcomes do not vary as a function of negative emotionality.

In the second set of analyses, we split the sample on the median into low and high negative emotionality groups scored such that 0 = low in negative emotionality and 1 = high in negative emotionality (*n*s = 85 and 76 respectively). Unlike what was observed using SEM, two interactions at the trend level were detected for attention regulation by negative emotionality for children's socially competent behavior and writing achievement (*p*s = .09 and .10). That is, attentional regulation was most important for predicting math and writing achievement for children low versus high in negative emotionality.

Although analyses using OLS regression confirmed the role of negative emotionality as a moderator of the attention-achievement link, they provided little support for its role as a moderator of the relations between regulation (both attentional and behavioral) and children's socioemotional adjustment. Similarly, limited support was observed for the hypothesized role of negative emotionality as a moderator of the relations between behavior regulation (assessed longitudinally and concurrently) and children's academic outcomes.

CONCLUDING INTEGRATIVE STATEMENT

Contributions

Overall Contributions

First, this set of dissertation studies addresses a population that has received little attention in the emotion regulation literature (cf. Garner, Jones, & Miner, 1994; Garner & Spears, 2000). The multimethod measures, contrasting geographical locations, and longitudinal design offered here aim to inform and ultimately stimulate progress in the emerging literature on self-regulatory processes in the context of economic disadvantage.

Second, researchers are only now beginning to delineate relations between different aspects of regulation and different aspects of children's socioemotional and academic functioning. These papers are thus extending the literature into new domains by underscoring how important it is to distinguish attentional, behavioral, and control-specific forms of regulation (particularly with reference to inhibitory control) as they relate to child adjustment. Thus, even if the boundary lines between the constructs are still being drawn, it is clear that these aspects of regulation are interrelated yet unique with respect to their relations to other outcomes.

Third, by testing for the hypothesized mediated and moderated relations, these papers represent some of the first studies to *empirically* link competencies in regulating behavior to early reading and writing success in the classroom, independent of factors that are known to influence academic achievement such as maternal age, education, workforce entry, family income category, and child age.

Paper-Specific Contributions

*Paper **1** study contributions*. Interest in relations between self-regulatory skills and socioemotional adjustment among lower risk children has spawned a large body of research (*e.g.*, Eisenberg, 2001; Shoda, Mischel, & Peake, 1990), but comparatively

few studies have been conducted on relations between self-regulatory processes and academic achievement for either low- or higher-risk children (Blair, 2002; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003a). In Paper 1, we examined self-regulation as a central pathway through which effective limit-setting prior to school entry influences subsequent adjustment among Head Start children.

Findings from Paper 1 indicate that the extent to which children were able to engage in attentional and behavioral forms of regulation fully explained the relations between limit-setting practices and early reading success among children from low-income households. Insofar as attentional and behavioral regulatory processes relate to early reading performance, we expect that future studies will bear important policy implications for school readiness legislation.

*Paper **2** study contributions*. Paper 2 makes four contributions to the literature. First, it is one of the first studies to test whether inhibitory control operates through behavioral regulation and thereby traces the order of temporal associations between inhibitory control and behavior regulation. Second, it contributes to a large body of research that examines the long-term effects of behavior regulation skill development (Metcalfe & Mischel, 1999; Mischel, Shoda, & Peake, 1988; Mischel, Shoda, & Rodriguez, 1989) by examining the continuity of such skills over a two-year period, in addition to examining its influence on later adjustment. Third, it serves as one of the first studies to *empirically* link competencies in regulating behavior to early reading and writing success in the classroom, above and beyond factors that are known to influence academic performance.

Apropos of the third contribution, by delineating the role of self-regulation in later academic achievement, research in this area has the potential to prompt changes in how self-regulatory skill curricula are developed and implemented by early childhood educators who serve low-income families. Since 2003, both Congress and

the Bush Administration have called for funding and curriculum changes to the Head Start program emphasizing the development of pre-literacy and pre-math skills in Head Start classrooms (U.S. Dept. of Health and Human Services, 2003). While the long-term benefits of Head Start are unclear, Paper 2 sheds some light on the benefits of developing behavior regulation skills as a pathway through which inhibitory control influences the first-grade reading and achievement of Head Start graduates. The findings suggest that policymakers would be well advised to consider funding further research on the role of behavior regulation as a mechanism, an area that has the potential to yield effective intervention strategies.

Fourth, the findings in Paper 2 on social competence are germane to today's larger, political landscape. In his budget request for 2006, President Bush proposed $100 million to fund technical assistance and research demonstrations to support marital stability, particularly within the context of economic disadvantage, as a part of the Administration's "Healthy Marriage" Initiative (U.S. Dept. of Health and Human Services, 2005, para. 1). Paper 2 results imply that the pathways through which inhibitory control influences later social competence are especially complex for children in single-parent families. "Complex" should not be equated to "worse." Instead, we should ask questions about what self-regulatory skills look like in the context of greater risk.

The social competence findings from Paper 2 are also aligned with objectives established at the National Infant Mental Health Forum (U.S. Dept. of Health and Human Services, 2000): to conduct research that demonstrates the integral nature of self-regulatory skills for healthy social and emotional development. To do this we must consider longitudinal data that permit us to study the effects of processes over time. Longitudinal findings from this study indicate that the constellation of processes that influence the role of behavior regulation in affecting social competence for low-

income children (but not problem behavior or achievement) may operate differently in children who reside with mothers who are married and children whose mothers are unmarried prior to school entry—even after a host of demographic factors are held constant.

*Paper **3** study contributions*. Policymakers and educators are currently engaged in an overall effort to close the achievement gap between higher- and lower-income children. The current legislative focus, as evidenced in the Bush Administration's "Good Start, Grow Smart" Initiative, prioritizes pre-reading and pre-math skills over social and emotional skill development for federal Head Start participants nationally—approximately 500,000, four-year-old children (Children's Defense Fund, 2005). As acknowledged by many researchers (Fantuzzo et al., 1999; Raver, 2002; Raver & Zigler, 1997), competencies in both cognitive and socioemotional development are necessary (as well as health services) for future academic success and thus a hierarchical approach to what Head Start teachers emphasize seems unwise.

Findings from Paper 3 could inform these efforts, as they suggest that expected associations between child attention regulation and early reading performance do not hold for children high in negative emotionality. This implies that policymakers hoping to close the achievement gap among America's schoolchildren in the primary grades may need to supplement their efforts to fine-tune pedagogical practices by providing comprehensive services that address children's emotional well-being.

One example of a classroom-based intervention designed to promote young children's emotional well-being through self-regulatory skill development is called is called the "Incredible Years Dinosaur Program" developed by Webster-Stratton and colleagues (Webster-Stratton & Reid, 2004; Webster-Stratton & Taylor, 2001). This empirically validated program comprises a teacher training/classroom quality intervention in which teachers receive extensive training in effective management of

children's disruptive behaviors, while also learning skills to support young children's in developing emotional and behavioral self-control. Designed for use with three- to eight-year-old children, teachers select from over 60 lesson plans to teach specific skills at least 2 to 3 times a week in 15-to-20-minute large group circle time followed by small group practice activities. Examples of units taught in the curriculum include teaching problem-solving steps and understanding and detecting feelings.

Limitations

Overall Limitations

Sample size. The dissertation studies were limited to some extent by the small sample size. Structural equation modeling typically requires 5-10 cases per parameter estimated. The majority analyses utilized the entire sample ($N = 163$) and thus it appears that the sample size was adequate to test the hypothesized mediation and moderation models.

Stratified sample. Likewise, another global limitation to the dissertation studies was the fact that the sample was highly stratified by geographic location. At both Time 1 and Time 2 rural families had higher incomes. In comparison with their urban counterparts, rural mothers were older, more educated, more likely to be married with White children, and less likely to experience depression. Thus, the dissertation papers actually examined two samples. While such heterogeneity is notable, it most certainly had negative ramifications for our ability to detect the hypothesized relations.

Moderation by marital status analyses. Another global limitation of the dissertation studies was the exploratory nature of the analyses of moderation by marital status. We did not hypothesize that the pathways that lead to socioemotional and academic competence among low-income children would vary as a function of marital status once other sociodemographic factors were held constant. However, the

issue merits consideration, particularly for children's socially competent behaviors. To address such a hypothesis adequately in future research, analyses with larger samples are necessary to determine whether the hypothesized system of relations investigated herein differ among low-income children from single- and two-parent families.

Paper-Specific Limitations

*Paper **1** study limitations*. The small sample size was particularly problematic in Paper 1. Structural equation modeling typically requires 5-10 cases per parameter estimated. Given that our hypothesis was not designed to be estimated with 53 parent-child dyads, models tested for externalizing behaviors in the married sample violated this requirement. Nonetheless, IFI and RMSEA goodness-of-fit indices for the moderation, total effect, and mediation models consistently indicated acceptable model fit.

Another limitation of Paper 1 is that information on parenting practices was based on parent self-reports, which may reflect parents' beliefs or attitudes about limit-setting in general rather than their actual behaviors. This may provide one explanation why relations between limit-setting practices and children's adjustment were virtually non-existent in Paper 1 (only one total effect out of six possible was detected). This is odd because a considerable amount of research suggests that we should see relations between parenting and children's socioemotional outcomes within low-income households (Conger, Conger, & Elder, 1997; Duncan, Brooks-Gunn, & Klebanov, 1994; McLeod & Shanahan, 1993; McLoyd, 1990; Sroufe, 1996). Future studies that utilize child self-reports or observational measures may provide a more accurate picture of parenting than parent self-reports.

It is also possible that behavioral regulation as measured by latency to touch during one resistance-to-temptation task failed to capture the full range of children's

behavioral regulation strategies. In contrast, parent ratings of attention regulation were based on hundreds of events. Thus it may be possible to account for the weak magnitude of their association by contrasting the global qualities of the attention regulation measure with the specific qualities of the behavior regulation measure.

*Paper **2** study limitations*. A central limitation for Paper 2 was the over-constrained nature of the Time 1 behavior regulation measure. The nature of this particular delay-of-gratification task may not have elicited frustration acute enough to arouse children to the point of displaying unregulated behavior (defined as touching a prohibited object) and thus may have undermined the validity of the behavior regulation measure at Time 1. Thus, insufficient variation in children's behavior during this task may help explain why this measure was uncorrelated with all of the outcome variables assessed in Paper 2 in the entire, married, and unmarried samples.

Funder and Block (1989) acknowledge that most children typically hit a ceiling in delay-of-gratification tasks. In particular, they argue that delay studies tell us more about children who do not delay compared with the large number of children who do (Funder & Block, 1989, p. 1049). This coupled with an experimental task (that more readily lends itself to microanalytic coding of task behavior—including looking behavior—see Grolnick et al., 1996; Raver et al., 1999 for specifics about observational coding of task behaviors) as opposed to the more global, time-to-touch assessment used in Paper 2. These factors limited the extent to which we were able to adequately assess the hypothesized associations between children's inhibitory control and subsequent adjustment by examining the mediating role of children's behavior regulation skills measured at both Time 1 and Time 2.

*Paper **3** study limitations*. Currently, nearly all temperament theorists agree that environment influences temperamental tendencies among children, such as a proclivity toward negative emotionality. In view of this, one limitation of Paper 3 is

that it does not focus on parenting or children's exposure to multiple risk factors. While all children in the current study resided in low-income households and were thus at greater risk for adverse developmental outcomes, prior research with this same sample reveals considerable heterogeneity in social capital among the study families (Marcynyszyn, 2006a). Second, the narrow range of negative emotions examined in this paper clearly limits the generalizability of our findings to children who experience anger or frustration. It is important to acknowledge that fearfulness and sadness were not assessed in the present study so it was not possible to test whether these features of negative emotionality operate as moderators of the regulation-adjustment linkage. Third, future studies that use observational assessments of child negative emotionality in both home and school contexts in addition to parent-report measures, as in Paper 3, may provide a better test of the hypothesized moderating effects by negative emotionality on the relations between self-regulation and adjustment.

Future Directions

Definition and measurement. Future work on the self-regulation construct should include a concerted effort to arrive at something approaching consensus on its definition. In the absence of such a consensus, researchers should strive to refine their conceptions of the construct (Cole et al., 2004; Eisenberg et al., 2004; Langlois, 2004). It is difficult to make progress in self-regulation research when investigators use different measures, because it is then almost impossible to compare the results of separate studies.

Researchers measuring self-regulation face several challenges in addition to the abovementioned definition problem (see Cole et al., 2004; Eisenberg et al., 2004). First, there is a need for more viable measures of the construct. As described by Eisenberg and colleagues (2004), some measures of child self-regulation tap

emotionality, social competence, or adjustment as much as regulation itself. Second, typical features of delay-of-gratification tasks (novel situations, adults, or objects) may inadvertently tap behavioral inhibition (i.e., shyness), not self-regulatory skills per se. Thus, delay tasks that assess situational compliance in novel or strange situations might be used in conjunction with other self-regulation measures to understand the unique contributions of each construct.

Although researchers cite studies about regulation of positive emotional arousal (i.e., to keep arousal within a manageable and pleasurable range), their studies appear to assess children's propensity to exhibit positive emotion but not to regulate it. In particular, some researchers report using tasks to measure regulation of both negative and positive affect, yet the tasks generally involve observing children's affect during free play activities (Calkins, 1997; Calkins, Smith, Gill, & Johnson, 1998; Grolnick, Cosgrove, & Bridges, 1996).

Studies on exuberance examine positive emotionality and thus have the potential to yield useful results on self-regulation of positive affect (see Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Henderson, Marshall, Fox, & Rubin, 2004; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1999). Thus far, however, these studies rely on parental report (Fox et al., 2001; Henderson et al., 2004) or children's responses to exuberance-eliciting activities (high energy approach and positive affect) while overlooking the regulation of exuberance (see Goldsmith et al., 1999 for an exception). Development of research in this area will further distinguish the self-regulation literature from the stress and coping literature through its focus on positive emotionality.

Similarly, conflating levels of emotionality with regulatory skills/capacity—viewing positive emotions as "regulated" and negative emotions as "unregulated"—represents a third measurement issue. Because self-regulatory skills are sometimes

inferred from infrequent displays of negative affect, measures of self-regulation and emotionality can be confounded. As suggested by Eisenberg and colleagues (2004), this is in part why it is useful to assess processes that often are involved in self-regulation (e.g., attention shifting and focusing, inhibition of behavior) rather than trying to assess the regulation of the emotion itself.

Bronfenbrenner's (1979) ecological systems theory emphasized understanding child development in context. One important type of context beyond the scope of these papers yet still worthy of note is that of extreme familial environments in which children are exposed to maltreatment. These extreme contexts have important implications for how researchers conceptualize "regulated" behavior. In particular, they imply that regulatory difficulties arise not because children are using inappropriate or deficient strategies, but rather, given the extreme demands of the familial context, optimal forms of self-regulation do not exist (Thompson & Calkins, 1996). Clearly, the child who behaves in an extremely defiant manner at school and thereby alerts school administrators to possible abuse should not be viewed as low in self-regulation skills. If anything, displays of dysregulation would be considered competent in the short term because they serve to alert and, hopefully, marshal others to intervene at some level on behalf of the child. Thus great care is warranted as we consider the nature of adaptive self-regulatory skill development.

Underlying neurobiological processes. The physiological correlates of self-regulation represent a relatively new yet active area for research (Evans & English, 2002; Gunnar, 2000; Repetti, Taylor, & Seeman, 2002). A review by Eisenberg and colleagues (2004) suggests that effortful control (sometimes labeled as self-regulation) and reactive processes are most likely localized in different parts of the brain (Derryberry & Reed, 1996; Eisenberg & Morris, 2002). For example, vagal modulation of respiratory-driven, high-frequency heart-rate variability has been

associated with executive control (i.e., self-regulation) on behavioral tasks, whereas processes involved in reactive control, such as avoidance, have been correlated with sympathetic modulation of heart-rate variability (Mezzacappa et al., 1998). In addition, investigators have used vagal tone (Fox, 1989; Porges, Doussard-Roosevelt, & Maiti, 1994) and cortisol responding (Gunnar, 2000) as measures of regulation (or similar constructs). As identified by many researchers, neurobiological work will most certainly inform how self-regulation is conceptualized, particularly with respect to distinctions among self-regulatory constructs as well as maturational issues related to the development of different self-regulatory competencies. Moreover, from a policy perspective, studies that incorporate physiological measures are likely to further additional research on self-regulation and (if supported by the evidence) the development and dissemination of interventions related to self-regulation by providing unbiased assessments of adjustment.

Culture. Most studies on emotion regulation have been conducted in the US and thus a clear need exists—especially amid growing interest in understanding processes in other cultural contexts—for studies in different cultures and subcultures. Eisenberg and colleagues (2004) describe areas or research that would be helpful in cross-cultural research:

> similarities and differences across cultures in conceptions of regulated behavior, when regulation is desirable, and how it is achieved; the applicability of measures of emotion-related regulation across cultures and how they can be adapted to be culturally sensitive and valid; cultural differences in commonly enacted regulation styles and strategies; and cultural differences in the relations between regulation and other psychological variables, such as parenting socialization, social competence, and psychological adjustment (Eisenberg, Champion, & Ma, 2004, p. 247).

Policy. Policy changes are implied throughout this dissertation, but the topic of school readiness stands out in particular not only because of the results reported here but because of the current political and sociocultural climate. La Paro and Pianta (2000) conducted a meta-analysis of the stability of preschool academic/cognitive indicators of outcomes for young children which revealed, in terms of performance in comparable domains one-to-three years later, moderate correlations for early achievement/cognitive outcomes. Their meta-analysis further indicated that, on average, 25% of observed variance in these outcomes was predicted from preschool or kindergarten academic/cognitive status. These low-to-moderate estimates indicate that research on school readiness would benefit from not only defining but also assessing readiness in terms other than those that refer exclusively to children's cognitive skills and academic abilities (La Paro & Pianta, 2000; Raver & Zigler, 1997).

The results of these dissertation studies may help guide policy related to what it means to be ready for school. At times, education policy and child well-being are separate and distinct areas of research and policy. Bringing the two together may allow us to address prior shortcomings of educational policies designed for low-income, preschool age children. These dissertation studies represent a first step toward addressing a very real gap in our understanding of skills that are likely to underscore school readiness by elucidating how self-regulation operates within high-risk contexts.

REFERENCES

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.

Bronfenbrenner, U. (1979). *The Ecology of Human Development.* Cambridge: Harvard University Press.

Calkins, S. D. (1997). Cardiac vagal tone indices of temperamental reactivity and behavioral regulation in young children. *Developmental Psychobiology, 31*(2), 125–135.

Calkins, S. D., Smith, C. L., Gill, K. L., & Johnson, M. C. (1998). Maternal interactive style across contexts: Relations to emotional, behavioral and physiological regulation during toddlerhood. *Social Development, 7*(3), 350–369.

Children's Defense Fund (2005). *Using child assessments in Head Start*. Retrieved October 8, 2005, from http://www.childrensdefense.org/earlychildhood/headstart/using_child_assessments.pdf

Derryberry, D., & Reed, M.A. (1996). Regulatory processes and the development of cognitive representations. *Development and Psychopathology, 8*, 215-234.

Duncan, G. J., Brooks-Gunn, & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development, 65*(2), 296-318.

Eisenberg, N. (2000). Emotion, regulation, and moral development. *Annual Review of Psychology, 51*, 665-697.

Eisenberg, N., Champion, C., & Ma, Y. (2004). Emotion-related regulation: An emerging construct. *Merrill-Palmer Quarterly, 50*(3), 236–259.

Eisenberg, N., & Morris, A. S. (2002). Children's emotion-related regulation. In R. Kail (Ed.), *Advances in child development and behavior* (Vol. 30, pp. 190-229). Amsterdam: Academic Press.

Evans G. W., & English, K. (2002). The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. *Child Development, 73*(4), 1238-1248.

Fantuzzo, J., Stolzfus, J., Lutz, M. N., Hamlet, H., Balraj, V., Turner, C., & Mosca, S. (1999). An evaluation of special needs referral process for low-income preschool children with emotional and behavioral problems. *Early Childhood Research Quarterly, 4*, 465-482.

Fox, N.A. (1989). Psycho physiological correlates of emotional reactivity during the first year of life. *Developmental Psychology, 25,* 364-372.

Fox, N. A., Henderson, H. A., Rubin, K. H., Calkins, S. D., & Schmidt, L. A. (2001). Stability and instability of behavioral inhibition and exuberance: Psychophysiological and behavioral factors influencing change and continuity across the first four years of life. *Child Development, 72*(1), 1-21.

Funder, D. C., & Block, J. (1989). The role of ego-control, ego-resiliency, and IQ in delay of gratification in adolescence. *Journal of Personality and Social Psychology, 57*, 1041-1050.

Garner, P. W., Jones, D. C., & Miner, J. L. (1994). Social competence among low-income preschoolers: Emotion socializers practices and social cognitive correlates. *Child Development, 65*, 622-637.

Garner, P. W., & Spears, F. M. (2000). Emotion regulation in low-income preschoolers. *Social Development, 9*, 246-264.

Goldsmith, H. H., Reilly, J., Lemery, K. S., Longley, S., & Prescott, A. (1999). *The Laboratory Temperament Assessment Battery—Preschool Version: Description of measures*. Retrieved October 10, 2005, from http://psych.wisc.edu/goldsmith/Researchers/GEO/geo_researcher_faq.htm

Grolnick, W., Cosgrove, T., & Bridges, L. (1996). Age-graded change in the initiation of positive affect. *Infant Behavior and Development, 19*(1), 153–157.

Gunnar, M. R. (2000). Early adversity and the development of stress reactivity and regulation. In C.A. Nelson (Ed.), *The Minnesota Symposia on Child Psychology: Vol 31, The Effects of adversity on neurobehavioral development* (pp. 163-200). Mahwah, NJ: Erlbaum.

Henderson, H. A., Marshall, P. J., Fox, N. A., & Rubin, K. H. (2004). Psychophysiological and behavioral evidence for varying forms and functions of nonsocial behavior in preschoolers. *Child Development, 75*(1), 236-250.

Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003a). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*(1), 101-119.

Langlois, J. H. (2004). Emotion and emotion regulation: From another perspective. *Child Development, 75*(2), 315-316.

La Paro, K. M., & Pianta, R. C. (2000). Predicting children's competence in the early school years: A meta-analytic review. *Review of Educational Research, 70*(4), 443-484.

Marcynyszyn, L. A. (2006a). *Self-Regulation as a mediator of the relationship between caregivers' limit-setting and children's behaviors and academic performance*. Unpublished doctoral dissertation, Cornell University, NY.

McLeod, J. D., & Shanahan, M. J. (1993). Poverty, parenting, and children's mental health. *American Sociological Review, 58*, 351-366.

McLoyd, V. C. (1990). The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development. *Child Development, 61*, 311-346.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Bulletin, 106*(1), 3-19.

Mezzacappa, E., Kindlon, D., Saul, J. P., & Earls, F., (1998). Executive and motivational control of performance task behavior, and autonomic heart-rate regulation in children: Physiological validation of two-factor solution inhibitory control. *Journal of Child Psychology and Psychiatry, 39,* 525-531.

Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology, 54*, 687-696.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989, May). Delay of gratification in children. *Science, 244*, 933-938.

Porges, S. W., Doussard-Roosevelt, J. A., & Maiti, A. K. (1994). Vagal tone and the physiological regulation of emotion. In N.A. Fox (Ed.), Emotion regulation: Behavioral and biological considerations. *Monographs of the Society for Research in Child Development, 59* (Serial No. 240), 167-186.

Raver, C. C., & Zigler, E. F. (1997). Social competence: An untapped dimension in evaluating Head Start's success. *Early Childhood Research Quarterly, 12*, 363-385.

Repetti, R. A., Taylor S. E., & Seeman, T. E. (2002). Risky families: family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128*, 330–366.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 132-189). New York: Russell Sage Foundation.

Thompson, R. A., & Calkins, S. D. (1996). The double edged-sword: Emotion regulation for children at risk. *Development and Psychopathology, 8*, 163-182.

U. S. Department of Health and Human Services (2000, October). *Report of the Infant Mental Health Forum*. Washington DC: Author.

U.S. Department of Health and Human Services (2003, July 25). *Regarding Passage of the School Readiness Act of 2003 (H.R. 2210)*. Retrieved October 2, 2005, from http://www.hhs.gov/news/press/2003pres/20030725a.html

U.S. Department of Health and Human Services (2005). *Eight allowable activities of the Proposed Healthy Marriage Promotion Grant*. Retrieved October 10, 2005, from http://www.acf.hhs.gov/healthymarriage/funding/activities.html

Webster-Stratton, C., & Reid, M. J. (2004). Strengthening social and emotional competence in young children—The foundation for early school readiness and success Incredible Years Classroom Social Skills and Problem-Solving Curriculum. *Infants and Young Children*, *17*(2), 96–113.

Webster-Stratton, C., & Taylor, T. (2001). Nipping early risk factors in the bud: Preventing substance abuse, delinquency, and violence in adolescence through interventions targeted at young children (0–8 years). *Prevention Science, 2*(3), 165–192.

APPENDIX A

ACADEMIC CODING

The Academic Grading Scheme for the Early Social Development Study

- Numeric and non-numeric grades were converted to a 5-point numeric scale (range: 0-4)

- The Numeric Scale
    - We started with zero because most scales start with zero.
        - ✧ Grades were anchored at 2.0: satisfactory progress.
        - ✧ 0 was assigned for needs improvement and unsatisfactory performance.
        - ✧ 4.0 was assigned for excellent or very good performance.
        - ✧ 1.0 and 3.0 were assigned as midpoints between 0 and 2.0; 2.0 and 4.0.

- Rounding Point Five Grades (*e.g.*, B+, C-)
    - In order to maintain the integrity of a five-point scale (range: 0-4), point five grades (*e.g.*, grades with pluses or minuses) were consistently rounded up and down. This method allowed us to avoid creating an academic scale with more than 5-points.

- Effort Grades
    - Effort grades were converted to a 0-4 scale so that they would be consistent with the academic grading scheme. Thus, although the majority of school districts tended to use 4-point effort scales (*e.g.*, consistently = 4.0, usually = 3.0, needs more effort = 2.0, and effort not apparent = <u>1.0</u>) we replaced the lowest score [typically 1.0] with a zero so that the effort grades mirrored the 5-point (0-4) academic grading scheme (*e.g.*, consistently → 4.0, usually → 3.0, needs more effort → 2.0, and effort not apparent → <u>0</u>).

- Reading/Writing Development Grades (ONLY)
    - In the Ithaca, Dryden, and Trumansburg School Districts, Reading and Writing (development) grades were presented using bar charts. That is, teachers marked bar charts on the students' report cards in order to indicate student progress.

    - Bar Charts
        - ✧ If teachers made lines between the "A" and "C" categories on the students' bar charts, for example, these lines were coded as either "A" <u>or</u> "C." Thus, in coding these development grades, point five grades (*e.g.*, B+ = 3.5), were not assigned.

The Reading Grading Scheme

Barry Reading key
V = Very good → 4.0
S+ (grade received) → 3.0
S = Satisfactory → 2.0
I = Improving, growth shown → 1.0
N = Needs improvement → 0
X = does not apply at this time → blank

Dryden Reading Development key
f2-f4 third grade → 4.0
f1 second grade → 4.0
e4 second grade → 3.0
[e3.5] → 3.0
e3 first grade, Early level 3 → 2.0
[e2.5] → 2.0
e2 mid first grade, Early level 2 → 2.0
[e1.5] → 2.0
e1 first grade, Early level 1 → 1.0
EM kindergarten → 0

Dryden Reading Development

	Kindergarten		First			Second		Third		
Level	PM	EM	E1	E2	E3	E4	F1	F2	F3	F4
Grades LM/ CR assigned	--	0	1.0	2.0	2.0	3.0	4.0	4.0	4.0	4.0

Dryden Reading Level key
F4 = F4 Level
F3 = F3 Level
F2 = F2 Level
F1 = F1 Level
E4 = Early 4 Level
E3 = Early 3 Level
E2 = Early 2 Level
E1 = Early 1 Level
EM = Early Emergent
PM = Pre-Emergent

Groton Reading key
E = Excellent → 4.0
S+ (grade received) → 3.0
S = Satisfactory → 2.0
S- (grade received) → 1.0
I = Inconsistent → 1.0
N = Needs improvement → 0

Ithaca Reading key
E = consistently achieves excellent results → 4.0
G+ (grade received) → 4.0
G = meets requirements with good results → 3.0
S+ or S/G (grades received) → 3.0
S = meets requirements with satisfactory results → 2.0
S- or N/S (grades received) → 1.0
N = experiences difficulty, needs to improve, needs time → 0
v = indicates materials covered → blank
done → blank

Note 3 children in the Ithaca City School District (ICSD) have permanent report cards (*i.e.*, the summary report card that the ICSD holds onto) in lieu of the standard district report cards.

Ithaca Permanent Record Card Reading key
E = Making excellent progress → 4.0
S+ = Making good progress → 3.0
S = Making satisfactory progress → 2.0
S- = Making slow but continued progress → 1.0
U = Making minimal progress → 0

Ithaca Reading Development

Stage	EE early emergent	AE adv. emergent	EB early begin	AB adv. begin	EI early indp.	AI adv. indp.	E exp.	VE very exp.
Book level	A-to-1	2	3-to-4	6-to-12	14-to-18	20-to-28	30-to-34	38-to-44
Reading Bench-mark End	--	--	--	--	Level 16 = 1st grade	Level 24 = 2nd grade	--	Level 40 = 3rd grade, Level 44 = 4th/5th grade
Grades LM/ CR assigned	0	1.0	1.0	2.0	3.0 [AB/EI]	3.0	4.0	4.0

adv = advanced; begin = beginner; exp. = experienced; indp. = independent

Ithaca Reading Development (Stage) key
ve → 4.0
e → 4.0
ai → 3.0
ei → 3.0
ab/ei (grade received) → 3.0
s+ (grade received on perm card) → 3.0
ab → 2.0
s → (grade received on perm card) → 2.0
eb → 1.0
ae → 1.0
s- (grade received on perm card) → 1.0
ee → 0

Note Ithaca reading and writing development grades at the 3rd grade level ("VE" and "AI" respectively) were coded as 4.0. Reading and writing development grades at the 2nd grade level ("AI" and "EI" respectively) were coded as 3.0.

Lansing Reading & Reading Level key
S = satisfactory → 4.0
S- (grade received) →2.0
N = needs improvement → 0
* = item does not apply at this time → blank

Rochester Reading key
E = Excellent → 4.0
VG = Very Good → 3.0
S+ (grade received) → 3.0
S = Satisfactory Progress → 2.0
S- (grade received) → 1.0
N = Needs Improvement → 0
U = Unsatisfactory Progress → 0

St. Helen Reading key
4 = demonstrates a thorough understanding of subject matter → 4.0
3 = demonstrates a clear understanding of subject matter → 3.0
2 = demonstrates a partial understanding of subject matter → 2.0
1 = does not demonstrate an understanding of subject matter → 0

St. Monica Reading key
A = Excellent → 4.0
B+ = Very Good → 4.0
B = Good → 3.0
C+ = Average → 3.0
C = Fair → 2.0
D = Unsatisfactory → 1.0

F = Failing → 0

Trumansburg Reading Development key
I = Advanced beginning 2 → 4.0
G = Advanced beginning 1 → 3.0
E = Early beginning → 2.0
C = Advanced emergent → 1.0
A = Early emergent → 0

The Math Grading Scheme

Barry Math key
V = Very good → 4.0
S+ (grade received) → 3.0
S = Satisfactory → 2.0
I = Improving, growth shown → 1.0
N = Needs improvement → 0
X = does not apply at this time → blank

Dryden Math key
* = Commendable progress → 4.0
✓ = Steady progress → 2.0
x = Not progressing as expected → 0
☐ = Not assessed at this time → blank

Groton Math key
E = Excellent → 4.0
S+ (grade received) → 3.0
S = Satisfactory → 2.0
S- (grade received) → 1.0
I = Inconsistent → 1.0
N = Needs improvement → 0

Ithaca Math key
E = consistently achieves excellent results → 4.0
G+ (grade received) → 4.0
G = meets requirements with good results → 3.0
S+ or S/G (grades received) → 3.0
S = meets requirements with satisfactory results → 2.0
S- or N/S (grades received) → 1.0
N = experiences difficulty, needs to improve, needs time → 0
✓ = indicates materials covered → blank
done → blank

Ithaca Permanent Record Card Math key
E = Making excellent progress → 4.0
S+ = Making good progress → 3.0
S = Making satisfactory progress → 2.0
S- = Making slow but continued progress → 1.0
U = Making minimal progress → 0

Lansing Math key
S = satisfactory → 4.0
S- (grade received) →2.0
N = needs improvement → 0
* = item does not apply at this time → blank

Rochester Math key
E = Excellent → 4.0
VG = Very Good → 3.0
S+ (grade received) → 3.0
S = Satisfactory Progress → 2.0
S- (grade received) → 1.0
N = Needs Improvement → 0
U = Unsatisfactory Progress → 0

St. Helen Math key
4 = demonstrates a thorough understanding of subject matter → 4.0
3 = demonstrates a clear understanding of subject matter → 3.0
2 = demonstrates a partial understanding of subject matter → 2.0
1 = does not demonstrate an understanding of subject matter → 0

St. Monica Math key
A = Excellent → 4.0
B+ = Very Good → 4.0
B = Good → 3.0
C+ = Average → 3.0
C = Fair → 2.0
D = Unsatisfactory → 1.0
F = Failing → 0

Trumansburg Math key
S = secure → 4.0
D/S (grade received) → 3.0
D = developing → 2.0
B/D (grade received) → 1.0
B = beginning → 0

The Writing Grading Scheme

Barry Writing key
V = Very good → 4.0
S+ (grade received) → 3.0
S = Satisfactory → 2.0
I = Improving, growth shown → 1.0
N = Needs improvement → 0
X = does not apply at this time → blank

Dryden Writing Development key
f2-f4 third grade → 4.0
f1 second grade → 4.0
e4 second grade → 3.0
[e3.5] → 3.0
e3 first grade, Early level 3 → 2.0
[e2.5] → 2.0
e2 mid first grade, Early level 2 → 2.0
[e1.5] → 2.0
e1 first grade, Early level 1 → 1.0
EM kindergarten → 0

Dryden Writing Development

	Kindergarten		First			Second		Third		
Level	PM	EM	E1	E2	E3	E4	F1	F2	F3	F4
Grades LM/ CR assigned	--	0	1.0	2.0	2.0	3.0	4.0	4.0	4.0	4.0

Dryden Writing Level key
F4 = F4 Level
F3 = F3 Level
F2 = F2 Level
F1 = F1 Level
E4 = Early 4 Level
E3 = Early 3 Level
E2 = Early 2 Level
E1 = Early 1 Level
EM = Early Emergent
PM = Pre-Emergent

Groton Writing key
E = Excellent → 4.0
S+ (grade received) → 3.0
S = Satisfactory → 2.0
S- (grade received) → 1.0
I = Inconsistent → 1.0
N = Needs improvement → 0

Ithaca Writing key
E = consistently achieves excellent results → 4.0
G+ (grade received) → 4.0
G = meets requirements with good results → 3.0
S+ or S/G (grades received) → 3.0
S = meets requirements with satisfactory results → 2.0
S- or N/S (grades received) → 1.0
N = experiences difficulty, needs to improve, needs time → 0
v = indicates materials covered → blank
done → blank

Ithaca Permanent Record Card Writing key
E = Making excellent progress → 4.0
S+ = Making good progress → 3.0
S = Making satisfactory progress → 2.0
S- = Making slow but continued progress → 1.0
U = Making minimal progress → 0

Ithaca Writing Development

Stage	EE early emergent	AE advanced emergent	EB early begin	AB advanced begin	EI early Indp.	AI advanced indp.	E exp.	VE very exp.
Writing Bench-mark End	--	--	--	AB = 1st grade	EI = 2nd grade	AI = 3rd grade	--	--
Grades LM/ CR assigned	0	1.0	1.0	2.0	3.0 [AB/EI]	3.0	4.0	4.0

begin = beginner; exp. = experienced; indp. = independent

Ithaca Writing Development (Stage) key
ve → 4.0
e → 4.0
ai → 4.0
ei → 3.0

ab/ei (grade received) → 3.0
s+ (grade received on perm card) → 3.0
ab → 2.0
s → (grade received on perm card) → 2.0
eb → 1.0
ae → 1.0
s- (grade received on perm card) → 1.0
ee → 0

Lansing Writing key
S = satisfactory → 4.0
S- (grade received) →2.0
N = needs improvement → 0
* = item does not apply at this time → blank

Rochester Writing key
E = Excellent → 4.0
VG = Very Good → 3.0
S+ (grade received) → 3.0
S = Satisfactory Progress → 2.0
S- (grade received) → 1.0
N = Needs Improvement → 0
U = Unsatisfactory Progress → 0

St. Helen Writing key
4 = demonstrates a thorough understanding of subject matter → 4.0
3 = demonstrates a clear understanding of subject matter → 3.0
2 = demonstrates a partial understanding of subject matter → 2.0
1 = does not demonstrate an understanding of subject matter → 0

St. Monica Writing key
A = Excellent → 4.0
B+ = Very Good → 4.0
B = Good → 3.0
C+ = Average → 3.0
C = Fair → 2.0
D = Unsatisfactory → 1.0
F = Failing → 0

Trumansburg Writing Development key
AB = Advanced beginning → 4.0
EB = Early beginning → 2.0
AE = Advanced emergent → 1.0
EE = Early emergent → 0

APPENDIX B

EM ALGORITHM

At present, pairwise and listwise deletion are the methods used most commonly to address the problem of incomplete data (Grace-Martin, 2001; Wothke & Arbuckle, 1996). In listwise deletion (LD), cases with missing data on any of the variables are excluded from the analysis. In pairwise deletion (PD), cases are excluded only if they have missing data on the variables involved in a specific analysis. Listwise and pairwise deletion may lead to biased results depending on why the data are missing.

According to Wothke and Arbuckle (1996), there is "little theoretical justification" for using listwise or pairwise deletion to handle missing data (p. 2). The EM algorithm is defined as a "general method of finding the maximum-likelihood estimate of the parameters of an underlying distribution from a given data set when the data is incomplete or has missing values" (Bilmes, April 1998, p. 1).

While researchers have known about the advantages of full information maximum likelihood estimation (FIML) methods for decades (see Anderson & Gerbing, 1984; Hartley & Hocking, 1971; Little & Rubin, 1987; Rubin, 1976), these theory-driven techniques have until recently had little influence on the treatment of missing data. Wothke and Arbuckle (1996) argues that the "under-utilization" of FIML estimation to address the missing data issue is due in part to the unavailability of the method in standard statistical analysis programs and to the misconception that the method yields results comparable to or modestly better than pairwise/listwise deletion techniques (p. 2). It is important to note that FIML is a type of maximum likelihood (ML) estimation, which utilizes a more specific version of the EM algorithm. Theoretically, FIML is a form of ML and thus these terms, FIML and ML, are essentially interchangeable (personal communication with Karen Grace-Martin on January 5, 2006).

The advantages of FIML estimation depend on the sample size and the extent to which the data are missing. All causes of missing data fit into four classes, based on the relationship between the missing data mechanism and the missing and observed values (Grace-Martin, 2001). These classes are important to understand because the problems caused by missing data and the solutions to these problems differ across the four classes. A key distinction is whether the explanation for the incompleteness identifies ignorable (*i.e.*, MCAR, CD, or MAR) or non-ignorable data as missing.

The first data class of missing data is designated as Missing Completely at Random (MCAR). MCAR means that the missing data mechanism is unrelated to the values of any variables, whether missing or observed. Most incomplete data are not MCAR. At the opposite end of the continuum is Non-Ignorable (NI) missing data. NI means that the missing data mechanism is related to the missing values. NI problems occur when there are limitations or problems with the observation process. Between these two extremes are data classes designated as Missing at Random (MAR) and Covariate Dependent (CD). Both of these classes require that the unavailability of the data in question is unrelated to the missing values, but may be related to the observed values of other variables. MAR means that the missing values are related either to observed covariates or to response variables, whereas CD means that the missing values are related only to covariates.[30] The CD class represents a type of MAR data. Simulations with MCAR data indicate that FIML techniques are more precise compared with PD and LD estimation techniques.

Before proceeding, it is important to clear up a common misconception about FIML estimation. This estimation technique does not "replace" missing data values. That is, FIML estimation is not imputation (Acock, 2005; Arbuckle & Wothke, 1999; Schafer & Graham, 2002). The benefits of FIML over listwise and pairwise deletion are reviewed by Little and Schenker (1995) and thus are not described in detail here.

When data are MCAR, "PD and LD estimates are consistent, although less efficient" (Wothke, 2000, p. 3). Further, Wothke (2000) states that:

---

[30] Missing values on income represent a common example of CD missing data. These CD missing values may be unrelated to participants' actual income values, but related to their educational status. For example, it is possible that individuals with more education are less likely to reveal their income than those individuals with less education (Grace-Martin, 2001).

> If the data are only MAR, PD and LD estimates can be biased. ML estimates, on the other hand, are already both consistent and efficient when the data are only MAR. In addition, some authors have suggested that ML estimates will tend to show less bias than estimates based on PD or LD even when the data deviate from MAR (Little and Rubin, 1989; Muthén, Kaplan and Hollis, 1987) (Wothke, 2000, p. 3).

In simulations where the data are distributed normally (*e.g.*, centered almost exactly at zero), two conclusions are possible. First, estimation bias by all three methods (PD, LD, and ML) is negligible (the anticipated result with MCAR data). Second, the mean square errors can be interpreted as sampling variances, indicating differences in the precision of the estimates. That is, given the assumption that variances of sample means and regression coefficients are inversely related to sample size, the relative mean square errors can be used to quantify the relative gains in efficiency of ML estimation over PD. Switching from PD to ML can improve precision in a manner equivalent to increasing the sample size by a factor of almost 3. Specifically, in a simulation where regression weights were estimated from a latent variable to an endogenous variable as precisely with PD as with ML, the sample size would need to double to achieve comparable estimates. Wothke (2000) argues that it is impossible to put a single figure on the gain in accuracy of estimation to be had by eliminating PD or LD in favor of ML.

Although simulations such as these demonstrate that ML estimates are less biased than PD or LD estimates, it is also true that some mean errors obtained through ML remain large in relation to their standard errors. Thus, while yielding less-biased estimates than PD and LD, ML does not appear to compensate completely for the bias introduced by the missing data process.

ML estimation with incomplete data is both feasible and accessible and should therefore be the preferred method of treating missing data when the alternative is pairwise or listwise deletion. Moreover, the fact that it does not rely on the MCAR requirement is a feature that "remains to be fully exploited" (Wothke, 2000, p. 8).

A summary of two key questions regarding the EM algorithm, FIML, and the Amos program that arose during my dissertation defense is included below.

Question 1. What method does the Amos program (versions 4.0 and higher) use for missing data analysis and how does this approach differ, computationally, from other approaches used to handle missing data? Unlike most other methods, FIML estimation uses all of the information from the observed data. As outlined in the "Questions about Missing Data" section of the SmallWaters Corporation's web site (n.d.):

> The likelihood is computed for the observed portion of each case's data and then accumulated and maximized. Amos's ML approach usually yields results equivalent to Don Rubin's EM approach, except that Amos also incorporates constrained moment matrix estimation. In addition, FIML *requires no imputation*" [emphasis added] (SmallWaters Corporation, n.d.).

The ML method that AMOS uses is the optimal method for treating missing data because it does not "replace" missing data values. For example, Amos was designed to assume that the data are MAR and then to compute the likelihood of the parameter values given the observed data for each case. The ML estimates are obtained from the point at which the likelihood reaches its maximum value. The EM algorithm does impute the unobserved data.

As described by Wothke (2000), Rubin's EM approach (*i.e.*, Dempster, Laird & Rubin, 1977) is one of several algorithms with which it is possible to obtain ML estimates. The FIML algorithm used by Amos is also ML, but more closely related to the methods suggested by Hartley & Hocking (1971) than the methods suggested by Rubin and colleagues. One distinction between FIML and the EM algorithm approach is that FIML provides standard error estimates by using 1st- and 2nd-order derivatives. The EM algorithm "only uses 1st order derivatives and does not, per se, produce standard errors" (SmallWaters Corporation, n.d).

Unlike Graham's EM program (SmallWaters Corporation, n.d.), which utilizes a normal theory implementation of the EM algorithm, the Amos program uses the EM algorithm in FIML to estimate missing data values from the portion of the data that are

available. Amos does not use imputations (Wothke, 2000). Instead, models are estimated by FIML. Both ML methods typically yield identical point estimates of the model parameters, except that computational differences are sometimes encountered. Indeed, original EM methods proposed by Dempster, Laird and Rubin (1977) do not produce standard error estimates ("Questions about Missing Data," 2006).

Question 2. Given a scenario in which the data are MCAR, multivariate normality is assumed, and statistical significance issues (*e.g.*, $p < .05$) are set aside, would you obtain the same pattern of results when using only complete data (when using listwise deletion)? That is, are missing data results obtained by using listwise deletion under these conditions (MCAR, multivariate normality) comparable to results obtained using FIML in Amos?

According to Wothke (2000), when the data are MCAR, pairwise or listwise deletion methods are asymptotically equivalent to full information ML, but the standard errors of their parameter estimates are often substantially larger (SmallWaters Corporation, n.d.). Wothke (2000) argues that FIML makes more efficient use of the available data. To obtain statistical power comparable to those found in FIML methods, much larger samples are needed for PD methods and even more so for LD methods.

REFERENCES

Acock, A. C. (2005). Working with missing values. *Journal of Marriage and Family, 67*, 1012-1028.

Allison, P. D. (1987). Estimation of linear models with incomplete data (pp. 71-103). In C. C. Clogg (Ed.), *Sociological Methodology*. San Francisco: Jossey-Bass.

Anderson, J.C., & Gerbing, W. D. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood for maximum likelihood confirmatory factor analysis. *Psychometrika, 49*, 155–173.

Arbuckle, J. L., & Wothke, W. (1999). *Amos 4.0 user's guide*. Chicago: SmallWaters Corporation.

Bilmes, J. A. (April, 1998). *A gentle tutorial of the EM Algorithm and its application to parameter estimation for Gaussian Mixture and Hidden Markov Models*. Retrieved January 3, 2006, from http://www.icsi.berkeley.edu/ftp/global/pub/techreports/1997/tr-97-021.pdf

Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood estimation from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society, Series B, 39*, 1–38.

Grace-Martin, K. (2001, October). *StatNews #46: Missing Data Mechanisms*. Retrieved January 4, 2006, from http://www.osc.cornell.edu/Statnews/stnews46.htm

Hartley, H. O., & Hocking, R. R. (1971). The analysis of incomplete data. *Biometrics, 27*, 783–823.

Little, R. J. A., & Rubin, D. B. (1987). *Statistical analysis with missing data*. New York: Wiley.

Little, R. J. A., & Rubin, D. B. (1989). The analysis of social science data with missing values. *Sociological Methods and Research, 18*, 292–326.

Little, R. J. A., & Schenker, N. (1995). Missing data (pp. 39–75). In G. Arminger, C. C. Clogg, & M. E. Sobel (Eds.), *Handbook of statistical modeling for the social and behavioral sciences*. New York: Plenum.

Muthén, B., Kaplan, D., & Hollis, M. (1987). On structural equation modeling with data that are not missing completely at random. *Psychometrika, 52*, 431–462.

Rubin, D. B. (1976). Inference and missing data. *Biometrika, 63*, 581-592.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177.

SmallWaters Corporation (n.d.). *Questions about missing data*. Retrieved January 3, 2006, from http://www.smallwaters.com/amos/faq/faqa-missdat.html

Wothke, W. (2000). *AMOS White Paper: Longitudinal and multi-group modeling with missing data*. Retrieved January 3, 2006, from http://www.smallwaters.com/whitepapers/longmiss/Longitudinal%20and%20multi-group%20modeling%20with%20missing%20data.pdf

Wothke, W., & Arbuckle, J. L. (1996). *Full-information missing data analysis with Amos*. Retrieved January 5, 2006, from ftp://hqftp1.spss.com/pub/web/wp/AMOSP.pdf

APPENDIX C

MEASURES

Child Behavior Questionnaire (CBQ)

s)_____

Instructions: Please read carefully before starting

On the next pages you will see a set of statements that describe children's reactions to a number of situations. We would like you to tell us what your child's reaction is likely to be in those situations. There are of course no "correct" ways of reacting; children differ widely in their reactions, and it is these differences we are trying to learn about. Please read each statement and decide whether it is a "true" or "untrue" description of your child's reaction within the past six months. Use the following scale to indicate how well a statement describes your child:

Circle # If the statement is:

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
extremely untrue	**quite untrue**	**slightly untrue**	**neither true nor untrue**	**slightly true**	**quite true**	**extremely true**	**not applicable**

If you cannot answer one of the items because you have never seen the child in that situation, for example, if the statement is about the child's reaction to you singing and you have never sung to the child, then circle NA (not applicable).

Please be sure to circle a number or NA for every item.

My Child:

1. Gets angry when s/he has to go to bed.

1 2 3 4 5 6 7 NA

2. Can lower his/her voice when asked to do so.

1 2 3 4 5 6 7 NA

3. Is hard to get her/his attention when s/he is concentrating on something.

1 2 3 4 5 6 7 NA

4. Sometimes prefers to watch rather than join other children playing.

1 2 3 4 5 6 7 NA

Rothbart-2 s)_____

1	2	3	4	5	6	7	NA
extremely untrue	**quite untrue**	**slightly untrue**	**neither true nor untrue**	**slightly true**	**quite true**	**extremely true**	**not applicable**

My Child:

5. Usually rushes into an activity without thinking about it.
   1 2 3 4 5 6 7 NA

6. Is not afraid of large dogs and /or other animals.
   1 2 3 4 5 6 7 NA

7. When picking up toys or other jobs, usually keeps at the task until it's done.
   1 2 3 4 5 6 7 NA

8. Rarely gets irritated when s/he makes a mistake.
   1 2 3 4 5 6 7 NA

9. Is good at games like "Simon Says," "Mother, May I?," and "Red Light, Green Light."
   1 2 3 4 5 6 7 NA

10. Seems to be at ease with almost any person.
    1 2 3 4 5 6 7 NA

11. Sometimes interrupts others when they are speaking.
    1 2 3 4 5 6 7 NA

12. Can easily shift from one activity to another.
    1 2 3 4 5 6 7 NA

13. Has a hard time following instructions.
    1 2 3 4 5 6 7 NA

14. Has temper tantrums when s/he doesn't get what s/he wants.
    1 2 3 4 5 6 7 NA

15. When practicing an activity, has a hard time keeping her/his mind on it.
    1 2 3 4 5 6 7 NA

16. Decides what s/he wants very quickly and goes after it.
    1 2 3 4 5 6 7 NA

Rothbart-3 s)_____

1 extremely untrue	2 quite untrue	3 slightly untrue	4 neither true nor untrue	5 slightly true	6 quite true	7 extremely true	NA not applicable

My Child:

17. Acts very friendly and outgoing with new children.
    1 2 3 4 5 6 7 NA

18. Will move from one task to another without completing any of them.
    1 2 3 4 5 6 7 NA

19. Is afraid of loud noises.
    1 2 3 4 5 6 7 NA

20. Doesn't worry about injections by the doctor.
    1 2 3 4 5 6 7 NA

21. Often rushes into new situations.
    1 2 3 4 5 6 7 NA

22. Gets quite frustrated when prevented from doing something s/he wants to.
    1 2 3 4 5 6 7 NA

23. Prepares for trips and outings by planning things s/he will need.
    1 2 3 4 5 6 7 NA

24. Is not afraid of the dark.
    1 2 3 4 5 6 7 NA

25. Takes a long time in approaching new situations.
    1 2 3 4 5 6 7 NA

26. Gets mad even when even mildly criticized.
    1 2 3 4 5 6 7 NA

27. Is sometimes shy even around people s/he has known a long while.
    1 2 3 4 5 6 7 NA

Rothbart-4 s)_____

1	2	3	4	5	6	7	NA
extremely untrue	**quite untrue**	**slightly untrue**	**neither true nor untrue**	**slightly true**	**quite true**	**extremely true**	**not applicable**

My Child:

28. Can wait before entering into new activities if s/he is asked to.
    1 2 3 4 5 6 7 NA

29. Gets angry when s/he can't find something s/he wants to play with.
    1 2 3 4 5 6 7 NA

30. Usually stops and thinks it over before deciding to do something.
    1 2 3 4 5 6 7 NA

31. Is slow and unhurried in deciding what to do next.
    1 2 3 4 5 6 7 NA

32. Has difficulty waiting in line for something.
    1 2 3 4 5 6 7 NA

33. Has a lot of trouble stopping an activity when called to do something else.
    1 2 3 4 5 6 7 NA

34. Tends to say the first thing that comes to mind, without stopping to think about it.
    1 2 3 4 5 6 7 NA

35. Acts shy around new people.
    1 2 3 4 5 6 7 NA

36. Has trouble sitting still when s/he is told to (at movies, church, etc.).
    1 2 3 4 5 6 7 NA

37. When eager to go outside, sometimes rushes out without putting on the right clothes.
    1 2 3 4 5 6 7 NA

38. Is able to resist laughing or smiling when it isn't appropriate.
    1 2 3 4 5 6 7 NA

Rothbart-5 s)_____

1 extremely untrue	2 quite untrue	3 slightly untrue	4 neither true nor untrue	5 slightly true	6 quite true	7 extremely true	NA not applicable

My Child:

39. Is comfortable asking other children to play.
1 2 3 4 5 6 7 NA

40. Rarely gets upset when told s/he has to go to bed.
1 2 3 4 5 6 7 NA

41. When drawing or coloring in a book, shows strong concentration.
1 2 3 4 5 6 7 NA

42. Becomes easily frustrated when tired.
1 2 3 4 5 6 7 NA

43. Is afraid of the dark.
1 2 3 4 5 6 7 NA

44. Is good at following instructions.
1 2 3 4 5 6 7 NA

45. Approaches slowly places where s/he might hurt her/himself.
1 2 3 4 5 6 7 NA

46. Is rarely frightened by “monsters” seen on TV or at movies.
1 2 3 4 5 6 7 NA

47. Gets irritable about having food s/he doesn’t like.
1 2 3 4 5 6 7 NA

48. Sometimes turns shyly away from new acquaintances.
1 2 3 4 5 6 7 NA

49. When building or putting something together, becomes very involved in what s/he is doing, and works for long periods.
1 2 3 4 5 6 7 NA

Rothbart-6 s)_____

1	2	3	4	5	6	7	NA
extremely untrue	**quite untrue**	**slightly untrue**	**neither true nor untrue**	**slightly true**	**quite true**	**extremely true**	**not applicable**

My Child:

50. Approaches places s/he has been told are dangerous slowly and cautiously.
1 2 3 4 5 6 7 NA

51. When s/he sees a toy or game s/he wants, is eager to have it right then.
1 2 3 4 5 6 7 NA

52. Rarely protests when another child takes her/his toy away.
1 2 3 4 5 6 7 NA

53. Has difficulty leaving a project s/he as begun.
1 2 3 4 5 6 7 NA

54. Is not very careful and cautious in crossing streets.
1 2 3 4 5 6 7 NA

55. Rarely laughs aloud while watching TV or movie comedies.
1 2 3 4 5 6 7 NA

56. Can easily stop an activity when s/he is told “no.”
1 2 3 4 5 6 7 NA

57. Is among the last children to try out a new activity.
1 2 3 4 5 6 7 NA

58. Is easily distracted when listening to a story.
1 2 3 4 5 6 7 NA

59. Easily gets irritated when s/he has trouble with some task (*e.g.*, building, drawing, dressing).
1 2 3 4 5 6 7 NA

60. Has an easy time leaving play to come to dinner.
1 2 3 4 5 6 7 NA

Rothbart-7 s)_____

1	2	3	4	5	6	7	NA
extremely untrue	**quite untrue**	**slightly untrue**	**neither true nor untrue**	**slightly true**	**quite true**	**extremely true**	**not applicable**

My Child:

61. Is "slow to warm up" to others.
1 2 3 4 5 6 7 NA

62. Sometimes doesn't seem to hear me when I talk to her/him.
1 2 3 4 5 6 7 NA

63. Is usually able to resist temptation when told s/he is not supposed to do something.
1 2 3 4 5 6 7 NA

64. Sometimes becomes absorbed in a picture book and looks at it for a long time.
1 2 3 4 5 6 7 NA

65. Gets nervous about going to the dentist.
1 2 3 4 5 6 7 NA

66. Gets angry when called in from play before s/he is ready to quit.
1 2 3 4 5 6 7 NA

67. Gets angry when provoked by other children.
1 2 3 4 5 6 7 NA

68. Has a hard time concentrating on an activity when there are distracting noises.
1 2 3 4 5 6 7 NA

69. Sometimes has a "dreamy" quality when others talk to her/him, as if s/he were somewhere else.
1 2 3 4 5 6 7 NA

70. Has trouble concentrating when listening to a story.
1 2 3 4 5 6 7 NA

71. When watching TV, is easily distracted by other noises or movements.
1 2 3 4 5 6 7 NA

Rothbart-8 s)_____

1	2	3	4	5	6	7	NA
extremely untrue	**quite untrue**	**slightly untrue**	**neither true nor untrue**	**slightly true**	**quite true**	**extremely true**	**not applicable**

My Child:

72. Is distracted from her/his projects when you enter the room.

1 2 3 4 5 6 7 NA

73. Often shifts rapidly from one activity to another.

1 2 3 4 5 6 7 NA

74. Will ignore others when playing with an interesting toy.

1 2 3 4 5 6 7 NA

Parent-Child Relationship Inventory (PCRI)

The statements below describe different ways some parents feel about their children. For each statement, decide how you feel. Please mark the statement that best describes how you feel using the following scale:

1	2	3	4
Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**

Try to respond to all of the statements. If you aren't sure how you feel, mark the response that comes closest to your feelings at this time. *There are no right or wrong answers.*

1. I have trouble disciplining my child.
   1 2 3 4

2. I have a hard time getting through to my child.
   1 2 3 4

3. My child is more difficult to care for than most children are.
   1 2 3 4

4. I sometimes give in to my child to avoid a tantrum.
   1 2 3 4

5. My child is never jealous of others.
   1 2 3 4

6. I wish I could set firmer limits with my child.
   1 2 3 4

7. My child is out of control much of the time.
   1 2 3 4

8. I never worry about my child.
   1 2 3 4

9. I wish my child would not interrupt me when I'm talking to someone else.
   1 2 3 4

10. I often lose my temper with my child.
    1 2 3 4

11. I have never had any problems with my child.
    1 2 3 4

12. I have never been embarrassed by anything my child has said or done.
    1 2 3 4

13. My child really knows how to make me angry.
    1 2 3 4

14. My child never puts off doing things that should be done right away.
    1 2 3 4

15. I sometimes find it hard to say no to my child.
    1 2 3 4

16. I often threaten to punish my child but never do.
    1 2 3 4

17. Some people would say that my child is a bit spoiled.
    1 2 3 4

Social Competence and Behavior Evaluation Scale
Preschool Edition (SCBE)

Instructions

The following is a list of statements describing a child in three broad categories: emotional adjustment, social interactions with peers, and social interactions with adults. Use the following scale to rate the child by circling one choice for each statement to indicate the child's typical behavior or emotional state. Each of the ratings indicates how often a typical emotional state or behavior occurs:

Rating	Description
1	Almost NEVER occurs.
2 or 3	SOMETIMES occurs.
4 or 5	OFTEN occurs.
6	Almost ALWAYS occurs.

If you want to circle another number after you have made a choice for the same item, cross out your prior choice and circle another one. *Do not erase* the unwanted choice because it may damage the form. Make every effort to assign a rating to each statement; leave an item blank only if you have no way of evaluating the child on that particular statement. If more than a few items are left without any rating, the results may not be meaningful.

1. Enjoys demonstrating new songs, games, and other things he/she has learned.
2. Maintains neutral facial expression (doesn't smile or laugh).
3. Sensitive to another's problem.
4. Wets or dirties pants at school.
5. Curious.
6. Tired.
7. Easily frustrated.
8. Gets angry when interrupted.
9. Looks directly at you when speaking.
10. Irritable, gets mad easily.
11. Worries.
12. Laughs easily.
13. Easily adjusts to new situations.
14. Gets bored quickly and appears uninterested in playing.

15. In a good mood.
16. Patient and tolerant.
17. Takes pleasure in own accomplishments.
18. Tolerates interruptions and disturbances.
19. Difficult to console when he/she cries.
20. Self-confident.
21. Explores his/her environment.
22. Readily adapts to difficulties.
23. Timid, afraid (e.g. avoids new situations).
24. Sad, unhappy or depressed.
25. Anxious, nervous (e.g. bites fingernails).
26. Active, ready to play.
27. Whines or complains easily.
28. Inhibited or uneasy in the group.
29. Listens attentively when spoken to.
30. Screams or yells easily.
31. Bullies weaker children.
32. Forces other children to do things they don't want to do.
33. Gets upset when the teacher attends to another child.
34. Inactive, watches the other children play.
35. Negotiates solutions to conflicts with other children.
36. Remains apart, isolated from the group.
37. Children seek him/her out to play with them.
38. Does not respond to other children's invitations to play.
39. Takes other children and their point of view into account.
40. Self-centered, does not recognize other children's interests.
41. Is involved wherever the children are having lots of fun.
42. Hits, bites or kicks other children.
43. Cooperates with other children in group activities.
44. Gets into conflict with other children.
45. Comforts or assists another child in difficulty.
46. Has to be first.
47. Refuses to share toys.
48. Takes care of toys.
49. Doesn't talk or interact during group activities.
50. Attentive towards younger children.
51. Stays calm when there are conflicts in the group.
52. Initiates or proposes games to other children.
53. Spontaneously apologizes to other children for causing a problem.
54. Makes games competitive.
55. Spontaneously helps a child pick up toys or other objects.

56. Delights in playing with other children.
57. Goes unnoticed in a group.
58. Works easily in groups.
59. Takes pleasure in hurting other children.
60. Shares toys with other children.
61. Recovers quickly when he/she falls or hurts self (doesn't cry very long).
62. Hits teacher or destroys things when angry with teacher.
63. Helps with everyday tasks (e.g. distributes snacks).
64. Persistent in solving own problems.
65. Disrespectful of teacher.
66. Accepts compromises when reasons are given.
67. Clear and direct when he/she wants something.
68. Stops talking immediately when asked.
69. Needs teacher's presence to function well.
70. Asks for help when it is unnecessary.
71. Opposes the teacher's suggestions.
72. Cries for no apparent reason.
73. Is autonomous and able to organize him/herself.
74. Defiant when reprimanded.
75. Clingy towards teacher in novel situations (e.g. field trip).
76. Takes initiative in situation with new people.
77. Ignores directives and continues what he/she is doing.
78. Accepts teacher's involvement in own activity.
79. Cries when parent leaves.
80. Asks permission when necessary.