

## 5 Mother, I'd rather do it myself: some effects and non-effects of maternal speech style<sup>1</sup>

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How is natural language learned? A major problem in accounting for this feat, approximated by even the dullest child but not even the brightest chimpanzee, arises from the contrast between the input and the final product: speech forms and their privileges of occurrence in a language are so varied that any heard sample will support countless generalizations about the items, structures and meanings that are to be acquired. How could one get the right data for constructing all and only English, if one were learning English; Basque, if one were learning Basque?

Some theorists have approached this dilemma strictly in terms of the interaction of this heard speech with language-specific mental structures in the child learner. They stress that the child has rich and specific hypotheses for evaluating incoming linguistic data; i.e. he will entertain only certain candidate generalizations among those that are logically possible, owing to innate language-learning predispositions,



and hence he will construct only certain grammars from a wide variety of sample inputs (see, for discussion, Chomsky, 1965; McNeill, 1966a; Fodor, Bever, & Garrett, 1974). Probably no one will contest at least a weak version of this position: to account for why human children but not house-cats acquire language it is necessary to look to species-specific and perhaps task-specific ways of responding to linguistic input.

But some recent investigators concentrate on another issue, one that is also indisputably relevant in accounting for language learning: they study the communicative settings in which the child acquires his language competence. This broader focus has led, for example, to studies of gestural and postural interactions between mothers and preverbal infants as precursors and possibly organizers of the speech-acquisition process to follow (Bruner, 1974/5). And in particular, this broader focus on the communicative environment has led to more explicit studies of the child's strictly linguistic environment — the utterances he hears (see Snow, this volume, for a review of this literature). A claim that has been made, on the basis of such studies, is that the child is not at first confronted with all the complexity and variety of natural language. It is asserted, on the contrary, that mothers introduce forms and meanings to the learning child in a principled way, thus narrowing the candidate generalizations about language structure the learner is in a position to hit upon (Levitt, 1975). If this assertion is correct, it might bear on the kinds of procedures the child must be supposed to bring to the language-learning situation.

In the discussion here, we will accept and hopefully clarify both these kinds of claim: to some extent, the child is biased to organize incoming linguistic data in specified ways; and to some extent, the mother preorganizes these data, essentially by speaking in certain ways and in certain communicative settings. Moreover, we argue in favor of a further mechanism supporting language acquisition: the child has means for restricting, as well as organizing, the flow of incoming linguistic data; he filters out some kinds of input and selectively listens for others. This is a sense of 'preprogramming' for language acquisition that has not been widely considered (but see Shipley, Smith & Gleitman, 1969; Slobin, 1973a; Ervin-Tripp, 1973, for discussion of this possibility).

The investigation reported here focuses on maternal speech style and the influence this exerts on the course and rate of language acquisition. The interest in maternal speech, widespread in recent years, arises on very clear grounds. Part of the argument that language

learning must be guided by rich and restrictive hypotheses about universal grammar turns on a consideration of naturally-occurring adult speech. Putatively, this forms the child's data for constructing his language. But ordinary speech is a haphazard, disorganized sample of sentences in the language. Also, this sample is partly degenerate (containing false starts, mumbles and ungrammatical sentences) and is only loosely tied to referents and situations the child observer could perceive, or likely conceive from context (telephone conversations about repairing the lawn mower, talk about zebras that goes on when out of the zoo). If these are the environmental circumstances, and if language acquisition is nonetheless successful for all within narrowly circumscribed time limits (and it is, in gross outline, despite some individual differences in vocabulary and overall fluency), then the learners must have been strongly predisposed to construct only certain outcomes. That is, this argument is to the effect that children construct the same language knowledge under widely varying environmental influences — the claim is that the environment need not be narrowly specified, nor does the input need to be ordered in any principled way.

This conclusion can be brought into some question if it can be shown that naturally-occurring adult speech does not constitute the child's linguistic ambience, his effective environment. For example, it has been suggested that the child may listen primarily to high-pitched speech, to speech accompanied by pointing, eye-contact and other gestures, to speech which begins by calling his name and to speech which contains some familiar words. That is, he may attend selectively when he has reason to suppose that he is being addressed, and such speech may have special properties good for language learning. But of course this comes down to claiming that the child has certain internal predispositions that aid language acquisition — in this variant, a kind of filter on input.

The view that language learning is heavily influenced by forces from outside the child rather than by dispositions inside him is best made if it can be shown that there is a language teacher who, purposely or not, presents data to the child in an orderly way. The prime candidate is the mother. In its strongest form, this claim is that the child can construct language knowledge only from a very carefully circumscribed kind of data, presented to the child selectively in correspondence with his language growth. Hence the best beginning argument in favor of an acquisition process that demands highly specific kinds of environmental support would be the finding that maternal speech is not just adult speech.



Many recent investigations do reveal that mothers' speech differs from speech among adults (e.g. Drach, 1969; Pfuderer, 1969; Phillips, 1970; Remick, 1971; Broen, 1972; Snow, 1972; Sachs, Brown & Salerno, 1976; Newport, 1976; Snow, this volume). Similar effects are apparently found for any speaker addressing a very young child (Shatz & Gelman, 1973; Sachs & Devin, 1976). This stylistic variant of everyday speech is systematic enough to deserve its own name; we have called it 'Motherese'.

In the first sections of this report, we will take a close look at the taxonomy of Motherese and its adjustment to the child's stage of language learning. The data for this inquiry were collected in the context of natural conversation among mothers, their children and one of us (ELN). We simply chatted with the mothers and children, and then compared the mothers' speech to the experimenter with their speech to the children. We also computed correlations between language measures of the children and the maternal speech, simple correlations which presumably reflect adjustments of maternal speech style to listener sophistication. These procedures allow us to raise some questions in principle about how Motherese might affect specifics of language learning. Our conclusions are more modest than those of some writers on this topic. We find that Motherese is hard to characterize as a simplified teaching language on the basis of its structure and content. To the contrary, some of our findings retrieve the intuitions of every grandmother-in-the-street: the properties of Motherese derive largely from the fact that the mother wants her child to do as he is told right now, and very little from the fact that she wants him to become a fluent speaker in future. Whatever influences Motherese exerts on language growth have to operate within these intentional constraints. It would not be surprising, therefore, if certain differences between Motherese and adult talk, no matter how striking and uniform, are inconsequential for the child's linguistic development.

In later sections of this report, we ask more directly to what degree and in what respects Motherese influences language learning. Notice that the finding that Motherese exists cannot by itself show that it influences language growth, or even that this special style is necessary to acquisition — despite frequent interpretations to this effect that have appeared in the literature. After all, Motherese is as likely an effect on the mother by the child as an effect on the child by the mother. To approach these problems of cause and effect, we held a second interview with our mother-child pairs six months following the first one. We now were in a position to compute a

language growth score for each child for this time interval, and to compare this against the mother's speech style at the first interview. But some ticklish questions of interpretation would arise if these comparisons were made in terms of simple correlations between mother's usage and child's language growth.

To understand the problem here, suppose we were able to discover certain speech forms that could rightly be called Basic Motherese. And suppose we found that some mothers of our subject children use these forms more than other mothers. Suppose, finally, that the children of precisely those mothers who used Basic Motherese most consistently were the children who showed the greatest language growth during the six-month interval. Can we now assume that the use of Basic Motherese was responsible for this accelerated growth? No, on many grounds. One cause for skepticism is that Basic Motherese may be used more when the child is least sophisticated linguistically, but also the child may grow the fastest the less his linguistic sophistication, i.e. the more he has left to learn. Then the conclusions from these hypothetical findings could only be (a) a mother speaks to a linguistically unsophisticated speaker-hearer in Basic Motherese; and (b) a linguistically unsophisticated speaker-hearer moves very quickly, over time, toward increased linguistic sophistication — language growth curves decelerate. It would not follow that (c) Basic Motherese is what caused this burst of new language knowledge in the unsophisticated party. For many reasons of this sort, any assessment of the influence of maternal speech on child language growth requires analyses more complex than simple correlations.

Our approach to disentangling cause and effect in interpreting our findings derived from the convenient fact that not all our mother subjects were the same, even when differences among them due to differences among their offspring are left aside. Beyond the adjustment of mothers each to her own child's abilities (revealed in the initial correlational analysis) there remained some variance in maternal speech styles which appeared to be attributable only to individual differences among the mothers. It is this residual variance that constitutes differences in the linguistic environments of our child subjects, independent of environmental differences due simply to differences in the children themselves. In addition, not all our child subjects' growth rates were the same, even when differences among them due to differences in their age and absolute levels of achievement are left aside. It is this residual variance in growth rates that constitutes individual difference in the speed of learning, independent of whether the child is a beginner or more advanced at the initial



interview. Accordingly, we equated statistically for differences in Motherese and differences in child growth rate due to children's differing ages and language knowledge by simultaneously partialling out effects of both these factors. The effect of this procedure is to equalize all subjects on these dimensions – it is now 'as though' all subjects had been identical in age and language skill at the first interview, for such differences as existed have been erased. Now, correlations between the mothers' usage at interview 1 and language growth differences among these equalized children can tell us something about how the mother influences the child. Our discussion of how Motherese contributes to language learning is therefore based on such a second-order correlational analysis (see 'Procedure' for other details).

The conclusions from this analysis are again modest, partly because limitations on both sample size and procedure preclude strong claims, and partly because one cannot be certain of cause–effect relationships from correlational analyses, no matter how complex. But the pattern of the findings does support some suggestions about how Motherese influences learning. Summarizing these findings: individual differences among mothers in communicative styles seem to influence language learning in complex ways. An interaction between the child's listening biases and the mother's presentation of aspects of syntactic structure predicts the rate at which the child learns certain language-specific constructions. But at the same time many general properties of emerging language competence seem to be insensitive to characteristics of the maternal speech environment.

## PROCEDURE

### METHOD

Fifteen mothers and their young daughters were visited in two two-hour sessions held six months apart. At the first recording, the children fell into three age groups (12–15 months, 18–21 months and 24–27 months). All of the families were middle class. The mothers were initially told that we were interested in their children's language learning, and that conversation should simply be 'natural'. After the second interview, we told the mothers that their own speech had been part of the investigation, and asked them whether we had their approval to use the recorded data. All agreed. The entire sessions were transcribed by the experimenter and a research assistant. The analy-

sis of Motherese was carried out on a sample segment of the first interview (approximately 100 utterances from each mother to her child and 50 utterances from mother to experimenter). Analysis of the effects of individual mothers' styles was first carried out on the same sample (as reported in Newport, Gleitman & Gleitman, 1975) and then cross-validated on the entire transcripts, as well as on even–odd page split-halves of the transcripts.

## CODING

### The mothers' utterances

Maternal utterances were separated into those addressed to the experimenter and those addressed to the child. A set of utterances for each listener type was coded for well-formedness, sentence length, structural complexity (indexed, for preliminary purposes, as number of sentence-nodes (S-nodes) per utterance and derivational length), psycholinguistic complexity (explicitness with which the surface form preserves the underlying structure; see Bever, 1970), sentence type (declarative, imperative, etc.), intelligibility, frequency of self-repetition and imitation of the child, deixis (the use of linguistic variables to make reference, e.g. 'This is the apple'), and expansion (the case in which the mother repeats what the child has said, but corrects his 'telegraphic' version into well-formed adult English; see Brown, 1973). Table 5.1 provides example maternal sentences and their coding assignments.

### The children's utterances

Child speech was coded for syntactic complexity, estimated through mean length of utterance (MLU), mean noun-phrase frequency and length, mean verb-phrase frequency and length, inflection of noun-phrases (plural marking), and auxiliary structure (modals and tense marking) for both the first session and the succeeding one six months later. Table 5.2 shows example child utterances and their coding assignments. In addition, total vocabulary size at each session was estimated. Finally, 'growth scores' were obtained for each of the children by computing the difference between the first and second interviews on each of these measures.



Table 5.1 *Manner of scoring for measures of mothers' speech*

<u>Measure</u>	<u>Manner of scoring</u>	<u>Example</u>
<i>Well-formedness</i>		
Grammatical utterance	% of all utterances which are complete, colloquially acceptable sentences	<i>What do you wanna eat?</i>
Sentence fragment	% of all utterances which consist only of isolated constituents or phrases	<i>The apple.</i> <i>Under the table.</i>
Interjection	% of all utterances which are one of the following: yes, no, uh-huh, uh-uh, right, okay, etc., spoken in isolation	<i>Okay.</i>
Ungrammatical	% of all utterances which are ill-formed even in colloquial speech	<i>The boy Susan didn't do it.</i>
Unanalyzable	% of all utterances which were either incomplete and broken off in mid-stream or were either partially or wholly unintelligible	<i>He said that he. . .</i>
<i>Sentence complexity</i>		
MLU	Mean number of words/utterance	<i>That's a big dog = 5</i>
S-modes/utterance	Mean number of underlying sentences/utterance	<i>I think that's a big dog = 2</i>
<i>Sentence type</i>		
Declarative	% of grammatical utterances	<i>You can sing a song.</i>
Yes-no question	% of grammatical utterances	<i>Can you sing a song?</i>

Table 5.1 (*continued*)

<u>Measure</u>	<u>Manner of scoring</u>	<u>Example</u>
Imperative	% of grammatical utterances	<i>Sing a song.</i>
Wh- question	% of grammatical utterances	<i>What can you sing?</i>
Deixis	% of grammatical utterances	<i>That's a dog.</i>
<i>Discourse features</i>		
Expansion	% of all utterances which repeat, in whole or in part, utterances of the <i>child</i> and in addition add extra morphemes	C: <i>Boy dog.</i> M: <i>Yes, that's the boy's dog.</i>
Repetition	% of all utterances which repeat, in whole or in part, previous <i>maternal</i> utterances (i.e. self-repetition)	M: <i>That's a dog.</i> <i>That's a big dog.</i>



Table 5.2 Manner of scoring for measures of children's speech

Measure	Manner of scoring	Example
MLU	Mean number morphemes/utterance	<i>The boy can hit balls.</i> 6
Noun-phrases/utterance	Mean number noun-phrases/utterance	<i>2 boy, balls</i>
Words/noun-phrase	Mean number words/noun-phrase	<i>Boy = 1, balls = 1, mean = 1.0</i>
Noun inflections/noun-phrase	Mean number noun inflections/noun-phrase (plurals)	<i>Boy = 0, balls = 1, mean = .5</i>
Verbs/utterance	Mean number main verbs/utterance	<i>1 hit</i>
Auxiliaries/verb	Mean number auxiliary words/verb	<i>1 can</i>
Inflections/verb	Mean number verb inflections/verb (past tense, past participle)	0
Vocabulary size	Total number word types (as opposed to tokens) produced during the interview	5

## ANALYSIS

## A description of Motherese

Selected samples of the mothers' speech from interview 1 were subjected first to an overall descriptive taxonomy, according to the proportions of utterances that fell into the various coding categories. In addition, the data were analyzed for the adjustment of maternal speech to gross listener differences (by considering differences to adult listeners versus child listeners) and also to finer distinctions of the age, syntactic usage and vocabulary size of the child listeners (by noting the simple correlations between mothers' speech features and child measures at interview 1). These analyses of the speech from interview 1 form the basis for describing Motherese and its 'tuning' to the child's current stage of language sophistication. Results of this analysis were reported in detail in Newport (1976) and are summarized in 'The nature of Motherese' below.

## Effects of Motherese on the child's language growth

The next, and in some sense the primary, task was to ask whether individual differences in mothers' speech predicted the child's language growth. For reasons stated in the introductory remarks, this task calls for more than a simple correlational analysis between various features of the mother's speech during the first observation (e.g. the mean length of her child-directed utterances) and changes in the child's linguistic output over the six-month span (e.g. the increase in the mean length of the child's utterances). In fact, we obtained many such correlations. The trouble is that these correlations may not reflect an effect of the mother upon the child's language growth at all. Instead, they may be spurious by-products of several other factors. The child's language growth was assessed by a difference score, but the children differed in their starting ages and levels. The initial analysis (see above) revealed that to some extent mothers adjusted their speech to such factors. Since this is so, the correlations between indices of mothers' speech and children's growth rates may reflect the joint operation of (a) the adjustment of the mothers to their child's age and initial linguistic level, and (b) the fact that the amount of the child's improvement over a given time span depends upon his age and base line at the beginning of the interval (this must be so since the language acquisition curves are not linear). We therefore equated starting levels statistically by simultaneously partialling out both the child's age during the first interview and his level on any



given linguistic measurement at that time. The resulting partial correlations ( $r_{xy \cdot ab}$ ) are our primary means for assessing how individual differences in maternal speech styles effect accelerated or delayed growth of the child listeners.

### Cross-validation

Leaving aside the inherent difficulties of assessing cause and effect from correlational studies, the procedure just described has another problem: the partial correlations obtained were those statistically 'significant' effects that derived from comparing a very large number of variables (child and mother measures) against each other. Under the circumstances, some of the significant correlations would be expected by chance alone. It was obviously necessary to cross-validate these results. As a first procedure, we analyzed the entire transcripts (including the segments that formed the basis for the initial analysis), now looking only at those maternal variables that seemed to be relevant to early stages of language growth on the basis of the earlier results. These included the significant effects from the initial analysis as well as certain variables first found not to yield an effect, but theoretically likely candidates for affecting growth. The partial correlations with child measures were again computed on these data. In a second procedure, we conducted the same analyses on two halves of the protocols separately, on an even-odd page, split-half basis. With minor exceptions, which will be noted, the results of these procedures reproduced those of the original analysis. It should be noted, however, that these procedures are not enough. A further cross-validation, now underway, involves a replication of the entire procedure using new subjects. Since this step is incomplete, the conclusions presented here must be considered tentative.

### CHARACTERISTICS OF THE CHILD POPULATION

The subject children, ranging from 12 to 27 months at the first interview, varied quite a bit in their speech. Some children spoke solely in one-word utterances, while others used many multi-word utterances (MLU ranged from 1.00 to 3.46 with a mean at 1.65; the mean upper bound on sentence length was 4.67). The mean number of noun-phrases per utterance ranged from 0.80 to 1.47 (mean = 1.02). The mean number of morphemes per noun-phrase ranged from 1.00 to 1.46 with a mean at 1.17. Mean verbs per utterance ranged from zero to 0.65 (mean = 0.23) and the mean morphemes in the verb struc-

ture (when present) ranged from 1.00 to 1.75 (mean = 1.17). The number of different words used during the whole interview ranged from 3 to 210, with a mean at 84. Almost all of these measures inter-correlated significantly (not surprising, since few of them are independent of each other), and MLU was the single measure that inter-correlated most highly with all the others (again, not mystifying, since it is independent of none of the others). Overall then, there was a reasonable range of primitive speech to compare against mothers' speech.

### THE NATURE OF MOTHERESE

#### THE SYNTACTIC PATTERN OF MATERNAL SPEECH

Like other investigators, we found that the speech of mothers to young children looks at first glance 'simpler' than speech to adults. For one thing, it is short (mean MLU was 4.24, while the mean MLU to the experimenter was 11.94,  $p < 0.001$ ). Further, Motherese is highly intelligible: only four in every hundred utterances to the child were impossible to transcribe because of mumbles and slurs. (The percentage of unanalyzable adult-directed speech was 9%, again a highly significant difference between the corpora types.) And finally, the speech of mothers to children is unswervingly well formed. Only one utterance out of 1500 spoken to the children was a disfluency. Differences between the adult-directed and child-directed corpora are on this dimension again highly significant ( $p < 0.001$ ). Yet it should be noted that the difference in proportions here is absolutely small and unimpressive: contrary to some expectations, disfluencies (true garble) in the adult-directed corpora were only 5% of all utterances. The majority of utterances to both listener types were *bona fide* grammatical sentences (60% of those to the children, 58% of those to the adults). The rest were well-formed isolated phrases (e.g. 'the ball' and 'under the table', as naming utterances and answers to queries) and stock phrases and interjections (e.g. 'Ooops!', 'OK' and 'Thank you'). In summary: adult-adult utterances are enormously longer than those to little children; a higher level of intelligibility is maintained for the children, probably (although we did not measure this) as a consequence of slower speech rate with resulting diminution of junctural deformations at morpheme boundaries; and finally, there are fewer disfluencies in child-directed speech.

A preliminary guess from this quick brush with the facts might be that Motherese is a simplified teaching language, designed to inculcate



the forms of English by presenting easy examples to little minds. But if this is so, there are a number of perplexing characteristics of Motherese. To understand these, we have to be more specific about what could be meant by a 'simple style' of speech.

Suppose one were teaching a foreign language and wished to write a systematic supporting curriculum. A good simple principle might be to present canonical sentences of the new language first. For English, these would surely be the simple active declarative sentences, with Subject-Verb-Object ordering of the grammatical relations. But Motherese is not simple on this principle. It is more complex than ordinary talk among adults. While only 30% of mother-to-child utterances are declaratives, a whopping 87% of adult-directed utterances are declaratives. Furthermore, 28% of clauses in the Motherese utterances are undeformed, i.e. involve no optional movement or deletion transformations. But fully 45% of clauses in the adult-directed utterances are undeformed. Put another way, length of derivational history would be longer for the Motherese utterances. Admittedly, the attempt to identify 'psychological complexity' with derivational length has a checkered history in psycholinguistic research. We are not putting it forward as a 'good' measure. (See Brown & Hanlon, 1970, for an alternative measure of 'cumulative complexity' that is rather more natural.) The attempt here is to give some explicit statement of what might be meant by the frequent claim that Motherese represents a syntactic simplification of everyday speech. One candidate is derivational length. We consider further candidates below — all will fail to predict in any detail the characteristics of Motherese.

Consider a second principle for the foreign-language curriculum: even if you don't want to begin teaching with simple active declaratives, at least introduce one new construction at a time rather than all mixed together. But on this principle Motherese is again more complicated than normal speech. There is a wider range of sentence types and more inconsistency to children than to the experimenter. For example, questions and imperatives are almost non-existent in the adult-directed corpus, thus narrowing the range of types, but 18% of the Motherese utterances are imperatives and 44% are questions of various kinds. In what sense, then, is Motherese a simple form of English? Only in one sense described earlier: the sentences to children are shorter because they go one proposition at a time. Embeddings and conjunctions are rare in the Motherese corpora.

Overall then, 'syntactic simplicity' is a pretty messy way to characterize Motherese. Only one finding fits in with such an interpretation: the number of S-nodes in maternal speech (its propositional

complexity) is low. We do not deny that this could be a crucial and real simplification, despite the fact that others (use of canonical sentences, construction of sentence type) go by the board when we look at the taxonomy of Motherese. But we will show somewhat later that even the finding of low propositional complexity is probably better interpreted in terms of a gross bias toward brevity in maternal speech rather than in terms of a metric of syntactic simplicity. Then we can hardly agree with such writers as Levelt (1975) who asserts that Motherese has been shown to present the child with a syntactically limited subset of sentences in the language; and that 'from the purely syntactic view the urge for strongly nativist assumptions has been diminished by these findings'. On the contrary, nativist assumptions are left intact by a close look at Motherese — they neither gain nor lose plausibility. The point is that demonstrating that speech to children is different from other speech does not show that it is better for the language learner. Most investigators have jumped from the finding of a difference, here replicated, to the conclusion that Motherese is somehow simple for inducing the grammar. But the finding that Motherese has properties of its own does not show that these give acquisitional support. Notice, at any rate, that the view of Motherese as a syntactically simple corpus merely transfers a very strong claim about the child (that, owing to restrictive and rich hypotheses, he can deduce the grammar from haphazard primary data) to a very strong claim about his mother (that she has some effective notion of what constitutes syntactic simplicity so that in principle she can choose utterances on this basis).

It remains to be said that, as a third principle, our curriculum designer would surely move from the simple to the complicated as his pupils progressed. A related claim, then, is that maternal speech — if it is a teaching language — will grow syntactically more complex in a fine-tuned correspondence with the child's growing linguistic sophistication. Our findings are not consistent with this view. The proportion of canonical declaratives *increases* ( $r = 0.51$ ) with the MLU of the children. The sentence range *narrows*, e.g. imperatives decrease ( $r = -0.58$ ). Though the mothers' MLU and propositional complexity (number of S-nodes per utterance) do increase with the children's MLU, the correlations within this range of sophistication come nowhere near statistical significance ( $r = 0.22$  with maternal S-nodes per utterance and  $r = 0.40$  with maternal MLU).

Although there are gross differences in the complexity of speech to adults versus speech to young children (and these are confounded with sheer length of utterance), there is no compelling evidence in



our data that mothers tune their syntactic complexity to the growing language competence of their children through this crucial age of syntax acquisition, the period from one to two and a half years. We will show, eventually, that maternal syntax likely does have some impact on syntax acquisition — but these effects are subtler and more restricted than has sometimes been claimed.

#### A FUNCTIONAL DESCRIPTION OF MATERNAL SPEECH

It appears that Motherese is not a syntax-teaching language. But if not, what accounts for its special properties? Along with some other investigators (see Shatz & Gelman, this volume), we believe this language style arises primarily in response to the pressures of communicating with a cognitively and linguistically naive child in the here-and-now, not from the exigencies of the language classroom. There are at least three factors that seem to produce this style: (a) only a few topics are of mutual interest to mothers and infants. If even this minimal meeting of minds is to be served by language, then (b) strains on the attention and processing capacities of the child have to be minimized, and (c) some special discourse features marking points of misunderstanding will have to be employed.

#### Topical constraints

Mothers want their children to drink their juice and clean up the playroom, so these are the things that are talked about. Children, in their turn, are almost always galvanized into action by such speech as they attend to and comprehend, even on those rare occasions when an action response was not the intent of the speaker.<sup>2</sup> On these grounds, the topic of Motherese is, by and large, a set of instructions to the child to act upon (or at least gaze upon) some objects (see also Shatz & Gelman, this volume; Gelman & Shatz, 1976). This singularity of intent does not require the mother to mind her syntax and, in fact, broadens the range of likely sentence types.

Let us first consider whether this claim can in principle be correct: can the same intent be expressed by differing sentence types? The sentences below, despite radical difference in form, can all be interpreted as directions to perform an action, though, to be sure, the direction is sometimes indirect and 'polite'. (For discussion of the conversational meaning of speech acts in approximately this sense and the 'indirect directive' see Searle, 1969, 1975.)

- (1) Put the block in there! (imperative)
- (2) Where does the block go? (wh- question)
- (3) Doesn't the block go in there? (yes-no question)
- (4) Oh, the poor block fell on the floor! (declarative)

Leaving aside the formalism by which the meaningful relationships among these sentences can be explicated (a matter on which we take no stand), it is clear that the common language allows interpretation of all of them as directions to perform the same act (getting the blocks in there). But (2) and (3) can also be interpreted as requests for information, and (4) can be interpreted as a mere commentary on the current state of affairs. 'Rich interpretation' of the context of our Motherese utterances (cf. Bloom, 1970) suggests that they are almost uniformly action-directives, whatever the form. Considering the problems of determining the mothers' true motives, we will not try to support this claim with a close quantitative analysis.<sup>3</sup> Instead, we will argue by inference from the distribution of sentence types.

Imperatives and questions are the most common syntactic devices for requesting action from a listener. Sixty-two percent of utterances to the children took these forms (18 % imperatives, 15 % wh-questions, 21 % yes-no questions and 8 % deictic questions). Only 11 % of utterances to the experimenter were of these forms (2 % imperatives, 1 % wh- questions and 8 % yes-no questions), a highly significant difference ( $p < 0.001$  for each measure). The mother can hardly exchange information with her young child, and so only 30 % of her utterances to him took the usual declarative, commentary form. In contrast, 87 % of her utterances to the experimenter were declarative. Summarizing, the Motherese utterances are unified by an underlying intent to direct the child's action, and this intent results in a scatter of linguistic types.

The adjustment of Motherese to the child's maturity supports the same interpretation. Features of maternal speech related to conversational meaning correlate with a wide variety of measures of the child listeners, including age, vocabulary size and syntactic sophistication. For example, *negative* correlations between the proportion of maternal utterances which were imperative and child variables range from  $-0.35$  (with child's mean number of noun-phrases per utterance) to  $-0.72$  ( $p < 0.01$ , with child's mean number of verbs per utterance and vocabulary size). Positive correlations between maternal utterances which were declarative range from  $0.33$  (with child's mean number of noun-phrases per utterance) to  $0.69$  ( $p < 0.01$ , with child's mean number of morphemes per noun-phrase). That is, these maternal speech features are apparently



adjusted in detail to characteristics of the listener. Action-directives *decrease* and declarative comments *increase* as the child develops.

### Processing constraints

The constraint on maternal conversational intent does seem to determine some aspects of her speech style. If the mother wants the child to eat with his spoon or dance for Aunt Fanny, she will have to put her requests in some form the child is likely to understand. Quite correctly, she seems to view her child listener as limited in attention span and processing capacity. She speaks slowly and clearly and keeps her utterances short. The advantages in comprehensibility here for a wandering and inadequately informed young mind are fairly obvious. The same perceived situational needs account naturally for the fact that Motherese is always well formed. An English-speaking mother surely is biased toward the belief that well-formed English is easier to deal with than garbled English – it is, for her, whether it is for the child or not. We are claiming, then, that three special characteristics of Motherese (brevity, well-formedness and intelligibility) arise for the purpose of here-and-now communication with a limited and inattentive listener, and cannot be described in terms of a language-instruction motive; this begins to suggest that they may not serve a language-learning purpose (a matter on which we argue more directly below).

### *Processing variables are not tied to language stage*

A communicative interpretation of the three maternal variables under consideration here is supported by a look at how they are adjusted to particulars of the child listener. If they were effects of the mother's view to the future (helping the child learn English), or if they were to support learning whatever the mother's motive, then they ought to be tuned to the child's language sophistication. They are not. There are no significant correlations between the mother's tendency to speak grammatically, intelligibly, or briefly, and language characteristics of the particular child listener. Mother's MLU rises with the listener's age ( $r = 0.53, p < 0.05$ ) but is uncorrelated with his verbal sophistication. The mother's grammaticality and intelligibility are uncorrelated even with child age and vary only across listener class (child versus adult). It is likely, then, that the mother adjusts in these regards rather grossly, in response to changing cognitive characteristics of the child that are only loosely tied to language.

Since this is so, it is hard to see how these adjustments could be of value to a learner conceived as requiring explicit, closely graded data presentation (syntax whose complexity is 'systematically expanded' as the child learns, as some claim). Similarly, if the three variables under consideration here were relevant to language acquisition in any direct way, those mothers who modulated them most effectively ought to have children who acquired English most quickly. Anticipating the study of this issue, reported below, none of these variables has any consequence for language growth rate, so far as we can see.

### *Processing simplicity, not syntactic simplicity*

We believe that certain aspects of maternal speech styles are in the direction of easing the child's comprehension by reducing the attentional and processing tasks that are demanded. In particular, we believe that the constraint on length in Motherese utterances (the low MLU) is a constraint on processing complexity, not a constraint on syntactic complexity. A problem in making this interpretation is posed by the fact that surface length in morphemes and grammatical complexity (however this is defined) are pretty well confounded in English. A long utterance will generally also be propositionally complex, i.e. will contain many S-nodes. Thus analysis in either of these terms yields a highly significant effect of listener type. The issues here can be partly disentangled by looking at some cases where the two hypotheses yield different predictions.

*Deletions.* Deletion of underlying elements from a spoken sentence would seem to contribute to syntactic complexity on a number of definitions (it lengthens the derivational history; it increases the disparity between deep and surface structures). It is plausible that deletion increases processing complexity as well by leaving inexplicit some semantic elements; but deletion presumably contributes to processing simplicity too, by keeping the utterance short. Motherese is highly deleted compared to adult-directed speech. For instance, *do-you* deletion ('Wanna go out?' as opposed to 'Do you wanna go out?') is common in Motherese (6% of all utterances) and non-existent in adult-directed questions. Similarly, isolated phrases such as 'on the table' occurred considerably more often to the children (17%) than to the adults (9%,  $p < 0.05$ ). And of course, as reported earlier, the high proportion of subjectless imperatives is another demonstration that brevity has priority over syntactic simplicity or semantic explicitness in maternal speech.



*Movement transformations.* The fact reported earlier that Motherese contains many questions (which move a deep structure element from canonical position, e.g. the auxiliary moves leftward in 'Can you eat?'), assures a longer derivational history for aspects of the Motherese corpora on this dimension. It would appear that any definition of syntactic complexity will rate declaratives (relatively rare in Motherese) as 'simpler' than questions (relatively common in Motherese). Furthermore, mothers show no tendency to use the syntactically simpler 'I put out the cat' (no particle movement) in preference to 'I put the cat out' (the version arising from the particle-movement transformation) to their children. In fact, the latter version is the more frequent in both corpus types. This form has been argued to be the simpler on processing grounds, for it keeps together the Subject-Verb-Object units on which real-time comprehension strategies are apparently based (Bever, 1970). Similar facts hold for other transformations, such as dative movement (Newport, 1976).

On balance then, processing simplicity seems the more natural description of these findings. Only because issues of processing and issues of syntax very often predict the same biases in the corpus is there an apparent effect in Motherese of direct reduction of syntactic complexity. This conclusion is bolstered by the finding that special syntactic properties of Motherese are not adjusted to the child's learning. If the view is that the small number of S-nodes in maternal utterances is a syntactic effect (rather than, as we have argued, an artifact of a processing effect), it is still not tuned to the individual learner well enough so that it could plausibly affect learning: the number of S-nodes per maternal utterance fails to correlate with any particulars of the child listeners – their age ( $r = 0.28$ ) or their syntactic sophistication ( $r$  ranges between 0.02 and 0.27 on the various child measures) – but differs only grossly across age class (child versus adult listener).

To concretize the position we have taken, consider the following sentences:

- (5) Where do you think the block goes?
- (6) The block goes there.
- (7) Want a block?

Utterances of these three types are typical of the Motherese corpora. The distribution of these types yields the overriding effect of action directives, the major but smaller effect of processing constraints, and, perhaps, the smaller yet effect of syntactic simplification. All three of these utterances are action directives; (6) and (7) are short and thus presumably easy to process, while (5) is not; both (5) and (7)

are syntactically complex, (5) because it disguises by sequential re-ordering the grammatical relations that represent its underlying structure and (7) because it deletes constituents which are obligatory in well-formed English. Thus the mother's speech is best described in terms of conversational meanings (the topic of directing action) and adjustments to processing limitations (keep it short and sweet). The fine tuning between mother and developing child is in terms of these same issues, thus supporting the distinction between formal and functional adjustments in Motherese. It seems that the child learns the language in the absence of graded lessons in syntax.

### Discourse features of Motherese

At last we arrive at three properties of maternal speech that might serve a teaching function: deixis, expansion and repetition. A *deictic* utterance, for our purposes, is one which names a referent by means of a variable whose identification depends on the speakers and their situations ('*There* is a ball', '*Here*'s your giraffe', '*That*'s your nose'). What *that* refers to depends on what is around and focussed on at the moment. Sixteen percent of the Motherese utterances involve deixis, compared to only 2% of the adult-directed utterances ( $p < 0.001$ ).<sup>4</sup> *Expansion* (Brown, 1973) is the case where the mother provides an adult version (e.g. 'Yes, the book is on the table') in response to the child's foreshortened or distorted attempt (e.g. 'Book table'). Six percent of the Motherese utterances are expansions, and obviously no adult-directed utterances are expansions. *Repetitions* are the case where the mother follows her own utterance (e.g. 'Go find the duck') with one or more exact or partial renditions of the same content ('Yes, go find it – the duck – go get the duck!'). Twenty-three percent of the mothers' utterances involve some repetition of this sort.

Plausibly, deictic usage might help build vocabulary, expansions might help build syntax and repetition might influence both to the extent that it could allow rehearsal or comparison among forms. Like the topical constraints discussed earlier, these discourse features are adjusted to a wide variety of measures of the child subjects. For example, deixis is positively correlated with the child's estimated vocabulary ( $r = 0.62, p < 0.05$ ); exact imitation with expansion is positively correlated with the child's vocabulary ( $r = 0.79, p < 0.01$ ) and partial imitation with expansion is positively correlated with every measure of child sophistication (ranging from  $r = 0.52, p < 0.05$  with vocabulary to  $r = 0.88, p < 0.001$  with MLU). Maternal self-repetition is *negatively* correlated with the child's age ( $r = -0.55$ ,



$p < 0.05$ ) and to many measures of his linguistic sophistication (for example,  $r = -0.68$ ,  $p < 0.01$  with mean verbs per child utterance, and  $r = -0.69$ ,  $p < 0.01$  with his vocabulary). But these adjustments of maternal discourse features to aspects of the child listener do not yet allow us to distinguish between cause and effect (are they influences of the mother on the child or influences of the child on the mother?), or between teaching function and communication function. We therefore turn now to the second-order correlational analysis, whose outcomes may enable us to unravel some of these issues.

### RELATIONS BETWEEN MATERNAL SPEECH STYLES AND LANGUAGE ACQUISITION

The previous analysis has established that some of the syntactic properties of Motherese grow out of the fact that she wants to make conversation with her young child rather than teach him generative grammar. We now report a more direct correlational study of the ways maternal speech styles may influence language growth. After all, despite the fact that the mother may merely want Johnnie to pick up his blocks or drink his juice, she nevertheless speaks in special ways to him to maximize her chances. That is, the result of the mother's mundane intents is a corpus restricted in topic, utterance length and certain syntactic features dependent on length limits. It is possible that these effects of mothers' transactions with children influence acquisition, regardless of the mother's motivation or the fineness with which the adjustments are made. We have so far only shown that mothers do not consistently simplify syntax. This merely disposes of the most obvious hypothesis (presentation of a 'miniature language' sample) about how the mother could train her child to talk.

We now examine correlations between individual differences in mothers' speech (i.e. the residual variance in maternal speech measures after partialling out that variance attributable to adjustments to the child's age and level of linguistic achievement at the first interview) and child growth rate (i.e. child language scores at interview 2 minus interview 1, with the same partialling procedure). Thus, as described in the section on Procedure, these partial correlations represent the relation between maternal speech and child growth, partialling out the effects of the child listener on the maternal speaker, which were reported above. These partial correlations are thus thought to reflect the effects of maternal speech styles on the child's progress with the language.

We will show that certain highly limited aspects of the mother's speech do have an effect on correspondingly limited aspects of the child's learning. Many other identifiable special properties of Motherese have no discernible effect on the child's language growth. The maternal environment seems to exert its influence on the child only with respect to language-specific structures (surface morphology and syntactic elements that vary over the languages of the world), and even then only through the filter of the child's selective attention to portions of the speech stream (roughly, utterance-initial positions, and items whose referents are clear). Thus learning does respond to narrowly specified features of the environment. But at the same time, this learning is contingent on what the children are disposed to notice in that environment, on their strategies of listening and the hypotheses they are prepared to entertain. We discuss separately below (1) those aspects of the child's learning that show effects of different mothers' styles and (2) those aspects of maternal speech that are effective and ineffective in predicting (producing?) varying rates of learning.

### ENVIRONMENTALLY SENSITIVE AND INSENSITIVE ASPECTS OF LANGUAGE LEARNING

Major patterns of the double-partial correlations are shown in Table 5.3. (Please refer to Tables 5.1 and 5.2 for an explanation of the coding decisions involved in the measures tabulated here. A large number of slightly different breakdowns of these data were made, and are available from the authors; these yield similar correlational outcomes to the measures reported here.) To organize these outcomes, we discuss here the aspects of child language growth that are evidently sensitive to the mothers' speech styles (the columns of Table 5.3). The two left-hand columns pertain to the child's growth in nominal inflection (mainly, e.g., adding the *s* to *rat* and the *z* to *rag* to mark plurality) and in verb-auxiliary paradigms (the appearance of modals such as *can*, *will* and *do*; and progressive and perfective elements as in 'I am eating', 'I have eaten'). These inflectional and paradigmatic forms are specifics of the surface structure of English sentences; they are handled in rather different ways in other languages. The two rightmost columns pertain to the substantive and verbal notions that are becoming manifest in the children's utterances: the number of true verbs per utterance, and the number of noun-phrases per utterance. These are indices of the language features that carry the main



Table 5.3 Double-partial correlations between maternal speech and child language growth, partialling out initial child age and language<sup>a</sup>

Measures of maternal speech	Measures of child growth					
	Grammatical functions		Length		Propositional content	
	Auxiliaries/ verb-phrase	Inflections/ noun-phrase	Morphemes/ utterance (MLU)	Verbs/ utterance	Noun-phrases/ utterance	
Declarative	0.25	0.01	0.10	0.16	0.02	
Yes-no question	0.88***	-0.05	0.50√	0.35	0.16	
Imperative	-0.55*	-0.52√	-0.38	-0.29	0.19	
Wh- question	-0.36	-0.07	-0.29	-0.02	-0.24	
Interjection	0.53√	0.22	0.42	-0.08	0.11	
Deixis	-0.09	0.58*	0.13	-0.12	-0.08	
Expansion	0.51√	0.14	0.23	0.03	-0.16	
Repetition	-0.58*	-0.51√	-0.50√	-0.05	-0.27	
Mean length of utterance	0.34	0.10	0.14	0.38	0.22	
S-nodes/utterance	0.21	-0.05	0.37	0.05	0.31	

√  $p < 0.08$  \*  $p < 0.05$  \*\*\*  $p < 0.001$

<sup>a</sup> Slightly different values for these correlations have been reported previously (Newport *et al.*, 1975). Previous correlations were performed on samples of the interviews. The present correlations were performed on the entirety of the interviews: see p. 120 for the details of this cross-validation procedure.

semantic burden of the child's message. They are what he is talking about. So far as we know, there is little or nothing unique in what can be talked about in English, in contrast to other languages. Plausibly, then, these latter measures are indices of the child's exploitation of universal aspects of language structure and content.

Column three shows the child's growth in MLU (mean number of morphemes per utterance). This is a composite measure, reflecting the contribution both of language-specific paradigmatic devices (e.g. tense and plural markers contribute to MLU) and language-general devices (e.g. obviously each verb in the utterance contributes to MLU). Thus inspection of Table 5.3 reveals that growth of child MLU grossly correlates with a measure of maternal speech just when a specific child measure (e.g. growth in auxiliary structure) correlates with a measure of maternal speech. Even so, none of the correlations with child MLU quite reaches statistical significance. Thus useful discussion turns on the more narrowly defined measures (columns one and two; columns four and five). We take it that the child MLU growth measure has no import independent of the various measures that contribute to it.<sup>5</sup>

As Table 5.3 shows, certain language-specific aspects of the child's speech seem to be influenced rather dramatically in their rate of growth by aspects of the mother's usage. The growth in mean number of elements in the child's verbal auxiliary yields a partial correlation with the mother's tendency to ask yes-no questions ( $r = 0.88$ ,  $p < 0.001$ ) and to expand ( $r = 0.51$ ,  $p < 0.08$ ), and a negative partial correlation with the mother's tendency to use imperatives ( $r = -0.55$ ,  $p < 0.05$ ). The child's growth rate for noun inflection also yields a partial correlation with the mother's tendency to employ deixis ( $r = 0.58$ ,  $p < 0.05$ ) and a near-significant negative partial correlation with the proportion of maternal imperatives ( $r = -0.52$ ,  $p < 0.08$ ).

In contrast, the measures of child language growth that we take to be indices of universal aspects of language structure and content are, so far as we can see in this limited study, insensitive to individual differences in maternal speech styles. The child's growth in the use of complex sentences (indexed as the number of noun-phrases and number of verb-phrases per utterance in Table 5.3) is unaffected by the aspects of Motherese examined here. None of these partial correlations comes anywhere near a probable non-chance effect. These phenomena of language use seem to be dependent on cognitive and linguistic maturity. While they are functions of the child's age, they are not related to specifiable features of the maternal environment.



These effects and non-effects of the environment on child language growth accord with many reports in the literature. Most centrally, there appears to be an early set of propositions, and some uniform surface-structure devices (mainly, word-order) for expressing the arguments of these propositions, among children learning a wide variety of languages (Slobin, 1968; Bloom, 1970; McNeill, 1966*a*; Brown, 1973; Edwards, 1973; Newport & Ashbrook, 1976). The same propositions and word-order devices seem to be used even by deaf children deprived of explicit linguistic models (Goldin-Meadow, 1975; Feldman, Goldin-Meadow & Gleitman, 1976). It is not surprising, then, that differences among mothers in speech style do not affect the child's growth along these dimensions. The obtained environment-dependent result for the growth of noun-phrase inflection and, particularly, auxiliary structure, again accords with related findings in the literature. For example Nelson and his colleagues (Nelson, Carskaddon & Bonvillian, 1973; Nelson, 1975) have reported selected effects on auxiliary growth (e.g. future and conditional tenses, negative questions) in a paradigm where expansions and recast sentences are specifically provided to the child learner.

Further support for the coherence of these findings comes from a source outside the usual domain of language acquisition studies, from a look at the evolution of languages of the world. Many linguistic studies reveal a changeable role of elements of the auxiliary structure in language design. Particularly relevant in this regard are pidgin languages (roughly, communication systems used for limited purposes between linguistic communities who speak different languages) and creoles (roughly, evolved pidgins, at the point when these come to be used in broad social settings and, in particular, acquire native speakers who do not know the parent languages). The study of pidgins and their creolization has generated much interest within linguistics in recent years (Labov, 1971*b*; Sankoff & Laberge, 1973). Apparently, pidgin languages are characterized by a sharp simplification of grammatical features. They use optional morphological devices to express time and aspect, and word-order devices almost exclusively to mark the grammatical relations (Slobin, 1975*a*). Elaborated auxiliary structure and inflectional devices appear rapidly during the process of creolization; evidently the rate of growth of such features during creolization vastly exceeds the rate of language change in an evolved language, even though in both cases the linguistic community is essentially monolingual at this point.

The relevance of such facts to issues in language acquisition has been discussed in a very important recent paper by Slobin (1975*a*):

various historically unrelated pidgins simplify grammatical features in similar ways, and these suggestively resemble the simplifications of early child syntax – the same inflectional devices and elaborated auxiliary structure are missing. A plausible inference from these facts is that there are universal principles of linguistic simplification that appear under specifiable conditions. Among these conditions may be the use of a language in restricted social settings and by non-native speakers (both conditions applying to pidgins) and the use of language by an immature novice (the condition applying to young children). If this account is essentially correct, then the inflectional and paradigmatic devices of mature English speech are not universal properties of human communication systems but, rather, are special language features that appear in certain environments and conditions of use. Then it is easier to understand why these features of syntax emerge developmentally in response to closely-specified environmental conditions (stateable maternal speech properties) more than do the universal language design features (which seem to emerge under diffuse environmental conditions).

Summarizing, many measures of child language growth are insensitive to differences in the speech styles of our subject mothers. Of course it is possible to suppose that these non-correlations reflect sameness among these mothers on dimensions relevant to the acquisition process. However, as we shall describe below, these mothers do vary along dimensions that have presumptive relevance to acquisition. For example, mothers do vary in their child-directed MLU, but this variance does not affect growth in the child's MLU as indexed by the partial correlations ( $r = 0.14$ ). We conclude, then, that a broad range of language skills develops under diffuse environmental conditions. These skills are, so far as we can see, just those that reflect universal properties of human communication systems. In contrast, certain structures that are uniquely rendered in the surface forms of English (elements of the auxiliary, the inflection of noun-phrases) are sensitive to delicate variations in mothers' style. In short, to the extent that Urdu and Tagalog and English are alike, differences among mothers do not yield differing growth rates in our subjects (accounting for the lack of correlations in columns four and five of Table 5.3); but where learning 'from the outside' must logically be the primary factor – where the language has special individual properties – maternal speech styles evidently do affect the rate of that learning (yielding the many significant correlations of columns one and two of Table 5.3).



## EFFECTIVE AND INEFFECTIVE ASPECTS OF MATERNAL SPEECH STYLE

We have described the aspects of the child's language that are closely influenced by the external model, as suggested by the effects in the columns of Table 5.3. We ask here what features of that model (which differences in input by mothers) have these selective effects. To do so, we return to Table 5.3, now considering the rows, which represent the various properties of Motherese. Here we simply state the findings. We reserve more general discussion for later when the findings for both child-effects and mother-effects are in.

Table 5.3 suggests that many properties of Motherese have no effect on language growth at all, not surprisingly, for it is already clear that Motherese is predominantly shaped for the local needs of communication. Thus the mother's MLU does not correlate with child growth rates (correlations range between 0.10 and 0.38). Her tendency to use the canonical declarative form is similarly ineffective (correlations between 0.01 and 0.25), as is the mean number of S-nodes in her sentences (her propositional complexity; correlations range between  $-0.05$  and 0.37). In sum, whether mothers speak in long sentences or short ones, restricted or wide-ranging sentence types, complex sentences or simpler ones — none of these plausible candidates for a teaching style have a discernible effect on the child's language growth during the six-month interval we investigated. To this extent, the picture that comes out of these results is one of a semi-autonomous unfolding of language capabilities in the child, rather than a fine sensitivity to specific syntactic features of the input model.

We acknowledge that these major non-effects have to be interpreted cautiously in light of the limitations of the procedure. First, since all of our subject mothers — and perhaps all mothers everywhere — speak Motherese, non-effects found here can only be said to exist within a narrow range of differences among mothers. Perhaps maternal simplifications are essential for normal acquisition but once some threshold of speech modulation is reached, further differences among mothers beyond this are not relevant; if this is the situation, our procedures could not discern this. Second, sheer frequency of differing usage across mothers may not be the correct variable to examine for growth effects. Third, the sample mothers (15 white middle class Americans) and the situation (four hours of conversation with a visiting psychologist) may give so unrepresentative a range of maternal speech styles that real and powerful effects of environmental

difference are not visible. However, if these non-effects of syntactic style are attributable to faulty or insufficient observation, we should expect to find no correlations at all between mothers and their children, or only accidental and incoherent ones. But as Table 5.3 shows, there are clear partial correlations between the child's growth and restricted syntax and discourse features of Motherese. We turn now to closer inspection of these findings.

The pattern of correlations between maternal speech and the growth of surface syntactic patterning in child speech reveals complex effects of how often mothers produce certain constructions, in conjunction with the particular fashion in which they are presented. For example, the growth of the verbal auxiliary in the child is uncorrelated with the absolute frequency of auxiliaries produced by the mother ( $r = 0.31$ ) but is correlated with her tendency to use auxiliaries in first utterance-position (as in yes-no questions, e.g. 'Can you kiss your elbow?',  $r = 0.88$ ,  $p < 0.001$ ). But the mother's use of auxiliaries in utterance-medial positions (as in wh- questions, e.g. 'Where *can* you sit?') is uncorrelated ( $r = -0.36$ ) with the child's auxiliary learning, and the mother's use of positive imperatives — which have no auxiliary — correlates negatively ( $r = -0.55$ ,  $p < 0.05$ ) with the child's auxiliary learning.

Related findings concern the effects of discourse features of Motherese. The use of deixis (e.g. 'Those are apples') correlates significantly with growth in noun-phrase inflections. The use of expansions yields a near-significant correlation with auxiliary growth ( $r = 0.51$ ,  $p < 0.08$ ). On a slightly different scoring (see footnote 5) partial-plus expansions show a much stronger relation to auxiliary growth ( $r = 0.75$ ,  $p < 0.01$ ). Self-repetition by the mother yields a negative partial correlation with both these child growth measures ( $r = -0.51$ ,  $p < 0.08$  with noun-phrase inflection, and  $r = -0.58$ ,  $p < 0.05$  with auxiliary structure). How can we explain these selective effects of Motherese on selected aspects of language learning? We try now to organize the findings in terms of the mechanics that may be at work in the child to produce them.

## IDEAL MOTHERESE: SOME HYPOTHESES

The basic position for which we will now argue is that the child is biased to listen selectively to utterance-initial items and to items presented in referentially obvious situations: the child acts as a filter through which the linguistic environment exerts its influence (Shipley *et al.*, 1969; Ervin-Tripp, 1973; Slobin, 1973a).



The frequency and types of mother's utterances, then, influence growth only to the extent that they pass through this filter, i.e. when they occur under presentation conditions to which the child selectively attends. Particulars of mothers' style thus interact with the child's processing biases for language, producing differential rates of acquisition; specifically, the mother helps by talking when the child's eye (either the mind's eye or the face's eye) is on the word or construction referred to.

### Maternal syntax and the processing bias

It has been demonstrated elsewhere (Shipley *et al.*, 1969) that children have their own ways of biasing their linguistic input. They pay special attention to the beginnings of utterances. If the beginning of an utterance is excessively unfamiliar, the child is unlikely to attend to the rest of this utterance. (Of course this bias must be imperfect, else the child would never learn anything he didn't know already.) If children are listening specially to sentence beginnings, it would appear likely that they would learn certain things faster if these were spotlighted in first position with some frequency.

A finding consistent with this hypothesis is that the growth of the verbal auxiliary is strongly correlated with the mother's tendency to use this in first position. In English, the auxiliary is so 'fronted' in certain kinds of questions ('Can you sing?') and in negative imperatives ('Don't sing'). But in declarative sentences, the auxiliary either appears medially ('You can sing') or does not appear at all ('You sang'). In *wh*-questions ('What can you sing?') the auxiliary is again medial, and in the positive imperative ('Sing!') it does not occur. As we have seen, growth of the verbal auxiliary is positively correlated with *yes-no* questions (utterance-initial auxiliary), negatively correlated with positive imperatives (auxiliary absent), and uncorrelated with declaratives and *wh*-questions (medial auxiliary). This pattern of results suggests that aspects of the linguistic environment exert their influence on the child through his pre-set bias to focus on certain aspects of incoming utterances, properties of their beginnings.

Summarizing Table 5.3 thus far: (1) only language-specific aspects of the child's growth are influenced by narrowly-prescribed features of the linguistic input, and hence the significant effects are all in columns one and two, none in columns four and five; and (2) only those characteristics of maternal syntax that fit the child's listening biases for learning these yield significant effects. These are the *yes-no* questions, which support the processing bias (listening to beginnings).

Declarative sentences which present auxiliaries medially have no such effect and finally, auxiliary-absent imperatives do not provide the appropriate data and hence are negatively correlated with the child's growth rate.

### Learning effects of the maternal discourse features

We now discuss the remaining effects in the rows of Table 5.3, which relate to discourse features of maternal speech style, primarily deixis and expansion. In earlier discussion (see 'The nature of Motherese') we asserted that these discourse features — and in fact much of the form and content of Motherese — can be described on the supposition that mother and child are mutually engaged in an attempt to communicate about the here-and-now, trying to get the local situation managed at the moment, rather than trying to make a frontal attack on the language acquisition problem. Bruner (1974/5) has recently presented and reviewed evidence that a similar communicative intent accounts quite naturally for interactions between mothers and even preverbal children: such postural-gestural interactions can be conceived as attempts by the communicative partners to single out and mutually focus attention on given objects and actions. Some relevant devices here are following the partner's line of regard, picking up and shaking the target object, etc. While, as Bruner points out, these activities do not explain how the child learns to refer or learns which linguistic or gestural entities refer to which objects and actions in the world, they do suggest that much preverbal communication is devoted to the infant and adult mutually 'indicating and differentiating the very limited set of objects with which they traffic'.

The same kind of intent — singling out and identifying the local referents in a communication situation — accounts quite naturally for aspects of speech from mother to infant. For example, Collis (1975) has shown that mothers tend to vocalize about an object primarily when their young child is looking at it (see also Bruner, 1974/5 for discussion). Surely this is a convenient tack to take in communicating successfully with a novice; but this same tack must surely be salutary to long-term language acquisition for it will help the child discover the conventional labels for identifiable referents. That mothers and young speaking children continue to engage in responsive looking, pointing and naming is a fact often cited in discussions of semantic development (Clark, 1974). The same intent to make mutually comprehensible reference seems to account naturally for why the mothers we have studied use linguistic deixis extensively



(16% of all mother-to-child utterances involve deixis). Notice that the use of linguistic deixis — just like pointing the finger — demands as a condition of appropriate use that the listener already be looking at the object being referred to or that the speaker make an accompanying gesture — such as pointing, or looking himself, which conventionally has the effect of moving the listener's gaze toward that object. Then when such an expression appears in our corpora, we can be quite confident that the child listener had its referent directly in view — it would be an odd mother indeed who would say 'That's a ball' when she saw her child looking at a rhinoceros.<sup>6</sup>

Then since children must somehow use properties of visible referents as clues to the meaning of words, we might hypothesize that those of our subject mothers who use deixis proportionally most often are making this *referent-matching strategy* the more consistently available to their children, with possible effects on learning: they are providing a verbal label just when the child's eye is on its referent. The children of such mothers might be expected to acquire aspects of nominal expressions most rapidly. We did find a partial correlation between growth in surface structural aspects of the child's noun-phrases and the frequency of maternal deixis (inflections per noun-phrase are correlated with deixis,  $r = 0.58$ ,  $p < 0.05$ , see Table 5.3). This finding suggests that the more the mother produces lexical items that are explicitly coincident with their referents, the more easily the child analyzes the constructions into which these items enter. But, rather surprisingly, we did not find a stable partial correlation between maternal deixis and the learning of the lexical items themselves (correlation between deixis and child vocabulary growth,  $r = -0.15$ ). While a significant correlation was found in the initial analysis of transcript segments, it did not survive the cross-validation procedures. This non-effect may simply reflect the roughness of our procedure for estimating vocabulary size. Or it may be a true finding: this is one among many instances that we have reported where variations among mothers yield correlations with surface features of child syntax (here, inflection) but not with content variables.

Certain further findings can similarly be accounted for on the view that referent-matching plays an important role in the acquisition of surface syntax. Recall that mothers use affirmative imperatives in different proportions: children whose mothers use these the most often acquire auxiliary elements slowest. We argued earlier that this is because affirmative imperatives lack the auxiliary. But it is also so that affirmative imperatives are poor constructions from which to learn the language from the point of view of reference-making. They rarely

map clearly onto the non-linguistic context: one says 'Throw me the ball' just when it is not being thrown and often when it isn't even in hand. Appropriately, then, the more frequently the mother produces imperatives, the more slowly the child grows not only in auxiliary structure but also in noun-phrase inflection (see Table 5.3).<sup>7</sup>

Another issue that we believe is related to the same strategy has to do with the mother's tendency to expand (imitate with addition or correction) the child's utterances. Is there an analogy to reference-matching here? The question is whether one can use a construction (e.g. an auxiliary) just when the child's attention is fixed on the mapping of that construction to its meaning. How can this be done? Neither syntactic forms nor the relations among them are visible in the world. But suppose that the mother often understands from the non-linguistic context some relation that the child is trying to express in the terms of his primitive syntax (see Bloom, 1970, for discussion of this 'rich interpretation' of the context of speech). Suppose, for example, the child utters the ambiguous sentence 'No eat!' under the following different circumstances: as he pushes away his food; as his sister greedily eats up his candy; or as a dog threatens to bite him. (These examples are broadly adapted from an incident in Maurice Sendak's (1967) linguistically and philosophically deep children's tale, *Higglety, Pigglety, Pop*) The obvious English interpretation might be 'I won't eat that rotten porridge!', 'Don't you eat my chocolates!' and 'Don't eat me up!'

Despite limited knowledge of English, the child's saying 'No eat!' in one of these contexts reveals — though not errorlessly — that such-and-such a notion, correctly expressed in English in such-and-such a way, is at that moment directly in the child's consciousness, in his mind's eye. If at that instant the mother provides an appropriate English form ('No, Shirley won't eat your chocolates, Harvey . . .') she effectively produces a construction when the child's attention is fixed on the notion that construction refers to in the language. This might ease the problem of mapping between conceptual relations and their syntactic reflexes in English (Cazden, 1965; Brown, Cazden, & Bellugi, 1968; Brown, 1973). And, as Table 5.3 shows, the more frequently the mother produces these expansions, the more quickly her child learns the surface forms of the verbal auxiliary.<sup>8</sup>

For completeness, it is fair to add that a great many hypotheses of other sorts might accommodate some of these findings. For example, maybe mothers who are polite and request action from their children, rather than commanding it, establish better human relations with their offspring. But wouldn't it be odd to suppose that, as a courtesy,



the children return the favor by producing complicated verbal auxiliaries for their proud mothers? At any rate, a number of such hypotheses have been reviewed, and none seems to us to account for these data overall as well as the one just described. But much more extensive work along these lines, which we now have underway, is necessary to solidify this general approach.

### The pseudo-effect of repetition on language growth

Earlier we reported many simple negative correlations between the child's age and linguistic stage and the mother's tendency to repeat herself. Such correlations, found in many previous studies, are often interpreted as suggesting that repetition aids language learning, either by providing drill (many exemplars, allowing rehearsal and efficient storage) or perhaps by allowing the child to compare a set of forms that keep meaning relatively constant (as in the typical repetition sequence 'Go get the duck — the duck — yes, get it — that's right — get the duck'). On this interpretation, as the child gets older and comes to know more of the language, the need for such drill diminishes, explaining the negative correlations. But notice that to account for the tremendous repetitiveness of mothers (23 % of all utterances involved some repetition) and for the simple correlations between maternal repetitions and child language sophistication, it is not necessary to invoke a teaching motive or function. It is sufficient to conclude that the younger and more linguistically naive the listener, the less likely he is to attend to, comprehend and obey the mother's initial utterance — so she repeats it. On this latter interpretation, repetition could hardly function to aid acquisition: if the child did not attend to the first rendition, then the second rendition would not be, for him, a repetition of just-previously stored information. (In fact, Newport (1976) showed that the child's tendency to respond to an utterance was unrelated to the serial position of that utterance in a repetition sequence, suggesting that its 'repeatedness' is irrelevant.)

To determine whether repetitions *influence* language growth, it is necessary to look at the partial correlations between maternal repetitions and child growth scores. Table 5.3 shows that maternal self-repetitions are negatively correlated with the child's growth rate both in auxiliary structure ( $r = -0.58, p < 0.05$ ) and noun inflection ( $r = -0.51, p < 0.08$ ). So at first glance there does seem to be an effect of repetition on language learning, but it is a puzzling effect indeed: if repetitions served the child's learning purposes, the

double-partial correlations should have been positive. Since these correlations are negative, to hold onto the claim that repetition is relevant to language learning, one would have to conclude that it *delays* acquisition, either by narrowing the child's data base or, perhaps, by boring him to tears.

Luckily no such procrustean arguments are necessary. It turns out that the apparent effect of repetition is a simple consequence of the fact that the mothers' repetitive utterances consist preponderantly of syntactic types that are themselves negatively correlated with language growth. Specifically, since mothers are most often repeating instructions to act, a substantial number of repetitions are imperatives. This is hardly surprising on a communicative, rather than didactic, interpretation of maternal speech: when polite requests are disregarded, peremptory commands are likely to follow. We have argued above that imperatives, by virtue of their surface forms and their non-transparent referents, are poor exemplars for language learners. In fact, if imperative repetitions are excluded from the analysis of repetitions, the significant correlations between repetition and language growth disappear (e.g.  $r = -0.27$  with growth in auxiliary structure); but if we remove the repetitive imperatives from the analysis of imperatives, the partial correlation between imperatives and growth scores remains ( $r = -0.60, p < 0.05$ ). In short, the apparent effect of repetition on language learning is an artifact of the individual sentence types of which the repetitions are composed. Despite the initial plausibility, then, of the idea that re-presentation of forms might aid the language learner, there is no such effect in our data.<sup>9</sup>

### A NOTE ON REINFORCEMENT

By what means does the mother have the effects she has on language growth? Generally, we have talked of the mother as an exemplar or model of language: what she says and when she says it matters to the child's learning, on some dimensions. But perhaps the mother can help further, essentially by red-pencilling the child's errors. Expansion is at least indirectly such a case, for here the mother provides the child with a 'corrected' model. There is another effect in our data which seems to be interpretable as a kind of feedback or reinforcement effect: the frequency with which the mother says 'Yes' or 'Mm-hmm' or even 'No' in response to the child's utterances correlates positively with the growth of vocabulary ( $r = 0.58, p < 0.05$ ), with the growth of verb inflections ( $r = 0.61, p < 0.05$ ) and with the



growth of auxiliaries ( $r = 0.53, p < 0.08$ ).<sup>10</sup> (This coding category is listed as *interjections* in Table 5.3) At first glance, this finding for interjections seems at variance with the report by Brown & Hanlon (1970) that mothers reinforce their children in terms of the truth value of their utterances, rather than in terms of syntactic niceties in these utterances. But there really is no paradox here. Our finding is not that mothers say 'mm-hmm' more often to well-formed sentences than to garbles — only that some mothers say 'mm-hmm' more than others, and that this influences the rate of language growth. It is plausible that mothers tend to respond with 'mm-hmms' more often when they understand what the child said (i.e. when he speaks in an English-like way) than when they do not. Such responses from mothers may constitute confirmatory evidence for a child trying to build some hypotheses about how to speak English effectively, so an 'mm-hmming' mother may be of use to the language learner.

But the question at issue here is whether such 'reinforcement', if that is what it is, can be an explanatory concept in describing the course and process of language acquisition. We have reported that many features of the child's language environment have no discernible effect on how his language grows; and many features of the child's speech grow in indifference to some variability in the environment. Very specific, very limited, structures in the child relate quite narrowly to aspects of the surround, and this relation is in turn mediated by pre-set strategies of listening and learning. This hardly denies that a little encouragement may be helpful. Surely, it is helpful. But no concept as broad and undifferentiated as encouragement (selective reinforcement) can get at exactly what is encourageable and in what ways: on how language is learned. Even if it could be shown that one was reinforced always and only for speaking grammatically, this would not explain — without begging the question — how it happens that generalization is always from old grammatical sentences to new grammatical sentences.

In answer to this more interesting question, we have considered some possible learning strategies in the child (e.g. listen to familiar beginnings; listen in the presence of identifiable referents). This does not commit us to the claim that language learning would take place without a cooperating mother (that you could learn English by watching television) or if that mother comprehended and applauded every garble the child uttered. We accept on the basis of our findings — as well as sanity — that a supportive and relevant environment will aid the language learner, but this does not suggest how language is learned.

## SUMMARY AND SOME CONCLUSIONS

Our studies of mothers' speech have some curious implications for theories of language acquisition. It has often been assumed that mothers speak to their children in the distorted and complex ways of adult speech. Given this assumption, it follows that the function relating acquisition and environment is loose — leading to the further assumption that the child must be richly and specifically pre-programmed for language acquisition. Once investigators noticed that the first assumption was partly false (that Motherese differs systematically from speech to adults), they made an unwarranted assumption in their turn. They took for granted that Motherese is a well-designed 'teaching language', tailored for the specific purpose of language acquisition. Indeed this may be so, for all we know, but not on the assumption that this learning corpus is a constructionally simple one. Motherese is syntactically complex on most obvious definitions. Whatever constructional simplifications occur in Motherese seem to arise for interactional reasons — as constraints on the kinds of things one talks about to children and gross constraints on psychological complexity in the ways one talks to them. Moreover, whatever syntactic simplifications occur are not finely tuned to the child's developing language skills. Recent language-acquisition proposals hypothesize that the language environment of the child becomes successively more complex in correspondence with the child's growing language skills, and thus may be at all times appropriate for an environmentally-dependent acquisition process. For example, Levelt (1975) writes 'the child is presented with grammatical strings from a miniature language, which is systematically expanded as the child's competence grows'. Our findings suggest instead that many features of the mother's speech change in accordance with the child's age, not his competence with constructional features of the language.

Thus the fact that mother's speech is different from adult-directed speech can give only small comfort to those who suppose the child's language learning to depend on very specific or finely modulated environmental support. However, any theory which requires only rough appropriateness of the environment to the needs of acquisition is consistent with these results. We have suggested in outline a position of this kind in which (1) the acquisition of universal aspects of language design proceeds in indifference to the details of varying individual environments, at least within the range of some gross syntactic simplifications (which would appear to occur necessarily in any world where mothers wish to communicate with their children), and (2) individual



differences in the linguistic environment, exemplified by the mother, exert their effects only on the acquisition of language-specific aspects of surface structure, and even then only through the listening biases of the child. We have suggested a processing-bias hypothesis and a referent-matching hypothesis as components of such a theory: to the extent that a mother makes syntax perspicuous for the child, underlining constructions by placing them in salient positions in surface structure, or by providing exemplars at the moment the child's attention is drawn to their referents (in the world or in the mind), the child acquires the appropriate formal devices more quickly.

Finally, it seems of some importance to fit these findings into the context of recent discussions of the acquisition of semantics and cognitive development. There has been a rather strong reaction in the developmental psycholinguistic literature against the bias of some linguists – Chomsky of course is the one most often cited – to concentrate attention on the acquisition of syntax rather than semantics, and to leave aside possibly related phenomena of cognitive development. Whether this is a fair construal of the acquisition problem for language by linguists is an exegetical matter, which we side-step. But clearly Chomsky (1965), Fodor (1966) and others have been perceived to take a strictly syntactic line when worrying about acquisition. This perception has provoked controversy. For example, Ervin-Tripp (1971) writes 'It is tragic to cut off from the domain of research the large field of cognitive relations which are found in early sentences . . . by assuming *a priori* that there are no problems in their acquisition.' Our findings suggest that these two kinds of concerns may be relevant to different and separable aspects of language growth: the conditions for the acquisition of cognitive–semantic relations (measured here only by the average number of nouns and verbs per utterance) and those for the acquisition of grammatical functions which elaborate those relations (here, auxiliary structure and noun inflections) seem different. We have nothing to say about how the child learns or develops with regard to the semantics of natural language. But we can say that, however this is done, it is accomplished with less close reliance on environmental linguistic support than is the acquisition of some properties of surface syntax. It is in this latter dimension that we find dramatic effects of an environmentally-dependent acquisition process – 'learning' in the traditional psychological sense of that word.

We have acknowledged in this discussion that our data collection and coding procedures were quite limited, and that the range of subjects and situations we investigated was rather narrow. But insofar as

these studies fit in with and contribute to prior investigations of language and its learning, the thrust of the findings is this: the child is biased to acquire information about his language in terms of narrowly prescribed processing strategies and preconceptions about the world that language could represent. Working within these biases and presuppositions, the mother has little latitude to teach her child about the nature of language; but she can at least improve his English.

## NOTES

1. In order to be able to use pronouns in this report, we have adopted the convention of calling mothers 'she' and children 'he'. This convention is violated only when we speak of our child subjects individually, for all of them were girls. We wish to thank Heidi Feldman, John Jonides, Dan Osherson, Marilyn Shatz and our mothers, for their valuable contributions to our thinking about maternal speech styles, and for significant help in interpreting the experiments reported here. Thanks are also due to Herb Clark for a very helpful discussion of this work. The research was carried out with the support of NIH grant No. 23505, the William T. Carter Foundation, the Spencer Foundation, Academic Senate Research Grants from the University of California at San Diego and US Public Health Service Grant MH-15828 to the Center for Human Information Processing. Suzanne Hale and Dianne Simpson are thanked for meticulous work in coding and analysis.
2. The discussion here centers on the mothers. Claims about the bias of children to respond by action to speech come from a variety of sources. As one simple demonstration, Shipley *et al.* (1969) showed that children of the ages under investigation here are as likely to throw a ball given that they touch it, when you say 'Ball!' as when you say 'Throw me the ball!' or even if, by experimental disingenuity, you say 'Gor ronta ball!' Balls are 'to throw'. Similarly, Shatz (1975) showed that young children tend overwhelmingly to respond to questions as action directives rather than as requests for information: although easy to 'set' for the action interpretation, they are hard to set for the information interpretation.
3. Analysis of free speech along this dimension has been carried out by Shatz, (1975), Shatz & Gelman (this volume), and Gelman & Shatz (1976). Our data-collection procedures did not allow analysis in these terms. For one thing, we did not videotape the sessions, so our inferences would be based on the restricted information from the sound recordings. In any case, Bloom's method requires a measure of painstaking observation and coding that we prefer to admire from afar.
4. One might well wonder how deixis is used in adult–adult speech. It is rare, but there are some reasonable show-and-tell contexts (e.g. 'This is our old dining-room suite; the expensive new chairs are out being cleaned'). In the experimental sessions, adult-directed deixis occurred only when the mother tried to identify for the experimenter some fuzzy speech-acts by the child, e.g., after the child said 'Mffwk', the mother said to the experimenter, 'That was "milk"'.
5. A correlation of 0.55 on these analyses is significant at the 0.05 level. We



treat correlations above 0.50 ( $p < 0.08$ ) as probably reflecting non-chance effects, and report them in the text. We do so for two reasons. First, as Table 5.3 shows, there is a major difference between language-specific and language-general ('universal') correlational outcomes. The language-general content variables never yield a whiff of significance (the largest  $r$  in the last two columns is 0.38, a number that is surely to be interpreted as a chance perturbation). In contrast, a number of the surface-syntax variables in the first two columns yield significant correlations. Near-significant misses ( $r$  in the low 50s,  $p$  between 0.06 and 0.08) also all fall in these columns, suggesting that they ought to be treated as more than chance differences from zero. Further, as Tables 5.1 and 5.2 show, we had to group and analyze our data in terms of a coding procedure that involved making some arguable decisions. For example, how to define 'expansion'? Clearly, if the mother says everything the child says and adds some more, that must be an expansion, on everyone's definition. But what if she says part of what the child says and then adds something new? For example, the child says 'Book table', and the mother responds 'On the table'. Is this 'partial-plus' imitation functionally equivalent to a full expansion? We could hardly be sure, and so we analyzed the data in more than one way. 'Partial-plus' expansions, looked at alone, in fact yield a double-partial correlation of 0.75 ( $p < 0.01$ ) with child's auxiliary growth. Since this is so, and since this measure could well be the right one, it seemed unrealistic to dismiss the result for a closely related measure (all expansions, see Table 5.3) just when it missed the 0.05 level of statistical significance by two or three decimal points. Anyhow, that has been our decision, over all measures. We nevertheless acknowledge that there is difficulty in evaluating the weaker obtained correlations. Cross-validations of these findings, now underway, will obviously help resolve these questions.

6. We have reported 16% deixis in Motherese. The proportion, over mothers, is really much larger than this if we include such locutions as 'See the baby?', 'Look at that spot on your dress', etc. But the variety of expressions — and hence the coding problems — which can have deictic interpretation is enormous. We settled for claiming deixis only when the usual demonstratives (*here, this, there, etc.*) occurred appropriately in the utterance. Thus we have estimated deixis in Motherese very conservatively.

7. The original analysis, on transcript segments, examined negative imperatives separately from affirmative imperatives. This separate analysis of the two types of imperatives has not yet been completed on the entire transcripts and is therefore not reported in the text. Note, however, that negative imperatives differ from their affirmative counterparts in two relevant ways. First, they do have a sentence-initial auxiliary, though it is always the same one (*don't*). Second, while affirmative imperatives rarely map clearly onto the non-linguistic context, negative imperatives almost always do. That is, one says 'Eat your peas' when they are not being eaten and 'Don't eat your peas' when they are. Appropriately, then, the frequency of negative imperatives in mothers' speech in the segment analyses did not predict the delayed growth in either noun or auxiliary structure that the frequency of affirmative imperatives did.

8. The relations between expansion and language growth have been studied before (see, e.g. Cazden, 1965; Feldman, 1971) and generally the results have been negative. But Cazden studied effects of a visiting experimenter performing expansions with the child over a series of sessions. It may be over-optimistic to suppose that these sometime interactions could substitute for the mother's

prevailing speech style. Where mothers' spontaneous expansions have been directly observed, and where measures of the child's growth in relation to this were selective, a relationship is discernible. Keith Nelson (1973, and personal communication) has collected data on both experimentally controlled and naturally occurring expansions. He has found results like those reported here: the more frequent the predicate expansions, the more rapidly children acquire auxiliary structure.

9. It is necessary to add here that a similar argument might be suggested to account for the apparent effect of *expansions* on language growth. But in this case, analysis of expansions in terms of their syntactic features does not mitigate the double-partial correlations: most expansions are declarative sentences; expansions yield a partial correlation with language growth; but declarative sentences yield no such partial correlation (see Table 5.3).

10. The effects reported here did not appear in the original analysis of transcript segments. Perhaps, since this effect is one that does not 'go through' our first cross-validation procedure (segment analysis compared to whole-transcript analysis), it ought to be ignored until such time as it reappears under further cross-validation. It is our own bias to hold this issue in abeyance, awaiting further work. Yet the concept of reinforcement has at least a surface persuasiveness and a long theoretical history in the psychological discussion of language learning. It therefore seems unreasonable to suppress a finding which on the face of it might be an effect of reinforcement, as that notion is generally conceived. We acknowledge in the discussion that follows that such an effect probably exists — but that it accounts for language learning only if the issues of 'what is reinforced' and 'what is a reinforcer' are begged.