

Scaffolding in low-income mother-child dyads: Relations with joint attention and dyadic reciprocity

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This study was conducted to further extend scaffolding research to low-income dyads because living in poverty may serve as a risk factor for experiencing difficulties in social and cognitive development during childhood. Scaffolding was examined in the context of mother-toddler dyads' ($N = 56$) performance of a routine feeding task that was difficult for 2-year-olds to complete independently. Both verbal and nonverbal behaviours were microanalytically coded in order to characterise the successive scaffolding strategies by mothers, and their children's responses. Also, scaffolding data were compared to data on joint attention and dyadic reciprocity obtained from a free-play task. Results show that mothers' use of constructive verbal strategies during the feeding task was positively associated with joint attention and mother-initiated dyadic reciprocity, both of which may be viewed as indices of maternal sensitivity. Thus, the provision of verbal assistance may be one mark of maternal sensitivity during scaffolding in low-income dyads.

Mothers' provision of guidance, encouragement, and structure during routine problem-solving tasks has been viewed as a critical "scaffold" to young children's cognitive development (Wood, Bruner, & Ross, 1976). Although much normative research on scaffolding has examined parent-child engagement among high and middle SES families, less is known regarding ways that low-income parents provide this important support within sensitive social interaction. At the same time, recent research on low-income children's development suggests that responsive social engagement between parent and child serves as a buffer against risks posed by poverty (Chase-Lansdale & Brooks-Gunn, 1995; Duncan, Brooks-Gunn, & Klebanov, 1994; Huston, McLoyd, & Garcia Coll, 1994). One hypothesis is that sensitive low-income parents may effectively scaffold their children's problem-solving skills, facilitating their children's later cognitive competence. However, reliable measures that tap individual differences among low-income parents' ability to scaffold their children's behaviour are needed in order to test this hypothesis.

As noted by Garcia Coll et al. (1996), previous studies of low-income, minority children have tended to focus on their possible deficiencies by comparing them to non-minority, middle class children. The present study seeks to expand research on low-income mother-child dyads by examining normative processes of development, and by using within-group comparisons to highlight sensitive mothers' competencies and their children's capabilities. Specifically, how do low-income parents tutor their toddlers in the solution of a commonly encountered problem? How is scaffolding related to other measures of mother-toddler interaction, across behavioural contexts? We seek to provide a clearer empirical

portrait of behaviours that are encompassed by the term "scaffolding", in low-income families, and to examine relations between scaffolding of a feeding task and measures of joint attention and dyadic reciprocity during free-play.

Previous research on scaffolding among middle and high SES families

Scaffolding refers to a co-constructive process by which a tutor, often a parent, takes into consideration the abilities of a learner, typically a child, to structure a task in accordance with those abilities. Scaffolding research has a basis in Vygotsky's (1978) idea that tutors should target their instruction toward the child's "zone of proximal development", which includes abilities that are currently developing. With the help of tutors seeking the zone of proximal development, children may successfully complete tasks that they cannot yet perform independently. Vygotskian theory has recently been extended by Rogoff and colleagues (Rogoff, 1990; Rogoff, Mistry, Goncu, & Mosier, 1993) in their investigations of joint problem solving as "guided participation in cultural activity". In both scaffolding and guided participation, parental competence is clearly marked by sensitivity in providing consistent verbal and nonverbal cues, tailored to the child's developmental level, in order to assist the child in successfully solving a problem.

Findings regarding scaffolding have typically been based on studies of middle-income families conducted in the United States or other English-speaking countries. However, in research on differences in patterns of guided participation among low-income families in Guatemala and India and

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This research was supported in part by a grant to the first author from The College of Human Ecology Graduate Student Research Awards Fund at Cornell University. Also, this paper was written with support from the US Department of Agriculture START program awarded to the second author. Many thanks to Joylyn Somersel for the time she spent diligently coding scaffolding data.

middle-income families in the United States and Turkey, Rogoff et al. (1993) point out that this process may be culturally influenced. In all four locations, caregivers and toddlers were able to work together in order to reach the type of common understanding necessary for the completion of culturally relevant activities. Thus, some aspects of guided participation seem to be important regardless of the cultural context. However, it is somewhat unclear whether the observed differences in scaffolding practices should be attributed to culture, families' income levels, or aspects of the families' rural or urban environments. To address this question, further research is needed to examine the critical components of scaffolding during problem-solving episodes among low-income families in the United States.

Social coordination in mother-child dyads

Adult direction and maintenance of child attention have emerged as playing a central role in scaffolding. Adult tutors must also be sensitive to child cues by accurately gauging and responding to children's initiatives to solve a task, as well as maintaining awareness of the children's responses to their own initiatives (Landry, Garner, Swank, & Baldwin, 1996; Pratt, Kerig, Cowan, & Cowan, 1988). Parallel lines of research on joint attention and dyadic reciprocity have examined these two components of dyadic interaction as markers or indices of social coordination or co-regulation between parent and child (Fogel, 1993; Raver & Leadbeater, 1995). Toward the end of their first year, infants become able to coordinate their attention with that of others, thereby establishing a joint frame of reference, or joint attention (Dunham & Moore, 1995), which must be established before scaffolding can occur (Hodapp, Goldfield, & Boyatzis, 1984). Reciprocity is also likely to be an important feature of social coordination and scaffolding in mother-infant pairs. Dunham and Dunham (1995) argue that, in optimal social interactions, adults' responses are not only temporally contingent upon infants' previous behaviours, but also are reciprocal in that they expand upon features of those behaviours.

Studies of joint attention in low-income dyads provide the basis for a better understanding of competent caregiving among parents of children at risk. High levels of joint attention and reciprocity are associated with global ratings of maternal sensitivity in low-income mother-infant dyads (Raver & Leadbeater, 1995), and also longitudinally predict better outcomes among high-risk, low-birthweight infants (Garner, Landry, & Richardson, 1991; Landry, 1995). However, measures of joint attention have often been assessed during free-play, whereas scaffolding studies have focused on problem-solving tasks. A clearer empirical understanding of relationships between scaffolding and joint attention in different contexts is especially important, given recent research highlighting the value of examining the quality of dyadic interaction across multiple interactive tasks (Black, Hutcheson, Dubowitz, Starr, & Berenson-Howard, 1996; Landry, Smith, Miller-Loncar, & Swank, 1998; Leyendecker, Lamb, & Schölmerich, 1997). Black et al. (1996) found that low-income children demonstrated greater extremes in behaviour during feeding than during free-play, possibly because feeding tasks have a clear goal and are thus more structured and demanding than free-play tasks. Our study capitalises upon the ecological typicality of the feeding task to investigate scaffolding by examining ways that mothers aid their children in preparing to

drink from a juice box. Specifically, we viewed the insertion of a small plastic straw into a juice container as a goal-oriented task with a clear solution that is slightly beyond 2-year-olds' capabilities. Scaffolding data could then be compared to data on joint attention and reciprocity during free-play, to better understand relations between these constructs.

The present study

Our aims in conducting this study were twofold. First, we hoped to provide a descriptive portrait of mothers' and toddlers' scaffolding behaviours during problem solving. We anticipated that low-income, ethnic minority mother-child dyads would demonstrate considerable variability in their success at the scaffolding task, with some dyads exhibiting high levels of success and other dyads having difficulty. Second, we sought to contribute to growing literatures on scaffolding and joint attention by examining relations between these attention-based constructs in parent-child interaction, across interactive contexts. We hypothesised that mothers who could sensitively maintain longer periods of joint attention with their children during free-play would also be sensitive tutors who received higher scores on measures of scaffolding. Finally, in order to successfully complete the juice box task, mothers must coordinate their behaviours with those of their children, remaining sensitive to the children's social cues. Therefore, we expected dyads who had demonstrated higher levels of dyadic reciprocity during free-play to receive high scores on scaffolding measures.

Methods

Participants

Scaffolding was observed in 60 mother-child dyads taking part in a laboratory-based study of joint attention (Raver, 1996a). Three Spanish-speaking families were excluded from the current analyses, and data from an additional dyad were lost due to equipment problems. Families were recruited in an urban environment, from waiting rooms of paediatric primary care units or offices of the Program for Women, Infants, and Children (WIC); most mothers reported incomes of \$15,000 or less. The mean age of mothers at their children's birth was 24.63 years (range = 14–39, SD = 5.87). At the time of their participation, the children's mean age was 6.18 days before their second birthday (range = 41 days before to 48 days after, SD = 23.59): 57% of the children were male, 63% of the children were African-American, 14% were white, and 23% were of mixed racial heritage.

Procedure

During an 8 minute snack session, mothers were asked to let their child attempt to independently insert a straw into a juice box as "a test of fine motor skills", but that they could provide help if the child could not do this. Although mothers knew they were being videotaped, they did not know that the snack episode had been designed as an investigation of scaffolding. Measures of collaborative joint attention and dyadic reciprocity were based on dyads' behaviours during a separate, 10 minute free-play episode occurring prior to the scaffolding session on the same day. During free-play, mothers and

children were asked to play together with their choice of several attractive toys.

Coding scheme

Scaffolding episodes were videotaped and were coded in 5 second intervals using a VCR with jog/shuttle capability. Coders were allowed to view segments of the videotapes multiple times in order to make coding decisions for particular intervals when necessary. Although all mother-child dyads were given 8 minutes to complete the juice box task, only the portions of juice box sessions preceding the insertion of the straw were coded. Thus, for many dyads, the coded juice box episode was considerably shorter than 8 minutes in length.

Maternal strategies. Codes for mothers' strategies during the juice box task were based on investigations of scaffolding by Wood et al. (1976) and McNaughton and Leyland (1990). During the first pass through each scaffolding episode, coders noted whether or not mothers engaged in each of the following non-mutually exclusive behaviours: verbal strategies, manual help, modelling, and solution. Use of a *verbal strategy* was coded if mothers spoke at any time during a 5 second interval; such strategies were later divided into subcategories (described below). *Manual help* was coded when mothers offered physical assistance aimed at helping their children complete the juice box task, for example, by holding the juice box or unwrapping the straw. *Modelling* was coded when a mother illustrated how to perform aspects of the juice box task, using her own box or her child's box. Finally, *maternal solution* was coded whenever mothers helped to solve the task by pushing or positioning the straw into the juice box.

During a second pass through each episode, maternal speech codes were classified into mutually exclusive subcodes. Only a single code was assigned to each interval. *Recruitment* was coded when mothers recruited children's attention to the juice box task when they were not already focused on the task. *Direction maintenance* was coded when mothers used speech that kept children's interest focused on the task. *Verbal hints* were coded whenever mothers gave general or specific verbal instructions about how to approach the task. *Positive feedback* and *negative feedback* codes were used when mothers made noninformative positive or negative statements, respectively. *Off-topic speech* was coded when mothers made statements about something other than the juice box task, or spoke to the researcher. Finally, intervals in which the mother did not speak were coded as containing *no verbal instructions*.

Child behaviours. These were coded independently of mothers' behaviours during a final set of two passes through each video. During the third pass, children were coded as paying *attention* if they focused on the juice box task at any point during a 5 second interval. Also, they were coded as *solving* the task if they inserted the straw, or adjusted or bent the straw inside the box before drinking. During a final pass through each video, a series of mutually exclusive and exhaustive codes were used to indicate whether children *followed* or *did not follow* their mother's directives, *sought help vocally*, *sought help nonvocally* (e.g., a child handing the straw to her mother after failing to get it in by herself), or *did not work* at the juice box task. Children were coded as not working at the task if their responses during a particular interval were not

directed toward the task, if they lost interest, or if they were waiting for their mothers to give instructions.

Social contingency measures. In comparisons of mother-child dyads' scaffolding performance with measures of social contingency in this study, we employed measures of *collaborative joint attention* as described by Raver (1996a). Additionally, two measures of *dyadic reciprocity* sequences during free-play (Raver, 1996a) were employed. Sequences in which mothers made a bid, their children accepted that bid, and the mothers persisted; and sequences in which children made bids and mothers accepted were both considered *reciprocal*.

Reliability and data reduction

Twelve videotapes were selected at random in order to assess interobserver reliability. Agreement was considered to have occurred only when both individuals exactly agreed on a code for a particular 5 second interval. In order to achieve acceptable levels of reliability, the maternal verbal strategies of direction maintenance and verbal hints were collapsed for analysis into the category of *strategy support*, defined as any effort to encourage the toddlers to proceed with a strategy already being used, or to select a more appropriate one. Also, because positive and negative feedback occurred infrequently, these codes were collapsed into the single category of *feedback*. Finally, the child behaviour codes of "follow" and "does not follow" were collapsed into the more general category *child attempts to solve the task*, because the definition of each original code specified that the child was attempting to insert the straw without seeking help, whether or not maternal directives were being followed. After the implementation of all coding refinements, overall percentage agreement was high, at 90.8%. The obtained Cohen's kappa value, $\kappa = .74$ (range of values = .58-.93; summarised in Table 1) was good (Bakeman & Gottman, 1997).

Results

Descriptive statistics

To address the hypothesis that mother-child dyads would demonstrate considerable variability in their performance of the scaffolding task, descriptive statistics were computed for each coded component of scaffolding. Table 1 shows descriptive statistics for the non-mutually exclusive components of scaffolding, and for the mutually exclusive child responses. In general, standard deviations and ranges for the components were large. The mean length of scaffolding episodes was 127.1 seconds (range = 40-505 s). As anticipated, solution of the juice box task was slightly beyond the capabilities of most toddlers. The task was solved independently by the toddlers in only 16% of the mother-child dyads; in the remaining dyads it was solved either partly (in 38% of dyads) or completely (in 46% of dyads) by the mothers. On average, scaffolding episodes during which mothers completely solved the task ($M = 141.8$ s) lasted longer than those in which toddlers participated in solution, by solving the task jointly with their mothers ($M = 113.8$ s) or independently ($M = 115.6$ s).

The most common maternal verbal strategy was strategy support, which was used during 55.98% (range = 6.52-100%)

Table 1
Descriptive statistics for components of scaffolding

	Mean	SD	Range
Length of scaffolding episode (s):	127.1	110.3	40–505
<i>Maternal strategies as percentages of entire scaffolding episode</i>			
Verbal strategies ($\kappa = .66$)	78.61	15.14	45.45–100
Manual help ($\kappa = .93$)	57.12	26.34	10.87–100
Modelling ($\kappa = .65$)	9.97	13.65	0–54.55
Solution ($\kappa = .86$)	8.31	7.21	0–30.00
<i>Children's behaviours as percentages of entire scaffolding episode</i>			
Paying attention ($\kappa = .80$)	88.59	17.55	16.30–100
Child response ($\kappa = .58$)			
Working at juice box task	64.79	19.97	4.35–100
Seeking help verbally/vocally	16.83	13.28	0–50.00
Seeking help nonverbally	2.89	5.38	0–28.57
Off-task	14.71	18.93	0–92.39
Solution ($\kappa = .68$)	8.17	11.03	0–44.44

Note: Percentages represent the mean proportions of time in which each of these strategies was used during the coded problem-solving task.

of all coded intervals. When not providing strategy support, mothers typically were silent (during 21.39% of intervals, range = 0–54.55%) or engaged in off-topic speech (during 11.41% of intervals, range = 0–56.52%). Recruitment and feedback were less commonly used.

Children and their mothers engaged in joint attention during 46.27% (SD = 20.64) of the 10 minute free-play episode. Dyads engaged in mother-initiated reciprocal bidding sequences during 35.68% (SD = 18.68) of the free play episode, and in child-initiated reciprocal bidding sequences during 62.40% (SD = 29.13) of the episode.

Between-group comparisons of low-income mother-child dyads

Child attention analyses. To further examine variability in dyads' performance of the task, they were also compared using a median split of the child attention measure. Children must pay attention to the juice box task in order to insert the straw; thus, differences in their attentiveness may make important contributions to variability in dyads' behaviours. Because high levels of attentiveness were typical (median attentiveness score = 95.64%), the groups created by the median split can be best described as fully attentive and less attentive. One-way ANOVAs showed that, in comparison to mothers with less attentive children, mothers with fully attentive children spent more time solving the juice box task, $F(1, 54) = 7.84, p < .01$. Mothers of fully attentive children also spent more time engaging in strategy support than mothers with less attentive children, $F(1, 54) = 5.37, p < .05$, and were less likely to engage in off-topic speech, $F(1, 54) = 7.42, p < .01$. Like their mothers, fully attentive children differed in important ways from less attentive children. Fully attentive 2-year-olds spent significantly greater proportions of the scaffolding episode working at the juice box task, $F(1, 54) = 9.69, p < .01$, seeking help verbally, $F(1, 54) = 7.60, p < .01$, and solving the task, $F(1, 54) = 5.26, p < .05$. They also spent significantly less time off-task than less attentive children, $F(1, 54) = 33.0, p < .001$.

Optimal scaffolding analyses. Additional analyses were designed to investigate between-group differences in scaffolding behaviours on the basis of whether mothers used an "optimal" combination of scaffolding strategies. Following the suggestion by Wood et al. (1976) that effective tutoring involves providing both nonverbal and verbal assistance to learners, *optimal scaffolding* was considered to have occurred here when mothers used a combination of both types of strategies. High levels of manual help and high levels of modelling were considered to be optimal nonverbal strategies. High levels of *constructive verbal strategies* (composed of recruitment, strategy support, and feedback), were considered to be optimal verbal strategies. As shown in Table 2, mothers were classified into five groups on the basis of their use of manual help, modelling, and constructive verbal strategies. Highly involved mothers were those receiving scores above the median on all three of these components of optimal scaffolding, while less involved mothers received scores below the median. Moderately involved mothers scored below the median for some components and above the median on others. We chose to categorise our data in this way because, consistent with research on attachment (e.g., Ainsworth, Blehar, Waters, & Wall, 1978), we expected overall patterns of behaviour to make greater contributions to the scaffolding process than incremental changes in individual behaviours.

Correlational analyses revealed that both manual help and modelling were moderately correlated with mothers' use of constructive verbal strategies ($r_s = .34$ and $.38$, respectively, and $p_s < .01$). Manual help and modelling themselves were uncorrelated ($p > .05$). One-way ANOVAs and Tukey-Kramer *post-hoc* comparisons were used to explore differences between mother-child dyads based on the extent to which mothers used optimal scaffolding strategies. As shown in Table 2, these results suggest that differences between children of highly involved and less involved mothers are particularly notable. In comparison to children of less involved mothers, children of highly involved mothers were significantly more likely to themselves engage in successful problem-solving behaviours, by paying attention, working at the task, and

Table 2*Comparisons of mother-child dyads on the basis of proportion of episode spent using optimal scaffolding strategies*

	Group 1 (less inv.)	Group 2 (mod. inv., low verbal)	Group 3 (mod. inv., residual)	Group 4 (mod. inv., high verbal)	Group 5 (highly inv.)	Univariate F	Observed power
No. of dyads:	7	21	13	6	9		
Mean length of episode (s):	195.7	152.2	89.6	116.7	76.1	1.95	0.55
<i>Task behaviours as mean percentages of entire scaffolding episode</i>							
Proportion of scaffolding episode in which child:							
Pays attention	71.5 ^a	85.3 ^{ab}	95.1 ^b	95.2 ^{ab}	95.7 ^b	3.37*	0.81
Works at the task	41.7 ^a	64.2 ^b	65.5 ^b	77.2 ^b	74.7 ^b	4.31**	0.91
Seeks help verbally	17.4	16.0	20.5	10.3	17.4	0.62	0.19
Seeks help nonverbally	6.0	2.9	3.9	0.0	1.0	1.43	0.41
Off-task	34.9 ^a	16.6 ^{ab}	7.6 ^b	11.9 ^{ab}	6.9 ^b	3.43*	0.82
Solution	4.5	5.1	14.2	11.8	7.2	1.86	0.53
Mother solves task	4.4 ^a	7.2 ^a	8.7 ^{ab}	4.8 ^a	15.6 ^b	4.06**	0.89

Note: Group 1, less involved mothers; Group 2, moderately involved, low verbal mothers; Group 3, residual group of moderately involved mothers; Group 4, moderately involved, high verbal mothers; Group 5, highly involved mothers. From left to right, moderately involved groups are ordered by mothers' increasing use of verbal strategies and their decreasing use of nonverbal strategies. Analyses in which moderately involved mothers were aggregated are not reported here, given that the results of those analyses were similar to those shown above. Means with different superscripts significantly differ ($p < .05$), according to Tukey-Kramer *post-hoc* comparisons. * $p < .05$; ** $p < .01$.

avoiding off-task behaviours. Children of moderately involved mothers tended to experience intermediate levels of success during the juice box task, but were typically more similar to the children of highly involved mothers than those of less involved mothers.

Relations between scaffolding and other dyadic variables

To address the hypotheses that dyads receiving high scores on collaborative joint attention and dyadic reciprocity measures would also receive high scores on scaffolding measures, it was necessary to first specify which dyads were most successful in their efforts to complete the juice box task. As the optimal scaffolding analyses revealed significant between-group differences in the low-income sample, especially between children of highly involved and less involved mothers, the groupings used for those analyses were also used to explore the relationships between scaffolding, joint attention, and dyadic reciprocity. Because we hypothesised that mothers who received high scores on our measure of scaffolding would also maintain high levels of joint attention and dyadic reciprocity, one-tailed hypothesis tests were used. As shown in Table 3, these correlational analyses suggest that collaborative joint attention during free-play was positively associated with the use of

constructive verbal strategies and strategy support by mothers during scaffolding. In dyads with high levels of joint attention, mothers were more likely to use constructive verbal strategies, most notably strategy support. Also, mothers who successfully initiated reciprocal bids during free-play were more likely to use constructive verbal strategies and strategy support during scaffolding. In contrast, the use of child-initiated reciprocal bids was not associated with use of constructive verbal strategies or strategy support. However, children who more successfully initiated reciprocal bids during free-play were less likely to have mothers who used recruitment during scaffolding. Two-way ANOVAs did not reveal significant differences between groups of dyads on measures of mother-initiated reciprocity, child-initiated reciprocity, or joint attention; they also showed that neither the relationship between scaffolding and joint attention nor the relationship between scaffolding and dyadic reciprocity differed on the basis of child gender.

Discussion

As anticipated, there was considerable variability in how low-income mother-child dyads dealt with the demands of the juice box scaffolding task. Unlike past characterisations of low-income, ethnic minority mothers as relatively nonverbal (e.g.,

Table 3*Intercorrelations of scaffolding, joint attention, and reciprocity measures across contexts*

Scaffolding components	Manual help	Modelling	Constructive verbal	Recruitment	Strategy support	Feedback
<i>Free play context</i>						
Collaborative joint attention	.13	.03	.22*	-.19	.33**	-.16
Mother-initiated reciprocal bid	.07	.11	.27*	-.06	.26*	.05
Child-initiated reciprocal bid	-.21	.14	-.14	-.29*	-.05	-.07

* $p < .05$; ** $p < .01$. Correlations are one-tailed.

Watson, Kirby, Kelleher, & Bradley, 1996), mothers in this study were very verbally involved, typically spending over half the juice box episode talking about the task with their children. Mothers generally worked hard to keep their toddlers on task: Fully attentive children had mothers who were more engaged and focused on solving the problem, and who spent less time talking about other things, in comparison to mothers of less attentive children. Alternately, it could be argued that highly attentive and engaging toddlers drew their mothers' attention and assistance to the task: Fully attentive children tended to seek more verbal help, giving us a clear indication that scaffolding must be viewed from a dyadic rather than individually driven perspective. We also found that children whose mothers engaged in less manual help, less modelling, and less constructive verbal behaviour were less likely to persist in the task and were less attentive than children whose mothers more frequently used these strategies. There seems to be a clear increase in positive scaffolding outcomes as mothers become more involved in the scaffolding task, as children of less involved mothers were the least successful during the scaffolding episode, children of moderately involved mothers were moderately successful, and children of highly involved mothers were the most successful.

Preliminary support was found for the hypothesis that dyads that were high on joint attention during free-play would also receive high scores on measures of scaffolding during feeding. This relationship was particularly strong for the measure of mothers' verbal support, although the expected associations of manual help and modelling with joint attention were not found. There was also preliminary support for the hypothesis that dyads that received high dyadic reciprocity scores during free-play would also receive high scaffolding scores. In dyads with higher levels of mother-initiated reciprocal bids, mothers were more likely to engage in verbal strategy support, and in constructive verbal strategies in general. As with joint attention, anticipated associations of dyadic reciprocity with manual help and modelling were not found. In sum, we found that joint attention and reciprocity were related to the verbal, but not the nonverbal, aspects of scaffolding. Perhaps during free-play mothers relied on nonverbal instruction because task demands were less specific, whereas during the more demanding juice box task they favoured verbal instruction, in order to more effectively assist their toddlers with the task. This is in keeping with other research suggesting moderate, rather than high, consistency across interactive contexts (Black et al., 1996; Leyendecker et al., 1997).

When considering toddlers' contributions to the interaction it was interesting to note that, for dyads in which children initiated more reciprocal bids during free-play, mothers were less likely to engage in recruitment during the scaffolding task. However, children's initiation of reciprocal bids was not statistically related to their mothers' use of constructive verbal strategies. Perhaps children who take the lead during the free-play context tend to also do so during scaffolding, assuming from their mothers some of the responsibilities for promoting the interaction, consistent with Raver's (1996b) finding that toddlers in highly engaged dyads can effectively attain joint attention through initiation of reciprocal bids with their mothers.

Because both joint attention and dyadic reciprocity can be viewed as indices of maternal sensitivity (Raver & Leadbeater, 1995), our findings suggest that highly sensitive mothers provide high levels of verbal instruction aimed at enabling their

2-year-olds to solve the scaffolding task. Sensitive mothers should be expected to engage in different types of scaffolding behaviours across interactive contexts due to changing task demands. Just as maternal sensitivity may be highlighted by joint attention and dyadic reciprocity in the context of free-play, it may also be highlighted by the use of constructive verbal strategies during the juice box task. Consistent with our findings, moderate levels of cross-context consistency in mothers' behaviours with their 2-year-olds have also been found between teaching and play tasks by Calkins, Smith, Gill, and Johnson (1998). It should be noted that the current study represents a preliminary attempt to specify relationships between scaffolding, joint attention, and dyadic reciprocity, and that the associations reported here, although statistically significant, are modest. Further research is needed to clarify the nature of these observed relationships, and to investigate relationships between global parenting style and scaffolding.

Another potential limitation of this study involves the difficulty of determining the direction of influence from our findings. Perhaps the mothers who demonstrated less sensitivity (i.e., low levels of joint attention and reciprocity) were reacting to characteristics of their children (such as low responsiveness), or to their children's lack of interest in the task. Alternatively, perhaps the differences in these children's performance were due to differences in the scaffolding strategies used by their mothers. This question is an important one that may best be answered by additional research capitalising on the strengths of sequential analysis (Bakeman & Gottman, 1997) to gain greater insight into the process-oriented nature of scaffolding.

Although a longer and more difficult task might have provided a greater diversity of both maternal behaviours and child responses, it is noteworthy that the relatively brief juice box scaffolding task was useful in identifying reliable patterns of mother-child interaction. The task also seems to have been sufficiently challenging for toddlers. Our findings suggest that dyads in which mothers solved the task themselves took *longer* to achieve solution than dyads in which children solved the task independently or jointly with their mothers. Perhaps mothers waited to determine whether or not their children would be able to help with solving the task before completing it without the children's assistance. This explanation is also consistent with our goal of designing a task that would allow us to observe dyadic, interdependent problem solving approaches.

Our findings have important implications, given that low-income populations have been largely overlooked in previous scaffolding studies. Because being raised in poverty may, in combination with other disadvantages, place children at risk for difficulties in social and cognitive development (Garner, Jones, & Miner, 1994; Klebanov, Brooks-Gunn, McCarton, & McCormick, 1998), extending their learning through means such as scaffolding is of utmost importance. This study provides a foundation for extending scaffolding research to low-income dyads in an urban environment in the United States. It also provides preliminary evidence about how dyadic behaviours during the scaffolding of an everyday feeding task relate to dyadic behaviours in the context of free-play. A crucial task for future research is to further extend the study of scaffolding to children in low-income families, including those experiencing rural as well as urban poverty. As a consequence of such research, interventions may be designed through which parents can gain practice in facilitating independent performance by their children. Research by Klebanov et al. (1998)

shows that family poverty and its associated risk factors begin to exert significant negative influences on toddlers' cognitive development as early as age 2 years. However, these influences were largely ameliorated for children with positive home environments. Maternal sensitivity is very likely one component of a positive home environment, and interventions designed to encourage verbal interactions between mothers and their toddlers (Levenstein, Levenstein, Shiminski, & Stolzberg, 1998) have been shown to have long-term beneficial effects on high school graduation rates. Thus, to the extent that maternal sensitivity contributes to effective scaffolding, future interventions should focus on helping parents become more sensitive to the developmental needs of their toddlers.

Manuscript received January 1999

Revised manuscript received August 2000

References

- Ainsworth, M.D.S., Blehar, M.C., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.
- Bakeman, R., & Gottman, J.M. (1997). *Observing interaction: An introduction to sequential analysis*. (2nd ed.). New York: Cambridge University Press.
- Black, M.M., Hutcheson, J.J., Dubowitz, H., Starr, R.H., Jr., & Berenson-Howard, J. (1996). The roots of competence: Mother-child interaction among low income, urban, African American families. *Journal of Applied Developmental Psychology, 17*, 367-391.
- Calkins, S.D., Smith, C.L., Gill, K.L., & Johnson, M.J. (1998). Maternal interactive style across contexts: Relations to emotional, behavioral, and physiological regulation during toddlerhood. *Social Development, 7*, 350-369.
- Chase-Lansdale, P.L., & Brooks-Gunn, J. (Eds.). (1995). *Escape from poverty: What makes a difference for children?* New York: Cambridge University Press.
- Duncan, G.J., Brooks-Gunn, J., & Klebanov, P.K. (1994). Economic deprivation and early childhood development. *Child Development, 65*, 296-318.
- Dunham, P.J., & Dunham, F. (1995). Optimal social structures and adaptive infant development. In C. Moore & P.J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 159-188). Hillsdale, NJ: Erlbaum.
- Dunham, P.J., & Moore, C. (1995). Current themes in research on joint attention. In C. Moore & P.J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 15-28). Hillsdale, NJ: Erlbaum.
- Fogel, A. (1993). Two principles of communication: Co-regulation and framing. In J. Nadel & L. Camaioni (Eds.), *New perspectives in early communicative development* (pp. 9-22). New York: Routledge.
- Garcia Coll, C., Lambert, G., Jenkins, R., McAdoo, H.P., Crnic, K., Wasik, B.H., & Vazquez Garcia, H. (1996). An integrative model for the study of developmental competencies in minority children. *Child Development, 67*, 1891-1914.
- Garner, P.W., Jones, D.C., & Miner, J.L. (1994). Social competence among low-income preschoolers: Emotion socialization practices and social cognitive correlates. *Child Development, 65*, 622-637.
- Garner, P.W., Landry, S.H., & Richardson, M.A. (1991). The development of joint attention skills in very low birth weight infants across the first two years. *Infant Behavior and Development, 14*, 489-495.
- Hodapp, R.M., Goldfield, E.C., & Boyatzis, C.J. (1984). The use and effectiveness of maternal scaffolding in mother-infant games. *Child Development, 55*, 772-781.
- Huston, A.C., McLoyd, V.C., & Garcia Coll, C. (1994). Children and poverty: Issues in contemporary research. *Child Development, 65*, 275-282.
- Klebanov, P.K., Brooks-Gunn, J., McCarton, C., & McCormick, M.C. (1998). The contribution of neighborhood and family income to developmental test scores over the first three years of life. *Child Development, 69*, 1420-1436.
- Landry, S.H. (1995). The development of joint attention in premature low birth weight infants: Effects of early medical complications and maternal attention-directing behaviors. In C. Moore & P.J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 223-250). Hillsdale, NJ: Erlbaum.
- Landry, S.H., Garner, P.W., Swank, P.R., & Baldwin, C.D. (1996). Effects of maternal scaffolding during joint toy play with preterm and full-term infants. *Merrill-Palmer Quarterly, 42*, 177-199.
- Landry, S.H., Smith, K.E., Miller-Loncar, C.L., & Swank, P.R. (1998). The relation of change in maternal interactive styles to the developing social competence of full-term and preterm children. *Child Development, 69*, 105-123.
- Levenstein, P., Levenstein, S., Shiminski, J.A., & Stolzberg, J.E. (1998). Long-term impact of a verbal interaction program for at-risk toddlers: An exploratory study of high school outcomes in a replication of the Mother-Child Home Program. *Journal of Applied Developmental Psychology, 19*, 267-285.
- Leyendecker, B., Lamb, M.E., & Schölmerich, A. (1997). Studying mother-infant interaction: The effects of context and length of observation in two subcultural groups. *Infant Behavior and Development, 20*, 325-337.
- McNaughton, S., & Leyland, J. (1990). The shifting focus of maternal tutoring across different difficulty levels on a problem-solving task. *British Journal of Developmental Psychology, 8*, 147-155.
- Pratt, M.W., Kerig, P., Cowan, P.A., & Cowan, C.P. (1988). Mothers and fathers teaching 3-year-olds: Authoritative parenting and adult scaffolding of young children's learning. *Developmental Psychology, 24*, 832-839.
- Raver, C.C. (1996a). Relations between social contingency in mother-child interaction and 2-year-olds' social competence. *Developmental Psychology, 32*, 850-859.
- Raver, C.C. (1996b). Success at catching and keeping toddler's attention: An examination of joint attention among low-income mothers and their 2-year-olds. *Early Development and Parenting, 5*, 225-236.
- Raver, C.C., & Leadbeater, B.J. (1995). Factors influencing joint attention between socioeconomically disadvantaged adolescent mothers and their infants. In C. Moore & P.J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 251-271). Hillsdale, NJ: Erlbaum.
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Rogoff, B., Mistry, J., Goncu, A., & Mosier, C. (1993). Guided participation in cultural activity by toddlers and caregivers. *Monographs of the Society for Research in Child Development, 58* (8, Serial No. 236).
- Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Watson, J.E., Kirby, R.S., Kelleher, K.J., & Bradley, R.H. (1996). Effects of poverty on home environment: An analysis of three-year outcome data for low birth weight premature infants. *Journal of Pediatric Psychology, 21*, 419-431.
- Wood, D., Bruner, J.S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89-100.

