Published in final edited form as:
Infant Child Dev. 2008 August ; 17(4): 339–363. doi:10.1002/ICD.580.

Focused Attention in Toddlers:

Measurement, Stability, and Relations to Negative Emotion and Parenting

Bridget M. Gaertner[a,*], **Tracy L. Spinrad**[a], and **Nancy Eisenberg**[b]

a*School of Social and Family Dynamics, Arizona State University, Tempe, AZ, USA*

b*Department of Psychology, Arizona State University, Tempe, AZ, USA*

Abstract

This longitudinal study examined individual differences and correlates of focused attention when toddlers were approximately 18 months old (T1; *n* = 256) and a year later (T2; *n* = 230). Toddlers' attention and negative emotionality were reported by mothers and non-parental caregivers and rated globally by observers. Toddlers' focused attention also was observed during two mother-child interactions and an independent play task. Measures of maternal emotional support and control were obtained via self-report and observation. Some contemporaneous relations among indices of toddlers' attention were obtained, particularly for observed measures. Moreover, all measures of attention demonstrated stability across time. Negative emotionality was negatively related to toddlers' observed attention at both ages, whereas maternal praise had positive concurrent associations. Maternal control was negatively related to observed observed attention at T2 and also predicted longitudinally, but only for children who initially had low or moderate attention. The findings suggest that individual differences in focused attention evidence stability early in life but can be influenced by adult socialization.

Keywords

attention; toddlers; negative emotion; parenting

Contemporary theorists have deemed attention a core dimension of temperament in infants and children (Rothbart & Bates, 1998, 2006). A substantial body of literature speaks to the role of attention in learning and cognitive development, and attentional abilities predict developmental level and IQ, problem solving and language skills, and performance on tests of ability even early in life (Bono & Stifter, 2003; Choudhury & Gorman, 2000; Dixon & Smith, 2000; Lawson & Ruff, 2004; NICHD Early Child Care Research Network, 2003). Moreover, compelling evidence suggests the importance of attentional processes for other domains of young children's functioning, including effortful control (Kochanska, Murray, & Harlan, 2000), compliance (Hill & Braungart-Rieker, 2002), ability to delay gratification (Mischel, Ebbesen, & Raskoff Zeiss, 1972), and emotion-related regulation and social adjustment (e.g. Eisenberg, Fabes, Guthrie, & Reiser, 2000). Toddlerhood is an important period in the study of attention, given the significant developmental shift in the nature of attention occurring near the end of the first year, coupled with the emergence and increased consolidation of self-regulation across early childhood (Rothbart, Posner, & Kieras, 2006). The purpose of the present study was to investigate the stability and interrelations among indices of toddlers' focused attention from

*Correspondence to: Bridget M. Gaertner, School of Social and Family Dynamics, Arizona State University, Tempe, AZ, USA. E-mail: bridget.gaertner@asu.edu

the second to third year of life, and to examine the contributions of negative emotionality and parenting.

The Development of Attention across Toddlerhood

Attention refers to visual perception, orientation toward, and engagement with aspects of the external environment and includes components of 'selectivity, state of engagement, and higher-level control' (Ruff & Rothbart, 1996). Attentional processes occur at a number of levels, such as external behaviours (e.g. looking), psychological engagement, and neural and physiological responses. Individual variation in aspects of attention and other dimensions of temperament is thought to originate from inherent differences in biogenetic processes, and thus to exhibit a certain degree of consistency across situations and time (Rothbart & Bates, 1998; Rothbart & Derryberry, 1981). However, the systems underlying temperament often develop with age, which may result in considerable variability in the expressions and implications of aspects of temperament across time. In their extensive review, Ruff and Rothbart (1996) described the development of both reactive and regulatory systems of attention across early childhood. The initial attentional system reflects more automatic, orienting processes, whereas the second system, emerging near the end of the first year, is more effortfully controlled. Across the toddler and preschool years, this latter system increasingly assumes control of attentional processes, allowing for the volitional and flexible modulation of attentional resources based on goals for action.

Focused attention, the topic of interest in the present study, is marked by sustained and active engagement with a stimulus or task (as compared with mere looking or 'casual' attention). It is during periods of focused attention that cognitive information processing (i.e. learning) occurs (Ruff & Lawson, 1990; Ruff & Rothbart, 1996), and young children are more impervious to external distractions when engaged in focused play (Ruff & Capozzoli, 2003; Ruff, Capozzoli, & Saltarelli, 1996). With growing capabilities for attentional control, children typically exhibit increasing levels (i.e. frequency and duration) of focused attention across the first 4 years of life, with greater developmental change in focused attention than in overall measures of attending (i.e. total attention) (Choudhury & Gorman, 2000; Ruff & Capozzoli, 2003; Ruff & Lawson, 1990).

Not surprisingly, researchers have shown considerable interest in characterizing the development of focused attention across late infancy and early childhood. Focused attention has been examined in a variety of structured and unstructured play and problem-solving contexts, including both independent play (Choudhury & Gorman, 2000; Ruff & Capozzoli, 2003; Ruff & Lawson, 1990) and that with social partners, generally parents (Lawson & Ruff, 2004). These measures commonly reflect the length of time that children spend visually attending to, and engaged with, a specific stimulus or task and sometimes incorporate the intensity of effort or concentration. Adult ratings of children's attention also have been utilized (Putnam, Gartstein, & Rothbart, 2006). These questionnaire measures typically include items regarding the likelihood, frequency, or duration of specific, observable attentional behaviours in a variety of situations. Because children's motivation and ability for attending may vary depending on contextual features (e.g. presence of distractors), task requirements (e.g. specific goals), or involvement of others, or may be evaluated differently according to the nature and scope of situations assessed, it is informative to study focused attention using a range of methodologies and contexts.

Some evidence of stability in measures of focused attention has been found across early childhood. Moderate short-term stability of attention span during play has been observed in young toddlers (Power, Chapieski, & McGrath, 1985), and observer ratings of attention have exhibited stability from 7 to 12 months (Lawson & Ruff, 2001), from 1 to 2 years (Lawson &

Ruff, 2004), and from 6 to 24 months (Heinicke, Diskkin, Ramsey-Klee, & Oates, 1986). Parental reports of infants' duration of orienting also have been substantially correlated across multiple assessment points between 3 and 13.5 months of age (Rothbart, Derryberry, & Hershey, 2000), and parent ratings of attentional focusing appear to have moderate to large correlations across 6-, 12-, and 18-month spans during toddlerhood (Putnam *et al*., 2006). In terms of prediction, one study demonstrated that observers' global ratings of 1-year-old children's focused attention across independent and dyadic play and a problem-solving task were negatively related to inattention on a response-reaction task at 3.5 years, and 2-year-old ratings predicted focused attention observed at 3.5 years (Ruff, Lawson, Parrinello, & Weissberg, 1990).

Fewer studies have examined relations among observed measures of attention across various contexts, between different raters, or between observed and reported measures of attention. However, parent reports of 13.5-month-olds' duration of orienting were positively correlated with the length of sustained play observed in the laboratory (Rothbart *et al*., 2000), and Putnam *et al*. (2006) reported significant cross-rater correlations for ratings of attentional focusing at 24 and 36 (but not 18 or 30) months. On the other hand, Ruff *et al*. (1990) measured aspects of attention across a variety of play situations from 1 to 3.5 years of age and reported generally low or non-significant cross-context correlations within time. The present study examined stability and interrelations in an array of measures of toddlers' focused attention during the second and third years of life.

Attention and Negative Emotionality

Emotional reactivity, and particularly negative emotionality, is considered another fundamental dimension of temperament and has strong neurological and conceptual links to attention (Gray, 1991; Rothbart & Bates, 1998). Two lines of thinking have characterized the relations between attention and negative emotionality. In the first, negative emotion can be thought of as having the potential to disorganize attentional processes, making it difficult to maintain attentional focus (Rothbart & Bates, 1998; Ruff & Rothbart, 1996). On the other hand, the ability to utilize attentional control in the service of modulating emotions and emotion-related behaviour—particularly high levels of negative emotionality—is important for adjustment. In support of these notions, a number of investigators have found that greater attentional control is associated with lower levels of negative emotionality and greater ability to regulate negative emotions in infants and toddlers (Kochanska, Coy, Tjebkes, & Husarek, 1998; Rothbart, Posner, & Boylan, 1990; Rothbart, Ziaie, & O'Boyle, 1992), as well as older children (Derryberry & Rothbart, 1988; Eisenberg *et al*., 1993; Rothbart & Ahadi, 1994). Broadly speaking, it is likely that attentional processes and negative emotion continually and mutually influence one another across time. Nonetheless, longitudinal investigations such as the present study may help shed light on the nature of these relations across the toddler years.

Socialization of Attention

Although temperamental differences are considered constitutional in origin, attention develops within the context of environmental and social interactions and is continually influenced by these experiences (Rothbart & Bates, 1998). Researchers have demonstrated that adult behaviours can relate to children's attention in the immediate context (Parrinello & Ruff, 1988), and there is some evidence for this to be true across contexts and time (Bono & Stifter, 2003; NICHD, 2005). However, little work has addressed the roles of adult emotional support and control in supporting or hindering young children's focused attention.

In general, emotionally supportive parenting is thought to enhance children's willingness to explore and thus facilitate their engagement with the environment (Matas, Arend, & Sroufe, 1978). Theorists also have emphasized the importance of more specific forms of emotional

support experienced directly within learning or problem-solving contexts (Rogoff, 1990; Vygotsky, 1978). Positive affect and affirmative evaluations during play may stimulate children's interest in a task or refocus waning attention, as well as create a positive environment that increases enjoyment of such efforts. In addition, these discrete forms of emotional support may promote children's emerging internalization of parental values, including those that motivate children to engage and transact with the environment (Harter, 1981; Kochanska & Aksan, 1995). Relatedly, both positive affect and praise by adults during dyadic teaching and problem-solving interactions have been linked with persistence at tasks, self-praise, and performance on measures of selective attention in young children (Barocas *et al*., 1991; Diaz, Neal, & Vachio, 1991; Lutkenhaus, 1984; Stipek, Recchia, & McClintic, 1992). In contrast, toddlers of depressed mothers, who likely exhibit less emotional responsiveness and support, display less focused attention and task persistence (Breznitz & Friedman, 1988; Redding, Harmon, & Morgan, 1990).

In the present study, we examined multiple aspects of maternal emotional support, including self-reported warmth and observed positive affect and praise. It is possible that children's attention to objects and tasks relates more strongly to emotional support provided specifically in play contexts than to more global aspects of parenting. Moreover, although both positive affect and praise have been linked with children's increased attention and persistence with tasks, we considered these maternal behaviours separately, given the growing importance of feedback by social partners across early childhood and beyond. Moreover, positive expressivity may be more reflective of stable maternal personality traits that are predominant throughout mother-child interactions (Dunn, Creps, & Brown, 1996; Valiente *et al*., 2006), whereas praise might be more specifically tied to children's attentional behaviours. Thus, the provision of praise for children's actions or performance during play might be more motivating for continued attentional efforts than positive affect in general.

There are also socialization practices that likely impede young children's focused attention with objects and tasks—most notably, those involving a high degree of adult control. Rather than providing the minimal assistance necessary or using indirect means to influence behaviour, controlling parents tend to manage their children and their children's activities using physical or psychological force, make decisions and do things for their children rather than allowing independent efforts, and disregard children's goals or desires in lieu of their own ideas and intentions. Overall, a large body of literature suggests that gentle forms of parental control are thought to be conducive to positive outcomes in young children (e.g. Kuczynski & Kochanska, 1995), whereas more power-assertive and intrusive strategies have been linked with a number of maladaptive outcomes, including non-compliance, poor self-regulation, and diminished motivation (Grolnick, 2003; Grusec & Goodnow, 1994; Kochanska & Aksan, 1995).

Parents who are highly controlling may be more intrusive during play with their children, interfering with children's own spontaneous engagement with the task (Ruff & Rothbart, 1996). Investigators have consistently shown that adult strategies that redirect infants' and toddlers' attentional focus are related to lower levels of sustained attention and complexity of play as compared with behaviours that maintain and build upon children's ongoing focus of attention (Bono & Stifter, 2003; Landry & Chapieski, 1988; Landry, Garner, Swank, & Baldwin, 1996). When parents follow their own play agenda without sensitivity to children's cues, the pace of interaction may over-arouse children rather than providing an optimal level of stimulation necessary for sustaining attention. Moreover, when parents prevent children from organizing and directing their own actions and outcomes, it may be particularly frustrating and disruptive for toddlers, who are beginning to exhibit and desire more autonomous behaviour (Geppert & Kuster, 1983). Consistent with this notion, Calkins and Johnson (1998) reported that 18-month olds who were easily frustrated had mothers who tended to

interfere in their activities and complete tasks for them. Children who become accustomed to continual parental control of their actions and experiences may become less motivated or able to follow their natural interest in engaging with the environment and, in turn, may exhibit deficits in their ability to initiate or sustain attention. As discussed earlier, it is possible that adult control exhibited during play with children might be more influential for their attention to objects and tasks than controlling parenting behaviours in other contexts.

In considering the role of socialization in children's focused attention, it is important to recognize that these relations are likely to be neither linear nor unidirectional. Adult behaviours may be more influential for children with poor attentional skills than for those who are already very attentive. For example, investigators have reported that low-attending infants became more attentive when adults were involved in their play, in contrast to more independently attentive infants who did not appear to benefit from the adult involvement (Lawson, Parrinello, & Ruff, 1992; Parrinello & Ruff, 1988). Further, children's attentional behaviours may elicit certain patterns of response from social partners. Adults may find more opportunities to offer praise or display positive affect when interacting with highly attentive children, whereas they might be more likely to intervene or intrude in the play of children who exhibit little capacity to attend on their own. The longitudinal design of the present study allowed us to empirically examine these potentially complex relations between adult socialization and children's attention across time.

The Present Study

In the present study, we sought to address important limitations in our current understanding of the development of attention across toddlerhood. In order to determine how children's attentional behaviours—and the influences on these behaviours—might vary across contexts and situations, we examined focused attention using a range of distinct measures. Our first objective was to examine stability in individual differences in focused attention from the second to third year of life. In addition to age-related increases in attention that would reflect underlying developmental shifts, we also expected some stability in individual differences. Relatedly, we expected that toddlers would exhibit a certain degree of consistency across measures of focused attention, particularly at 30 months and perhaps across methods (i.e. adult-reported versus behavioural measures). Finally, although there is little consistent evidence to suggest sex differences in attention, particularly early in life, some investigators have found that infant and toddler girls score higher on measures of attention than do boys (Calkins, Dedmon, Gill, Lomax, & Johnson, 2002; Lawson & Ruff, 2004). Further, a recent meta-analysis of gender differences in children's temperament (ages 3 months-13 years) revealed small to moderate effect sizes for measures of attentional focusing, favouring girls (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Therefore, we also explored whether sex differences would exist in our measures of toddlers' focused attention.

Our second goal was to identify emotional and social correlates of children's focused attention. We expected negative relations between attention and negative emotionality, with perhaps bidirectional prediction between the two constructs across time. We also expected that maternal emotional support would relate positively to toddlers' attention, whereas negative relations would be found between maternal control/intrusiveness and attention, and that parenting would uniquely predict attention after taking children's emotionality into account. Moreover, we hypothesized that toddlers with poorer attention at T1 might be more influenced by maternal behaviours across time than children who were initially more attentive.

METHOD

Participants

Participants were part of a longitudinal study of toddlers' emotions, regulation, and early socioemotional development. Parents and their healthy, full term infants were recruited at birth through three local hospitals in a large metropolitan area in the southwest. Questionnaire and observational data were collected when children were approximately 18 months of age (Time 1) and again a year later (Time 2).

The T1 assessment involved 256 toddlers and their mothers (including nine families who participated only by mail; 141 boys, 115 girls; ages 16.8-20.0 months, *M* = 17.8 months). At T2, 230 toddlers and their mothers participated (including 14 families who participated only by mail; 128 boys, 102 girls; ages 27.2-32.0 months, *M* = 29.8 months). The majority of children were Caucasian (81%), although African American (5%), Native American (4%), Asian (2%), and Pacific Islanders (less than 1%) were also represented, with 2% identifying as multiracial and 5% who did not report race. In addition, some children were of Hispanic ethnicity (23%), although the majority were non-Hispanic (77%). Annual family income ranged from less than $15 000 to over $100 000, with the median income at the level of $45 000-60 000. Average maternal age at the time of the participant child's birth was 29 years (range = 18-44 years) and average paternal age was 31 years (range = 18-53 years). Parents' education ranged from 8th grade to the graduate level; median number of years of formal education completed by both mothers and fathers was approximately 14 years (2 years of college). At the T1 assessment, over half (59%) of all mothers were employed (82% of these full-time) as were most (96%) fathers (93% of these full-time). Most parents (85%) were married, and had been married from less than 1 year-25 years (*M* = 5.9 years, S.D. = 3.8). Nearly half (42%) of the children were firstborns.

Procedures

At each time point, mothers were sent a packet of questionnaires by mail (including measures of temperament and parenting) to complete and bring to the laboratory visit. Toddlers and mothers came to a laboratory on campus to participate in the laboratory sessions. For the purposes of this study, toddlers' focused attention was observed during independent and dyadic play, and mothers and toddlers were observed interacting in several situations, including free play, teaching, and cleanup. Observers made global ratings of toddlers' attention and negative emotionality across a series of tasks that occurred during the visit. At the end of the session, the participants were paid. Behavioural measures from the laboratory visit were coded from videotape, and reliability was established on approximately 25% of the sample. In addition, mothers were asked to give permission for questionnaires to be sent to the child's non-parental caregiver (or another adult who knew the child well). Questionnaire packets were returned through the mail by 173 caregivers at T1 and by 152 caregivers at T2.

Measures

Mothers and caregivers rated toddlers' focused attention and negative emotionality, and mothers reported on aspects of their parenting styles. Mothers and toddlers were observed in three interactive tasks, and toddlers participated in a behavioural measure of attention.

Children's Attention

At T1 and T2, toddlers' focused attention was assessed with a subscale of the Early Childhood Behaviour Questionnaire (ECBQ: Putnam *et al*., 2006). In addition, focused attention was observed during two mother-child interactions (free play and a teaching paradigm) and an

independent play task, and was rated globally by four observers during the laboratory assessment with a modified Infant Behaviour Record (IBR; Bayley, 1969).

ECBQ—The attention focusing subscale of the ECBQ was used, which consisted of 12 items assessing toddlers' ability to concentrate on a task (e.g. 'When playing alone, how often did your child play with a set of objects for 5 min or longer at a time'?). Mothers and non-parental caregivers rated each item on a 7-point scale (1 = *never*; 7 = *always*), and α were 0.76 and 0.79 at T1 and 0.81 and 0.85 at T2, for mothers and caregivers, respectively.

Free play—Mothers and toddlers were presented with a basket of toys and asked to play as they normally would at home for 3 min. Ratings of toddlers' focused attention were based on the extent to which the child attended, concentrated, and oriented toward the task materials, as well as the observed intensity of interest and involvement. Prolonged, steady gaze, intent facial expression, and close visual proximity with and active manipulation of the materials were considered indicators of high levels of attention. In contrast, lack of visual orientation, frequent off-task glances, and passive, repetitive manipulation of the materials were judged to reflect lower levels of attention. Toddlers' focused attention was evaluated in 15-s intervals on a 5-point scale, from 1 = *none* (child does not pay attention to the task or gives only scattered looks that do not focus on any task object) to 5 = *very high* (child appears very absorbed and focused on the task, with intense interest and prolonged manipulation of the materials). Averaging the ratings across all intervals yielded a total focused attention score, with interrater reliabilities (Pearson correlations computed for 23-28% of the sample) of 0.86 and 0.81, at T1 and T2, respectively.

Teaching task—Mothers and toddlers were presented with a difficult puzzle (animal/geometric shapes at T1 and pegs/geometric shapes at T2). Mothers were given 3 min and instructed to 'teach their child to complete the puzzle'. With similar criteria as free play, toddlers' focused attention was rated in 10-s intervals on a 4-point scale, from 1 = *none* to 4 = *high*. The average attention score across all intervals had interrater reliabilities (Pearson correlations computed for 26% and 25% of the sample) of 0.85 at T1 and 0.99 at T2.

Independent play—Toddlers' focused attention was observed during a block play paradigm (LAB-TAB: Locomotor Version, Goldsmith & Rothbart, 1999) at T1 and a bead play paradigm (LAB-TAB: Preschool Version, Goldsmith, Reilly, Lemery, Longley, & Prescott, 1993) at T2. At T1, children were given a set of brightly coloured interlocking blocks with several sensory features (e.g. a mirrored side, a rattle inside) and allowed to play with them in any way. At T2, children were given three different coloured buckets and a set of beads and were asked to sort the beads into the buckets by colour. At each age, the experimenter briefly demonstrated the materials (i.e. stacked two of the blocks or put a bead in each bucket), and then instructed the toddler to 'play with the blocks' or 'sort the beads'. During both tasks, mothers were seated out of view and asked not to interact with their toddlers, who were allowed to play with the blocks/beads for 3 min. The total time children attended to the blocks/beads in a focused manner (e.g. concentrated visual attention as well as touching or manipulating the materials) was coded from videotape. Interrater reliabilities (Pearson correlations for 26-29% of the sample) for the duration of focused attention were 0.92 at T1 and 0.91 at T2.

IBR ratings—Toddlers' attention was rated by four research staff who had observed the child throughout the laboratory session, using a modified IBR (IBR; Bayley, 1969). The IBR has typically been used to rate aspects of children's temperament and behaviour during the Bayley examination. Similar to other investigators (e.g. Stifter & Corey, 2001), we utilized this measure to make one global rating of toddlers' attention across the series of tasks that occurred throughout the entire laboratory visit. Attention to tasks referred to the degree to which the

child focused on and sustained interest in the series of tasks presented, and was rated on a 5-point scale (1 = constantly off-task, does not attend; 3 = moderate attention to each new toy, person, or situation; soon ready for another; off-task half the time; 5 = long continued absorption in task materials/activities). These items reflect the scale of the original IBR but wording was modified slightly for clarity. Children who spent a substantial proportion of the lab visit time oriented toward and actively engaged with task materials in a concentrated manner received higher IBR ratings, whereas children who were less able to sustain engagement with the materials and exhibited brief or infrequent periods of attention were rated lower. At each time point, these four observers' ratings were averaged to create a total IBR attention score, with α across raters of 0.74 and 0.84 at T1 and T2, respectively.

Children's Negative Emotionality

At T1 and T2, toddlers' negative emotionality was assessed with subscales of the ECBQ (ECBQ: Putnam *et al*., 2006). In addition, negative emotionality was rated globally by the four observers during the laboratory assessment.

ECBQ—The frustration, sadness, and fear subscales of the ECBQ were used to assess toddlers' emotional expressions and reactions to common situations. Mothers and non-parental caregivers rated each item on a 7-point scale (1 = *never*; 7 = *always*). The frustration subscale consisted of 12 items (e.g. 'When she asked for something and you said 'no', how often did your child protest with anger'?), with α of 0.77 and 0.86 at T1 and 0.81 and 0.84 at T2, for mothers and caregivers, respectively. The sadness subscale consisted of 12 items (e.g. 'During everyday activities, how often did your child become sad or blue for no apparent reason'?). Alphas for mothers and caregivers were 0.81 and 0.87 at T1 and 0.82 and 0.89 at T2. The fear subscale included 11 items (e.g. 'While at home, how often did your child show fear at a loud sound (blender, vacuum cleaner, etc.)'?) Alphas for mothers and caregivers were 0.73 and 0.83 at T1 and 0.75 and 0.79 at T2. For both mothers and caregivers, a composite score for negative emotionality was created at each age by averaging the three subscale scores, r's(211-241) = 0.30 -0.63 (mothers) and r's(121-160) = 0.27-0.64 (caregivers), p's<0.01.

IBR ratings—As with the IBR ratings of attention, toddlers' negative affect was rated once globally by four research staff who had observed the child throughout the laboratory session, using the IBR (Bayley, 1969). Observers evaluated children's negative affect across the entire laboratory visit, which included several tasks specifically designed to elicit frustration, sadness, and/or fear (but not reported in this study). Negative affect referred to the frequency, intensity, and duration of negative emotions the child exhibited during the visit, and was rated on a 5-point scale (1 = no negative affect displayed; 3 = three or more brief displays of negative affect; 5 = three or more intense, heightened, or prolonged displays of negative affect). These four observer ratings were averaged to create a total IBR negative emotion score, with α of 0.84 and 0.88 at T1 and T2, respectively.

Maternal Emotional Support

Mothers reported on a measure of their parental warmth and were observed in two interactive tasks with their toddlers.

Maternal warmth—Mothers completed the warmth subscale from the Parental Attitudes toward Childrearing questionnaire (Easterbrooks & Goldberg, 1984), which consisted of 10 items such as 'I express affection by hugging, kissing, and holding my child'. Items were rated on a 6-point scale (1 = strongly disagree to 6 = strongly agree) and averaged to create a total score. One item was subsequently dropped because it substantially lowered internal consistency. Cronbach's alphas for the parental warmth subscale (remaining 9 items) were 0.62 and 0.61 at T1 and T2, respectively.

Maternal positive affect—Maternal positive affect was examined during the free play and teaching tasks. Positive affect was coded on a 4-point scale every 15 s during free play and every 10 s during the teaching task. Ratings of positive affect were based on mothers' facial expressions (i.e. smiles) and verbal tone (i.e. positive tone or laughter), and a score of 1 was given if no evidence of affect was observed, a 2 for minimal affect (e.g. slight facial expression or tone), a 3 if there was evidence of moderate affect (e.g. prolonged facial expression or tone), and a score of 4 if positive affect was predominant during the interaction. Interrater reliabilities for positive affect were 0.82 for free play and 0.90 for teaching at T1 and 0.90 for free play and 0.84 for teaching at T2 (Pearson correlations based on 24-25% of the sample). Maternal positive affect was positively correlated between the two tasks at each age, r's(245, 216) = 0.32 and 0.39, p's<0.01, at T1 and T2, respectively. Thus, a composite of maternal positive affect was created at each age by averaging the scores across the free play and teaching tasks.

Maternal praise—Maternal praise was coded every 10 s during the teaching task as 1 = occurred, or 0 = did not occur. Maternal praise was considered to occur based on mothers' verbalized positive evaluations of children's efforts (e.g. 'Good job'!) or global characteristics (e.g. 'You're so smart'!), or behavioural indices of praise (e.g. clapping in response to children's actions). Interrater κ (based on 24-25% of the sample) for maternal praise during the teaching task were 0.89 at T1 and 0.75 at T2.

Maternal Control

Aspects of maternal control were observed during the free play, teaching, and clean-up tasks at the T1 and T2 laboratory assessments.

Maternal intrusiveness—At both T1 and T2, maternal intrusiveness was assessed during the two mother-toddler interactions. Mothers were rated on a 4-point scale every 15 s during free play and every 30 s during the teaching task. Ratings of intrusiveness were based on evidence of mothers' over-controlling behaviours that imposed a play agenda based on her desires rather than the child's interests, and failing to modulate her actions and verbalizations to the toddler's current level of arousal, interest, and ability. Intrusive behaviours included those such as overwhelming the child with a barrage of stimulation, changing the focus of play without regard to the child's current interest, or physically manipulating the child or the child's actions. A score of 1 was given if there was no evidence of intrusiveness, a 2 if one instance of intrusiveness was observed, a 3 if there was prolonged or intense intrusiveness, and a score of 4 if the mother was highly intrusive and over-controlling throughout the interaction. Interrater reliabilities were 0.82 for both free play and teaching at T1, and 0.81 for free play and 0.78 for teaching at T2 (Pearson correlations based on 24-25% of the sample). Maternal intrusiveness was positively correlated between the two tasks at each age, r's(245, 216) = 0.19 and 0.25, p's<0.01, at T1 and T2, respectively. Thus, a composite of maternal intrusiveness was created at each age by averaging the scores for free play and teaching.

Maternal control—Maternal control was also observed during a standard cleanup task that followed the free play sessions at T1 and T2. Mothers were asked (via headphones) to have the child clean up the free play toys using whatever strategies they normally would at home. This segment lasted until all the toys were returned to the basket or until 3 min had elapsed, and several forms of maternal verbal and physical control strategies were coded in 15-s intervals as 0 = did not occur or 1 = occurred. Verbal control strategies included gentle verbal guidance (e.g. gentle, playful, or indirect strategies, often accompanied by positive affect) and assertive verbal control (e.g. assertive but non-forceful directives), and physical control strategies included distal signals (e.g. physical strategies such as clapping, pointing, or modelling that involved no direct contact with the child), gentle physical control (e.g. physically but gently orienting the child, such as tapping the child's shoulder), and assertive physical control (e.g.

firmly and physically directing the child or the child's actions, such as removing a toy from their hand, in a decisive but neutral manner). Forceful verbal and physical strategies (i.e. strong control accompanied by negative affect) also were coded but rarely occurred. Interrater reliabilities using the κ statistic (based on 25-28% of the sample) ranged from 0.60 to 0.76 (M = 0.67) at T1 and 0.81 to 0.96 (M = 0.87) at T2.

A principal components analysis with an oblique rotation was applied to the five maternal control strategy variables during the clean-up task, and two components were extracted at each time point. One component included gentle verbal guidance, assertive verbal control, and assertive physical control (with loadings of -0.84, 0.90, 0.63 and -0.75, 0.89, 0.69 at T1 and T2, respectively). A maternal control composite was created by reversing the gentle verbal guidance variable and averaging this score with the assertive verbal and physical control variables. The second component obtained from the analysis included distal signals and gentle physical control (with loadings of 0.78, 0.80 and 0.82, 0.80, at T1 and T2, respectively), because this component reflected low levels of control and was not expected to either hinder or facilitate children's attention, it was not retained for this investigation.

RESULTS

Attrition Analyses

Families who participated in both assessment points (N = 223) were compared with those who attrited from T1 to T2 on the demographic and study variables. Families lost to attrition had lower family income (M = 3.44; 3 = between 30-45 K; 4 = 45-60 K) and maternal education (M = 3.68; 3 = high school graduate; 4 = some college) than those who remained in the study (M's = 4.16 and 4.36; t's(226, 238) = -1.97 and -3.43, p's<0.06 and 0.01 for income and education, respectively). In terms of the specific variables examined in this investigation, there was only one significant difference between attrited and non-attrited families. Mothers in attrited families reported lower scores on a parental warmth questionnaire at T1 (M = 5.24) than mothers in the remaining sample (M = 5.41), F(1.240) = 4.13, p<0.05.

Additional analyses indicated no significant differences between families providing caregiver data and those who did not.

Descriptive Analyses

The means and standard deviations for the T1 and T2 variables are presented in Table 1. At T2, toddlers' attention during the teaching task showed substantial non-normality (skewness>2.0 and kurtosis>7.0; Curran, West, & Finch, 1996). Transformations (reflect and inverse) were conducted with this variable at each age according the guidelines suggested by Cohen, Cohen, West and Aiken (2003), to reduce the negative skew to acceptable levels.

Relations with socioeconomic status (SES)—Composites of SES were created at each time by standardizing and averaging parents' education levels and family income (r's = 0.49-0.62). SES was positively related to IBR attention and maternal praise at both time points and to maternal warmth and positive affect at T1 (r's = 0.13-0.36, p's<0.05). Negative relations existed between SES and all maternal control variables at both ages (r's = 0.17-0.35, p's<0.05).

Age and sex differences—From T1 to T2, mean level increases were found in all of the child attention variables, with the exception of free play attention, and in maternal reports of children's negative emotionality and their own warmth (see Table 1). In addition, significant decreases were found from T1 to T2 in IBR ratings of children's negative emotionality and in mothers' observed positive affect and intrusiveness during the free play and teaching tasks and in their use of control during cleanup. Relations between child sex and the study variables were

assessed with a series of multivariate analysis of variances, with variables grouped by construct (caregiver-reported measures were grouped together due to the lower *n*). At each age, girls had higher focused attention scores during the teaching task (*M*'s = 3.28 and 3.81) than did boys (*M*'s = 3.12 and 3.63), *F*'s (1, 246 and 1, 216) = 3.75 and 7.20, $p = 0.05$ and $p<0.01$, at T1 and T2, respectively. Girls were also given higher IBR ratings of attention by the laboratory observers at T2 ($M = 3.62$) than were boys ($M = 3.36$), $F(1, 216) = 5.11$, $p<0.05$. Mothers were observed to be more controlling during cleanup at T2 with boys ($M = 0.15$) than with girls ($M = 0.10$), $F(1, 213) = 7.36$, $p<0.01$. No significant age × sex interactions were found.

Primary Analyses

Within- and across-time correlations among the study variables are presented in Tables 2 and 3.

Intercorrelations among measures of study constructs—Mothers' and caregivers' reports of attentional regulation were positively correlated with one another at T1, but not at T2. Focused attention during the free play and teaching tasks were correlated at both ages, and IBR ratings of attention related positively to all other observed measures of attention at both time points, with the exception of bead play at T2. Mothers' and caregivers' reports of negative emotionality were positively correlated at both ages, and mothers' reports of negative emotionality were similarly related to IBR ratings of the same at T2. Observed maternal measures of support (positive affect and praise) and control (intrusiveness and clean-up control) were positively correlated within constructs at both time points, whereas maternally reported warmth was unrelated to observed measures of maternal support at either age.

Predictor variables (child negative emotionality, maternal emotional support, and maternal control) were, for the most part, uncorrelated across constructs at each time point. However, negative relations existed between maternal reports of warmth and mothers' and caregivers' reports of negative emotionality at both ages. At both ages, maternal control was related negatively to observed positive affect, and at T2, was positively related to IBR ratings of negative emotionality and negatively related to maternal warmth.

Stability in measures of study constructs—All indices of toddlers' attention and negative emotionality, and maternal emotional support and control demonstrated at least modest stability across time, generally with stronger correlations for adult reports than for observed measures.

Correlations between negative emotionality and attention—As expected, negative relations between attention and negative emotionality were found within and across reporters at T1 and within reporters at T2. At both ages, IBR negative emotion ratings were negatively related to all observed measures of attention except that during the teaching task. Longitudinal relations were generally in the expected directions but somewhat mixed. Reports of attention at T1 were negatively related to reports of negative emotion at T2, and vice versa, within (and sometimes across) reporters. IBR ratings of negativity at T1 negatively predicted observed attention during teaching and independent play, but a positive relation was found between early caregiver reports of negative emotion and later attention during the teaching task. Finally, children with higher IBR attention ratings at T1 received lower IBR ratings of negative emotionality at T2.

Correlations between maternal socialization and toddlers' attention—At T1, measures of maternal control were not significantly related to children's attention. However, maternal praise during the teaching task was positively related to four of the six measures of attention at T1 and to attention during teaching and to IBR ratings of attention at T2. An

unexpected negative relation existed between maternal positive affect and block play at T1. At T2, maternal intrusiveness and control were each negatively related to free play and teaching task attention, as well as IBR ratings of attention. Finally, maternal reports of child attention and their own warmth were positively related at T2. Across time, maternal intrusiveness and control at T1 generally continued to predict lower levels of children's T2 attention during free play, teaching, and on IBR ratings. Moreover, free play attention at T2 was positively predicted by maternal warmth and praise at T1, and IBR ratings of attention at T2 were positively predicted by maternal positive affect and praise at T1. Measures of children's attention at T1 were generally unrelated to maternal variables at T2 (only 1 of 30 correlations was significant).

Regression Analyses—Hierarchical regression analyses were conducted to examine the unique prediction of toddlers' focused attention from negative emotionality and maternal socialization. Attention during free play and teaching and IBR ratings were standardized and averaged to form an observed attention composite. Observed attention during block/bead play was retained as a separate variable because it was not strongly related to the other observed measures, and maternal and caregiver reports also were examined separately due to low intercorrelations and missing caregiver data. Given the positive correlation between maternal intrusiveness and control and the similarity of their relations to our measures of attention, these variables were averaged to form a maternal control composite. In contrast, maternal warmth, positive affect, and praise were examined as distinct predictors due to their inconsistent intercorrelations and different patterns of relation to attention. In each regression, SES and child sex were entered in the first step, the negative emotionality variables were entered in the second step, and maternal socialization variables were entered in the third step. At T2, we also controlled for T1 attention and included a final step in which the interactions between maternal socialization variables and T1 levels of attention were entered individually. Because only one significant interaction was detected, we report findings from Step 3, unless otherwise noted.

The results of the T1 and T2 regression analyses are presented in Tables 4 and 5. At both time points, toddlers' focused attention was significantly predicted by negative emotionality, but only within the same type of measure (within reporter or between IBR negative emotion and the observed attention variables). Maternal socialization failed to predict variance in mother or caregiver reports of children's attention or observed attention during block/bead play. For the observed attention composite, maternal praise was a significant positive predictor at both ages and the maternal control composite was a significant negative predictor at T2. Longitudinal analyses generally revealed no prediction from T1 negative emotionality and maternal socialization for toddlers' focused attention at T2, after controlling for earlier attention. However, a significant attention × control interaction was obtained, $\beta = 0.12$, $p<0.05$, F change (1, 198) = 4.89, $p<0.05$. Specifically, negative effects of early maternal control on toddlers' later observed attention composite scores were evident only for children who had low or moderate scores on this attention composite at T1, but not for those observed to be highly attentive at T1 (slopes = -0.23, -0.15, 0.03, ps<0.01, 0.05, ns, for low, moderate, and high attenders, respectively).

DISCUSSION

It is well documented that attentional systems undergo remarkable increases in sophistication across early childhood, promoting capacities for efficient, flexible, and voluntary control of attentional resources. The ability to allocate and sustain focused attention is critical for initiating and maintaining transactions with the environment essential to learning, as well as for promoting competent functioning in a number of domains. Much of the recent empirical work on the development of attention in young children has addressed the developmental shifts that occur with age (e.g. Ruff & Capozzoli, 2003; Ruff & Lawson, 1990), and our study replicates these findings. Although substantial inter-individual variability existed, toddlers

generally demonstrated greater levels of focused attention at 30 months as compared with 18 months in all methods of assessment with the exception of mother-child free play. In addition, this study also provides some of the first evidence of overall stability in individual differences in focused attention from the second to third year of life, which is significant, given that the first years are generally characterized by the lowest levels of temperamental stability (Roberts & DelVecchio, 2000).

We utilized a broader range of attentional measures than in most previous work, including adult reports, observations during independent and dyadic play, and global ratings based on children's attention across an entire laboratory visit. No matter what the method of assessment, low to moderate stability was found from 1 year to the next, with higher stability in adult reports of toddlers' attention than in observed measures. It should also be noted that non-parental caregivers and laboratory observers were generally not the same individuals from T1 to T2. Although significant changes are occurring across the toddler period in the underlying neural systems responsible for attentional processes, this study demonstrates that individual differences may be maintained across this time, although this stability is not great in magnitude.

Less evidence was found for consistency in focused attention across methods of assessment, although all of the associations were in the expected direction. Mother and caregiver reports of attention focusing were correlated at fairly low levels at T1 and surprisingly were unrelated at T2. Putnam *et al*. (2006) recently reported moderate to large correlations between parents at some (but not all) ages during the second and third year for the attentional scale used in this investigation, but also noted that overt indicators of attentional processes may be less readily observable and contribute to low agreement across raters. Further, although adult reports of temperament can integrate patterns of children's behaviour across different contexts and occasions, the non-parental caregivers in our study likely had more varying reference points from which to judge individual children's attentional skills than did parents. It is not surprising that adult reports of attention were generally unrelated to children's performance in the laboratory, which may have been highly influenced by specific contextual and situational features of the tasks, although some relations have been found between reported and observed measures of attention in the past (Rothbart *et al*., 2000).

Similar to prior work with toddlers (e.g. Choudhury & Gorman, 2000), more within-time consistency was seen among observed measures of attention. Significant correlations were found in children's focused attention across free play and teaching tasks with their mothers. On the other hand, focused attention during mother-child tasks was unrelated to attention during independent play at either age. As supported by the results of this study, it is likely that the behaviours of social partners influence children's attention in the immediate context as well as across time. However, examining toddlers' attention in dyadic (or group) situations remains a useful endeavour as these settings likely approximate many of the contexts in which children typically learn and play in their everyday lives.

Notably, the global IBR ratings utilized in this study proved to be particularly informative and were significantly related to nearly all other measures of focused attention assessed in the laboratory (with the exception of bead play at T2). For this measure, observers assessed children's attention across a variety of tasks and situations during the lab visit, many of which were not specifically designed to evaluate attention. Other investigators have found global ratings of attention to be similarly stable, consistent with other observed quantitative measures, and to have predictive value (Lawson & Ruff, 2001, 2004; Ruff *et al*., 1990). Global ratings may allow an observer to sample children's behaviour across a range of contexts and to make inferences about common elements in patterns of behaviour (Cairns & Green, 1979). Thus, this methodology appears to be a fruitful area for future research.

Although few sex differences were found in measures of toddlers' attention, those that were significant indicated that girls exhibited more focused attention than did boys. Although evidence for sex differences in temperament is limited early in life, our findings correspond with reported trends for girls scoring higher than boys on measures of attention during early and middle childhood (Else-Quest *et al*., 2006), as well as on related measures of self-regulation (Kochanska, Murray, & Coy, 1997; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996).

Turning to the predictors of focused attention, toddlers with high levels of negative emotionality were consistently found to also have lower levels of attention, although this relation was only true for same-reporter measures and between IBR ratings of negative emotionality and the observed measures of attention (with the exception of an unexpected positive relation between caregiver reports of negative emotion and later teaching attention). Frequent or intense experiences of distress and negativity can be disruptive and also may relate to continual over-arousal, making it difficult for these children to maintain attentional focus on objects and tasks in the external environment. On the other hand, the increasingly voluntary control of attentional processes gained across early childhood promotes the use of attention in modulating negative emotions. These complex processes are suggested by the bidirectional correlations found between several of our measures of attention and negative emotion across time. Nonetheless, our analyses indicated that early negative emotionality predicted decreases in levels of focused attention across time, suggesting that such affect indeed has detrimental effects on children's capacity for sustained attention.

Maternal emotional support and control also uniquely predicted toddlers' focused attention, in different ways, and even when controlling for earlier levels of attention. First, we found that greater use of maternal praise during the teaching task predicted higher levels of the observed attention composite at both ages. Other findings were less consistent, with positive relations found between maternal reports of warmth and of children's attention at T2, between T1 positive affect and IBR ratings of attention at T2, and between T1 warmth and later free play attention.

A number of theorists have attested to the role of parental emotional support in enhancing and promoting children's transactions with the environment (Harter, 1981; Vygotsky, 1978). However, with praise for children's engagement and actions with the environment, adults convey enthusiasm and affirm that children's efforts are valued, fostering interest and motivation. Thus, praise may be a more specific and salient influence on children's continued attention and engagement with objects and tasks than more generalized affect or global styles of parenting. In fact, adult affective behaviours that are elicited by or focused on things external to that with which the child is engaged (e.g. as part of social play) may serve to distract children's attention from the task at hand. It is interesting that the unexpected negative relation was between maternal positive affect and children's attention during block play. It is possible, for example, that children whose mothers displayed more positive affect were more likely to become distracted from this task that was to be accomplished independently (e.g. by engaging in social interaction), as mothers were generally nearby.

Maternal control also was significantly related to children's focused attention. At T2, observed maternal control negatively predicted toddlers' attention, with prediction from T1 control as well. Children begin to assume and desire more responsibility for autonomous self-regulation across toddlerhood, which coincides with the development of executive systems of effortful control (Kochanska, Coy, & Murray, 2001; Kopp, 1982). Although more active guidance may facilitate attention and play in infants and younger toddlers, parental behaviours that continue to reflect high levels of behavioural control or explicit direction and intervention can be inappropriate for more skilled toddlers, providing little support for children's own natural

tendencies to engage with objects and tasks in the environment and instead being disruptive or frustrating. For children who are already poorly attentive, parental interference may be particularly detrimental for the development of their attention across time, as our findings indicated. It also should be noted that these effects were evident for even mild forms of parental control, as overall scores for intrusiveness were still relatively low and forceful forms of control were never observed.

The majority of significant relations between maternal socialization and toddlers' attention were for the observed variables. Adult and child behaviours may be more strongly related in the immediate context (e.g. within the same laboratory visit) than across different types of situations. In addition, adult reports of children's attention integrated observed patterns of behaviour across a wide range of contexts, some of which might be quite dissimilar to the laboratory assessments but nonetheless provide valuable information about children's attentional skills. For example, it is important to consider children's focused attention in situations that do not involve objects or defined activities (e.g. during social play, watching TV) and in tasks that are self-selected rather than externally defined (as in the laboratory). Our maternal socialization variables may not have reflected the factors important for the nature of focused attention captured by the mother and caregiver reports. Maternal variables—often measured in dyadic situations—also did not predict observed attention consistently, being generally unrelated to attention during the independent play task. On the other hand, parental control in both play and non-play situations similarly predicted decreased attention in children, suggesting that the effects of this type of parenting can be pervasive across some contexts. These mixed findings underscore the complex nature of attention and its predictors.

Because children's characteristics may elicit certain patterns of response from the social environment (Scarr & McCartney, 1983), bidirectional relations may have been expected between measures of toddlers' attention and maternal socialization. Children who readily engage in focused play may provide more opportunities for parents to express support for their efforts, whereas mothers might use greater levels of control with inattentive children in an effort to convey expectations, compel action, or preemptively avoid difficulties that they have come to anticipate. However, our longitudinal correlations indicate that maternal behaviours appeared to be a predictor, rather than consequence, of differences in children's attention across time.

Several limitations of this study should be noted. Although our findings were significant even after controlling for SES, our sample was predominantly Caucasian and from middle-class backgrounds. Broad cultural influences may impact parenting practices, child development (e.g. behaviours, abilities), and the relations between the two (Bornstein, 1991), and substantial cultural differences may exist in parental socialization of children's attention (Chavajay & Rogoff, 1999). Moreover, we examined children's focused attention during play with objects, and it was primarily measured in terms of visual attention and active engagement. Other forms of attention are important to understand as well. There was also some attrition across time, as well as a substantial number of families who did not provide caregiver data. As noted, we did control for SES (a difference found between families that remained in the study and those who attritted), and few other differences were found in the study variables between families with and without missing data. However, results should be interpreted with caution.

Nonetheless, this study has numerous strengths, including the multimethod approach, large sample size, and longitudinal design. The findings of this study contribute to the literature on the development of attention during toddlerhood and demonstrate that, although the relations among varying indices of attention may be complex, somewhat stable individual differences can be detected across children even amidst the rapid changes occurring during the first years

of life. The study also underscores the role of social experiences in the development of attention, suggesting an important area for future research.

ACKNOWLEDGEMENTS

Support for this study was provided in part by 5 R01 MH060838 to Nancy Eisenberg and Tracy L. Spinrad. We express our appreciation to the parents, toddlers, and caregivers who participated in the study and to the many research assistants who contributed to this project.

REFERENCES

Barocas R, Seifer R, Sameroff AJ, Andrews TA, Croft RT, Ostrow E. Social and interpersonal determinants of developmental risk. Developmental Psychology 1991;27:479–488.

Bayley N. The Bayley Scales of Infant Development. Training and scoring manual. 1969

Bono MA, Stifter CA. Maternal attention-directing strategies and infant focused attention during problem solving. Infancy 2003;4:235–250.

Bornstein, MH. Cultural approaches to parenting. Lawrence Erlbaum; Hillsdale, NJ: 1991.

Breznitz Z, Friedman SL. Toddlers' ability to concentrate: The influence of maternal depression. Journal of Child Psychology and Psychiatry 1988;29:267–279. [PubMed: 3417803]

Cairns, RB.; Green, JA. How to assess personality and social patterns: Observations or ratings. In: Cairns, RB., editor. The analysis of social interactions: Methods, issues, and illustrations. Lawrence Erlbaum; Hillsdale, NJ: 1979. p. 209-226.

Calkins SD, Dedmon SE, Gill KL, Lomax LE, Johnson LM. Frustration in infancy: Implications for emotion regulation, physiological processes, and temperament. Infancy 2002;3:175–197.

Calkins S, Johnson M. Toddler regulation of distress to frustrating events: Temperamental and maternal correlates. Infant Behavior and Development 1998;21:379–395.

Chavajay P, Rogoff B. Cultural variation in management of attention by children and their caregivers. Developmental Psychology 1999;35:1079–1090. [PubMed: 10442876]

Choudhury N, Gorman KS. The relationship between sustained attention and cognitive performance in 17-24-month old toddlers. Infant and Child Development 2000;9:127–146.

Cohen, J.; Cohen, P.; West, SG.; Aiken, LS. Applied multiple regression/correlation analysis for the behavioral sciences. 3rd ed.. Lawrence Erlbaum; Mahwah, NJ: 2003.

Curran PJ, West SG, Finch JF. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. Psychological Methods 1996;1(1):16–29.

Derryberry D, Rothbart MK. Arousal, affect, and attention as components of temperament. Journal of Personality and Social Psychology 1988;55:958–966. [PubMed: 3216290]

Diaz RM, Neal CJ, Vachio A. Maternal teaching in the zone of proximal development: A comparison of low- and high-risk dyads. Merrill-Palmer Quarterly 1991;37:83–108.

Dixon WE, Smith PH. Links between early temperament and language acquisition. Merrill-Palmer Quarterly 2000;46:417–440.

Dunn J, Creps C, Brown J. Children's family relationships between two and five: Developmental changes and individual differences. Social Development 1996;5:230–250.

Easterbrooks MA, Goldberg W. Toddler development in the family: Impact of father involvement and parenting characteristics. Child Development 1984;55:740–752. [PubMed: 6734315]

Eisenberg N, Fabes RA, Bernzweig J, Karbon M, Poulin R, Hanish L. The relations of emotionality and regulation to preschoolers' social skills and sociometric status. Child Development 1993;64:1418–1438. [PubMed: 8222881]

Eisenberg N, Fabes RA, Guthrie IK, Reiser M. Dispositional emotionality and regulation: Their role in predicting quality of social functioning. Journal of Personality and Social Psychology 2000;78:136–157. [PubMed: 10653511]

Else-Quest NM, Hyde JS, Goldsmith HH, Van Hulle CA. Gender differences in temperament: A meta-analysis. Psychological Bulletin 2006;132:33–72. [PubMed: 16435957]

Geppert U, Kuster U. The emergence of 'wanting to do it oneself': A precursor of achievement motivation. International Journal of Behavioral Development 1983;6:355–369.

Goldsmith, HH.; Reilly, J.; Lemery, KS.; Longley, S.; Prescott, A. Preschool Laboratory Temperament Assessment Battery. Department of Psychology, University of Wisconsin-Madison; 1993. (PS Lab-TAB; Version 1.0). Technical Report

Goldsmith, HH.; Rothbart, MK. The Laboratory Temperament Assessment Battery. Edition 3.1. University of Wisconsin-Madison; Madison, WI: 1999. Locomotor Version

Gray, JA. The neuropsychology of temperament. In: Strelau, J.; Angleitner, A., editors. Explorations in temperament: International perspectives on theory and measurement. Plenum Press; New York: 1991. p. 105-128.

Grolnick, WS. The psychology of parental control: How well-meaning parenting backfires. Guilford Press; New York: 2003.

Grusec JE, Goodnow JJ. Impact of the parental discipline methods on the child's internalization of values: A reconceptualization of current points of view. Developmental Psychology 1994;30:4–19.

Harter, S. A model of intrinsic motivation in children: Individual differences and developmental change. In: Collins, WA., editor. Minnesota symposium on child psychology. 14. Erlbaum; Hillsdale, NJ: 1981. p. 215-255.

Heinicke CM, Diskkin SD, Ramsey-Klee DM, Oates DS. Pre- and postbirth antecedents of 2-year-old attention, capacity for relationships and verbal expressiveness. Developmental Psychology 1986;22:777–787.

Hill AL, Braungart-Rieker JM. Four-month attentional regulation and its prediction of three-year compliance. Infancy 2002;3:261–273.

Kochanska G, Aksan N. Mother-child mutually positive affect, the quality of child compliance to requests and prohibitions, and maternal control as correlates of early internalization. Child Development 1995;66:236–254.

Kochanska G, Coy K, Murray K. The development of self-regulation in the first four years of life. Child Development 2001;72:1091–1111. [PubMed: 11480936]

Kochanska G, Coy K, Tjebkes T, Husarek S. Individual differences in emotionality in infancy. Child Development 1998;69:375–390. [PubMed: 9586213]

Kochanska G, Murray K, Coy K. Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. Child Development 1997;68:263–277. [PubMed: 9180001]

Kochanska G, Murray K, Harlan E. Effortful control in early childhood: Continuity and change, antecedents and implications for social development. Developmental Psychology 2000;36:220–232. [PubMed: 10749079]

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

Kopp CB. Antecedents of self-regulation: A developmental perspective. Developmental Psychology 1982;18:199–214.

Kuczynski L, Kochanska G. Function and content of maternal demands: Developmental significance of early demands for competent action. Child Development 1995;66:616–628. [PubMed: 7789191]

Landry SH, Chapieski ML. Visual attention during toy exploration in preterm infants: Effects of medical risk and maternal interactions. Infant Behavior and Development 1988;11:187–204.

Landry SH, Garner PW, Swank PR, Baldwin CD. Effects of maternal scaffolding during joint toy play with preterm and full-term infants. Merrill-Palmer Quarterly 1996;42:177–199.

Lawson KR, Parrinello R, Ruff HA. Maternal behavior and infant attention. Infant Behavior and Development 1992;15:209–229.

Lawson, KR.; Ruff, HA. Focused attention: Assessing a fundamental cognitive process in infancy. In: Singer, LT.; Zeskind, PS., editors. Biobehavioral assessment of the infant. Guilford Press; New York: 2001. p. 293-311.

Lawson KR, Ruff HA. Early attention and negative emotionality predict later cognitive and behavioral function. International Journal of Behavioral Development 2004;28:157–165.

Lutkenhaus P. Pleasure derived from mastery in three-year olds: Its function for persistence and the influence of maternal behavior. International Journal of Behavioral Development 1984;7:343–358.

Matas L, Arend RA, Sroufe LA. The continuity of adaptation in the second year: The relationship between quality of attachment and later competence. Child Development 1978;49:547–556.

Mischel W, Ebbesen EB, Raskoff Zeiss A. Cognitive and attentional mechanisms in delay of gratification. Journal of Personality and Social Psychology 1972;21:204–218. [PubMed: 5010404]

NICHD Early Child Care Research Network. Do children's attention processes mediate the link between family predictors and school readiness? Developmental Psychology 2003;39:581–593. [PubMed: 12760525]

NICHD Early Child Care Research Network. Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. Developmental Psychology 2005;41:99–114. [PubMed: 15656741]

Parrinello RM, Ruff HA. The influence of adult intervention on infants' level of attention. Child Development 1988;59:1125–1135. [PubMed: 3168620]

Power TG, Chapieski ML, McGrath MP. Assessment of individual differences in infant exploration and play. Developmental Psychology 1985;21:974–981.

Putnam SP, Gartstein MA, Rothbart MK. Measurement of fine-grained aspects of toddler temperament: The Early Childhood Behavior Questionnaire. Infant Behavior and Development 2006;29:386–401. [PubMed: 17138293]

Redding R, Harmon G, Morgan G. Relationships between maternal depression and infant's mastery behaviors. Infant Behavior and Development 1990;13:391–395.

Roberts BW, DelVecchio WF. The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. Psychological Bulletin 2000;126:3–25. [PubMed: 10668348]

Rogoff, B. Apprenticeship in thinking: Cognitive development in social context. Oxford University Press; New York: 1990.

Rothbart MK, Ahadi SA. Temperament and the development of personality. Journal of Abnormal Psychology 1994;103:55–66. [PubMed: 8040481]

Rothbart, MK.; Bates, JE. Temperament. In: Damon, W.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3. Social, emotional and personality development. 5th ed.. Wiley; New York: 1998. p. 105-176.

Rothbart, MK.; Bates, JE.; Eisenberg, N. Temperament. In: Damon, W.; Lerner, RM., editors. Handbook of child psychology: Vol. 3. Social, emotional and personality development. 6th ed.. Wiley; New York: 2006. p. 99-166.Series EdsVol. Ed.

Rothbart, MK.; Derryberry, D. Development of individual differences in temperament. In: Lamb, ME.; Brown, AL., editors. Advances in developmental psychology. 1. Lawrence Erlbaum Asociates; Hillsdale, NJ: 1981. p. 37-86.

Rothbart, MK.; Derryberry, D.; Hershey, K. Stability of temperament in childhood: Laboratory infant assessment to parent report at seven years. In: Molfese, VJ.; Molfese, DL., editors. Temperament and personality development across the life span. Lawrence Erlbaum; Mahwah, NJ: 2000. p. 85-119.

Rothbart, MK.; Posner, MI.; Boylan, A. Regulatory mechanisms in infant development. In: Enns, JT., editor. The development of attention: Research and theory. Advances in psychology. 69. Elsevier; New York: 1990. p. 47-66.

Rothbart, MK.; Posner, MI.; Kieras, J. Temperament, attention, and the development of self-regulation. In: McCartney, K.; Phillips, D., editors. Blackwell handbook of early childhood development. Blackwell; Malden, MA: 2006. p. 338-357.

Rothbart, MK.; Ziaie, H.; O'Boyle, CG. Self-regulation and emotion in infancy. In: Eisenberg, N.; Fabes, RA., editors. New directions in child development. 55. Jossey-Bass; San Francisco: 1992. p. 7-23.

Ruff HA, Capozzoli MC. Development of attention and distractibility in the first 4 years of life. Developmental Psychology 2003;39:877–890. [PubMed: 12952400]

Ruff HA, Capozzoli M, Saltarelli LM. Focused visual attention and distractibility in 10-month-old infants. Infant Behavior and Development 1996;19:281–293.

Ruff HA, Lawson KR. Development of sustained, focused attention in young children during free play. Developmental Psychology 1990;26:85–93.

Ruff HA, Lawson KR, Parrinello R, Weissberg R. Long-term stability of individual differences in sustained attention in the early years. Child Development 1990;61:60–75. [PubMed: 2307047]

Ruff, HA.; Rothbart, MK. Attention in early development: Themes and variations. Oxford University Press; New York: 1996.

Scarr S, McCartney K. How people make their own environments: A theory of genotype-environment effects. Child Development 1983;54:424–435. [PubMed: 6683622]

Stifter C, Corey J. Vagal regulation and observed social behavior in infancy. Social Development 2001;10:189–201.

Stipek D, Recchia S, McClintic S. Self-evaluation in young children. Monographs of the Society for Research in Child Development 1992;57(1)Serial No. 226

Valiente C, Eisenberg N, Spinrad TL, Liew J, Reiser M, Cumberland A, et al. Relations among mothers' expressivity, children's effortful control, and their problem behaviors: A four-year longitudinal study. Emotion 2006;6:459–472. [PubMed: 16938087]

Vygotsky, L. Mind in society: The development of higher psychological processes. Harvard University Press; Cambridge, MA: 1978.

Table 1

Means, standard deviations, and age differences in study variables at Time 1 and Time 2

	Time 1		Time 2		T1 versus T2
	M (Range)	**S.D.**	**M (Range)**	**S.D.**	***F***
Child attention					
Mother report (*n* = 242; 223)	4.23 (2.67-5.72)	0.56	4.58 (2.79-6.04)	0.56	116.51**
Caregiver report (*n* = 170; 149)	4.37 (1.91-6.23)	0.73	4.70 (3.19-6.67)	0.70	19.41**
Blocks/beads (*n* = 245; 215)	111.10 (0-180)	50.98	143.69 (0-180)	37.12	61.74**
Free play (*n* = 245; 216)	3.28 (1.42-4.58)	0.49	3.29 (1.67-4.00)	0.33	0.34
Teaching (*n* = 246; 216)	3.19 (1.07-4.0)	0.63	3.71 (1.0-4.0)	0.51	117.0**
IBR (*n* = 247; 216)	3.25 (1.0-4.75)	0.69	3.48 (1.0-5.0)	0.86	11.29**
Child negative emotion					
Mother report (*n* = 243; 223)	3.07 (1.46-4.99)	0.66	3.19 (1.71-5.17)	0.67	5.61*
Caregiver report (*n* = 170; 148)	2.73 (1.22-5.04)	0.80	2.70 (1.11-5.11)	0.72	0.00
IBR (*n* = 247; 216)	3.64 (1.0-5.0)	1.0	2.75 (1.0-5.0)	1.13	90.60**
Mother emotional support					
Warmth (*n* = 240; 222)	5.39 (3.5-6.0)	0.38	5.54 (4.11-6.0)	0.34	35.83**
Positive affect (*n* = 246; 216)	1.77 (1.08-2.76)	0.35	1.54 (1.0-2.63)	0.32	75.14**
Praise (*n* = 246; 216)	0.22 (0.0-0.67)	0.17	0.24 (0.0-0.72)	0.18	2.06
Mother control					
Intrusiveness (*n* = 246; 216)	1.26 (1.0-2.13)	0.25	1.18 (1.0-2.08)	0.18	34.99**
Control (*n* = 245; 215)	0.24 (0.0-0.89)	0.23	0.13 (0.0-0.67)	0.16	69.16**

Note. The means and standard deviations presented are those prior to transformations.

* $p<0.05$

** $p<0.01$.

Table 2

Intercorrelations among major study variables at Time 1 and Time 2

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Attention														
1. M attn	—				0.18		-0.33			0.30				
2. C attn	0.26	—						-0.55						
3. Free play			—	0.17		0.28			-0.19				-0.28	-0.16
4. Teaching			0.17	—		0.30						0.31	-0.21	-0.15
5. Blocks/beads					—				-0.20					
6. IBR attn			0.19	0.27	0.34	—			-0.52			0.16	-0.22	-0.30
Neg emotion														
7. M neg	-0.34	-0.15					—	0.26	0.15	-0.19				
8. C neg	-0.15	-0.35				-0.20	0.23	—		-0.18				
9. IBR neg			-0.14		-0.26	-0.53			—			-0.14		0.17
Maternal support														
10. Warmth							-0.23	-0.15		—				-0.16
11. Pos affect					-0.16						—	0.35		-0.17
12. Praise		0.17	0.24	0.54		0.19					0.28	—		
Maternal control														
13. Intrusive													—	0.33
14. Control											-0.17		0.39	—

Note. T1 correlations are below the diagonal, and T2 correlations are above the diagonal. M, mother report; C, caregiver report; Neg, negative emotion; Pos, positive. All correlations are significant at $p<0.05$.

Table 3

Correlations between major study variables at Time 1 and Time 2

	Time 2 variables													
Time 1 variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Attention														
1. M attn	0.53						-0.20			0.20				
2. C attn		0.52					-0.18	-0.40						
3. Free play			0.20											
4. Teaching				0.29		0.17								
5. Blocks/beads					0.15									
6. IBR attn	0.14			0.18		0.22			-0.17					
Neg emotion														
7. M neg	-0.18						0.63			-0.23				
8. C neg		-0.23		0.20				0.47		-0.15				
9. IBR neg				-0.14	-0.16				0.22					
Maternal support														
10. Warmth			0.18				-0.17			0.54			-0.17	
11. Pos affect						0.20					0.36	0.27		-0.15
12. Praise			0.15			0.20						0.16		
Maternal control														
13. Intrusive				-0.19		-0.20							0.50	0.30
14. Control			-0.14	-0.18		-0.20							0.34	0.55

Note. M, mother report; C, caregiver report; Neg, negative emotion; Pos, positive. All correlations significant at $p<0.05$.

Infant Child Dev. Author manuscript; available in PMC 2008 December 23.

Table 4

Hierarchical regression analysis for sociodemographic status, sex, negative emotionality, and maternal socialization in predicting toddlers' focused attention at Time 1

	M attention (n = 232)			C attention (n = 160)			Blocks attention (n = 230)			Obs attention (n = 232)		
	B	**S.E. *B***	***β***	***B***	**S.E. *B***	***β***	***B***	**S.E. *B***	***β***	***B***	**S.E. *B***	***β***
Step 1												
SES	-0.03	0.05	-0.04	-0.09	0.07	-0.10	-0.09	4.19	0.00	-0.03	0.05	-0.03
Sex[a]	0.11	0.07	0.10	-0.16	0.11	-0.11	6.44	6.56	0.06	0.11	0.08	0.08
R^2		0.01			0.02			0.01			0.02	
F for ΔR^2		0.64			1.52			0.97			1.85	
Step 2												
M neg	-0.28	0.06	-0.33**	-0.08	0.09	-0.08	6.71	5.03	0.09	0.10	0.06	0.10
C neg	—	—	—	-0.33	0.07	-0.36**	—	—	—	—	—	—
IBR neg	-0.02	0.04	-0.04	0.07	0.06	0.10	-13.31	3.24	-0.26**	-0.25	0.04	-0.36**
R^2		0.12			0.16			0.09			0.15	
F for ΔR^2		15.46**			8.72**			9.52**			17.16**	
Step 3												
M warm	0.06	0.10	0.04	-0.04	0.15	-0.02	-6.51	8.80	-0.05	0.09	0.10	0.05
M pos	-0.01	0.11	-0.01	-0.16	0.16	-0.08	-20.0	9.62	-0.14*	-0.09	0.11	-0.04
Praise	0.14	0.22	0.04	0.69	0.34	0.16	-17.19	20.4	-0.06	2.02	0.23	0.47**
Control	-0.01	0.05	-0.02	0.04	0.07	0.05	-0.34	4.16	-0.01	-0.05	0.05	-0.06
R^2		0.13			0.19			0.12			0.37	
F for ΔR^2		0.24			1.16			1.47			20.15**	

Note. M, mother report; C, caregiver report; Obs, observed composite; SES, socioeconomic status; neg, negative emotionality; pos, positive affect.

*p<0.05

**p<0.01.

[a]Infant sex: 0 = boys; 1 = girls.

Table 5

Hierarchical regression analysis for sociodemographic status, sex, negative emotionality, and maternal socialization in predicting toddlers' attention at Time 2, controlling for T1 attention

	M attention (*n* = 202)			C attention (*n* = 118)			Beads attention (*n* = 207)			Obs attention (*n* = 208)		
	B	**S.E. *B***	***β***	***B***	**S.E. *B***	***β***	***B***	**S.E. *B***	***β***	***B***	**S.E. *B***	***β***
Step 1												
SES	-0.03	0.04	-0.05	0.01	0.06	0.02	-0.99	3.20	-0.02	0.09	0.05	0.11
Sex[a]	0.08	0.07	0.07	0.06	0.10	0.04	0.41	5.26	0.01	0.12	0.08	0.08
T1 attn	0.45	0.06	0.46**	0.37	0.08	0.39**	0.10	0.05	0.14*	0.23	0.06	0.24**
R^2		0.29			0.29			0.02			0.19	
F for ΔR^2		26.74**			15.49**			1.47			15.95**	
Step 2												
M neg	-0.18	0.05	-0.22**	0.22	0.08	0.21**	1.20	3.95	0.02	0.00	0.06	0.00
C neg	—	—	—	-0.43	0.08	-0.44**	—	—	—	—	—	—
IBR neg	0.02	0.03	0.04	0.05	0.05	0.09	-6.88	2.31	-0.21**	-0.19	0.04	-0.31**
R^2		0.34			0.46			0.06			0.30	
F for ΔR^2		8.21**			12.12**			4.28**			16.74**	
Step 3												
M warmth	0.29	0.10	0.18**	0.00	0.15	0.00	10.62	7.63	0.10	-0.01	0.12	0.00
M pos	-0.03	0.11	-0.02	0.18	0.17	0.08	-4.11	8.50	-0.04	-0.03	0.13	-0.02
Praise	0.15	0.20	0.05	0.01	0.31	0.03	-8.65	15.61	-0.04	0.64	0.23	0.17**
Control	-0.05	0.04	-0.07	-0.08	0.06	-0.10	2.87	3.36	0.06	-0.22	0.05	-0.26**
R^2		0.38			0.48			0.08			0.39	
F for ΔR^2		2.30*			0.76			0.82			6.92*	

Note. T1 attn, T1 attention variable analogous to the T2 attention dependent variable of interest. M, mother report; C, caregiver report; Obs, observed composite; SES, socioeconomic status; neg, negative emotionality; pos = positive affect.

* $p<0.05$

** $p<0.01$.

[a] Infant sex: 0 = boys, 1 = girls.