

Early Maternal and Child Influences on Children's Later Independent Cognitive and Social Functioning

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The present study examined whether parenting and child characteristics of 2- and 3½-year-old children had common paths of influence on their 4½-year independent cognitive and social functioning. Structural equation modeling was guided by hypotheses that assumed children's later independence is facilitated by specialized parental support in early social interactions. To address the importance of variability in early development for understanding children's later independence, we included 104 term and 185 preterm children, as they are known to differ in early skills. As predicted, mothers' maintaining of children's interests indirectly supported 4½-year cognitive and social independence through a direct, positive influence on 2- and 3½-year skills. Directiveness positively supported children's early cognitive and responsiveness skills but by 3½ years, high levels of this behavior had a direct, negative influence on their cognitive and social independence at 4½ years. Whereas high levels of maintaining interests across these ages support later independence, directiveness needs to decrease in relation to children's increasing competencies. Results support a theoretical framework that emphasizes the importance of the social context for understanding the origins of children's later independent functioning.

INTRODUCTION

An important developmental goal for children during the preschool years is the ability to interact independently with their world without a high degree of structure and support from others. For cognitive tasks, this includes developing goals independently and using strategies flexibly for successful goal completion (Brown & DeLoache, 1978; Pea, 1982; Rogoff, Gauvain, & Gardner, 1987). In the social domain, preschool children show competency through control of their behavior and providing to others information regarding their needs and interests (Eisenberg et al., 1993; Kopp, 1982). Learning to develop cognitive goals independently is described by cognitive and neuropsychologists as important for executive processing skills (Brown, 1977; Denckla, 1996; Flavell, 1971; Rourke & Fuerst, 1991; Welsh & Pennington, 1988). Developmental psychologists describe children's behavioral control and initiations of social exchanges as important for self-regulation and social competence (Block & Block, 1980; Kopp, 1982; Mischel & Patterson, 1979; Wertsch, 1979). In spite of the importance of these different preschool developmental tasks, little is known about what influences their attainment.

Vygotsky (1978) emphasizes the importance of the social context for understanding the origins of children's later independent functioning. He proposes that children have a "zone of proximal development" in which adult support is critical for elevating a child's ability to accomplish goals beyond their autonomous performance. Within the social context, the

parent provides "other regulation" through specific interactive behaviors that are necessary for the very young child to accomplish tasks. The child gradually learns to take over these "regulatory" responsibilities by having successful learning experiences with their parent. Thus, children progress from relying on others to assist them in solving problems to the internalization of the skills required to solve problems independently (Henderson, 1984; Radziszewska & Rogoff, 1988; Rogoff, Mistry, Goncu, & Mosier, 1993). Although Vygotsky's (1978) theoretical framework highlights this process as dynamic across early development, few studies have examined this process across time.

Wertsch (1979) describes how 2 years old is an important age to begin examining children's learning in social interactions. Prior to this, infants begin to follow someone's line of visual regard and their non-verbal signals, but around 2 years they begin to understand the informational content of mothers' communication. However, children at this age remain limited in their ability to work in a communicative learning context due, in part, to their immature language. To assist children's understanding, mothers need to provide explicit directions (Wertsch, McNamee, McLane, & Budwig, 1980) and use behaviors that are tied to children's focus of interest (Akhtar, Dunham, & Dunham, 1991; Bruner, 1977; Tomasello & Todd, 1983). By 3 years of age, children continue to

need parental support for their focus of interest, but their increased language allows them to express more clearly their problem-solving goals; thus, less parental direction is needed. Through this interactional process, children gradually learn to share control and influence, skills that prepare them for greater independence in cognitive and social functioning.

Research documents the influence of mothers' responsiveness to children's interests and provision of direction on children's learning (e.g., Akhtar et al., 1991; Dunham & Dunham, 1995; Rocissano & Yatchmink, 1983). For example, children's play complexity was more likely to increase following requests where mothers maintained rather than redirected children's attention (Landry, Garner, Swank, & Baldwin, 1996). Numerous studies report increases in children's language skills (Barnes, Gutfreund, Satterly, & Wells, 1983; Bloom, Rocissano, & Hood, 1976; Tomasello & Todd, 1983) and cooperation (Rocissano, Slade, & Lynch, 1987) in response to mothers maintaining of their children's topics of interest. Maternal directiveness has a changing influence with positive relations to children's skills at younger ages (Barnes et al., 1983; Shatz, 1977) but negative relations at later ages (Kuczynski, Kochanska, Radke-Yarrow, & Girnius-Brown, 1987; Pappal & Maccoby, 1985). What is less well understood from recent research is whether mothers' maintaining and direction influences children's independent cognitive and social skills in similar ways across the toddler and preschool period.

A variety of measures are used to assess children's independence in cognitive and social domains. Two cognitive measures include novel problem-solving tasks and independent exploratory play (Landry, Copeland, Lee, & Robinson, 1990; Welsh & Pennington, 1988). Both tasks require children to set goals, develop an efficient plan for achieving goals, and exercise flexibility when task demands shift (Bullock & Lutkenhaus, 1988; Diamond, 1988; Kagan, 1981; Piaget, 1954; Welsh & Pennington, 1988). For example, children attempting to complete a puzzle may find that they need to reorganize their puzzle plan when a piece does not fit. Independence in social functioning often includes children's competency in initiating social interactions (Crockenberg & Litman, 1990; Kopp, 1982; Vaughn, Kopp, & Krakow, 1984). Due to the presence of a social partner, initiating requires children to take a conversational turn and identify and express their needs and interests to others (Landry, Swank, & Denson, 1997; Rourke & Fuerst, 1991). Although these cognitive and social skills both require independent functioning, they are separate areas of competency. A question remains as to whether they are influenced by similar parental behaviors.

Previously, with the same cohort of mothers and children examined in this study, we demonstrated the influence of positive versus negative parenting across the first year of life on children's rates of growth in cognitive and social skills through 3 years of age (Landry, Smith, Miller-Loncar, & Swank, 1997). More recently, we extended these findings to describe the complex relations between adaptive changes in mothers' behaviors and developmental changes in children across the first 3 years (Landry, Smith, Miller-Loncar, & Swank, 1998). In the present study, we address how this early interactive process between the mother and child provides information about children's independent functioning during the preschool period. With structural equation modeling, we examined whether there were common paths of influence of mothers' maintaining and directiveness and children's cognitive and social skills at 2 and 3½ years on children's goal-directed and social initiating skills at 4½ years. We felt it was important to examine this dynamic process starting at an age when children are initially dependent on parental support and following it through an age when they could accept more responsibility for their learning. Within the 2- and 3½-year ages, we hypothesized that the direction of influence was from mothers to children based on a theoretical framework that assumed a strong influence of parents' interactive behaviors on children's early learning (Adamson & Bakeman, 1982; Bruner, 1982; Vygotsky, 1978; Wertsch, 1979). However, statistical examination of the direction of influence was also conducted to support this theoretical framework. We also tested for support of bidirectional influences across time by examining whether children's 2-year skills predicted parents' interactions at 3½ years. For example, children who showed greater exploration of objects and use of language would provide mothers with greater opportunities to maintain and expand on their children's interests.

Maintaining and directiveness were hypothesized to be distinct styles and, therefore, not highly related. Both behaviors were expected to indirectly influence children's 4½-year goal-directed and initiating skills through their direct influence on children's 2- and 3½-year cognitive and social skills. Higher degrees of maintaining were expected to positively influence children's cognitive and social skills at 2 and 3½ years old. This type of special support allows children to learn that their interests are important and facilitates sustained focus on problem-solving activities by not placing on children's attentional and cognitive resources the high demands associated with maternal redirecting behaviors. Independent goal-directed skills were expected to benefit from this type of early sup-

port as children would have repeated experiences that encouraged them to take more active roles in solving problems.

Mothers' directiveness was expected to have age dependent effects. At 2 years old, when children require greater external support, higher degrees of directiveness were expected to have a positive influence on cognitive and social skills. As children increased in these skills by 3½ years of age, higher degrees of directiveness were expected to have a negative influence on cognitive and social skills. In contrast, strategies that guide and question, rather than direct, allow children to establish goals and strategies for goal attainment. Thus, high levels of maintaining and decreases in direction across this period would facilitate children's active participation in social interactions resulting in greater independence at 4½ years old.

To examine the question of how variability in children's early cognitive and social responsiveness relates to later independent cognitive and social functioning, we included term and preterm children, as they are known to differ in early development. For example, preterm children have greater problems organizing their behavior (Rose, 1983; Ruff, McCarton, Kurtzburg, & Vaughan, 1984) and developing social initiatives (Landry et al., 1998). The level at which term and preterm children were able to develop social and cognitive competencies at 2 years was expected to directly influence these skills at 3½ years. These skills, in turn, were expected to influence the development of later goal-directed and initiating skills.

In summary, our major objective was to determine whether early maternal and child characteristics had common paths of influence on children's 4½-year independence in cognitive and social functioning. We examined whether the influence of mothers' maintaining and directiveness on goal-directed and initiating skills was direct versus indirect through their effect on children's early cognitive and social skills. Given that goal-directed and initiating skills both require independence but are different developmental tasks, we were interested in whether they were influenced by similar versus different maternal and child characteristics.

METHOD

Participants

A cohort of 364 urban and rural, low socioeconomic status (SES) families with a preterm ($n = 228$) or a term ($n = 136$) infant were recruited during 1990 and 1991 as part of a longitudinal study of parenting and children's development at 6 and 12 months and 2,

3½, and 4½ years of age. Prematurity was defined as birth at ≤ 36 weeks gestation and weighing $\leq 1,600$ g. Children were excluded from participation in the study if they were diagnosed with significant sensory impairments, meningitis, encephalitis, symptomatic congenital syphilis, congenital abnormality of the brain, short bowel syndrome, or if they were positive for HIV antibody. They also were excluded if the primary caregiver was less than 16 years of age, was a drug abuser, or did not speak English. Children were considered term with gestational ages from 37 to 42 weeks, Apgar scores greater than 8 at 1 and 5 min, and a normal pregnancy history and physical exam at birth. Children with term births were recruited from the same hospitals as the preterm children and matched on SES, ethnicity, and infant gender. Eleven percent of parents approached for participation in the study declined. No differences were found on a broad range of demographic and medical characteristics between children whose parents chose to participate and those who declined.

The present study included evaluation of parenting and children's development at 2, 3½, and 4½ years of age for 185 preterm and 104 term children from the original cohort of children. All preterm children had some degree of medical risk associated with their premature birth with 40% having moderate to severe medical complications such as respiratory problems and 60% having less severe medical complications such as acute respiratory disease and/or mild degrees of intraventricular hemorrhage. Attrition from the original cohort recruited at birth was 21% and was due primarily to families moving outside the study area or loss of contact with families. Three additional children were excluded from the analyses because their primary caretaker changed over the study period.

For descriptive purposes, Table 1 provides information regarding medical and demographic variables for children in our study sample. The families were predominately from a lower-middle to lower SES background with an even distribution of boys versus girls across the term and preterm children. A greater proportion of the sample was comprised of African American mother-child dyads with the remaining dyads being Caucasian and English-speaking families from Hispanic origins. There were no differences across term and preterm children in proportion from each ethnic background.

Procedure

For this report, children's cognitive and language skills were examined in the home at 2 years and during a clinic visit at 3½ years of age. For all assessments,

Table 1 Medical and Demographic Characteristics of Sample

	Preterm (<i>n</i> = 185)	Term (<i>n</i> = 104)
Medical		
Birthweight (gm)	1114 (271)	3238 (704)
Gestation (weeks)	29.6 (2.6)	—
Hospitalization (days)	70.4 (70.5)	—
Demographic		
Socioeconomic status ^a	28.7 (10.8)	26.0 (9.1)
Maternal ethnicity (%)		
African American	60	63
Caucasian	23	23
Hispanic	14	14
Other	3	0
Infant gender (M/F %)	46/53	46/53

Note: Standard deviations are in parentheses.

^aHollingshead (1975) four-factor index.

preterm children were evaluated at ages corrected for amount of prematurity. Parenting behaviors and children's social responsiveness were assessed when children were 2 and 3½ years old through observation during a home visit that included a 60-min period of daily activity and a 10-min toy play session. These two conditions were chosen because they place different demands upon the child. Daily activities typically demand less attentional capability but more cooperation, whereas toy play places greater demands on cognitive and attentional skills. Children's primary caregivers were identified using a structured interview that documented who was primarily responsible for feeding, bathing, and attending to the child during the week and on weekends and this was reassessed at each home visit. For mothers who worked or attended school, those who identified themselves as the primary caregiver were so designated for the study, even though the infant may have been cared for by another person during working/school hours. For 98% of the children, the identified primary caregiver was the biological mother; for the rest, the maternal grandmother was usually the primary caregiver.

At the beginning of each home visit, observers spent approximately 10 min with each family describing the observation procedure, answering questions, and interacting informally with the family to enhance comfort and familiarity. For the naturalistic observation period, mothers were asked to go about their daily activities, but were requested to stay in the same room with their children and to feed, bathe, and/or dress their children during that hour. No further structure was placed on the family, and observers followed the dyad into all parts of the home as the family went about their daily activities. During toy play,

age-appropriate toys that are typically found in many types of homes were provided (2 years: puzzle, tea set, two dolls, stacking cups, truck with toy driver, puppet; 3½ years: discovery cottage with boy and girl figures, tea set, truck, workbench, puppet). Mothers were asked to play with their children in their usual manner and were told that it was their choice to play with one, some, or all of the toys. During both sessions coding procedures were the same; one research assistant coded maternal behaviors and one coded child behaviors using pencil/paper methods.

At 4½ years, children's social initiating skills were evaluated through home observation and, similar to the previous ages, included daily activities and a mother-child toy play session. Children's goal-directed behaviors were evaluated using an independent toy play task and two search tasks where children looked for rewards (fruit loop cereal) in a group of three, and then a group of six small boxes.

Measures

Cognitive and Language Skills

Children's cognitive and receptive language skills were evaluated at 2 years of age with the Bayley Scale of Mental Development (Bayley, 1969) and the Sequenced Inventory of Language Development—Receptive Communication Scale (SICD; Hedrick, Prather, & Tobin, 1975). At 3½ years we evaluated the same skills with the Stanford-Binet Test of Intelligence—Fourth Edition (Thorndike, Hagen, & Sattler, 1986) and the Clinical Evaluation of Language Fundamentals—Preschool Edition (CELF-Preschool; Wiig, Secord, & Semel, 1992). Change in testing instruments was necessary because the Bayley scales are limited to use through the first 2 years of life and the SICD is one of the few language instruments available for direct assessment of language skills in the toddler period. The 1969 version of the Bayley was used because the Bayley-II (1993) was not available when the study began. The Stanford-Binet Intelligence Test was chosen for the older age point because it allowed for continuity in testing, as many of the items closely match items on the Bayley scales. The CELF-Preschool allows for assessment of a broad range of language skills during the preschool ages and spans the period from 3 to 7 years. In a previous study (Landry, Smith, et al., 1997), we reported results of scaling procedures that showed significant correlations for a subset of this sample that received both the Bayley and Stanford Binet at 26 to 28 months. These results demonstrated similarities across this age range in the types of cognitive skills the two scales are measuring.

Mothers' Observed Behaviors

A maternal attention-directing event was defined as any maternal verbal (questions, comments, directives) or nonverbal behavior (orienting gestures, demonstrations, giving of objects) directed toward the child. Separate events were coded when 3 s or more elapsed between each maternal behavior. When mothers gave rapid requests, questions, or comments that did not allow time for the child to respond, the series was considered a single event. In the present study, two aspects of mothers' attention-directing style coded for each event were examined: the frequency of mothers' maintaining their children's attention, and the frequency of mothers' directive strategies. *Maintaining* was defined as a choice-providing strategy (i.e., question, suggestion, or comment) that related to the activity or object in which children were currently visually and/or physically engaged just prior to the mother's request or as a direct response to the child's attempt to attract the mother's attention to an object or activity. Mothers could also maintain their child's interest with a nonverbal behavior, such as demonstrating or physically assisting the child with a toy. *Directiveness* was defined as any verbal request (e.g., "put the ring here"), with or without a nonverbal behavior, that provided structured information about what was expected but offered less choice to the child. All directive requests were coded irrespective of the child's focus of attention.

A composite maintaining score was constructed by combining verbal and nonverbal maintaining during toy play and daily activities. As observation of toy play (10 min) was significantly shorter than that of daily activities (60 min), the toy play variable was weighted to equalize the variances of the two situations, thus maximizing the reliability of the measure. A similar composite was developed for directiveness across the two situations. The coefficient α s for these composites were .62 and .58 at 2 and 3½ years, respectively, for maintaining and .50 and .61 at 2 and 3½ years, respectively, for directiveness.

Children's Observed Social Behaviors

Two types of child social behaviors were examined: responsiveness, which measures the child's ability to respond to maternal requests, and initiating, which examines the child's ability to guide maternal attention to an activity of interest. Reliability and validity of these measures was established through a series of confirmatory factor and structural equation modeling analyses that is described in detail in a previous publication (Landry, Smith, et al., 1997). These

analyses indicated that the two social measures are separate constructs that account for significant variability in the group of behaviors used to assess them. In addition, the results provided support for assigning different weightings for specific social communicative behaviors (i.e., gestures, affect, eye gaze, verbalizations) and examining these behaviors as separate indicators of the larger constructs of responsiveness and initiating. The specific weightings assigned to each behavior were based on the developmental sequence of social behaviors documented in the literature (e.g., Butterworth, 1995; Kopp, 1982; Kuczynski & Kochanska, 1990; Leung & Rheingold, 1981). This weighting system also allowed for a monotonic increase in scores by age to capture linear growth in social behaviors over time. Greater weightings were given to behaviors that showed greater frequency with increased ages (e.g., length of verbal utterances). Construct validity for this scoring system has been demonstrated in studies showing appropriate developmental change in these skills across 6 to 40 months of age (Landry, Smith, et al., 1997; Landry et al., 1998).

To further validate this scoring system, expert raters viewed videotaped mother-child interactions for a subset of children at each of the age points and ranked these children as high, medium, or low in the maturity of the social behaviors they used to initiate and respond. A description of this procedure is found in Landry, Smith, et al. (1997). Additional validation was demonstrated by examining correlations between scores at each age derived from the theoretically based developmental weighting system and scores empirically derived through factor analyses. Correlations between these two scoring schemes at each age ranged from $r(287) = .70$ to $.97$, with a median of $.90$, for responsiveness, and $r(287) = .80$ to $.93$, with a median of $.82$, for initiating.

Social responsiveness. Behaviors were coded as a response if they followed within 3 s of a maternal attention-directing event and included the following categories: gestures, positive affect, eye gaze, words, and compliance and negotiating versus noncompliance to maternal requests. At 2 years, affect and eye gaze were given 1 point, as these behaviors emerge in early infancy, and attention-directing gestures received 2 points, as this behavior begins to emerge at the end of the first year of life (Leung & Rheingold, 1981). At 3½ years, all of these behaviors received 1 point, with additional points given for their use in combination. At 2 years, words received 2 points and vocalizations 1 point, as words are a marker at this age for more advanced social skills. At 3½ years, points were assigned based on whether children used single words (1 point), brief but incomplete utter-

ances (3 points), and complete sentences (5 points). Based in part on Kuczynski and Kochanska's (1990) developmental study of compliance, at 2 and 3½ years, compliance received 3 points, negotiating 4 points, and noncompliance, -2 points. These investigators documented variability in children's ability to comply across the toddler period, with most children adept at this skill by 3 years of age. The ability to assert social individuality through the use of negotiations, however, was found to be a marker for more social sophistication because it did not emerge until after 2 years of age and was related to competence in directing others' attention. Based on this research, we gave negative points for noncompliance at 2 and 3½ years because by this age, high levels of compliance have been documented; noncompliance is a marker for social immaturity (Kuczynski & Kochanska, 1990). An average social responsiveness score for each age was calculated by dividing the total number of points obtained across all maternal attention-directing events by the total number of events to control for frequency of maternal requests across dyads.

Social initiating. At 4½ years, social behaviors were coded as an initiation if they occurred when the mother had not interacted with the child for at least 3 s. Initiating behaviors were coded as separate events if they were separated by at least 3 s. Behavioral categories used to code children's initiating included gestures, affect, eye gaze, and words. These behaviors received the same number of points as described above under social responsiveness with a total initiating score obtained by summing points across all initiating events. In previous cross-sectional studies with children of similar ages, Landry, Garner, Pirie, and Swank (1994) found that in determining whether children's behaviors were a response or an initiation, responses most often occurred within the first 2 to 3 s after a request. If additional time was allotted, children's initiating behaviors tended to be inappropriately coded as social responses.

Children's Goal-directed Behaviors

Two measures were used to assess children's goal-directed behaviors at 4½ years. The measures were similar in that they required children to independently formulate problem-solving strategies and show flexibility in carrying out a plan. They differed in the specific task demands, as goals were specified in the search task but children were required to establish their own goals during play.

Search task behaviors. For each search task, rewards were hidden under each box in the children's view and children were then allowed to search one box per

trial until all rewards were found. Children were required to wait 5 s between each search trial for a maximum of 10 trials for the three-box search task and 20 trials for the six-box task. The total number of searches required across both tasks was used in data analyses. Higher scores indicated poorer performance. These box-search tasks are similar to those used by other researchers to assess planning, working memory, and future oriented behavior (for a review, see Welsh & Pennington, 1988).

Exploratory play behaviors. Children were videotaped while playing alone with three sequentially presented toys (a large set of wooden blocks, an animal/shape activity box, and a Sesame Street village with figures). Children were instructed to play alone with each toy while the examiner did "paperwork" for 3 min per toy. Bids for attention were handled first by trying not to attend to the child or telling a persistent child the examiner "could not play." Verbal interactions were kept to a minimum except that if a child was off task for a 30-s period (i.e., not touching or looking at any material), the child was verbally prompted to return to play with the toys but was not given information about how to play with the toy.

Every 10 s the child's highest level of play was determined based on a hierarchical level-of-play scale that ranged from 1 for off task, to 13 for functional play with mastery. Toy play levels (see Appendix A) were based on descriptions in the literature of children's developmental sequence of exploratory play (Fein, 1981; Fenson, Kagan, Keasley, & Zelazo, 1976; Piaget, 1954; Tamis-LeMonda & Bornstein, 1994). Portions of the scale have been described in our previous research with similar populations (e.g., Landry & Chapieski, 1989). A composite score was constructed by taking the average of the child's highest play levels for each 10-s interval across the three toys.

Interrater Reliability for Observational Measures

To estimate reliability for coding of maternal and child behaviors, one of the first two authors coded more than 15% of the home observations as a second rater. Using repeated measures analysis of variance, generalizability coefficients (reported below) were calculated to determine interrater reliability for each maternal and child variable within each time point (Fleiss, 1986). This method is recommended for studies using continuous behavioral observational data, and has the advantage of evaluating both the consistency across a variable for each rater and the variance across participants for those variables used in the analyses (Frick & Semmel, 1978). Coefficients above .50 indicate adequate reliability (Mitchell, 1979). Generaliz-

ability coefficients for maternal behaviors at the two age points (2 years/3½ years) were as follows: maintaining in daily activities, $r(287) = .95/.96$, and toy play, $r(287) = .73/.70$; and use of directives in daily activities, $r(287) = .98/.96$, and toy play, $r(287) = .68/.79$. Generalizability coefficients for child social responsiveness at these two age points and for social initiating at 4½ years were as follows: responsiveness in daily activities, $r(287) = .83/.94$, and toy play, $r(287) = .77/.79$; social initiations in daily activities, $r(287) = .95$, and toy play, $r(287) = .93$. Coefficients were somewhat lower in the toy play situation because there was less variability due to the smaller number of interactions in this briefer situation. The generalizability coefficient for children's independent goal-directed play behaviors was $r(287) = .94$.

RESULTS

First, we provide descriptive data regarding the indicator variables included in our model and how we used them to develop the outcome constructs of child social initiative and cognitive goal-directed behavior at 4½ years and the child and maternal predictor constructs at 2 and 3½ years. Second, we describe our data analytic approach, including the use of: (1) the measurement model that tested the adequacy of the constructs used in the full structural model and (2) results of a multistage model building approach. Model building was guided by specific hypotheses to determine the most appropriate model to account for influences of early maternal and child variables with children's later social initiative and goal-directed behavior. Prior to data analyses, variables were examined for the presence of outliers and normal distributions. No outliers (defined as 3.5 *SD* above or below the mean) were found; thus, the complete sample was included.

The nonnormality of distributions for social initiations, box-search task, and exploratory play was improved through the use of log transformations. Following the log transformation, the box-search task was also reverse-scored for ease in interpretability and so that higher scores also reflected better performance. The exploratory play data was negatively skewed; therefore, it was first reverse-scored and then log transformed. The log-transformed exploratory play data was then reversed back so that a higher score would reflect better performance.

Descriptive Data

Means and standard deviations for each of the indicator variables for the preterm and term children are presented in Table 2. At each time point and across

time, there were no differences for mothers of preterm and term children in their use of maintaining and directiveness. The overall frequency of maintaining showed significant increases from 2 to 3½ years during daily activities, $F(1, 304) = 164.7, p \leq .001$, and toy play, $F(1, 300) = 154.4, p \leq .001$, whereas directive strategies significantly decreased in both situations; daily activities, $F(1, 304) = 15.3, p \leq .001$, toy play, $F(1, 300) = 20.5, p \leq .001$. The large standard deviations demonstrate considerable variability across mothers.

Preterm children's skills were significantly different from term children's in cognitive and language skills at both 2 years, cognitive, $t(317) = -3.87, p \leq .001$, language, $t(313) = -2.67, p \leq .01$; and 3½ years, cognitive $t(304) = -5.99, p \leq .001$, language, $t(288) = -4.92, p \leq .001$. They also significantly differed in their exploratory play levels, $t(283) = -2.86, p \leq .01$, and search task, $t(284) = 2.45, p \leq .05$, at 4½ years. The means and standard deviations for these skills are summarized in Table 2. The language ages for all children were particularly low at 3½ years, given the children's cognitive abilities. This is similar to other studies that have found delays in verbal skills for children from multirisk environments, including lower incomes (e.g., Duncan, Brooks-Gunn, & Klebanov, 1994; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). On average, term children showed more complex toy manipulation and pretend play and needed fewer trials to find the hidden rewards.

A correlation matrix for the maternal and child indicator variables within and across ages is provided in Appendix B. These data were provided to depict the first order correlations among the separate indicator variables, information that is not available through assessment of relations among the constructs examined in the models.

Data Analytic Strategy

To systematically test our hypotheses, we conducted a multistep model building approach. We used LISREL 8.14 (Jöreskog & Sörbom, 1996) to test the adequacy of measurement models and the fit of the structural models. Based on the variance-covariance matrix, this program uses maximum likelihood estimation, and we used the convergence of multiple indices to evaluate how the model fits the data. The χ^2 test provides a comparison of the proposed model to the saturated model that fits the data perfectly. A nonsignificant χ^2 indicates that the model fits the data well. Because the χ^2 test is affected by the number of parameters estimated, nonnormal distributions, and large degrees of freedom, the Root Mean Square Error of Approximation (RMSEA), and

Table 2. Means and Standard Deviations for Mothers' and Children's Behaviors at the 2- and 3½-Year Age Points and Children's Outcomes at the 4½-Year Age Point

	2 Years			3½ Years			4½ Years		
	Term	Preterm	Effect Size ^a	Term	Preterm	Effect Size	Term	Preterm	Effect Size
Mother behaviors ^b									
Maintaining	37.98 (20.4)	37.57 (20.4)	.02	79.07 (33.9)	81.74 (36.6)	.08			
Directiveness	32.79 (15.9)	35.11 (15.6)	.15	30.49 (18.5)	32.86 (20.7)	.12			
Child behaviors ^c									
Cognitive	100.9 (15.6)	92.4 (18.6)	.48*	93.30 (11.2)	85.46 (12.3)	.66*			
Language	23.01 (3.3)	22.10 (4.4)	.32*	86.49 (14.0)	78.07 (14.3)	.59*			
Social responsiveness ^d									
Daily activities	2.86 (1.1)	2.71 (1.1)	.14	5.11 (1.9)	4.95 (1.8)	.08			
Toy play	2.98 (1.3)	2.82 (1.2)	.13	5.18 (1.8)	4.88 (2.1)	.15			
Child Outcomes									
Cognitive									
Goal-directed play ^e							9.07 (0.5)	8.75 (1.0)	.19*
Search task ^b							9.77 (1.3)	10.63 (3.4)	.36*
Social initiative ^d									
Daily activities							55.38 (4.2)	55.55 (4.0)	.04
Toy play							49.36 (2.1)	49.26 (2.0)	.05

^a Effect sizes are for preterm versus term group comparisons for the specified mother or child behavior.

^b Data are frequencies.

^c Values are standard scores except those for language at 2 years, which are age scores.

^d Data are average scores.

^e Data are average toy play levels.

* Significant difference between groups at $p \leq .05$.

the Nonnormed Fit Index (NNFI) were examined. These indices are not affected by skewed distributions in the data or sample size (Bentler & Bonett, 1980; Browne & Cudeck, 1993).

Our strategy was to create successively more restricted models to test our specific hypotheses. We first considered the measurement model that defines the constructs in terms of the indicator variables but does not restrict how the constructs may be related. If the measurement model provided an adequate fit to the data, then additional restrictions that specified how the constructs were related were applied to the model and tested against the preceding model. At each stage, we compared two competing models and examined the change in χ^2 (Likelihood Ratio Test; Bollen, 1989) to determine if a reduced model decreased the adequacy of fit. A nonsignificant χ^2 difference indicated that the more restricted model with fewer paths provided as adequate a fit to the data as the preceding model. This approach allowed us to increase the efficiency and power for testing hypotheses in the full model (Anderson & Gerbing, 1988). To account for Type I error due to the multiple analyses being conducted, we set the significance level at .01 when examining the change in χ^2 .

Preterm versus Term Analyses

To examine whether preterm and term children showed a different pattern of influence for their goal-directed and initiating skills, several comparisons were conducted. First, the variance-covariance matrices of the indicator variables were compared for the two groups using multi-sample analysis with LISREL. This procedure estimates the variance-covariance matrix for the total sample and then compares this combined estimate to each group's observed variance-covariance matrix (Jöreskog & Sörbom, 1996). The resulting fit indices describe the degree of difference between the matrices. Even though the χ^2 test was significant, the other fit indices indicated that the variance-covariance matrices were comparable; RMSEA = .05, $p > .05$; $\chi^2(136, n = 308) = 270.33$; NNFI = .83. We next examined the separate measurement models for preterm and term children using the same procedure as above except that the coefficients relating each indicator to its construct were constrained to be the same for both groups. When the resulting model-induced variance-covariance matrix was compared to each group's individual variance-covariance matrix, the results also indicated that the groups were

comparable; RMSEA = .05, $p > .05$; $\chi^2(187, n = 308) = 282.18$; NNFI = .91. Because these analyses indicate that the variance-covariance matrices and measurement models do not differ between preterm and term children, structural modeling was conducted using the combined sample.

Results of the Measurement Model

A full measurement model was examined to determine the reliability of the maternal and child constructs. For each child construct, we examined the amount of variance (r^2) in each of the indicator variables explained by the construct; these values are presented in Table 3. Children's social responsiveness scores in daily activities and toy play were used to develop the responsiveness constructs at 2 and 3½ years. For the cognitive/language construct; scores on the Bayley mental scale and the SICD were used as indicators at 2 years and scores on the Stanford-Binet and CELF-P were used at 3½ years. The cognitive variables accounted for a larger proportion of the variance than did the language variables, perhaps because the cognitive indicators measure a broader range of skills. The social initiating construct included children's initiating behavior during daily activities and toy play and the goal-directed construct included the number of searches across the two search tasks and the average high play level score. Because the maintaining, $r^2 = .62$ and $.58$ at 2 and 3½ years, respectively, and directiveness, $r^2 = .50$ and $.61$ at 2 and 3½ years, respectively, composite scores were

used as single indicators of the maternal constructs at 2 and 3½ years of age, one minus the reliability estimate for each were used to estimate the error variance at 2 years and the variance of the disturbance terms at 3½ years (Bollen, 1989). The fit of the measurement model was adequate, RMSEA = .05, $p > .05$; $\chi^2(63, n = 308) = 89.00$; NNFI = .96, and thus was used as the comparison model for the next stage of analyses.

Cross-Lag Analyses

To conduct the multistage model building analyses, we examined four structural models determining the cross-lag relations between each mother and child construct to justify our hypothesized within-time causal paths. Although we were not specifically interested in the pattern of influences in the infancy period for the structural model, we examined cross-lag panel analyses for mother-child interactions available on this sample at 1, 2, and 3½ years of age. Examining interactions from 1 to 2 years made it possible to track the pattern of influence prior to 2 years. In the four models, we compared the cross-lag coefficients from mother to child with those from child to mother to determine direction of influence.

Maintaining was significantly related to cognitive/language skills both from 1 to 2 years, $r(287) = .30, p < .05$, and from 2 to 3½ years, $r(287) = .36, p < .05$, and to responsiveness across these same ages, $r(287) = .10, p < .05$, and $r(287) = .29, p < .05$, respectively. There were no significant relations from the child constructs to maintaining. This provided support for the hypothesis that the direction of influence was from mothers' maintaining to children's behaviors. There were no significant relations between either early maternal directiveness and later child behaviors or between early child behaviors and later maternal directiveness. There was a trend for directiveness at 2 years to relate significantly to social responsiveness at 3½ years, $r(287) = .16, p = .06$. Without significant results from these analyses regarding direction of influence for directiveness, causal paths were based on our conceptualized framework that maternal directiveness influences children's learning. Support for this conceptualization is found in previous studies with similar groups of children (Barnes et al., 1983; Bloom et al., 1976; Kuczynski et al., 1987; Landry et al., 1996).

Table 3 Variance in the Indicator Variables Accounted for by the Predictor and Outcome Constructs

	2 Years	3½ Years	4½ Years
Mother behaviors			
Maintaining	.62*	.58*	
Directiveness	.50*	.61*	
Children's Behaviors			
Cognitive	.82	.54	
Language	.67	.59	
Social responsiveness			
Daily activities	.56	.77	
Toy play	.46	.47	
Goal-directed toy play levels			.43
Search series score			.50
Initiating			
Daily activities			.59
Toy play			.51

*Reliability coefficients.

Results of the Structural Model

The structural analyses guided by the multistage framework allowed us to determine direct versus indirect influences of mothers' behaviors on children's skills and whether children's skill levels directly in-

fluenced their mothers' behaviors within the first two ages. In examining the model, we did not hypothesize a causal relation between maternal maintaining and directiveness at each age; therefore, we allowed the constructs to be correlated at 2 years and the disturbance terms to be correlated at 3½ years. For similar reasons, the disturbance terms for the children's social responsiveness and cognitive constructs at each age were also allowed to be correlated.

In the first step, we examined the question of direct versus indirect influences of mothers' behaviors at 2 years on children's 4½-year skills. We hypothesized that this influence would be indirect through relations between maternal behaviors and children's skills at 2 years. This was done by eliminating from the model the four paths from the 2-year mother behaviors to the 4½-year children's outcomes. As we did not have specific hypotheses regarding the relation of maintaining to directiveness and directiveness to maintaining from 2 to 3½ years, we examined the need to include these two paths by eliminating them as well. The elimination of these six paths did not result in a significant change in fit from the full measurement model, χ^2 difference (6) = 6.19, $p > .25$. The restricted model continued to provide an adequate fit for the data, RMSEA = .04, $p > .05$; $\chi^2(69, n = 308) = 95.19$; NNFI = .97.

In the second step, we tested whether children's cognitive and social skills would influence their mothers' interactive behaviors across time by examining the fit of a model that included direct paths from children's skills at 2 years to mother behaviors at 3½ years with a model that did not include these paths. No significant change in the fit of the model was found when these paths were removed, χ^2 difference (4) = 4.05, $p > .05$, and thus we eliminated these four direct paths from subsequent model testing. The resulting model remained an adequate fit for the data, RMSEA = .03, $p > .05$; $\chi^2(73, n = 308) = 99.24$; NNFI = .97.

In the third step, we examined the longitudinal relations across time among mothers' and children's behaviors. We hypothesized that mothers' maintaining and directiveness at 2 years would indirectly influence children's 3½-year cognitive and social responsiveness skills through their earlier, direct influence on these skills at 2 years. To test this hypothesis, we examined a model in which the direct paths from maintaining and directiveness at 2 years to each of the children's skills at 3½ years (4 direct paths) were deleted. In addition, because the covariance between children's initiating and goal-directed behavior at 4½ years was nonsignificant, this term was eliminated from subsequent models. The elimination of these five paths did not significantly change the adequacy of

the fit from the previous model, χ^2 difference (5) = 13.29, $p > .01$. After eliminating nonsignificant and nonhypothesized paths in the first three stages, the model continued to provide an adequate fit of the data, RMSEA = .03, $p > .05$; $\chi^2(78, n = 308) = 112.53$; NNFI = .96.

In the fourth step, we tested our hypothesis that the influence of children's 3½-year skills on their 4½-year independent functioning would be domain specific. The two direct paths from cognitive skills to initiating and social responsiveness to goal-directed behavior were eliminated and the change in fit examined. No significant difference in the change in fit between the previous and the reduced model was found, χ^2 difference (2) = 1.22, $p > .05$. We also hypothesized that children's 2-year skills would indirectly, rather than directly, influence their 4½-year behaviors through a direct influence on their 3½-year social responsiveness and cognitive skills (four direct paths). Thus, we compared the previous model to a reduced model where these four direct paths were eliminated. In addition, because the covariance between the children's cognitive and responsiveness constructs at 3½ years was nonsignificant, this term was eliminated from subsequent models. The change in fit from the previous model to this reduced model was not significant, χ^2 difference (5) = 14.58, $p > .01$. To test the hypothesis that children's skills would not have cross-domain influences across ages at 2 and 3½ years, paths from 2-year cognitive to 3½-year social responsiveness skills and from 2-year responsiveness to 3½-year cognitive skills were eliminated. The change in fit was examined and was not significant, χ^2 difference (2) = 1.36, $p > .25$. The fit indices for this model were RMSEA = .04, $p > .05$; $\chi^2(87, n = 308) = 129.69$; NNFI = .96.

In the final step, we examined our hypothesis that mothers' behaviors at 3½ years would not have a direct influence on children's 4½-year skills but rather would have an indirect influence through their relation with children's 3½-year skills. However, as significant paths from 3½-year directiveness to both of the 4½-year children's skills were found in the previous model—goal-directed behavior, $z = -2.32$, $p \leq .02$; initiating, $z = -2.73$, $p \leq .01$ —we tested a reduced model that did not include the two paths from mothers' 3½-year maintaining to children's 4½-year skills. The change in fit was examined and was not significant, χ^2 difference (2) = .18, $p > .90$. We also eliminated the nonsignificant path from mothers' 3½-year directiveness to children's cognitive skills at the same age. Again, the change in fit was examined and was not significant, χ^2 difference (2) = .02, $p > .90$. The final model continued to provide an adequate fit for the data, RMSEA = .04, $p > .05$; $\chi^2(90, n = 308) = 129.9$; NNFI = .96. The unstandard-

ized and standardized path coefficients for the significant paths that remained in the final model are presented in Figure 1. Both are presented because the significance tests obtained for the unstandardized and standardized coefficients are easier to compare when interpreting two or more coefficients (Bollen, 1989). The variance accounted for in the constructs in the final model were as follows: 2 years: cognitive, 22.5%, responsiveness, 24.4%; 3½ years: maintaining, 51.2%, directiveness, 22.3%, cognitive, 54.4%, social responsiveness, 58.3%; 4½ years: cognitive goal-directed behavior, 27.5%, social initiating, 29.1%.

The question we addressed in this study concerned the pattern of relations between early mother and child behaviors with later development of children's independent skills. To assure that our conclusions about these relations would not change if mothers'

behaviors at the 4½-year outcome age were included, we examined the final model including these maternal behaviors with paths to the social and cognitive outcomes. With these four additional paths included in the model, the pattern of relations between early mother and child behaviors and later 4½-year outcome skills did not change.

In addition to the direct paths described above, two indirect paths were significant from 2-year maternal maintaining to children's 4½-year outcomes in the final model. First, maintaining at 2 years indirectly influenced goal-directed behaviors at 4½ years, $z = 4.1, p \leq .001$, which was accounted for in two ways. First, significant direct paths were found from 2-year maternal maintaining to children's 2-year cognitive skills to 3½-year cognitive skills to 4½-year goal-directed behavior. Second, significant paths were found from 2-year to 3½-

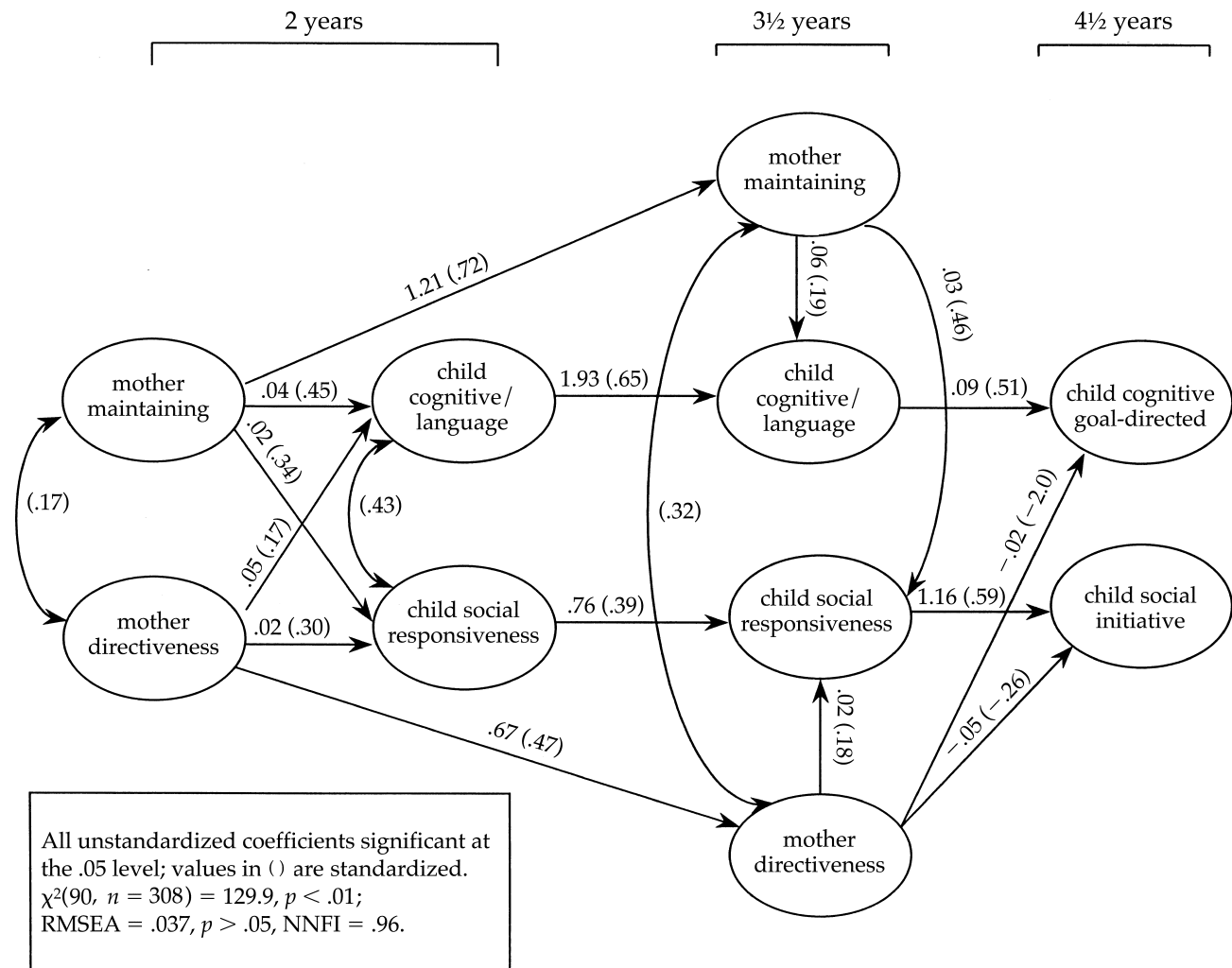


Figure 1 Estimated relations among maternal and child predictors and child outcomes for all paths included in the final model. RMSEA = Root Mean Square Error of Approximation; NNFI = Nonnormal Fit Index.

year maternal maintaining to children's 3½-year cognitive skills to their 4½-year goal-directed behavior. Maintaining at 2 years also indirectly related to initiating at 4½ years, $z = 4.9, p \leq .001$, via a direct influence on maintaining at 3½ years that in turn directly influenced 3½-year social responsiveness that then influenced initiating. Maternal directiveness at 2 years showed an indirect positive influence on children's 3½-year cognitive, $z = 2.0, p \leq .05$, and social, $z = 3.6, p \leq .001$, skills. However, there was also a significant indirect, positive path from mothers' 3½-year directiveness to children's initiating through children's 3½-year social responsiveness, $z = 2.1, p \leq .05$. Contrary to our hypothesis, directiveness at 3½ years also showed direct negative influences on goal-directed and initiating skills.

DISCUSSION

A question central to this investigation was whether independence in cognitive and social functioning was influenced by common pathways. There were clear common paths of influence for maintaining on these skills but somewhat different paths of influence for directiveness. The paths of influence for these two maternal interactive styles were similar for preterm and term children. The results demonstrate that mothers' early maintaining establishes an important foundation to support children's later independence in cognitive and social skills. By following children's focus of interest, mothers provide an early learning environment where children can develop the skills necessary to advance their learning. The influence of mothers' 2-year maintaining on children's later independence is indirect through its influence at 2 and 3½ years on children's cognitive and social skills. Therefore, maintaining appears to facilitate children's independent cognitive and social functioning by supporting early skills in these areas so that they proceed along more optimal trajectories. These trajectories are evident in the strong influence of children's 2-year cognitive and social skills on their 3½-year skills, which, in turn influenced their later independence in cognitive and social areas.

Many of children's early problem-solving and communication skills are initially supported through interactions with others (e.g., Bakeman & Adamson, 1984). In our model, maintaining may promote the 2- and 3½-year-olds' cognitive skills because it supports their more limited attentional and cognitive capacity by not requiring them to shift attentional focus and organize a new response (Bloom et al., 1976; Kaye, 1982; Landry et al., 1994). This may increase the salience of mothers' informational content as it decreases the likelihood of children being confused about what mothers are attempting to explain or re-

quest (Wertsch et al., 1980). The congruence between the children's attentional focus and mothers' input increases children's success in participating in joint learning situations. With repeated success in these joint activities, children gradually learn to take more control over their own problem solving so that they are better prepared by preschool ages to accomplish tasks that require establishing and carrying out goals. The significant indirect effect of early maternal maintaining on children's 4½-year goal-directed skills supports the theory that a child progresses from a reliance on others for solving problems to an internalization of these skills when others define the social activity from the child's perspective (Vygotsky, 1978; Wertsch, 1979).

Children's functioning in social interactions also involves coordinating their gaze with others and using appropriate affective, gestural, and verbal behaviors. The mechanism by which maternal maintaining supports children's social behaviors is similar to that described for support of cognitive skills. By establishing a common focus of interest, mothers make it easier for children to shift their gaze from objects to people and verbalize about this shared interest. It is theorized that caregivers who respond contingently to their children's interests and cues influence a range of social processes (e.g., contingency learning, sense of control and motivation to learn, sense of self; see Dunham & Dunham, 1995, for a review). By making requests that maintain children's current interests, mothers' behaviors become contingently responsive. For example, Tomasello (1988, 1992) describes the facilitative effect of maintaining toddlers' conversational topics during episodes of shared attention on their transition into greater independence in conversational skills. Schaffer and Crook (1980) reported increased compliance to maternal requests when the request reflected mothers' awareness of their toddlers' involvement state and adjusted the request to the child's current focus.

Dunham and Dunham (1995) point out that most of the research examining the influence of contingently responsive parenting on children's behavior has focused on changes in child behavior that occur within a social interaction. Support for a causal influence for this form of parenting on development, however, must come from studies demonstrating that the child's social experiences with this parenting style result in changes in their social, emotional, and/or cognitive development across time and context (Bronfenbrenner, 1979; Dunham & Dunham, 1995). Our results extend others' findings regarding the influence of maintaining by demonstrating its importance for children's later goal-directed and initiating skills.

We found common paths of direct influence from

mothers' directiveness to both goal-directed and initiating skills but different paths of indirect influence. Children were less likely to develop independence in 4½-year goal-directed and initiating skills if their mothers were highly directive at 3½ years. This is in contrast to the early, positive influence of directiveness on cognitive and social skills during the toddler period. These results are compatible with Wertsch's (1979) description of toddlers' increased need for direction that diminishes over time as they participate more fully in social interactions. Cross-sectional studies suggest that the influence of directiveness varies depending upon the age assessed; higher levels predict greater toddler competencies (Shatz, 1977) but poorer preschool outcomes (Landry et al., 1998; Nelson, 1973).

The model also showed an indirect, positive influence of 3½-year maternal directiveness on children's 4½-year initiating, but not on their goal-directed skills. This occurred through a positive, direct influence on children's 3½-year social responsiveness. Higher responsiveness, in turn, positively influenced initiating. The contradictory findings of a positive and negative influence of directiveness on initiating may be due to relations with different sources of variance in the social responsiveness and initiating constructs. It may be that children who continue to respond well at 3½ years when provided with increased structure are not those who become more competent initiators; thus, directiveness would not support later initiating. The positive influence of children's 3½-year responsiveness on later initiating may reflect those children whose social responding was influenced more by mothers' maintaining across 2 and 3½ years. Therefore, these children no longer require high degrees of structure by the preschool period. At this age, children are learning to be socially assertive in appropriate ways including negotiating, bargaining, and directing others' attention (Kuczynski & Kochanska, 1990; Kuczynski et al., 1987; Vaughn et al., 1984). The passively compliant child who may obtain high scores on a social responsiveness measure may not be learning these assertive social behaviors. Numerous studies document the negative relations of high parental control on children's social autonomy (e.g., Crockenberg & Litman, 1990; Parpal & Maccoby, 1985; Rocissano et al., 1987). The results of our model extend these previous findings by providing evidence for a negative influence of highly directive parenting on social independence.

Structural modeling across multiple ages allowed for examination of how parent and child factors at one age promote skill development at subsequent ages, and for determination of the direction of influence. We found significant paths across and within ages from mother to child for maternal directiveness

and within both ages (2 and 3½ years) for maternal maintaining. Our model did not show significant direct influences of the child on the mother across the 2- and 3½-year observations. A limitation of structural modeling is that the direction of influence within ages cannot be determined. Our assumption that the direction of influence was from mother to child within ages, however, was supported by cross-lag analyses for maintaining. Because cross-lag analyses showed no evidence of causality for directiveness, our assumption was based on previous findings (Crockenberg & Litman, 1990; Landry et al., 1996; Parpal & Maccoby, 1985). Our support for an influence of mother on child needs to be interpreted with respect to our study goals. Hypotheses regarding the influence of the mother on the child were established to illustrate how children's later independence initially may be supported by specific styles of parenting within social interactions.

The child's importance in this dyadic process is recognized and demonstrated in our model by the significant influence of children's skill development within social interactions on their later independence. Our model demonstrates that at 2 and 3½ years, children developed skills during interactions with their mothers that helped them ultimately develop internal regulation of their cognitive and social behavior. Influences across time were domain specific: cognitive skills influenced goal-directed behaviors and social responsiveness influenced initiating. The 2- and 3½-year cognitive and language skills we assessed, such as integrating and sequencing visual and motor behaviors to solve puzzles and learning vocabulary, promote independence in solving novel problems and carrying out play sequences. There is also a natural relation between skills required for social responsiveness and later initiating. Although responding and initiating are distinct constructs (Landry, Smith, et al., 1997; Rydell, Hagekull, & Bohlin, 1997), they both require children to coordinate their use of gestures, eye gaze, and words and to respond flexibly to feedback from others. Domain-specific relations may also be explained by the different task demands required for independence in goal-directed and social functioning. For example, initiating differs from goal-directed tasks in that it does not require attending to changing social cues with a partner; however, goal-directed tasks, unlike initiating, place high demands on children's verbal mediation skills.

Although our model was guided by specific hypotheses, a potential limitation in the use of structural modeling is that other models may be developed that fit the data equally well. As our sample was from lower-middle to lower SES backgrounds and a high proportion of participants were African American,

generalizability to groups not represented in our sample may be limited. In future studies, cognitive and social independence may be measured with tasks that place similar demands on children's skills such as the use of verbal mediation to solve both cognitive and social problems. With this approach, stronger cross-domain relations between predictors and outcomes may become apparent. Finally, our knowledge of individual differences in children's independence may be increased through examination of a broader range of parent, community, and child predictors. For example, Brody and Flor (1997) found that children's ability to independently set and attain goals mediated relations between family processes (i.e., predictability of family routine and quality of mother-child interactions) and children's academic and psychosocial outcomes.

Problems in independent functioning and self-regulation in childhood are linked to behavioral difficulties in late adolescence (Masten et al., 1995) and may provide a basis for understanding disorders of behavior and attention such as attention-deficit hyperactivity disorder (Barkley, 1997). Therefore, it will be important in future research to understand the range of factors in early childhood that predict variability in children's later independent functioning. The results of this study highlight the interactive process that supports children progressing from reliance on others in solving cognitive and social problems to the internalization of the skills needed to solve these problems independently.

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APPENDIX A

COGNITIVE GOAL-DIRECTED TOY PLAY LEVELS

1. *Off task.* The child is not involved physically or visually with any aspect of the toy.

2. *Looking.* The child is visually engaged with the toy without physical involvement.

3. *Passive hold/reaching or swiping without grasp.* The child is simply holding onto a toy or attempting to reach for a toy without manipulating it.

4. *Reaching and Grasping.* The child picks up a toy or reaches and successfully grasps a toy.

5. *Minimal toy movement and non-directed visual inspection.* The child is moving the toy often as a means for beginning physical exploration. This may include minimal fingering or rotating the toy while visually looking at different parts of the toy.

6. *Moving, banging, shaking.* The child is exploring the toy through a high degree of activity. The child may be shaking or banging the toy for the enjoyment of the movement rather than to achieve a specific goal.

7. *Intense visual and/or physical inspection.* The child sustains a visual gaze that usually includes active wrist rotation and tactile examination of the toy.

8. *Simple manipulation.* The child manipulates the toy for the purpose of achieving a particular effect such as opening the door on the Sesame Street house, rolling a car back and forth, or arranging several blocks without stacking.

9. *Complex manipulation.* The child is involved in play for the purpose of achieving an effect that includes the understanding of relatedness of the parts of a toy but not yet using the toy in its most appropriate functional way, such as stacking more than two blocks, putting a Sesame Street character into a car, or putting one or more animal shapes in one or more doors but not in the appropriate space in the animal/shape activity box.

10. *Simple pretend or functional play without problem solving.* For simple pretending, the child shows the emergence of using imagination with toys, such as saying "Hello" to a Sesame Street character, labeling a toy as something that it is not (e.g., calling a stack of blocks a school house), or rolling a car while making car sounds. For functional play without problem solving, the child uses the toy in a way that shows an understanding that the toy has a specific function but without an awareness of how the toy works as a whole. Play is characterized by one-to-one relations without using problem solving to integrate all aspects of the toy, for example, putting one animal shape in the correct animal/shape activity box door or matching one color-coded key to the right keyhole in the animal/shape activity box door.

11. *Animation with one activity or functional play with problem solving.* For animation with one activity, the child gives life to inanimate toys, but play is limited to one activity. For example, the Sesame Street character is seesawing, or the child has the character say, "Anybody home?" while the character is knocking on the door. For functional play with problem solving, the child uses the toy in a way that shows an understanding of how multiple parts of a toy can be included in the child's play scheme. At this point, however, the child's play shows considerable trial and error without successful completion of the goal. Examples of this play level include attempting to insert multiple pieces into the

shape spaces of the animal/shape activity box and/or matching multiple color-coded keys to the right keyholes in the animal/shape activity box doors.

12. *Animation with two activities or functional play with problem solving strategy.* For animation with two activities, the child begins to show two sequences to their pretend play activity. For example, the child has the Sesame Street character walk to the door and then knock, asking, "Is anyone home?" For the functional play with problem-solving strategy, the child uses the toy in a way that shows an understanding of the need for strategies rather than random trial and error approaches. However, the play does not involve smoothness in sequencing or mastery (e.g., miscalculations, need to try a new approach), and may include play

such as successfully matching multiple animals with shape holes and/or keys with animal/shape activity box doors with some self-correction.

13. *Extended play scheme with three activities or functional play with mastery.* An extended play scheme level involves three or four sequences in the pretend-play behavior, such as the child having a Sesame Street character say, "I'm going to go to the store," walking out of the house, getting in the car, and driving off. For functional play with mastery, the child uses strategies that allow him to smoothly complete the toy's intended use with mastery. For example, the child correctly matches all the animals and/or keys to the shape holes or animal/shape activity box doors without trial and error or self-correction.

APPENDIX B

CORRELATIONS WITHIN AND ACROSS TIME AMONG MATERNAL AND CHILD PREDICTOR AND OUTCOME INDICATOR VARIABLES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<i>Mother behaviors</i>																	
Maintaining																	
1. At 2 years	.45***	.10	.08	.34***	.34***	.30***	.27***	.28***	.34***	.16**	.18**	.03	.11*	.19***	.15*		
2. At 3½ years		.01	.23***	.29***	.22***	.19***	.19***	.16**	.47***	.16**	.28***	.06	.12*	.20***	.15**		
Directiveness																	
3. At 2 years			.23***	.11*	.02	.19***	.04	.19***	.18***	.11*	.16**	.01	.10	.03	-.01		
4. At 3½ years				.13*	.11*	.14*	.14*	.16**	.29***	.15**	.23***	-.11*	-.05	.05	-.07		
<i>Child behaviors</i>																	
Cognitive																	
5. At 2 years					.53***	.76***	.58***	.44***	.30***	.44***	.31***	.35***	.38***	.17**	.13*		
6. At 3½ years						.38***	.58***	.21***	.28***	.22***	.18***	.28***	.34***	.10	.09		
Language																	
7. At 2 years							.56***	.44***	.30***	.44***	.29***	.23***	.25***	.14*	.15*		
8. At 3½ years								.31***	.30***	.33**	.31***	.19***	.24***	.11***	.14*		
Responsiveness in daily activities																	
9. At 2 years									.40***	.51***	.31***	.09	.12*	.22***	.16*		
10. At 3½ years										.30***	.61***	.02	.14*	.33***	.25***		
Responsiveness in toy play																	
11. At 2 years											.30***	.06	.07	.17**	.15**		
12. At 3½ years												.01	.14*	.30***	.30***		
<i>Child Outcomes at 4½ years</i>																	
Goal-directed behavior scores																	
13. Toy play													.47***	.03	-.01		
14. Search series														.02	.01		
Social initiating																	
15. In daily activities																.54***	
16. In toy place																	

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

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