

Child Care and Children's Peer Interaction at 24 and 36 Months: The NICHD Study of Early Child Care

NICHD Early Child Care Research Network

Data from the National Institute of Child Health and Human Development Study of Early Child Care were examined to determine how children's experiences in child care were related to peer competence at 24 and 36 months of age, after controlling for the effects of family and child characteristics. Peer competence was assessed using mother and caregiver ratings as well as observations of children with their peers in child care, and at 36 months from observations of dyadic play with a familiar peer. Consistent, albeit modest, relations were found between child-care experiences in the first 3 years of life and children's peer competencies. Positive, responsive caregiver behavior was the feature of child care most consistently associated with positive, skilled peer interaction in child care. Children with more experience in child-care settings with other children present were observed to be more positive and skilled in their peer play in child care, although their caregivers rated them as more negative with playmates. Children who spent more hours in child care were rated by their caregivers as more negative in peer play, but their observed peer play was not related to the quantity of care. Child-care experiences were not associated with peer competence as rated by mothers or as observed in dyadic play with a friend. Maternal sensitivity and children's cognitive and language competence predicted peer competence across all settings and informants, suggesting that family and child-care contexts may play different, but complementary roles in the development of early emerging individual differences in peer interaction.

INTRODUCTION

Children's peer relationships are critical to their developing social competence (Berndt & Ladd, 1989; Hartup, 1983, 1996). Individual differences in peer interaction appear as early as the second year (Brownell & Brown, 1992), and by early to middle childhood they predict later social competence and psychological adjustment (Coie, Terry, Lenox, & Lochman, 1995; Morison & Masten, 1991). A key question, therefore, concerns the origins of individual differences in peer relations.

One source of these individual differences is the child's peer experiences during the school years (Dodge, Coie, Pettit, & Price, 1990; Hymel, Wagner, & Butler, 1990; Newcomb, Bukowski, & Pattee, 1993). Children's experiences with peers, however, begin long before they enter school. More than half of mothers with young children are now employed outside the home. Thus, the majority of infants and young children spend significant amounts of time in nonmaternal care, often with age-mates (NICHD Early Child Care Research Network, 1996; United States Department of Labor, 1994). Because peer skills are just beginning to emerge in these early years, child-care experiences may play an important role in the development of individual differences in peer competence. Two potential sources of child-care influence have been identified by researchers: children's experiences with other children in the child-care setting and their relationships and experiences

with their caregivers. Both possibilities were examined in the current study.

From the perspective of social learning theory (Bandura, 1989; Charlesworth & Hartup, 1967), children who have had more positive experience with age-mates or near age-mates would be expected to be more familiar and comfortable with peers, and hence, more sociable and engaged, more playful, and more affectively positive with other children. Likewise, from a social-cognitive perspective (Denham, McKinley, Couchoud, & Holt, 1990; Dunn & Cutting, 1999; Hay & Ross, 1982; Rubin & Rose-Krasnor, 1992) children who are more often engaged with age-mates in either positive or negative exchanges would have the opportunity to acquire greater social and emotional knowledge, more effective communication skills, and greater skill in compromise, negotiation, and reciprocity. These skills should permit them to engage in more complex social play, less hostile or escalating aggression, and more prosocial behavior with peers. In line with this reasoning, developmental studies of toddler peer skills have demonstrated that greater experience in adult-supervised play groups is associated with more frequent and more complex peer interaction (Holmberg, 1980; Howes, 1988; Mueller & Brenner, 1977). In addition, play with age-mates, even among toddler-aged children, has been shown to produce increased positive affect and more complex in-

teraction than solitary play, whether peer play occurs at home or in child care (Howes, 1990; Rubenstein & Howes, 1983).

Among young children with child-care experience, those who are more involved with their peers in their care settings exhibit greater social competence with peers by the third year of life (Lamb, Hwang, Bookstein, Brober, Hult, & Frodi, 1988). Likewise, preschool children with prior experience in child-care-based peer groups are more involved with peers and more cooperative than children without such experience (Harper & Huie, 1985). Children who remain longer with the same group of children are more peer oriented and less solitary over time when compared with children who have shorter histories within a given peer group (Galluzzo, Matheson, Moore, & Howes, 1990; Holmberg, 1980), and they are more prosocial toward peers in distress (Farver & Branstetter, 1994). Similarly, the more hours per week children spend in center care with other children, the less socially withdrawn they are from peers, and the more often they engage in positive behavior with playmates (Lamb et al., 1988; Volling & Feagans, 1995). Although some studies have reported no differences in peer skill as a function of child-care experiences (Hegland & Rix, 1990; Holloway & Reichart-Erickson, 1989; Rubin, Hastings, Chen, Stewart, & MacNichol, 1998; Schenk & Grusec, 1987; Thornburg, Pearl, Compton, & Ispa, 1990), the research summarized above indicates that early peer experience in child care has the potential to promote peer social competence.

In contrast, early studies suggested that extensive child care in the first 2 years of life was associated with lower social competence and heightened aggression later in preschool and beyond (e.g., Haskins, 1985; Schwartz, Strickland, & Krolick, 1974; for a review, see Belsky, 1990). Two recent reports (Bates et al., 1994; Vandell & Corasaniti, 1990) also have documented negative peer behavior as a function of early child-care experiences, even after controlling for family influences on peer skill.

Few of these studies assessed the amount or quality of children's peer experience, or the quality of children's relationships with caregiving adults. When child-care quality is studied directly, variations in the quality of child care are reliably associated with both concurrent and later peer relationships. This is true whether quality is assessed using such structural features as group size, caregiver-child ratio, or caregiver turnover, or in more process-oriented terms such as caregiver availability and quality of caregiver-child interactions. Higher quality care is consistently related to more competent peer interaction, and these associations hold for various measures of peer com-

petence at various outcome ages (Holloway & Reichart-Erickson, 1989; Howes, 1990; Phillips, McCarty, & Scarr, 1987; Volling & Feagans, 1995). Indeed, when infants and young children attend uniformly high-quality child care, earlier entry into care and more time spent in care are related to greater social competence longitudinally, even into preadolescence (Andersson, 1989, 1992; Field, 1991).

In general, previous researchers have not addressed the question of whether the association between child-care quality and peer competence is a function of the children's relationships with the adults who care for them or the nature of the children's experiences with age-mates. It seems reasonable to assume that adults who provide high-quality care also effectively supervise and support emerging peer relations. However, Howes and colleagues (Howes, Hamilton, & Matheson, 1994) found that caregivers who promoted positive, secure relationships with the toddlers in their care did not necessarily encourage or support positive peer exchange. The authors speculated that some sensitive caregivers may engage young children in adult-child play rather than facilitate peer interaction. Nevertheless, when caregivers did encourage positive peer contact, children displayed greater peer competence. Thus, the association between child-care quality and peer social competence may involve both the quality of adult-child relationships and adult encouragement of competent peer interaction.

In summary, the evidence suggests that young children's developing competence with peers is related to their experiences with both adults and peers in their child-care settings. With few exceptions (Galluzzo et al., 1990; Howes, 1988), however, researchers have not considered both amount of peer experience and quality of children's interactions with their caregivers in the same analysis; nor have they typically included family and child characteristics when examining child-care factors. The larger implication is that we do not yet have a coherent picture of which factors in very young children's social environments help to shape their developing peer competence. In particular, we do not know how young children's experiences with children and adults outside the family, either independently or in concert with family factors, relate to early peer skill.

In the current article we address these issues using data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care. This study provides a unique opportunity to consider a number of central questions regarding the origins of individual differences in developing peer competence, particularly the role of children's experiences

in child care. Child-care experiences were documented intensively and frequently beginning in the first year of life, as were family, maternal, and child characteristics. Peer relations were assessed at 24 and 36 months, in several contexts, using multiple procedures and informants, thus providing a multidimensional and converging view of the child's developing competencies.

The primary purpose of the present report is to examine how children's experiences in child care relate to individual differences in peer social competence at 24 and 36 months, a time when peer skills are rapidly developing. We studied three specific features of early child-care experience: (1) amount of time in child care, (2) quality of care as indexed by caregiver responsiveness and sensitivity, and (3) availability of other children in the care setting. On the basis of previous research, we expected that sensitive caregiving and amount of experience with other children would be positively associated with children's developing peer competence. It was unclear from existing work, however, whether the amount of nonmaternal care would be positively or negatively related to early peer competence.

Consistent with our previous articles (NICHD Early Child Care Research Network, 1997a, 1998, 2000), we examined the association between child-care experiences and peer competence after controlling for family selection factors. Children are not randomly assigned to child care, and child-care characteristics are known to covary with pre-existing family characteristics that predict the same outcomes (Bolger & Scarr, 1995; McCartney, 1984; NICHD Early Child Care Research Network, 1996, 1997b; Singer, Fuller, Keiley, & Wolf, 1998). To increase confidence in our inferences about relations between child care and social development, we systematically identified and statistically controlled such selection effects.

Multiple assessments of child and family characteristics over time also enabled us to examine associations between child care and peer competence in relation to other child and maternal influences. For example, individual differences in peer relations have been found to relate to child characteristics such as gender (Benenson, Apostoleris, & Parnass, 1997; Crick, Casas, & Mosher, 1997), temperament (Calkins, Gill, Johnson, & Smith, 1999; Eisenberg, Fabes, Murphy, Smith, & Karbon, 1995; O'Brien, Roy, Jacobs, Macaluso, & Peyton, 1999; Rubin, Caplan, Fox, & Calkins, 1995), and cognitive functioning (Bandura, 1989; Dodge, 1986). At preschool age, girls tend to be more sociable with peers than are boys (Howes, 1988), whereas boys are more likely to engage in nonsocial pretend play than are girls (Black, 1989, 1992) and to use more controlling or coercive strategies in play and conflict resolution (Crockenberg & Lourie,

1996; O'Brien et al., 1999; Sims, Hutchins, & Taylor, 1997). Hypothesized associations between cognitive processes and children's interactions with peers have been incorporated into both social cognitive (Bandura, 1989; Dunn & Cutting, 1999) and social information processing (Dodge, 1986; Rubin & Rose-Krasnor, 1992) frameworks. Specific cognitive achievements also have been linked to the growth of early peer skills, both theoretically (Brownell, 1986; Dunn, 1999) and empirically (Brownell, 1988; Brownell & Carriger, 1990; Slomkowski & Dunn, 1996). Difficult temperament in infancy has often been thought to reflect poor regulation of negative affect in response to frustration or challenge (Thompson, 1994), and peer aggression has been linked to poor anger and frustration regulation (Calkins et al., 1999; Rubin, Hastings, et al., 1998) as well as to difficult temperament more generally (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Eisenberg, Fabes, Nyman, Bernsweig, & Pinuelas, 1994; O'Brien et al., 1999). In the current study, we included child gender, temperament, and cognitive functioning in our predictions of peer social behavior assessed at 24 and 36 months.

Recent research and theory also have focused on familial factors associated with peer competence (Fagot, 1997; Ladd & LeSieur, 1995; Parke, Burks, Carson, Neville, & Boyum, 1994). In particular, the quality of mothers' behavior with their children has been shown to predict socioemotional competence and peer social behavior (Booth, Rose-Krasnor, McKinnon, & Rubin, 1996; Carson & Parke, 1996; Youngblade & Belsky, 1992; Zahn-Waxler, Denham, Iannotti, & Cummings, 1992). Mothers who are warm, positive, responsive, and engaged with their young children have children who become socially competent with their peers; whereas mothers who are insensitive, harsh, rejecting, and hostile, or who are disengaged or permissive, tend to have children who become aggressive, impulsive, and are often rejected by their peers. The mechanisms through which maternal behavior acts on the development of peer competence have been hypothesized to include children's internal working models (Sroufe & Fleeson, 1986), as well as parental coaching, modeling, and reinforcement of social skills (Parke et al., 1994). These may be similar to or different from the mechanisms through which caregiver-child interactions operate on early peer competence. To control for maternal factors in relations between child-care and early peer behavior, as well as to examine the independent role of maternal behavior in children's peer skill, we included maternal sensitivity as a predictor. Mother's sensitivity to her child during play was assessed at four time points in the child's first 3 years of life.

In keeping with our strategy for assessing child

functioning, we examined early peer competence using multiple methods and respondents. Both mothers and caregivers reported on the quality of children's interactions with peers. In addition, for those children who were in child care for 10 or more hours per week, trained observers recorded selected features of spontaneously occurring peer interaction in the child-care setting. Finally, at 36 months, children were videotaped in a dyadic, semistructured play situation with a familiar peer. Within each of these measurement contexts, children's positive and negative encounters with peers were conceptualized and measured separately, consistent with other research showing that both are important and independent predictors of later development (e.g., Rubin, Bukowski, et al., 1998).

The questions framing our inquiry were: (1) for the total sample, including children with no child-care experience, how does amount of time in child care in the first 3 years of life relate to peer competence at age 2 and 3 years, after family and child characteristics are taken into account? and (2) for children in child care, to what extent does peer competence relate to the amount of time spent in child care, positive caregiving, and the amount of experience in settings with other children present, after family and child characteristics are taken into account?

METHOD

Participants

Participants were recruited from hospitals located in or near Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI. During selected 24-hour sampling periods in 1991, 8,986 women giving birth were visited in the hospital. Of these, 5,416 met the eligibility criteria for the study and agreed to be phoned on their return home from the hospital. A subset of this group was selected in accordance with a conditional random sampling plan that was designed to ensure that the recruited families were demographically diverse (economically, educationally, and ethnically). When infants were 1 month old, 1,364 families (58% of those contacted) with healthy newborns were enrolled in the study. The recruited families included 24% ethnic minority children (173 African American, 83 Latino, 19 Asian, and 47 children of other ethnic or racial backgrounds); 11% of the mothers did not have a high school education, and 14% were single mothers. Of the mothers enrolled, 53% were planning to work full time, 23% part time, and 24% were not planning to be employed. The recruited families were similar to the

families in the catchment areas on these demographic variables, except that mothers in the study were slightly more likely (4%) to report that they expected to be employed than were nonparticipating mothers. Families were excluded from the sample if the mother was younger than 18 years of age, the family planned to move, there was a multiple birth, the infant had a known disability or remained in the hospital more than 7 days, the mother acknowledged substance abuse, the mother did not speak English, or the mother lived more than 1 hour from the laboratory site or in an extremely unsafe neighborhood as determined by local police.

Sample Observed in Child Care

At 24 months of age, when peer behavior was first systematically assessed, 669 children (336 boys, 333 girls) were observed in child care. The rest either were not in regular care for at least 10 hours per week ($n = 389$) or were not observed because of refusals or scheduling problems ($n = 145$). At 36 months of age, 706 children (352 girls, 354 boys) were observed in child care; 352 children were not in regular care, and 143 children were in child care that was not observed. In general, children observed in child care came from more educated, economically advantaged, and stable two-parent families than children not in child care, and children in child care who were not observed (Table 1).

Sample Observed in Dyadic Peer Interaction

At 36 months, 612 preschoolers were observed in dyadic interaction with a familiar peer. Children whose parents or caregivers were able to identify a same-sex, frequent playmate close in age to the study child were observed in dyadic play. Data are missing because some children did not have same-sex regular playmates, the peer's parents did not agree to the observation, or because of scheduling difficulties. Children who participated in the dyadic peer observation differed significantly, $p < .001$, from those who did not on income-to-needs ratio ($M = 3.76$ versus 2.52, respectively), a measure of family economic resources (family income divided by the poverty threshold); on maternal education ($M = 14.79$ versus 13.46 years, respectively); and on family structure (75.6% versus 49.7% from two-parent families, respectively).

Procedure

Mothers and children were visited at home when the children were 1, 6, 15, 24, and 36 months old. Phone

Table 1 Comparison among Children Observed in Care, Not Observed in Care, and Not in Care on Demographic Variables

	24 Months						36 Months					
	Observed (<i>n</i> = 669)		Not Observed ^a (<i>n</i> = 145)		Not in Care (<i>n</i> = 389)		Observed (<i>n</i> = 706)		Not Observed (<i>n</i> = 143)		Not in Care (<i>n</i> = 352)	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
Income-to-needs	3.85	(2.93)	3.03	(2.69)	2.55	(2.46)	3.79	(2.97)	2.93	(2.12)	2.65	(2.55)
Maternal education	14.77	(2.39)	13.86	(2.34)	13.68	(2.57)	14.65	(2.49)	13.91	(2.28)	13.76	(2.52)
% Two-parent families	75.6		57.9		53.6		71.1		58.0		49.7	

Note: Families of children observed in child care differed significantly from those of children not observed and/or not in care on all three demographic indices at each age.

^a Children who were in care, but were not observed.

^b Children not in at least 10 hours of care per week.

contacts were made at intervening 3-month intervals. At each visit, mothers completed questionnaires about themselves, the child, and their family, and responded to a standardized demographic interview. Children and their mothers also visited university laboratories when children were 15, 24, and 36 months old. At these visits a variety of standardized assessments was administered and children were observed during play with their mothers. Additionally, children receiving 10 or more hours per week of non-maternal care at 6, 15, 24, and 36 months of age were observed in the child-care setting where they spent the most time. Finally, at 36 months, children were observed in a standardized dyadic play situation with a familiar peer similar in age.

Measures

Variables entered into analyses included four sets of independent variables, six peer outcomes at 24 months, and nine peer outcomes at 36 months. The sets of independent variables were constructed on empirical and conceptual grounds and included (1) selection-effect covariates (maternal education and maternal attitudes toward employment), (2) child factors (gender, temperament, and cognitive/language performance at 24 and 36 months), (3) maternal sensitivity in play, and (4) child-care factors (amount of care, caregiving quality, and availability of other children in care).

Dependent variables were (1) maternal reports of positive and negative peer-related behavior at 24 and 36 months for all children; (2) caregiver reports of positive and negative peer-related behavior in child care at 24 and 36 months for children in child care; (3) observations of positive and negative peer-related behavior in child care at 24 and 36 months for children in child care; and (4) at 36 months only, observations

of positive, negative, and self-assertive behavior in dyadic play with a familiar peer.

Independent Variables

Selection-effect covariates. A number of family and maternal variables, including income-to-needs ratio, maternal education, total household size, and maternal attitudes about employment, were considered for use as selection-effects covariates. Two variables, maternal education and maternal beliefs about the risks of maternal employment, met our criteria for selection-effect covariates, which required that they be significantly related both to outcome measures of peer competence and to child-care predictors. These variables also tapped both family resource and maternal attitude domains, and were relatively independent of one another.

Maternal education was the number of years of schooling reported by the mother at the 1-month interview. The measure of *beliefs about the risks of maternal employment* was created by summing six 6-point items from the Attitudes Toward Employment questionnaire (Greenberger & Goldberg, 1989) administered to the mothers at the 1-month visit, Cronbach's $\alpha = .88$. Higher scores reflected the belief that maternal employment carried risks for children's development (e.g., "Young children learn more if their mothers stay at home with them.").

Child factors. In addition to gender (female = 0, male = 1), children's cognitive competence at 24 months and language competence at 36 months were entered into analyses, as was a measure of difficult temperament in infancy. Children's *cognitive competence* was assessed at 24 months using the revised Bayley Scales of Infant Development (BSID-II; Bayley, 1993) administered during a laboratory visit, yielding a single score, the Mental Development Index. As with

the original Bayley, scores are standardized so that the mean score is 100 with a standard deviation of 15.

Language competence was assessed at 36 months using the Reynell Developmental Language Scales (Reynell, 1991), administered during the laboratory visit. This instrument consists of two 67-item scales and yields two correlated scores, verbal comprehension and expressive language. For the current analyses, only the expressive language scale was used (e.g., child has one or more appropriate uses of past tense, child uses complex sentences, labels or describes objects or activities, and defines words). This was to avoid issues of multicollinearity and because expressive language may be an important contributor to peer interaction. Internal consistency exceeded .85 on this scale.

Temperament was assessed by maternal report when infants were 6 months old. Mothers completed the 55-item Infant Temperament Questionnaire (Medoff-Cooper, Carey, & McDevitt, 1993). A composite measure was created to index difficult temperament with higher scores reflecting greater intensity, negative mood, and lower adaptability to daily routines, Cronbach's $\alpha = .81$.

Maternal sensitivity. A composite measure of the mother's sensitivity during play with her child was constructed based on ratings of 15-min videotaped episodes of mother-child play in the home at 6 and 15 months of age, and in the laboratory at 24 and 36 months of age. At 6 months, mothers were asked to play with their infant for 7 min with any toy or object available in the home (or none at all), and then to play for 8 min with a standard set of toys provided by the examiners (rattles, activity center, ball, rolling toy, book, stuffed animal). At 15, 24, and 36 months, mothers and children were given three containers of age-appropriate toys and were instructed to play with these toys as they wished (see NICHD Early Child Care Research Network, 1999a). Tapes from all sites were sent to a central location where they were rated by coders blind to children's child-care status.

At each age an a priori maternal *sensitivity in play* composite was constructed based on these ratings. At 6, 15, and 24 months, this composite was the sum of three 4-point ratings: sensitivity to nondistress (including vocal, facial, and postural expressions and communication), positive regard, and intrusiveness (reversed). The coding system at 36 months was revised to provide more developmentally appropriate indices of sensitivity. The 36-month sensitivity composite was the sum of three 7-point ratings: supportive presence, respect for autonomy, and hostility (reversed). Intercoder reliability on the composite (Pearson correlations) was .87 at 6 months, .83 at 15 months, .85

at 24 months, and .84 at 36 months. Internal consistency (Cronbach's α) was .75, .70, .74, and .78, respectively. For details about assessment procedures and coding, see NICHD Early Child Care Research Network, 1997a, 1997b.

Child-care factors. Three aspects of children's experiences in child care were entered into the analyses: (1) amount of child care, (2) availability of other children in child care, and (3) positive caregiving received by the study child. At 3-month intervals, starting when the children were 3 months old, mothers were telephoned and asked about their current child-care arrangements. Up to three arrangements could be described. From these reports information regarding amount of child care and presence of other children was obtained. Information about positive caregiving was obtained from on-site observations of adult-child interactions.

For *amount of care*, average weekly hours of care was computed as the mean number of weekly hours in all nonmaternal care arrangements from 0 through 24 and 0 through 36 months of age. Children who received no nonmaternal care during a given 3-month epoch were assigned scores of "0."

Availability of other children in child-care settings was determined from 5 months of age onward using maternal reports collected at 3-month intervals. If mothers reported that two or more other children were available in either a primary or secondary child-care arrangement, then a score of 1 was recorded for the 3-month period. At 24 months, scores could range from 0 to 7, with higher scores representing more 3-month epochs with other children available in the child-care setting. At 36 months, scores could range from 0 to 11.

Positive caregiving was observed and rated in the child-care setting at 6, 15, 24, and 36 months of age for children who spent at least 10 hours per week in a regular, nonmaternal child-care arrangement. Observations in child-care settings were conducted on 2 half days during a 2-week interval using the Observational Record of the Caregiving Environment (ORCE; for details, see NICHD Early Child Care Research Network, 1996). Data collection comprised four 44-minute cycles spread over the 2 days. Each 44-minute cycle consisted of four 10-min observation periods plus a period for note taking. Intensively trained observers time sampled the occurrence of specific caregiving behaviors directed to the study child; they also rated several aspects of the quality of the caregiving provided to the study child on a series of 4-point scales at the end of each 44-min observation. For this report, five of the qualitative ratings were summed to index the positive quality of the primary

caregiver's interaction with the study child: sensitivity/responsiveness to child's nondistress expressions, stimulation of cognitive development, positive regard, detachment (reversed), and flatness of affect (reversed). Fostering exploration and intrusiveness (reversed) were added to the 36-month composite. Higher scores on the composites represented more positive, responsive, and sensitive caregiving. Cronbach's α for the composites were .89, .88, .86, and .82 at 6, 15, 24, and 36 months, respectively. All scales had adequate inter-coder agreement with "gold-standard" videotapes master coded by the investigators who developed the ORCE, $r_s = .94, .86, .81,$ and $.80$ at each age, respectively, and with live reliability partners, $r_s = .90, .89, .89,$ and $.90$ at each age, respectively.

Child Outcome Measures: Peer Interaction

Information on children's peer interaction was obtained from mothers' reports, caregiver reports, and observations in the child's regular child-care arrangement at 24 and 36 months and in a dyadic play session at 36 months.

Maternal and caregiver reports. Mother and caregiver reports of peer social behavior were obtained at 24 and 36 months, when all mothers and all primary caregivers in observed child-care arrangements completed the Adaptive Social Behavior Inventory (ASBI; Hogan, Scott, & Bauer, 1992). This measure was developed specifically to assess behavior that may be influenced by child-care experiences. Respondents rate 30 descriptions of child behavior on a 3-point scale representing frequency of occurrence for that child. For this report, two subscales representing positive and negative peer social behavior were obtained by summing the scores of items specifically related to peer interaction. *Positive sociability* consisted of 10 items (e.g., is helpful to other children, follows rules in games, joins others' play, shares toys). *Negative/aggressive* consisted of four items (e.g., teases others, bullies others). Cronbach's α s for the positive sociability subscale at 24 and 36 months were .75 and .74 for mothers' reports, and .78 and .82 for caregivers' reports, respectively; for the negative/aggressive subscale α s at 24 and 36 months were .51 and .57 for mothers' reports, and .68 and .69 for caregivers' reports, respectively. Cronbach's α s were low for the negative/aggressive subscale because the individual behaviors that the items represent occur with relatively low frequency at these ages, and because a child who engages in one type of aggression (e.g., bullying) may not engage in others (e.g., teasing). Because early aggression has been shown to be stable, however, we felt it important to assess, even if it occurred infrequently.

Observations in child care. Child-care observations of positive and negative social behavior were conducted as part of the ORCE described above. Several aspects of the study child's behavior with peers were recorded at 24 and 36 months during four 44-min observation cycles, by the same observers who recorded caregiver behavior. In each observation cycle, specific features of peer social behavior were recorded for their presence/absence during successive 1-min time samples (30 s observe, 30 s record) for three 10-min periods. After 14 min of additional observation and note taking, observers made qualitative ratings of the study child's social behavior over the entire 44-min observation period. Frequencies and qualitative ratings of peer social behavior were standardized and summed to create two larger composites for substantive analyses: positive peer play and negative peer interaction.

Positive peer play represented the complexity and positive sociability of children's interactions with their peers as observed in the child-care setting. It was defined as the sum of standardized scores on positive/neutral interaction with other children, proportion high-level play, and positive sociability, Cronbach's $\alpha = .62$ and $.70$ at 24 and 36 months, respectively. Positive/neutral interaction with other children reflected how frequently the child engaged other children in any type of nonnegative interaction (observation segments in which a peer was available and the child was engaged in positive/neutral interaction). Proportion high-level play reflected how much of the child's play with peers was both complex and reciprocal (number of observation segments in which a child was engaged in mutual pretend play divided by the total number of segments of peer interaction). Positive sociability was the observer's rating on a 1 to 4 scale of the child's interest in and positive engagement with other children. Thus, children with high scores on the composite were often engaged positively with other children and their peer play frequently included joint pretend play. Interobserver reliabilities with gold-standard videotapes (conducted before data collection began) and with live reliability partners (conducted on at least four regularly spaced intervals during data collection) on the individual scores constituting the composites ranged from .89 to .96.

Negative peer interaction was also observed using the ORCE, and represented the proportion of peer interaction that was negative or aggressive. It was calculated as the number of observed segments in which the child was involved in negative interaction with a peer divided by the total number of segments of peer interaction. Negative interaction was defined as the child's giving or receiving an unfriendly overture,

and included verbal and physical aggression. Because peer aggression at these ages is relatively infrequent and undifferentiated, the coding system did not distinguish among types of aggression (e.g., instrumental versus hostile, object struggles versus bullying), or the child's own role in negative exchanges. Thus, children high on negative peer interaction were proportionately more often engaged in unfriendly or negative interactions with other children. Interobserver reliabilities ranged from .92 to .96.

Observations in dyadic play. Dyadic peer play was observed at 36 months when children participated in a semistructured play session with a same-sex playmate close in age to the study child who had been identified by the child's parent or child-care provider as someone the child played with regularly ($n = 612$). Mean age of the familiar playmate was 39.3 months ($SD = 5.0$ months). These interactions were videotaped for later coding and were independent of the ORCE observations. Three measures of peer competence were derived from videotape ratings: peer skill, peer aggression, and self-assertion and control.

The dyadic play observations were carried out in a portable playroom set up in the child's regular child-care arrangement or in one of the children's homes if

the study child or the friend was not in child care. The playroom, constructed of heavy cardboard, was 90 cm high, 150 cm in diameter, and open at the top. This arrangement shielded the children from distractions in the surrounding environment and permitted us to standardize the children's play context. After being introduced to the playroom, the children were asked to sit down and three different toys were presented to them sequentially, in fixed order: a Magnadoodle, a Fisher-Price toy kitchen set, and a pair of flashlights, one of which was inoperable. The toys were selected to permit a range of play types and quantity, from cooperative and prosocial to solitary or negative. The experimenter set each toy one at a time on the floor between the two children, demonstrated how it worked, and then left the playroom. Children played with the Magnadoodle for 4 min, the kitchen set for 5 min, and the flashlights for 3 min. Children's interactions were videotaped through a curtained opening into the playroom. Children enjoyed playing in the playroom and rarely stood up or asked to leave.

The tapes were sent to a central site different from the one at which mother-child interaction was coded, where they were scored by coders unaware of the study children's family and child-care history. Play

Table 2 Means and Intercoder Agreement for Observed Categories of Behavior during Dyadic Peer Observation at 36 Months

Category of Behavior	<i>M</i>	<i>SD</i>	Intercoder Agreement
Peer skill			
Amount of positive interaction (shared positive affect, exchange of topics and toys, mutual involvement)	3.05	.75	.95
Amount and clarity of verbal interaction (frequent and effective communication to advance play)	1.90	.44	.97
Positive mood (smile, laugh, enthusiastic play)	2.69	.65	.95
Cooperation (sharing, turn taking, cooperation)	2.48	.71	.96
Concern for peer (expression of caring and concern, praise, helping)	1.41	.36	.94
Amount and quality of fantasy/creative play (role playing, fantasy script, creative use of materials)	1.80	.55	.97
Complexity of social play (simple social play to cooperative play to complex mutual pretend)	2.26	.52	.96
Response to provocation: shares (initiates joint play when peer tries to take toy)	.10	.33	N.A.
Social problem solving: property rights (conventional, respectful requests for toys)	.58	.74	N.A.
Peer aggression			
Instrumental aggression (physical attempts to take or control toy—grab, push, interfere)	1.38	.49	.97
Hostile aggression (angry, disruptive behavior without clear purpose)	1.16	.33	.94
Negative mood (discontent, boredom, anger, hostility)	1.36	.57	.96
Self-assertion and control (directs play, controls play session)	2.90	.78	.95

Note: N.A. = not available.

sessions were rated for several aspects of the study child’s peer social behavior—amount of positive interactions, clarity of verbal interaction, positive mood, cooperation, concern for peer, quality of fantasy play, and complexity of social play—using 3- or 5-point scales, with higher scores representing higher skill (see Table 2). Each scale was rated separately for each toy, and the codes were then averaged across the three toy episodes. In addition, two nominally scaled items were later recoded into the following ordinally scaled items: *response to provocation: shares* (originally scored Yes/No for each toy episode) was recoded as 0 to 3 based on the number of toy episodes out of three in which the child tried to resolve conflict by sharing a toy when the peer had tried to take the toy from the study child; and *social problem solving: property rights* was recoded as 0 to 3 based on the number of toy episodes out of three in which the child tried to gain possession of the peer’s toy by using an approach other than physical force or verbal demands (e.g., recognition of the other’s ownership, negotiation). These eight scores were standardized and summed to form the *peer skill* composite variable, Cronbach’s $\alpha = .80$. Children with high scores on this variable played in more positive, cooperative, complex ways, and more often resolved conflict by prosocial means.

A composite variable of *peer aggression* for the dyadic play session was derived by standardizing and summing the ratings for instrumental aggression,

hostile aggression, and negative mood, averaged over the three toy episodes, Cronbach’s $\alpha = .74$. *Self-assertion and control* was retained as a separate measure, to distinguish between aggression and assertion in the children’s play (see Clarke-Stewart, Gruber, & Fitzgerald, 1994). Intercoder agreement for the individual ratings of observed behavior can be found in Table 2.

Several parallel measures of the peer’s behavior during the dyadic interaction were correlated with the study child’s behavior to determine whether they should be controlled in substantive analyses. Correlations were low, $r_s = .003$ to $.17$, so the peer’s behavior was not considered further in analyses.

RESULTS

Preliminary Analyses

Zero-order correlations among the dependent variables at 24 and 36 months are presented in Table 3, along with the stability of these measures across the two ages. All variables showed significant, although modest, stability from 24 to 36 months. At 24 and 36 months, mothers’ and caregivers’ reports of children’s positive and negative peer behavior were significantly correlated with each other. There was one significant relation between mothers’ reports of children’s peer competence and children’s observed

Table 3 Correlations among Measures of Peer Social Behavior at 24 Months and 36 Months

	Mother Rating		Caregiver Rating		Child-Care Observations	
	Positive Sociability	Negative/Aggressive	Positive Sociability	Negative/Aggressive	Positive Peer Play	Negative Peer Interaction
Mother rating						
Positive sociability	.57***	-.16***	.14***	.01	.11*	-.06
Negative/aggressive	-.16***	.49***	.05	.13**	.05	.07
Caregiver rating						
Positive sociability	.29***	-.07	.25***	-.21***	.08	-.10*
Negative/aggressive	-.07	.16***	-.22***	.29***	.07	.03
Child care observation						
Positive peer play	.10**	.00	.18***	-.01	.31***	-.28***
Negative peer interaction	-.05	-.02	-.10*	.10	-.30***	.11*
Dyadic peer play (36 months only)						
Peer skill	.13**	.02	.25***	-.09	.14**	-.04
Peer aggression	-.04	.14**	-.04	.16**	-.03	.15**
Self-assertion and control	.07	.12	.19***	.09	.08	.12*

Note: 24-month data are above diagonal, 36-month data are below diagonal, and the bold-faced data on the diagonal are the stability of the measures from 24 to 36 months. Mother-reported variables are for the whole sample, caregiver-reported and observed variables are for the sample observed in child care, and dyadic play variables are for the sample observed with a familiar peer at 36 months.

* $p < .05$; ** $p < .01$; *** $p < .001$.

behavior with peers in child care at both 24 and 36 months. At 24 and 36 months, caregivers' reports of positive sociability were significantly negatively correlated with children's observed negative peer behavior in the child-care setting, and at 36 months caregivers' reports of positive sociability were significantly associated with observed positive peer play. Both caregivers' and mothers' reports of peer behavior were correlated with several aspects of children's dyadic play at 36 months, and children who were observed to be more positive in their child-care peer group were also significantly more skilled in dyadic play with a peer.

Correlations between the predictors and outcomes are presented in Table 4. These correlations must be interpreted with caution because they are not adjusted for selection effects. They indicate that mothers' sensitivity and children's cognitive/language skills were the strongest and most consistent correlates of peer social behavior. In addition, maternal reports of children's peer competence were consistently correlated with mothers' educational level, their beliefs about the risks of employment, and their ratings of their children's temperament during infancy. Maternal reports of peer competence were also sometimes correlated with child gender and child-care characteristics. Caregivers' reports of peer sociability and measures of observed peer play in child care were modestly correlated with positive caregiving in child care, children's experience in child-care settings with peers available, and hours in child care. Some of the measures of dyadic play were modestly correlated with mothers' beliefs about the risks of employment, children's language skills, gender, maternal sensitivity, and amount of experience in child-care settings with peers available.

Predictive Analyses

Regression analyses examined the extent to which the measures of peer competence were related to selection, child, maternal, and child-care factors, and, for repeated measures, whether those patterns of association changed over time. All regression models were fit simultaneously and included site as a covariate to adjust for differences among the 10 sites.

Predictors included both time-invariant and time-varying measures. The time-invariant predictors either did not vary over time or were assessed only once. These were site, maternal education, maternal beliefs about risks of employment, gender (male = 1, female = 0), and child temperament. The time-varying predictors were measured repeatedly. These were the children's cognitive/language skills, mater-

nal sensitivity, quantity of child care, quality of caregiving in child care, and number of times children were in child care with other children present. For these variables, a cumulative or mean score for each individual was created for each of the two time periods. The first time period was from the child's birth through the 24-month assessment. The second time period was from the 27-month assessment through the 36-month assessment. A separate intercept was estimated for each child as a random variable. In addition, the correlation among the repeated measures was estimated to adjust for the lack of independence among them. The repeated measures for each individual were assumed to have an autoregressive distribution. That is, it was assumed that repeated measures collected more closely in time were more highly correlated than those collected at more distant time intervals.

The repeated-measures regression analyses were fit using a general, linear, mixed-model analysis approach (Jennrich & Schluchter, 1986; Laird & Ware, 1982). These analyses estimated a separate set of regression coefficients for each age under the assumption that there was a common covariance structure over time. For example, the analysis of maternal report of positive sociability involved one set of coefficients that described the relations between the predictors and positive sociability as measured in the first 2 years and a second set of coefficients that described the relations between the predictors and positive sociability between the second and third year.

The overall analysis plan involved testing the main effects and interactions with age for each block of predictors. First, we tested whether each block of predictors showed a different pattern of association with the outcome at 24 than at 36 months. At the same time, we tested whether each block of predictors contributed significantly to predicting a given outcome over time. Individual parameter estimates were interpreted only if block tests were significant. All continuous predictors were standardized to have a mean of 0 and a standard deviation of 1 to enhance interpretation of coefficients. Thus, the main-effect parameter for each predictor reflects the across-time association between that predictor and the peer outcome measure when all other predictors were at their mean values.

For the three measures of dyadic play at 36 months, which were assessed only at this age and not at 24 months, the multiple regression analyses involved the same blocks of predictors. In these analyses, we computed cumulative scores for the time-varying measures of maternal sensitivity, quantity of child care, quality of caregiving in child care, and

Table 4 Correlations between Predictors and Outcome Measures of Peer Social Behavior

	Maternal Rating				Caregiver Rating				Child-Care Observation				Dyadic Peer Play at 36 Months		
	Positive Sociability		Negative/Aggressive		Positive Sociability		Negative/Aggressive		Positive Peer Play		Negative Peer Interaction				
	24 Months (n = 626)	36 Months (n = 650)	24 Months (n = 620)	36 Months (n = 647)	24 Months (n = 535)	36 Months (n = 586)	24 Months (n = 524)	36 Months (n = 582)	24 Months (n = 446)	36 Months (n = 514)	24 Months (n = 437)	36 Months (n = 511)	Peer skill (n = 489)	Peer Aggression (n = 489)	Self-Assertion and Control (n = 489)
Selection															
Maternal education	.08***	.10***	-.10**	-.07	.06	.11**	-.13**	-.12**	.07	-.02	-.06	-.06	.05	-.04	-.01
Beliefs about employment risks	-.10*	-.05	.11**	.06	-.06	-.07	-.01	-.05	-.06	-.11*	.11*	.03	-.14**	.07	.03
Child															
Gender male = 1 ^a	-.11** M < F**	-.11*** M < F***	-.06 M < F	-.01 M < F	-.12** M < F**	-.10** M < F*	.05 M > F	.04 M > F	-.06 M < F	-.02 M < F	.05 M > F	.10* M > F*	-.14*** M < F***	-.02 M < F	-.17*** M < F***
Cognitive/language competence	.20***	.24***	-.12***	-.14***	.20***	.26***	-.03	-.13**	.11*	.10*	-.04	-.15***	.25***	-.06*	.16***
Temperament	-.10*	-.08**	.07	.10***	-.06	-.02	.01	-.02	-.01	-.03	.05	.05	-.01	.02	.02
Maternal sensitivity	.17***	.17***	-.12***	-.18***	.16***	.17***	-.10*	-.16**	.14**	.09*	-.01	-.07	.18***	-.12***	.08
Child care															
Hours	.08*	-.08*	.05	.05	.00	.00	.16***	.10**	.01	.13**	-.05	.00	.07	-.05	.05
Peer availability	.06	-.01	-.05	.03	-.01	.06	.09*	.08	.08	.17***	.03	-.02	.12*	-.09*	.04
Positive caregiving	.03	.12**	-.05	-.03	.17***	.13**	-.07	-.14***	-.08	-.07	-.10*	-.12**	.01	.02	-.02

Note: Dyadic play variables are for the sample observed with a familiar peer at 36 months.

^a Male–female comparison was based on the *t* test. Under the assumption of equal variances, the correlation *p* value and *t* test *p* value are identical.

p* < .05; *p* < .01; ****p* < .001.

number of times children were in care settings with peers available. A cumulative score was computed for each family that represented the mean of the maternal sensitivity at 6, 15, 24, and 36 months; the average hours of child care from birth through 36 months; the mean of the positive caregiving composite from 6, 15, 24, and 36 months; and the number of times in which the child had two or more peers in the child-care setting. The other predictors included site, maternal education, risks of employment, gender, the 36-month Reynell Expressive Language score, and temperament. Again, the contribution of each block of predictors was tested, and individual predictors were interpreted only if the block test was significant.

Effect sizes were computed when either main effect or interaction tests were significant. Partial correlations were computed to provide an index of the magnitude of the observed associations for continuous variables, and standardized mean differences (the difference between group means divided by the root mean squared-error) were computed for the categorical variables. All other predictors were included as covariates in these computations. Cohen recommends that $r = .10$ be regarded as a small effect size, $r = .30$ as a moderate effect size, and $r = .50$ as a large effect size when partial correlations are examined (Cohen, 1988).

Longitudinal Predictions

Repeated-measures regression analyses examined the 24- and 36-month measures of maternal and caregiver report and observed peer interaction in child care. Results from these analyses are shown in Tables 5 through 7. The first column for each outcome lists the coefficients and standard errors (*SEs*) estimated for each 24-month predictor. The second column lists the coefficients and *SEs* estimated for each 36-month predictor. The third column, labeled Main Effect, lists the *F* statistic from the block test for the main effect across time for that set of predictors. Significant main effect *Fs* for individual predictors are also shown in this column. The final column, labeled Effect \times Age lists the *F* statistic from the block test that compared the 24-month and 36-month coefficients for each predictor. This determined whether the association between predictors and the outcome changed over time. The test of the main effect reflects whether the mean of the 24- and 36-month coefficients is significantly different from zero, whereas the test of interaction with age indicates whether the 24- and 36-month coefficients are significantly different. It is possible for the main effect to be significant when only one or neither of the 24- or 36-month coefficients is significant,

even if there is not a significant interaction with age. This can happen when both coefficients are similar, but their *p* values may be slightly larger than .05.

The results from the analysis of maternal report of positive sociability are shown in the first columns of Table 5. These analyses indicate that mothers reported more positive sociability at 36 months than at 24 months, $F(1, 766) = 31.16, p < .001$, as can be seen by comparing the estimated intercepts for the two ages in Table 5. However, the associations between the selection, child, maternal, and child-care blocks and maternal report of positive sociability did not change significantly from 24 to 36 months as indicated in the Effect \times Age column. The child and maternal blocks provided the only significant associations with this outcome, with maternal reports of more positive sociability associated with more advanced cognitive/language skills, $F(1, 766) = 25.89, p < .001$, less difficult temperament, $F(1, 766) = 8.50, p = .004$; and greater maternal sensitivity, $F(1, 766) = 6.52, p = .01$. (Note that neither of the estimated coefficients at 24, $p = .054$, or 36 months, $p = .052$, for maternal sensitivity reached statistical significance, but the averaged main effect parameter was statistically significant.) Partial correlations between maternal report of positive sociability and cognitive/language skills, $r = .15$ at 24 months and $r = .18$ at 36 months; difficult infant temperament, $r = -.10$ at 24 months and $r = -.11$ at 36 months; and observed maternal sensitivity, $r = .10$ at 24 months and $r = .07$ at 36 months, indicated that these tended to be small effects.

For maternal report of negative/aggressive peer interaction (Table 5), mothers reported increasing levels of agonism from 24 months to 36 months, $F(1, 765) = 14.16, p < .001$, but the patterns of association between the predictors and outcome did not differ between 24 and 36 months. The selection, child, and maternal blocks were significantly related to maternal report of negative social behavior over time. Specifically, mothers reported higher levels of negative peer behavior when they perceived more costs associated with employment, $F(1, 765) = 6.13, p = .014$; the children were male, $F(1, 765) = 3.94, p = .048$; the children had lower cognitive/language skills, $F(1, 765) = 5.82, p = .016$; when mothers had reported more difficult temperament in their infants, $F(1, 765) = 7.56, p = .006$; and when the mothers were rated as less sensitive in play with their children, $F(1, 765) = 11.20, p = .001$. Partial correlations between maternal report of negative/aggressive play and maternal report of the risks of employment, $r = .11$ at 24 months and $r = .05$ at 36 months; the children's cognitive/language skills, $r = -.07$ at 24 months and $r = -.09$ at 36 months; maternal report of difficult infant temperament, $r = .07$ at

Table 5 Longitudinal Analysis of 24- and 36-Month Peer Social Behavior: Maternal Ratings

	Maternal Ratings of Positive Sociability						Maternal Ratings of Negative/Aggressive					
	24 Months		36 Months		Main Effect <i>F</i>	Effect × Age <i>F</i>	24 Months		36 Months		Main Effect <i>F</i>	Effect × Age <i>F</i>
	β	SE	β	SE			β	SE	β	SE		
Intercept	2.372	.013	2.450	.012		31.16***	1.373	.013	1.436	.014		14.16***
Site ^a					1.51						1.76	
Selection					1.59	.02					3.57*	.36
Maternal education	-.004	.014	-.006	.013			-.013	.014	-.004	.015		
Beliefs about employment risks	-.018	.013	-.018	.012			.032*	.013	.023	.013	6.13*	
Child					13.77***	.03					5.13**	.94
Gender (male = 1)	-.018	.011	-.017	.011			-.030*	.012	-.010	.013	3.94*	
Cognitive/language competence	.048***	.014	.053***	.012	25.89***		-.025	.015	-.029*	.015	5.82*	
Temperament	-.028*	.012	-.028**	.011	8.50**		.023	.012	.033*	.013	7.56**	
Maternal												
Sensitivity	.023	.012	.023	.012	6.52*	.00	-.021	.013	-.047*	.014	11.20***	2.04
Child care					.44	1.65					.89	1.22
Hours	.017	.014	-.013	.013			.021	.015	.010	.014		
Peer availability	-.007	.013	-.009	.010			-.011	.014	.018	.013		
Positive care	-.001	.010	.011	.011			-.003	.011	.017	.014		

Note: Beta coefficients and standard errors (SE) are shown for each predictor at each age. The Main Effect *F* corresponds to the test for each block of predictors across age, and is also shown for individual predictors when the block was significant. The Effect × Age *F* tested whether the association between predictors and outcome changed with age.

^aIndividual site coefficients are not reported because site was included only as a control variable.

p* < .05; *p* < .01; ****p* < .001.

24 months and *r* = .10 at 36 months; and observed maternal sensitivity, *r* = -.05 at 24 months and *r* = -.13 at 36 months, again indicated modest effects.

Results from the analysis of the caregivers' reports of positive peer sociability are shown in the first columns of Table 6. These results indicate that caregivers reported increased positive social play from 24 to 36 months, *F*(1, 706) = 12.87, *p* < .001; and that the patterns of association between the selection, child, maternal, and child-care predictors were similar across time. The child, maternal, and child-care blocks significantly predicted caregivers' ratings, with higher ratings of positive sociability related to whether the children were female, *F*(1, 706) = 4.19, *p* = .041; higher cognitive/language skills, *F*(1, 706) = 17.20, *p* < .001; greater maternal sensitivity, *F*(1, 706) = 7.54, *p* = .006; and more positive caregiving in child care, *F*(1, 706) = 10.45, *p* = .001. Again, modest effects were observed. The partial correlations between the caregivers' ratings of positive social play and cognitive/language skills, *r* = .11 at 24 months and *r* = .16 at 36 months; observed maternal sensitivity, *r* = .09 at 24 and 36 months; and positive caregiving, *r* = .12 at 24 months and *r* = .07 at 36 months, were small. The standardized difference (effect size) between boys and girls was also small, *d* = .08 at 24 months and *d* = .05 at 36 months.

For caregivers' reports of negative or aggressive peer play in child care (Table 6) there was no reliable change from 24 to 36 months, *F*(1, 701) = 1.63, *p* = .20; and the patterns of association with the selection, child, maternal, and child-care predictors did not differ significantly across time. The maternal and child-care blocks predicted caregiver ratings, with higher ratings of negative play related to lower maternal sensitivity, *F*(1, 701) = 5.50, *p* = .019; more hours of child care, *F*(1, 701) = 6.96, *p* = .009; and being in child-care settings with peers available more often, *F*(1, 701) = 7.86, *p* = .005. Again, modest effects were observed. The partial correlations between the caregiver ratings of negative social play and maternal sensitivity, *r* = -.07 at 24 months and *r* = -.10 at 36 months; hours of child care, *r* = .11 at 24 months and *r* = .04 at 36 months; and amount of experience with peers in child care, *r* = .07 at 24 months and *r* = .10 at 36 months, were small.

Results from the analysis of peer interaction observed in child care are shown in Table 7. These results indicate that observed positive social play did not change from 24 to 36 months, *F*(1, 622) = .98, *p* = .32; and that the patterns of association with the selection, child, maternal, and child-care predictors did not change significantly across time. The maternal and child-care blocks significantly predicted observed

Table 6 Longitudinal Analysis of 24- and 36-Month Peer Social Behavior: Caregivers' Ratings

	Caregivers' Ratings of Positive Sociability						Caregivers' Ratings of Negative/Aggressive					
	24 Months		36 Months		Main Effect <i>F</i>	Effect × Age <i>F</i>	24 Months		36 Months		Main Effect <i>F</i>	Effect × Age <i>F</i>
	β	<i>SE</i>	β	<i>SE</i>			β	<i>SE</i>	β	<i>SE</i>		
Intercept	2.310	.018	2.393	.016		12.87***	1.365	.020	1.397	.018		1.63
Site ^a					2.02*						1.12	
Selection					1.03	.20					2.42	.87
Maternal education	-.017	.019	-.004	.017			-.037	.020	-.029	.019		
Beliefs about employment risks	-.013	.018	-.018	.016			.009	.019	-.019	.018		
Child					9.11***	.32					.38	.50
Gender (male = 1)	-.028	.015	-.019	.014	4.19*		.016	.017	.009	.016		
Cognitive/language competence	.045*	.020	.067***	.017	17.20***		.010	.021	-.017	.019		
Temperament	-.019	.016	-.013	.015			.007	.017	-.007	.016		
Maternal Sensitivity					7.54**	.06					5.50*	.48
.037*	.018	.031	.017				-.023	.019	-.041*	.018		
Child care					3.56*	.86					7.04***	.87
Hours	.011	.021	.008	.017			.060**	.023	.022	.019	6.96**	
Peer availability	-.011	.019	.019	.015			.043*	.020	.033	.017	7.86**	
Positive caregiving	.045**	.015	.028	.017	10.45**		-.006	.016	-.028	.019		

Note: Beta coefficients and standard errors (*SE*) are shown for each predictor at each age. The Main Effect *F* corresponds to the test for each block of predictors across age, and is also shown for individual predictors when the block was significant. The Effect × Age *F* tested whether the association between predictors and outcome changed with age.

^a Individual site coefficients are not reported because site was included only as a control variable.

p* < .05; *p* < .01; ****p* < .001.

positive play, with more positive play related to greater maternal sensitivity, $F(1, 662) = 5.41, p = .02$, and more frequent experience with peers in child care, $F(1, 662) = 7.30, p = .007$. Again, modest effects were observed. The partial correlations between observed positive peer play and maternal sensitivity, $r = .06$ at 24 and 36 months, and experience with peers in child care, $r = .06$ at 24 months and $r = .15$ at 36 months, were small.

For negative peer interaction observed in child care (Table 7), results indicate that more negative interaction occurred at 24 months than at 36 months, $F(1, 618) = 18.65, p < .001$, but the patterns of association with the selection, child, maternal, and child-care predictors were similar across time. Only the child-care block significantly predicted observed negative interaction, with more negative peer interaction related to less positive caregiving in child care, $F(1, 618) = 8.25, p = .004$. Again, modest effects were observed; the partial correlations between observed negative interaction and positive caregiving, $r = -.09$ at 24 months and $r = -.10$ at 36 months, were small.

Dyadic Peer Play at 36 Months

The final set of analyses predicted three aspects of dyadic play with a friend, which was assessed at 36

months only, precluding longitudinal analyses. Results are shown in Table 8. The standardized regression coefficients are reported in the first column and *F* tests for the contribution of each block of variables are reported in the second column. The first outcome, observed peer skill, was significantly related to the selection, child, and maternal blocks. More skilled play was observed among children who were female, scored higher on expressive language, and whose mothers were rated as more sensitive during play with their children. Small to moderate effect sizes were observed, with the partial correlations ranging from .12 (maternal sensitivity) to .22 (language skills). The effect size for gender, $d = -.10$, was also modest. The second outcome, observed aggression, was significantly related only to the maternal block, with more peer aggression associated with less maternal sensitivity, partial $r = -.10$. The third outcome, self-assertion, was related only to the child block, with more self-assertion observed among females, $d = -.15$, and among children with higher language scores, partial $r = .15$.

DISCUSSION

Data from the NICHD Study of Early Child Care show that child-care experiences, child characteris-

Table 7 Longitudinal Analysis of 24- and 36- Month Peer Social Behavior: Observed Peer Interaction in Child Care

	Observed Positive Peer Play						Observed Negative Peer Interaction					
	24 Months		36 Months		Main Effect <i>F</i>	Effect × Age <i>F</i>	24 Months		36 Months		Main Effect <i>F</i>	Effect × Age <i>F</i>
	β	SE	β	SE			β	SE	β	SE		
Intercept	-.190	.138	-.372	.133		.98	.206	.012	.146	.008		18.65***
Site ^a					7.43***						6.69***	
Selection					1.02	2.01					2.94	2.09
Maternal education	.105	.123	-.209	.124			-.017	.010	-.001	.007		
Beliefs about employment risks	-.076	.117	-.165	.112			.019	.010	.002	.007		
Child					2.59	.63					2.23	1.04
Gender (male = 1)	-.187	.103	-.048	.103			.007	.009	.012	.006		
Cognitive/language competence	.106	.138	.265*	.107			.008	.011	-.014	.007		
Temperament	-.032	.107	-.110	.105			.010	.009	.008	.006		
Maternal Sensitivity	.206	.115	.185	.117	5.41*	.02	.004	.010	-.004	.007	.00	.46
Child care					4.79**	1.61					3.41*	.5
Hours	-.029	.142	.225	.116			-.007	.012	-.005	.007		
Peer availability	.155	.157	.412**	.134	7.30**		.020	.013	-.000	.008		
Positive caregiving	-.168	.100	-.139	.118			-.015	.008	-.016*	.007	8.25**	

Note: Beta coefficients and standard errors (SE) are shown for each predictor at each age. The Main Effect *F* corresponds to the test for each block of predictors across age, and is also shown for individual predictors when the block was significant. The Effect × Age *F* tested whether the association between predictors and outcome changed with age.

^aIndividual site coefficients are not reported because site was included only as a control variable.

* *p* < .05; ** *p* < .01; *** *p* < .001.

tics, and family characteristics are all associated with toddlers’ emerging peer interactional competencies. In particular, this large-scale longitudinal study enabled us to explore the relations between each of these sets of predictors and the development of peer social competence after controlling for the effects of the other predictors. This strategy is critical because there is now substantial empirical evidence that family and child-care characteristics are related, including evidence from this sample (NICHD, 1996, 1997b). The picture we are able to construct from these findings suggests that 3-year-olds in child care are more positive and less agonistic in their peer play than are 2-year-olds; that the correlates of individual differences in peer social competence are similar for 2- and 3-year-olds; that child-care experiences relate to peer competence in the child-care setting but not in other settings; that sensitivity in adult caregiving, particularly from mother but also from caregivers in child care, is the most consistent correlate of early peer competence; that quantity of child care and peer experience in child care are also associated with peer competence; and, finally, that child characteristics are systematically related to peer competence across settings.

Child Care and Peer Competence

This study’s findings have shown that as peer skills are developing in the second year of life, children’s child-care experiences are associated with the quality of their peer engagement both as rated by caregivers and as observed in child care. Interestingly, although experiences with caregivers and with other children in child care were related to developing peer skill, the association held only for peer behavior assessed in the child-care setting itself. Child-care experiences were not associated with mothers’ ratings of their children’s peer competencies at either 24 or 36 months, nor with the quality of play with a friend during structured dyadic interaction at 36 months.

The most consistent finding for child-care experience was that more sensitive and responsive behavior by caregivers was associated with less negative, more positive play with other children. This was true both when the quality of children’s peer play was rated by caregivers and when it was observed during children’s actual play. The importance of caregivers’ sensitivity is consistent with previous research that has found systematic relations between child-care quality and a variety of social and emotional outcomes

Table 8 Regression Analysis of Cumulative Predictions of 36-Month Peer Social Behavior: Children Observed in Dyadic Play with a Friend

	Dyadic Peer Play at 36 Months					
	Peer Skill		Peer Aggression		Self-Assertion and Control	
	b	F	b	F	b	F
Site		2.15*		1.09		1.11
Selection		4.43*		.55		1.72
Maternal education	-.110*		.008		-.102	
Beliefs about employment risks	-.100*		.051		.008	
Child		10.22***		.38		7.85***
Gender (male = 1)	-.091*		-.048		-.146**	
Cognitive/language competence	.261***		-.021		.182**	
Temperament	.021		.007		.031	
Maternal		6.80**		4.72*		.92
Sensitivity	.138**		-.121*		.053	
Child care		.97		.46		.46
Hours	.005		.006		.049	
Peer availability	.038		-.055		-.014	
Positive caregiving	-.059		.009		-.031	
Total R ²		.14**		.04		.08**

Note: For each individual predictor, standardized regression coefficients are reported.

* $p < .05$; ** $p < .01$; *** $p < .001$.

(Deater-Deckard, Pinkerton, & Scarr, 1996; Howes, 1990; Howes, Phillips, & Whitebook, 1992; Lamb, 1998; Volling & Feagans, 1995). Unlike most previous research, in the present study child and family influences were statistically controlled in assessing the relation between caregiving quality and outcomes. Thus, even though child characteristics and features of the parenting environment were also related to peer outcomes, the quality of children's interactions with caregiving adults in child care was associated with peer competence over and above these other factors.

The current study did not identify specific mechanisms by which caregivers may influence children's peer competencies. Engaged, responsive caregivers may provide materials and contexts to encourage positive interactions with other children, or positive feedback for cooperative, skilled interactions; or they may monitor and intervene in negative peer engagements, thereby discouraging or preventing them (Howes, Matheson, & Hamilton, 1994; but see also Howes, Hamilton, & Matheson, 1994). Alternatively, positive relationships with sensitive caregivers may carry over into positively toned interactions with other children. Sensitive caregiving may be associated with more secure attachments between children and their caregivers, producing more adequate working models to serve as guides for children's relation-

ships with peers (Howes, Hamilton, et al., 1994; Oppenheim, Sagi, & Lamb, 1988). Regardless of the mechanism, adult caregiving appears to be a central correlate of children's early peer competence.

In addition, prior child-care experience with other children also was related to peer competence, although less systematically than was caregiver behavior. Greater cumulative experience in child-care settings with other children present was associated with more complex and positive peer play in child care when peer play was observed and rated during ongoing interaction. However, caregivers rated children as more negative in peer play when the children had spent more time in settings with other children present. How could caregivers perceive and rate children as more negative, whereas observers rated the same children's actual interactions in the same setting as more positive?

The growing literature on the form and function of conflict in children's early peer interactions suggests how these findings might be reconciled. Much of young children's peer conflict centers around objects and space (Caplan, Vespo, Pedersen, & Hay, 1991; Hay & Ross, 1982; O'Brien, et al., 1999; Rende & Killen, 1992) rather than the overt aggression that is more frequent among school-age children. Moreover, it has been found that toddlers and young preschoolers

who more often engage peers agonistically also more often engage others prosocially (Brownell & Brown, 1992; Pepler, Craig, & Roberts, 1998). Longitudinally, Rubin has reported that peer conflict among toddlers is associated with both sociability and social skill later in the preschool years (Rubin, Hastings, et al., 1998). This was the pattern in the current study as well, in which observed frequencies of positive and negative peer interaction in child care were significantly positively correlated with each other both within ages, $r = .51, p < .001$ at 24 months; $r = .46, p < .001$, at 36 months, and across ages, $r = .34, p < .001$ at 24×36 months. These converging findings across several studies suggest that conflict among young children may be a marker of sociability and a result of immature efforts to engage other children.

Furthermore, a number of authors have suggested that conflict and conflict resolution may play a positive role in young children's growing social competence, permitting children to acquire and practice skills of negotiation and compromise (Bayer, Whaley, & May, 1995; Crockenberg & Lourie, 1996; Dunn & Herrera, 1997; Hay & Ross, 1982; Laursen, Hartup, & Koplas, 1996; O'Brien et al., 1999; Ross & Conant, 1992; Shantz & Hobart, 1989). This may be especially true for the conflicts over objects and space that characterize toddler play. In the current study, caregivers might, indeed, have accurately perceived greater amounts of conflict in settings with several children present. Yet higher rates of relatively benign conflict may also have provided opportunities for the children to learn to resolve conflict more effectively and to move more quickly or smoothly into other kinds of skilled social play, which our observers captured in their ratings.

These speculations suggest that it would be useful to distinguish among the particular kinds of agonistic behavior that young children engage in as a function of their child-care experiences. Unfortunately, the demands of collecting the large amounts of observational data in this study prevented more finely differentiated coding of children's conflict in the child-care setting. Thus an important next step for research is to determine how specific features of children's peer conflict vary as a function of child-care experiences and how such variation relates to development of both positive and negative peer social behavior. It is equally important for future research to determine whether caregivers' ratings of peer agonism provide an early indication of future problems beyond the toddler years, or simply reflect a normative increase in conflict during these years. Finally, it is clear that we will not be able to assess fully the effects of child care on socioemotional development until we better

understand how caregiver perceptions and reports relate to what trained observers perceive and record in the child-care setting.

The third child-care variable analyzed was the amount of time per week children spent in care. As with the findings for experience with other children in care, the results for this predictor were inconsistent. Children who spent more hours in child care were rated by their caregivers as more aggressive, but there was no relation between amount of child care and observed aggression with peers in child care. Previous research has shown that more time in child care relates to more positive peer interactions among toddlers and preschoolers (Galluzzo et al., 1990; Howes, 1990; Thornburg et al., 1990; Volling & Feagans, 1995) and fewer peer conflicts (O'Brien et al., 1999), and that more familiar peers exhibit more frequent and more positive interactions (Harper & Huie, 1985; Howes, 1988; Mueller & Brenner, 1977). Two recent studies that specifically addressed aggression among toddlers found no association between amount of child care and young children's tendencies to initiate conflict or to behave aggressively with their peers (Prodromidis, Lamb, Sternberg, Hwang, & Brober, 1995; Rubin, Hastings, et al., 1998). Earlier research, however, has suggested that children with extensive early child-care experience may become more aggressive and noncompliant in later childhood (Bates et al., 1994; Belsky, 1990, 1999; Haskins, 1985; Schwartz et al., 1974; Vandell & Corasiniti, 1990). Across these studies there is no systematic effect for whether the data were reported by mothers or caregivers or were observational. Because it is not possible to interpret the null findings from our own observational data, we are left to ask whether the caregivers' reports were accurate, reflecting greater knowledge of the children's interaction qualities than our limited observations were able to capture, or whether they were possibly biased by some feature we did not control in our analyses (e.g., education, child-rearing attitudes) that covaried with amount of time children spent in child care. As noted above, then, we must await future analyses of peer outcomes at later age periods in this sample to establish the predictive validity of caregiver ratings of children's early peer agonism in relation to hours in child care. Evidence of an association between time in child care early in life and poorer social functioning during the elementary school years (Bates et al., 1994; Vandell & Corasiniti, 1990) makes this inquiry all the more important.

Maternal Sensitivity

Just as caregiver sensitivity was systematically related to peer competence in the child-care setting, so

too was the mother's sensitivity while playing with her young child. However, unlike caregiver sensitivity, maternal sensitivity was associated with children's peer skills across all contexts and informants. That is, our objective observations of mothers' play behavior with their infants and young children were the strongest and most consistent correlates of children's behavior with their peers. Mothers who were more positive and responsive, and less intrusive or hostile in play with their 24- and 36-month-olds, and who allowed their 36-month-olds age-appropriate autonomy in play, had children who were seen by their caregivers as more positive and less negative with peers. Their children also were observed to be more positive and socially skilled with other children both in child care and in structured dyadic interaction with a friend. Mothers who were more sensitive also rated their children as more positive and less negative with their peers. These findings are consistent with prior work (Deater-Deckard et al., 1996; Ladd & Lesieur, 1995), but extend earlier findings because our analyses controlled for all other predictors in the model. Thus, these patterns for maternal sensitivity held true regardless of children's particular experiences in child care.

This finding is striking, but perhaps not remarkable, given that children's experiences with their mothers are much more stable, consistent, and pervasive than are children's experiences with their child-care providers. Many decades of research have shown small, but extremely reliable associations between mothering and many different aspects of developing social competence (Rubin, Bukowski, & Parker, 1998), and experimental work has confirmed the causal nature of maternal influence (Parpal & Maccoby, 1985).

The more interesting possibility raised by these results is that parenting may represent a broader, more general path of influence on peer competence, whereas child-care experiences may constitute a more constrained, situation-specific source of influence. Further longitudinal analyses on this sample as the children enter school and expand their peer networks will be able to shed light on this intriguing possibility.

Child Characteristics

Nearly all the measures of peer competence exhibited age-related changes. However, there were no significant interactions between the predictors and age, indicating that the predictive patterns were the same at 36 months as they were at 24 months. There was also significant, although modest, stability between 24 and 36 months for all peer interaction measures. This provides suggestive evidence that early appearing in-

dividual differences in peer interaction skill and style may be formative and that the factors influencing individual differences may first appear when peer relations begin to emerge, even in rudimentary form.

Interestingly, the age-related patterns differed slightly between child care and home settings. Peer interactions in child care became more positive and less agonistic between 24 and 36 months both as rated by caregivers and as observed during peer play. Mothers also rated their 36-month-olds as more positive with peers than their 24-month-olds, but they additionally rated them as more aggressive. Thus, children in child care appear to become generally more positive and less aggressive in peer play with age, whereas at home they become more positive but also more aggressive. This age-related increase in positive, complex play is consistent with a growing literature on the origins and normative development of early peer competence (Brownell & Brown, 1992; Eckerman & Whitehead, 1999; Verba, 1994). It is not clear why mothers rate their 36-month-olds as both more positive and more negative in their play with peers than 24-month-olds. One possibility is that 36-month-olds are simply more frequently engaged with other children, and mothers are therefore more likely to notice negative interactions at this age. Another possibility is that mothers consider the negative peer interactions of their older children as more intentional, thus evaluate them more negatively (Dix, Ruble, Grusec, & Nixon, 1986).

Children who were rated by their mothers as temperamentally difficult in infancy were later rated by their mothers as more negative and less positive in peer play. However, mothers' ratings of infant temperament were unrelated to children's behavior with peers in child care or during structured play with a friend. To the extent that difficult temperament in infancy reflects poor emotion regulation, and to the extent that there is some stability in emotion regulation through the toddler years (Eisenberg et al., 1994; Kopp, 1982), it is perhaps not surprising to find that infant temperament predicts toddler peer relations. However, we must interpret these findings with caution because they are limited to maternal report. Although mothers may be the best and most widely informed reporters of their children's characteristics (Rothbart & Bates, 1998), their own biases and personalities may also produce spurious empirical relations over time or contexts (Seifer, Sameroff, Barrett, & Krafchuk, 1994; Youngstrom, Izard, & Ackerman, 1999). Nevertheless, given the accruing weight of evidence from diverse research perspectives, including behavior genetics, that infant temperament is associated with individual differences in socioemotional

development (Caspi, 1998; Rothbart & Bates, 1998), it remains important to probe the role of temperament in early forms of peer social play, particularly in relation to child care.

Child gender did not relate to caregivers' ratings of peer play or to observations of peer play in child care. However, mothers rated boys as more aggressive with other children, and at 36 months girls were observed to be both more positive and skilled as well as more assertive during dyadic play with a friend. There are a number of possible explanations for this dissociation between the findings for the child-care setting and the findings for maternal report and structured dyadic play. One possibility is that peer play in child care occurs more often in groups, and that despite structural differences in boy versus girl groups (Maccoby, 1990), social play in toddler peer groups may not differ in affective quality or complexity as a function of gender (Serbin, Moller, Gulko, Powlishta, & Colburne, 1994). In contrast, in dyadic play, boys' play styles, which are more active and arousing and more focused on dominance and competition, may have garnered them lower ratings on features such as cooperation and prosocial behavior than girls, whose play more often emphasizes affiliation and agreement (Leaper, 1994; Maccoby, 1990). Another interesting possibility is that caregivers in child care may attempt to reduce gender differences in play more than mothers do, for example by encouraging mixed-sex rather than same-sex play (Fagot, 1994; Lockheed, 1986).

Finally, children who scored higher on assessments of cognitive and language development were rated by both their mothers and their caregivers as more positive with their peers, and by mothers as less negative and aggressive. Observations of peer play confirmed these ratings. Children with more advanced cognitive and language skills were more skilled and more assertive during dyadic play with a friend at 36 months. In short, children's cognitive and linguistic skills were positively related to their peer competence in the child-care context as well as in non-child-care settings. In previous analyses of data from this sample, we have reported relations between child-care experiences and cognitive and language outcomes in 2- and 3-year-olds (NICHD Early Child Care Research Network, 2000). One might wonder, therefore, whether the cognitive or language measures in the current analyses acted as mediators of the relations between child care and peer outcomes that we have reported here. Supplemental analyses to test this possibility (by removing cognitive and language predictors from regression models) showed that this was not the case: child-care effects were not stronger with cognitive and language predictors removed from

the models. Peer social competence was thus independently related both to child care and to cognitive and linguistic skills in this study. Others have recently found that preschoolers' language abilities and cognitive skills are significant contributors to cooperative play, conflict resolution, and effective communication with friends (Dunn & Cutting, 1999; Rubin & Rose-Krasnor, 1992). The findings from the current study suggest that these effects begin as soon as competent peer interactions appear in the second year.

In summary, children in child care become more positive and less negative in their social play between 24 and 36 months. Regular, albeit modest, relations emerged between child-care experiences in the first 3 years of life and individual differences in children's peer competencies. Caregiver sensitivity and responsiveness were the most consistent aspects of child-care experience associated with positive, skilled peer interactions in child care, regardless of the amount of time children spent in child care or how much experience they had with other children in child care. Greater experience in child-care settings with other children present was also associated with more competent peer play as observed in child care, above and beyond the quality of caregiving in those settings. Caregivers rated these children as more negative in peer play, however. They similarly rated children who had experienced more weekly hours of care as more negative in peer play, regardless of caregiving quality, although children's observed peer play did not differ in relation to amount of child care. We have suggested that these apparent inconsistencies might be clarified by conducting more differentiated observations of peer conflict among very young children, as well as by more fully exploring how caregiver reports relate to observations of children's social behavior and how they each predict later social functioning.

Child-care experiences were not associated with children's peer competence as rated by their mothers or as observed in structured dyadic play. In contrast, both maternal sensitivity and the children's own cognitive and language competence were systematically associated with the quality and complexity of their peer play across all settings and informants. Together, these findings suggest that peer competence may be acquired differently in different contexts. In this study, our observations in the child-care setting may have tapped different kinds of skills than mothers were privy to or than we observed in structured dyadic play with a friend. This, in turn, raises the possibility that children's experiences in child care may be more important for their group-based peer competencies than for the growth of dyadic peer relationships. Of course, at the time of this report the children

were quite young. As a result, their rated and observed behavior was still rudimentary, and their friendships were not yet well developed. Future analyses as the children develop stable friendships and regular peer-group relationships in the late preschool and early school years will permit us to consider such possibilities with greater confidence.

We note in closing that the effect sizes for most of the significant findings were modest by the usual standards. But partial correlations do not reveal the full implications of these findings. We have reported elsewhere, for example, that modest effect sizes translate into meaningful and substantial increases in many scores (NICHD Early Child Care Research Network, 1999b). Moreover, even small effects can be important when multiplied by the many thousands of children to whom they apply.

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