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The Integration of Mothers' Referential Speech with Joint Play

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MESSER, DAVID J. *The Integration of Mothers' Referential Speech with Joint Play.* CHILD DEVELOPMENT, 1978, **49**, 781–787. This investigation was conducted in order to study how mothers' speech to infants is related to other concurrent activities. The mothers and their infants (aged 11, 14, and 24 months) were observed in a joint play situation involving a number of toys. It was found that maternal reference to a toy coincided with the manipulation of that toy, and reference was particularly associated with actions which were likely to involve joint attention to a toy. These results indicate that nonverbal behavior can provide infants with information about the object to which their mothers' speech refers.

Speech to children differs in various respects from speech to adults. As a number of studies have shown, it tends to be simpler, more repetitive, and characterized by different patterns of intonation (Phillips 1973; Snow 1972; Garnica, Note 1) and is thus more suited to language acquisition than was once thought. Yet by themselves these characteristics are not sufficient to explain how infants interpret speech—in particular, how its specific referential function is conveyed. Other sources of information are needed for this purpose, and it is in this respect that the nonverbal context of speech addressed to infants becomes of interest.

It has often been asserted that speech to young children tends to be object related and to be tied to the immediate context (Bloom 1971; Brown & Bellugi 1964). Howe (Note 2), for example, demonstrated that on 50% of the occasions when mothers named objects in the presence of their young children they were holding the respective object within 2½ sec of the start of the utterance; similarly, Collis (1977) reports that naming is synchronized with joint gaze at distal objects. It is thus likely that the nonverbal context supplies information necessary to establish which object is being referred to. Certainly children who have already mastered the rudiments of language seem to be influenced by this source, in that difficulty is experienced by them in following instructions when the subject of the utterance is a toy other than the one being held (Bem 1970; Huttenlocher, Eisenberg, & Strauss 1968). If older children use the nonverbal context of language then it may well be that younger children are even more dependent on this type of information.

The aim of the present study is to examine the extent to which mothers synchronize their verbal references to objects with other, nonverbal events when addressing children in the first 2 years of life. There are many components which make up the nonverbal context of speech; however, the various activities of mother and child that serve to coordinate their interest are likely to be especially relevant. In this respect manipulation probably rivals the success of gaze (Collis 1977; Collis & Schaffer 1975) and of pointing (Murphy & Messer 1977) as a means of integrating the mother's and the infant's interest in features of the environment, because this is a natural and often occurring form of activity which gives each partner an effective way of indicating his own interest and of obtaining the attention of the other partner. Our concern will therefore be with the relationship between mothers' speech and the ongoing manipulation of toys by both mothers and children in a free-play situation.

Method

Subjects.—The subjects were 42 mother-infant pairs, recruited from predominantly

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middle-class and upper-working-class areas. The infant ages were chosen to give a relatively wide spectrum of verbal ability over a comparatively small age range, namely, a preverbal group, a group just beginning to acquire single words, and a group of rather more sophisticated verbal ability (11, 14 and 24 months, respectively; range ± 10 days). There were 14 infants in each age group (seven male and seven female).

Procedure.—The mothers were contacted by telephone. They were told that a study was being conducted into how infants of different ages play with toys. The procedure was outlined, and it was emphasised that an attempt was being made to simulate a setting which could occur at home.

Before the sessions started every effort was made to set the mothers at ease, and then the procedure was outlined once more, the mother being asked to play with her infant just as she wished. There were two 5-min play sessions. The first allowed the pair to become familiar with the situation and involved play with four building blocks. Only the second session, which involved play with seven small toys, was used to obtain data.

Apparatus.—The sessions took place in a room of a child-welfare clinic and were recorded with video equipment. The camera was placed on a tripod 2–3 m from the pair, and the rest of the video equipment, which was operated by the author, was situated behind a screen. The infant was seated on the mother's lap in front of a table, which had a tray with raised edges clamped to it, constituting the play area. The toys consisted of a red "matchbox" bus, a red plastic car, a "bendy" dog (Pluto), a small doll, a green plastic fish, a small plastic horse, and a yellow teddy bear.

Data extraction.—On a first examination of the videotapes with sound turned off the manipulations performed on the toys were noted, using the categories shown in table 1. In each case the identity of the toy was also noted. Verbal utterances were transcribed on the second playing of the recordings. An utterance was considered to be a set of words separated from other words by a marked pause, or by a change in the intonation pattern. All the mothers' verbal utterances were written down, as well as any infant vocalization that could be identified. Details of the utterances and actions were entered on the data sheets in such a way as to preserve their temporal integration. This meant that utterances which co-occurred with a manipulation were entered on the sheet alongside that manipulation.

A reference to a toy was categorized as a "name," "pronoun," or "indirect reference." Naming was the reference to a toy by a common noun, proper noun, or a baby-language noun. A pronoun was considered to be a word for which the name of a specific toy could be substituted (e.g., this, he, her, it). When a toy was referred to without the use of a name or pronoun it was termed an "indirect reference." In these cases the content of the utterance had to be dependent on the presence of a

TABLE 1

MANIPULATION CATEGORIES

Manipulation	Description
Infant:	
Touches	Toy touched without being picked up, accompanied by coordinated visual and manipulative regard so as to appear intentional
Picks toy up	Toy moved above or along the table
Picks up after mother	Infant touches the last toy the mother touched
Holds after both	Infant continued to hold the toy after the mother had let go of it
Takes toy from the mother	A tug of war so the toy is moved from the locus of holding
Mother:	
Brings and leaves	Toy brought nearer to the infant and immediately left
Bring and holds	Similar to the previous movement except that the toy was retained; includes when toy held up for the infant to see
Touches	Toy moved less than 6 cm
Moves toy back and forth	Toy moved to and from infant, at least twice
Holds after both	Similar to infant holds after both
Takes away	Toy removed from locus of play
Other categories:	
No toy held	An utterance was said while no toy was being held
Both hold	Toy held or touched by both partners

specific toy. This could include an action in relation to a toy (e.g., "push") or some reference to part of the toy (e.g., "see the wheels"). The identity of the toy referred to was largely determined by the semantic content of the utterance, though eye gaze was sometimes used as an additional cue. In any utterance only one reference to a particular toy was coded, and for pronouns and indirect reference the maximum number of toys that could be referred to was two.

The data were subsequently transformed line by line into numeric form for computer analysis. Each line contained information about the toy held, the action performed on the toy, the most specific of the three reference types, and the identity of the toy referred to. After all the recordings had been made the tapes were reanalyzed to ensure that the categories had been used consistently. A month afterward one subject from each age group was randomly selected for a formal reliability study which I carried out. If, after coding, an item was categorized differently from the original transcript or was out of place, this was regarded as an error. The percentage agreement between the two transcripts for 11 months was 79.9; for 14 months, 79.4; and for 24 months, 89.9 (percentage agreement = 100 − total errors × 100/total number of observations).

Results

The relation between reference and toy held.—The sample from which these results were obtained consisted of a total of 1,074, 1,095, and 1,253 maternal utterances for the 11-, 14-, and 24-month groups, respectively. A high proportion of this sample was references to the toys provided for play (86%, 89%, and 92%, respectively). Using these utterances, contingency tables were prepared by cross-classifying the identity of the toy referred to with the identity of the toy being manipulated at the same time. Separate tables were constructed for each age group, each reference type, and identity of individual (mother or child) manipulating the toy (18 tables in all). It was found that between 73% and 96% of all references were to toys that were at the same time being manipulated (see table 2). A more appropriate statistic to examine this relationship is the κ coefficient (Fleiss 1973) which takes account of chance agreement between the identity of the toy referred to and the identity of the toy being manipulated (see table 2). The range of κ's indicates that mothers referred to toys being manipulated at the time more often than would be expected by chance, and for each of the 18 κ's, the z score was significant at $p < .0001$.

A less conventional but equally useful way to examine these contingency tables is by the use of information theory (Attneave 1959), because this provides a way to quantify overall relationships (e.g., between toy held and toy named). There were seven toys which could be referred to, so the maximum uncertainty about which toy would be referred to is $\log_2 7 = 2.81$ bits. When the frequency of reference to each toy is known, the uncertainty is decreased by between 1% and 4%. In contrast, when the identity of the toy being played with is known, the uncertainty is reduced by between 57% and 89% (depending on age, individual holding, and reference type: the "raw-bias" method [MacRae 1971] was used to obtain unbiased estimates of uncertainty). This highlights the redundancy present in the situation and shows that the uncertainty about which toy was being referred to was considerably reduced by knowing the identity of the toy being manipulated. Thus information was potentially available from ongoing activities to aid the infant's comprehension of speech.

Instances of lack of correspondence between reference and manipulation were examined further. The three most common forms this took are listed below, with the figures in parentheses giving an overall frequency for the 11-, 14-, and 24-month age groups, respectively:

1. An utterance could overlap two actions performed on different toys—this type of discrepancy was not examined further (61, 64, 85).

2. A toy was referred to but no toy was being manipulated (48, 51, 28).

3. A toy was being manipulated while another toy on the table was being referred to (103, 143, 195).

There were no significant differences between the age groups or between reference types in the frequency of discrepancies (as a proportion of all references), and so it appears that even the mothers of older infants ensured that their speech was closely tied to ongoing manipulative activities. Further tests were conducted to establish the context in which these

TABLE 2

AGREEMENT BETWEEN IDENTITY OF TOY REFERRED TO AND IDENTITY OF TOY MANIPULATED AT THE TIME

	11 MONTHS							14 MONTHS							24 MONTHS						
	Agreement When Infant Manipulated Toy			Agreement When Mother Manipulated Toy				Agreement When Infant Manipulated Toy			Agreement When Mother Manipulated Toy				Agreement When Infant Manipulated Toy			Agreement When Mother Manipulated Toy			
	%	N	κ	%	N	κ	TOTAL	%	N	κ	%	N	κ	TOTAL	%	N	κ	%	N	κ	TOTAL
Naming	85	170	.82	90	147	.89	360	79	221	.75	88	177	.86	458	73	279	.68	86	148	.83	463
Pronouning	83	152	.80	96	110	.94	295	79	136	.71	92	125	.90	299	81	217	.76	91	124	.89	407
Indirect reference	82	114	.78	94	106	.93	266	78	79	.74	91	88	.88	215	84	144	.79	93	97	.91	280

NOTE.—The *N*'s are the overall number of observations in each contingency table from which the percentage of agreements (%) was calculated. They do not sum to the totals because references occurred with the manipulations "no toy held" and "both hold."

TABLE 3

CONTINGENCY TABLES SHOWING ASSOCIATION OF SPEECH CATEGORIES WITH MANIPULATION TYPES

	11 MONTHS						14 MONTHS						24 MONTHS					
	N	P	I	NR	S	Total	N	P	I	NR	S	Total	N	P	I	NR	S	Total
Group A:																		
Mother brings and holds	62*	64**	53**	10	15	204	86**	61**	46**	14	18	225	54	60**	45*	4	10	173
Infant picks toy up	64**	25	22	21	70	202	85	56	22	22	76	261	150*	112	57	34	105	458
Both hold	15	22	37*	9	60*	143	32	23	40**	5	58**	158	22	57*	34	11	53*	177
Group B:																		
Infant touches	6	3	1	4	33**	47	5	3	1	5	40**	54	16	5	1	2	36**	60
Mother brings and leaves	42	19	20	12	71**	164	22	11	3	11	52**	99	15	14	11	6	36**	82
Mother takes away	6	4	6	4	36**	56	5	8	5	3	36**	57	10	2	3	4	28**	47
Mother touches	15	7	7	10	82**	121	34	19	15	6	48**	122	23	20	28**	7	28	106
Group C:																		
No toy held	28	11	9	28	...	76	28	15	8	18	...	69	14	9	5	11	...	39
Other manipulations	122	140	111	55	93	521	161	103	75	39	88	466	159	128	96	24	66	473
Total	360	295	266	153	460	1,534	458	299	215	123	416	1,511	463	407	280	103	362	1,615
Contingency coefficient			.49						.44						.41			

NOTE.—N = naming, P = pronouning, I = indirect reference, NR = utterance with no reference, S = silences. The differences between observed and expected frequencies was assessed by the use of the binomial test. The contingency coefficients were calculated from the complete tables, i.e., before collapsing the rows for "other manipulations."

* $p < .05$.
** $p < .01$.

discrepancies occurred. At 11 and 14 months there were more discrepancies before a toy was held than afterward (two-tailed sign test: instances of ambiguity, when the referent of a discrepancy was held during the preceding and subsequent manipulations, were excluded from this analysis). This may well have been due to the mothers either anticipating the infants' interest or drawing attention to a toy not at present being manipulated. A comparison was made between the frequency of references to toys (i) held at the same time, (ii) held during adjacent actions, and (iii) held during nonadjacent actions. In every one of the nine comparisons (3 ages $\times$ 3 reference types) the effect was significant ($p < .01$, Page's L test [Bradley 1968]). Thus mothers were more likely to refer to toys being played with at the same time than in an adjacent time block and to toys played with in an adjacent time block than in a nonadjacent one. This indicates that as time from contact with the toy increased the probability that it would be referred to decreased.

The relation between reference and types of manipulation.—This part of the analysis was undertaken to discover whether a relationship exists between reference and particular types of manipulation. To do this a contingency table of manipulation types $\times$ speech types was constructed for each age group. The manipulation types are shown in table 1, and the types of speech used are naming, pronouning, indirect reference, utterances containing no reference, and silences.

Certain types of manipulation (group A in table 3) were associated more closely with reference than others. The one action which shows this above all is "mother brings and holds," which was frequently accompanied by all three forms of reference, and especially so at the two younger ages. Thus the action which was frequently used to introduce a toy to the infant, thereby gaining his attention and, in addition, perhaps attracting him away from another toy, was the action most consistently associated with reference. "Infant picks up" and "both hold" are also likely to indicate when an infant is especially interested in a toy. The former was associated with naming in two of the three age groups while the latter showed age-dependent associations with indirect reference and pronouning. "Both hold" was, however, also accompanied to a significant degree by silence. This appears to be because this activity involved not only prolonged periods of joint attention (which were mostly accompanied by speech) but also very brief exchanges that did not warrant accompanying reference.

There were other actions (group B in table 3) which were quite consistently accompanied by silence alone. These actions were "infant touches," "mother brings and leaves," "mother takes a toy away," and "mother touches a toy." When each of these manipulations is examined individually, it becomes apparent that all were brief and were unlikely to arouse the interest of the pair. Thus, if a mother referred to a toy during one of these actions, the infant's attention would probably be elsewhere.

The overall predictability of reference from manipulation was also assessed by the use of information statistics. The uncertainty about the five reference types occurring was 2.32 bits and was reduced by between 0.08 and 0.13 bits when the frequency of the reference types was known. The gain of information, from knowing how co-occurring actions affect the probability of reference, was 0.21, 0.16, and 0.13 bits, at 11, 14 and 24 months, respectively.

Thus an *overall* knowledge about the co-occurrence of reference and actions would not appreciably reduce the infant's uncertainty about the type of reference that was being used. This result suggests that the best way of reducing the unpredictability of the infants' environment may be to attend only to certain actions. This would be a good strategy to adopt, as more speech occurred with movements which were likely to be attention worthy to infants.

There is some indication of a difference between age groups in that contingency coefficients, calculated as an alternative descriptive index of overall association between speech and manipulation, decreased with age (see table 3.). Thus, with increasing age there appears to be a slight trend for particular speech types and manipulative types to become less closely associated, and it may well be that the mothers of older infants were starting to use different types of reference in a greater range of circumstances.

Discussion

The findings of the present study demonstrate that mothers' speech to young children tends to be closely integrated with other con-

current activities during a joint play session. Not only were verbal references synchronized with manipulation of the appropriate object, but references were also most closely associated with those actions which were especially likely to maintain the infants' interest in that object. Thus, by revealing one way in which speech is integrated with nonverbal features of the interaction, these findings complement the impressive array of evidence which shows how the early linguistic environment is modified in order to match the child's linguistic competence and thereby make the input more comprehensible. That mothers use nonverbal communicative devices as a supplement to verbalizations is already known. Bridges (Note 3), for instance, has provided detailed illustration of this relationship with regard to gestural cues accompanying a mother's verbal directions in an object-retrieval situation, demonstrating in particular that utterances difficult for the child to understand are more likely to be complemented by several diverse nonverbal cues. Here, however, we have drawn attention to the fact that nonverbal aspects are not merely used to supplement speech but are finely integated with it—with the result that the child is given plenty of help in understanding the identity of the referent by the mother's careful timing of her utterance to coincide with the manipulation of the appropriate object.

There are four conditions with a bearing on the relationship between reference and manipulative activity to which this study has given some attention. These are age, type of reference, identity of manipulator (mother or infant), and type of manipulation. Perhaps the most noteworthy aspect is the fact that the relationship held across most of these conditions. It certainly applied to the whole age range examined here (i.e., 11–24 months) and to all three forms of reference. Thus in each age group and for each form of reference there was minimal ambiguity about the identity of the referent of maternal speech, although there was an indication that at 24 months the synchrony between speech and manipulation was no longer as strong as before. It is well known that in due course speech gradually becomes less context bound, and it may well be that this process would have been more clearly detected had the study been carried beyond the age of 2 years.

That mothers synchronize their verbal references not only with their own actions on the toys but also with those of their infants is ample testimony to the watchfulness which mothers tend to display in such dyadic encounters. The synchrony, that is, did not merely arise in an intrapersonal form; it occurred because the mothers closely observed the ongoing flow of joint play activity and ensured that they timed their responses to take place at the appropriate points during the interaction. In this respect these findings indicate the same sensitivity that mothers have been found to show in such other forms of dyadic interaction as feeding (Kaye 1977), mutual attention to the environment (Collis and Schaffer 1975), and vocal interchange (Schaffer, Collis, & Parsons 1977).

However, not all actions showed the relationship to speech in the same way and to the same degree. Some types of manipulation, such as infant touches, mother brings and leaves, mother takes toy away, and mother touches a toy, were indeed more closely associated with silence. These actions, however, were often of a brief and somewhat casual nature, whereas the activity that showed by far the closest relationship to reference (i.e., mother brings and holds) tended to be performed with emphasis as a way of introducing a toy to the infant and thus involving a particularly attention-worthy act.

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