

# Mothers' Speech Adjustments and Child Language Learning: Some Methodological Considerations.\*

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## ABSTRACT

This paper reviews some of the methodological and conceptual problems confronted in the study of the role of adult-child interactions in the process of language acquisition. Consideration is given to the basic methodological approach of the sixties and early seventies, to recent findings of 'input' studies and to data from parent-child conversations collected in the author's laboratory. The implications of the finding that the child itself plays a major role in influencing the nature of the input and parental interactions are discussed, and conclusions drawn as to the nature of some of the complexities involved in investigating cause and effect in language acquisition.

Specifically, it is argued that much of the inconsistency in the results of investigations of cause and effect has been produced by failure to take into account the effects of individual children's linguistic abilities and communicative behaviours on the form and quality of parental conversations with them. The evidence suggests that most features of maternal speech that have been considered facilitative in the acquisition process are correlated with the development of attributes of the child as a conversational partner.

## OVERVIEW OF THE PROBLEM

In child language research, we have made considerable advances in characterizing the functions and structures children acquire at various stages of development. However, we still know virtually nothing about the role of the environment in the learning of these functions and structures. As yet, we are unable to explain why development proceeds at all, nor why it proceeds the way it does. It has become obvious that these issues will be elucidated by a

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Careful examination of both the linguistic and the non-linguistic milieu of the developing child.

However, the rare studies that have tried directly to determine the relationship between specific forms of parent-child interaction and the developmental process have arrived at inconsistent, ambiguous and generally inconclusive results. The thrust of this paper is to review the recent research on this problem and then suggest some methodological considerations, arising from data on parent-child conversations, which may account for some of the confusion and may help to clarify some of the complex issues involved.

The problem of discovering how the young child goes about learning the grammatical structure of language has often been likened to that of discovering the contents of a sealed, opaque engineering box (Chomsky 1965 & 1972; McNeill 1966 & 1970; and Fodor 1966, among others). In order to determine its internal structure and its manner of operation, it is necessary to compare 'what is known about the input to this device with what is known about its output' (Fodor 1966; 107-8). Some form of this simple methodological principle has generally served to support strong nativistic assertions about the intricacy of the language acquisition device that was deemed necessary to explain the seeming ease with which children learn the grammar of language. Fodor (1966) has made the argument quite explicit:

If the linguistic information in the child's data closely approximates the linguistic information he must master, we may assume that the role of intrinsic structure is relatively insignificant. Conversely, if the linguistic information at which the child arrives is only indirectly and abstractly related to the data provided by the child's exposure to adult speech, we shall have to suppose that the child's intrinsic structure is correspondingly complex. (107)

Most nativists have rested the case for complexity and specificity in the child's predispositions for language learning on the second side of this characterization of the problem. As Chomsky (1965) formulated the rules described in transformational grammar, they operate on abstract base structures in such a way that the surface forms of utterances need have no simple relation to the base sentence forms.

Children, therefore, could not be exposed to what they have to learn directly; nor could they arrive at correct inferences by external guidance because no speaker knows enough of the rules to teach or display them. It was further assumed that the primary linguistic input to the language-learning child could be considered to be like the casual speech of adults. Thus, McNeill (1966 & 1970) claimed that much of the child's input was in the form of overheard fragments of adult speech, and Fodor (1966), that we could assume that the child's linguistic environment was not substantially different from the adult's.

Chomsky (1965, 1972 & 1976) further characterized the input: as it was subject to the performance restrictions of casual conversation, the speech the child heard would be rapid, disfluent, and full of false starts, stammerings and revisions. The sentences would often be incomplete, disrupted or uttered "contrary to linguistic rule." It, therefore, would form only a "degraded" or "degenerate" source of input that could in no way support the rapid construction of a complex grammar. Hence, it was logically necessary to postulate that the child approached the acquisition task innately endowed with a linguistic pre-program which was set to operate on minimal exposure to speech data.

However, as Ervin-Tripp (1971) pointed out, the main weakness of this argument is that it is based on the premise that if we cannot explain how something is learned within traditional learning theory frameworks, it is unlearnable and, therefore, must be just "innately acquired." Other options, for instance, to discard or revise either the linguistic or the learning theory, or simply to challenge the characterization of the input, were not considered.

The first assumption to be successfully challenged was that of a "degenerate" input. In the early seventies, several analyses were published that actually investigated the nature of mothers' speech to children, on the grounds that in Western societies, at least, it is maternal speech that is the child's primary source of linguistic data (e.g., Drach 1969; Snow 1972a; Broen 1972; and Cross, 1973). Such studies showed that the structure, content, fluency and discourse character of mothers' speech to language-learning children is far from unsystematic and irrelevant to the learning process. The authors

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argued that mothers address their children in a highly specialized speech register, using a small and simplified subset of the utterances they use in adult-directed conversations.

More detailed investigations have ensued, many of them directly comparing adult-directed speech with child-directed speech, and all finding that on most measures the parameters barely overlap.

For nativists who were impressed by cross-linguistic research which suggests that, at general levels, developmental patterns are uniform across different languages, cultures and sub-cultures, there is replicated research to show that similar modifications are made by mothers in rural African villages, in black urban communities in the United States, in several European languages, as well as in middle class, English-speaking cultures. Similarly replicated research has shown that fathers, female non-mothers, older siblings, teachers and day-care attendants of both sexes make similar adjustments. Moreover, remarkably little difference has been found between mothers from extremes of socio-economic circumstances within Western cultures. Thus, it seems to be the case that it is impossible to exchange meanings with a language-learning child without major adjustment. **Contrary to the nativist argument, the ease of language acquisition may be as much attributable to the assistance provided by the child's characteristic input as it is to the detailed pre-structure of his/her innate linguistic endowment.** This conclusion is warranted in terms of precisely the same kind of 'black-box' argument that has been used to defend the Innateness Hypothesis.

Even so, while there is little wrong in principle with the 'black-box' analogy — whether used to support nativist or more interactionist conceptualizations of the learning process — it can be shown that the methodological principle derived from it is misleadingly simplistic. It will be argued here that, when applied to interactions in real time between parents and developing children, it neglects much of the inherent complexity of the input-output relationship. For this reason, it is inadequate to guide investigation of the respective roles of the child's mental structure and the organization of the linguistic input. As Chomsky (1972 & 1976) has indicated, it essentially involves the simplifying assumption that the acquisition process is somehow instantaneous. However, it is obvious even to the most casual observer

that children, unlike Fodor's black-box, do not acquire language instantaneously; they change throughout the course of development. Once it is admitted that the developmental process is a gradual one, extending over several years of rapid growth, then clearly, several complicating questions arise. Chomsky himself has recognized this complication:

Are the child's learning capacities different at different stages of development? Does he handle evidence differently at these various stages? Are there well-defined stages, marked by different modes of learning, or do "learning strategies" mature more or less continuously, or do they remain constant . . . or do they decay? (Chomsky 1976; 121)

The recent literature on prelinguistic and linguistic development suggests an answer to one, at least, of Chomsky's questions. Several reviewers have concluded that the evidence now in suggests that there may indeed be defined stages in language development — mainly on the grounds that radically different linguistic devices are required to describe early development. De Villiers and de Villiers (1977) provide a fairly representative comment from this viewpoint:

Our conclusion is thus: at a certain point in development the child's semantic encodings are liberated from serving particular performative functions. At a later point, syntactic forms gain independence from particular semantic roles. The motivation for these reorganizations is something of a mystery (p.37).

But, since we must also be concerned with the input to the acquisition process, we must add to Chomsky's questions about the possibility for changes in the child, a further complicating question about the relation between the input and the child's developing capacities: Does the input — the child's data and 'evidence' — itself change as parents adapt to changes in the child's linguistic capacities and learning strategies? Thus, it can be seen that once one adopts a realistic developmental perspective, the language acquisition process should be viewed as a vastly complicated interaction between several components: the changing nature of the child's linguistic knowledge,

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the changing nature of the child's learning strategies, and the possibly changing nature of the parent-child interactions and the linguistic input parents provide. For these reasons, the 'black-box' approach is misleadingly simplistic.

Little is known about the way any of these aspects of the interaction change over the course of development. Even less is understood about how changes in each component influence change in the others and, what is more important in the study of language development, how these interactions may eventually influence the acquisition process as a whole. However, as Ervin-Tripp (1971) has argued, the simplest procedure is to start with an investigation of the input because, unlike the structure of the child's mind, it does not have to be inferred; it is available to direct observation and manipulation.

This paper reports an attempt to make such a start by examining the relationship between the child's level of linguistic ability and changes in the input provided by parents' speech over a relatively narrow slice of development. The aim was to examine mothers' speech adjustments to a sample of children for whom they were the primary caretakers and, therefore, the primary source of linguistic input. Specifically, the question addressed concerns the extent to which mothers 'tailor' their speech style to the child's linguistic ability. Earlier work investigating this question (e.g., Cross 1973, 1975, 1977a & 1978) has shown that some aspects of mothers' speech are not only adjusted generally to language-learning children in comparison with adult-directed speech, but also that some adjustments are made quite continuously and sensitively to small increments in the child's developmental progress. It has become possible to argue, as some researchers have done (e.g., Pfuderer 1969; Snow 1972a; Levelt 1975; and Cross 1975) that, throughout the primary acquisition period, the input may remain finely tuned to the child's linguistic requirements. However, so far, no conclusive evidence for this possibility has been published. Scant attention has been paid to the fineness of mothers' speech adjustments, and none at all to the methodological problems such adjustments pose for research into the role of mothers' speech in acquisition.

The present paper specifically investigates the hypothesis that many of the features that have been found to distinguish mothers'

child-directed speech from adult-directed speech are significantly correlated with the child's linguistic maturity, and can therefore be studied reliably only under research conditions that adequately control for the child's level of development. This problem is highly relevant for future research into the influence of various aspects of the input to the language-learning process. Several attempts to manipulate the incidence of specific maternal speech features in children's inputs have failed to demonstrate conclusively that any feature is effective in promoting linguistic development, and there has been a great deal of inconsistency in findings (see Cross 1978, for a review of the relevant studies).

In the light of the preceding discussion, it seems likely that this inconsistency may be due to the use of research designs which neglect to control for the influence of the child's linguistic ability on the mother's speech adjustments, as well as overlooking the possibility that, in natural situations, individual children may play large roles in actively eliciting specific types of maternal speech behavior by their own communicative behaviors in parent-child exchanges.

## THE PRESENT INVESTIGATIONS

A series of investigations undertaken by the author, which used observational and recorded data on natural mother-child conversations at home, have strongly suggested that just this kind of two-way interaction influences the nature and incidence of a large variety of discourse and syntactic aspects of mothers' speech adjustments to their two-year-old children.

### Subjects and Data

The subjects for most of these studies have been 20 middle-class English-speaking mothers and their children who spanned an age range of approximately 16 months, between one-and-a-half to three years. The data were transcripts of hour-long samples of their spontaneous conversations while they played with a small set of toys in the child's usual play-room at home. The transcripts were made by the investigator and two speech pathologists from audio- and

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video-tapes of these play sessions, backed up by on-the-spot contextual notes and, where necessary, both phonetic and interpreted versions of utterances. A detailed code of the mothers' speech has been constructed which classifies more than 80 features.

### Mothers' Speech Variables

Most of the mothers' speech features, and their operational definitions, were taken from replicated studies of mothers' speech — although, as some important aspects (such as its referential basis, tutorial functions and conversational structure) have not received attention previously, some new categories were included. The left-hand column of Table 1 contains the descriptive title of each feature, under the headings of the following major aspects of mothers' speech that they were designed to measure:

1. *Discourse Features.* These were features which coded the semantic relations between utterances — either between the mother's own utterances or between the child's and mother's. Under this heading were included the percentages of utterances that were imitations, expansions or semantic extensions of the child's preceding utterance, and those utterances which were semantically-new or unrelated to the ongoing theme of discourse. Also included were several types of maternal self-repetitions, and any utterances, or sequence of utterances, that were cross-classified as expansions or extensions and self-repetitions.
2. *Syntactic Features.* These included measures of the length, surface and deep complexity, the syntactic well-formedness or integrity of mothers' utterances, as well as several major sentence types and the proportions of pronouns and noun-phrases per utterance.
3. *Referential Field.* The mothers' utterances were also coded for referential immediacy — that is, for the extent to which they were about the child's ongoing activity or events he was engaged in, the mother's activities or to other people (such as ourselves), objects or happenings in the immediate recording situation, or were non-immediate in the sense of having



references that were spatially or temporally removed from the situation.

4. *Conversational Features.* Several more general measures of conversational style were included – rate of speech, ratio of mother to child utterances and proportion of maternal utterances per conversational turn. Additionally, several measures of disruption in the conversation were included – the amount of over-talking and the proportions of null responses and non-informative turns.
5. *Tutorial Features.* Also included were a number of explicit tutorial functions mothers appeared to use to elicit or correct language in conversations with their children. Among these were attentionals, quiz questions, sentence completion items, occasional questions, corrections and requests for clarification.<sup>1</sup>

### The Child Variables

The columns in Table 1 contain simple correlation coefficients between each of the mothers' speech features (across rows) and ten measures of their children's maturity (down the columns). The first four were measures of the children's comprehension of aspects of language.

1. *Language Reception Test (LRT).* This was a measure of the child's ability to demonstrate comprehension of 100 sentences of varying complexity by means of imitation, pointing to appropriate pictures, manipulating toys or puppets, answering questions or responding appropriately to directives and requests for actions.<sup>2</sup>
2. *Syntax Comprehension Test (SCT).* This was a sub-test of the Language Reception Test which was comprised of only those items which specifically tested the child's comprehension of linguistic rules, syntactic and morphological. The items in this section were drawn from experimental investigations in the literature which tested minimal syntactic and morphological contrasts in ways small children seemed to be able to follow.

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3. *Dialogue Comprehension Test (DCT)*. The Dialogue Comprehension Test was another sub-test of the LRT, which comprised imitation items, simple questions, requests for actions and directions to manipulate toys. These items were administered by the mother and differed from the SCT in that there was no systematic variation of the syntactic construction of the items and no control over how the child interpreted the utterances (i.e., over the cues the child used in comprehension). It was assumed that most of the items in this sub-test assessed the kind of receptive processing the child may use in normal dialogue interactions with parents.
4. *Receptive Vocabulary Test (PPVT)*. The Peabody Picture Vocabulary Test was administered to obtain a measure of the children's receptive vocabularies. Only raw scores for this test were used, since it was intended that absolute comparisons across children be made regardless of their ages.

The next five child-development measures assessed aspects of their spontaneous speech.

5. *Mean Length of Utterance (MLU)*. This measure was calculated according to Brown's (1973) recommendations, with the exception that samples of 300 sequential utterances were used for each child.
6. *Developmental Sentence Score (DSS)*. The Developmental Sentence Score was calculated as recommended by Lee (1974). This was a developmentally-weighted measure of child grammatical maturity in spontaneous speech based on Brown's (1973) grammatical analysis of longitudinal data. It was used in the present study as a more 'pure' measure of syntactic maturity than MLU.
7. *Extended Production Measure (EPM)*. This measure was included to overcome objections to the use of MLU as a measure of complexity in child speech as noted in Cross (1975 & 1977a) and Crystal (1974). The length of the ten per cent of longest utterances was calculated in a total sample of 500 utterances available for each child.

8. *Child Comprehensibility (COMP)*. The comprehensibility of child speech was used as a measure of success in spontaneous communication by simply counting the number of utterances in each child's sample that were unintelligible (in part or whole) or whose meaning was obviously unclear to either the mother or the transcribers (see Cross 1977a, for a rationale for the use of this measure and further details of operational definition).
9. *Expressive Vocabulary (TTR)*. As a measure of the relative lexical diversity in children's spontaneous speech, the type-token was calculated for the first and last 100 words in each child's speech sample.
10. *Chronological Age (AGE)*. The children's chronological ages were included and measured in months and weeks.

## RESULTS AND DISCUSSION

As the coefficients in Table 1 show, 62 of the 83 maternal speech measures, particularly the discourse features, were significantly correlated with at least one measure of the children's levels of development. This finding is taken as supporting the hypothesis that mothers adjust many aspects of their speech closely in tune with small differences in their children's ages and linguistic maturity. The mothers in this study provided a particularly clear picture of linguistic tailoring, if it is recalled that their children represented a relatively narrow range of age and ability (i.e., there were only 16 months difference in ages and less than two morphemes difference in their mean lengths of utterance). It is likely that a larger sample and a wider range of linguistic ability would have produced more significant correlations, since many already hover around the moderately correlated level (i.e., a further 19 were above .30 for at least one child variable). In fact, only 12 maternal measures were correlated at less than .30 with at least one child development measure.

As it was, 33 out of the 83 features were significantly and most highly correlated with one or other of the children's receptive measures, 12 with the spontaneous speech measures and seven with age. A comparison of the correlations across the child variables

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Table 1  
Simple Zero-order Correlation Matrix between Child Development Variables and Maternal Speech Measures

Mothers' Speech	Child Development Measures									
Discourse Features	LRT	SCT	DCT	PPVT	MLU	DSS	DPM	COMP	TTR	AGE
Interpretations										
Imitations	181	218	115	258	194	405†	184	111	146	167
Partial Expansions	-684**	-493*	-772**	-590**	-587**	-554*	-587**	-684**	-590**	-339
Complete Expansions	-813**	-691**	-821**	-787**	-680**	-692**	-801**	-606**	-662**	-581**
Elaborated Expansions	-552*	-563**	-490*	-449*	-433†	-346	-461*	-399†	-343	-442†
Total Interpretations	-754**	-614**	-792**	-668**	-625**	-560*	-692**	-639**	-642**	-475*
Semantic Extensions										
NP Extensions	-321	-225	-371	-282	-235	-067	-287	-298	-334	-377
Pronoun Extensions	418†	322	408†	446*	318	332	330	-208	290	254
Predicate Extensions	176	028	299	353	358	321	327	359	262	-083
Total Extensions	312	243	286	380†	262	364	245	106	170	077
Discourse Combinations										
Interpretations + Tot. Exts.	-271	-219	-319	-159	-218	-094	-279	-342	-320	-252
Interpretations + NP Exts.	-673**	-538*	-722**	-597**	-542*	-428†	-613**	-585**	-600**	-441†
Expansions x Repetitions	-774**	-600**	-812**	-752**	-593**	-622**	-679**	-758**	-564**	-645**
Extensions x Repetitions	-603**	-499*	-613**	-586**	-473*	-372	-599**	-587**	-387†	-536*
Total Synergistic Sequences	-692**	-557*	-713**	-672**	-537*	-483*	-652**	-675**	-471*	-599**
										(Continued .....

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Table 1 (cont'd)

Discourse (cont'd)	LRT	SCT	DCT	PPVT	MLU	DSS	EPM	COMP	TTR	AGE
Non-contingent Responses										
Unique Responses	724**	539*	737**	587**	547*	521*	563**	539*	388*	659**
Thematic Responses	-023	-091	095	040	-066	189	-039	208	282	021
Total Non-contingent Responses	369	224	457*	340	245	407†	273	429†	400†	365
Maternal Repetitions										
Exact Repetitions	-548*	-408†	-515*	-583**	-382†	-217	-465*	-351	-451*	-441†
Partial Repetitions	-807**	-702**	-778**	-779**	-734**	-438†	-801**	-523*	-369	-689**
Transformed Repetitions	-616**	-225	-113	-168	-153	041	-148	-268	-378†	-321
Semantic Repetitions	-668**	-453*	-669**	-641**	-666**	-400†	-639**	-446*	-167	-328
Total Sequential Repetitions	-788**	-660**	-747**	-777**	-717**	-367	-750**	-589**	-147	-657**
Non-sequential Repetitions	-623**	-620**	-552*	-614**	-493*	-553*	-592**	-529*	-369	-335
Total Repetitions	-825**	-738**	-763**	-812**	-714**	-510*	-785**	-646**	-275	-599**
Referential Features										
Child Activities	-584**	-392†	-649**	-515*	-460*	-400†	-504*	-677**	-372	-284
Mother's Activities	088	-039	186	195	-068	117	018	-169	062	153
Child + Mother Activities	-442†	-341	-451*	-330	-351	-299	-398	-505*	-181	-169
Other Immediate References	247	113	349	183	300	289	243	504*	307	085
Total Immediate References	-422†	-354	-397†	-299	-393†	-044	-393†	-297	-252	-200
Non-Immediate References	692**	558*	685**	591**	568**	662**	627**	416†	442†	503

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Table 1 (cont'd)

Syntactic Features	LRT	SCT	DCT	PPVT	MLU	DSS	EPM	COMP	TTR	AGE
Complexity Measures										
Mother MLU	780**	652**	730**	736**	593**	508*	685**	475*	343	545*
Diff. C-M MLU	-439†	-360	-480*	-465*	-728**	-312	-620**	-297.	-072	-209
Long Utterances	694**	608**	629**	649**	520*	456*	620**	471*	235	436†
Single Words	-485*	-418†	-426†	-341	-331	-095	-445*	-357	-483*	-226
Propositional Complexity	444*	214	568*	489*	271	487*	381	619**	406†	168
Preverb Complexity	316	326	226	167	062	312	176	075	212	427†
Isolated Phrases	160	-034	308	465*	286	330	263	228	066	270
Grammaticality Measures										
Incomplete Sentences	-334	-099	-464*	-276	-277	-040	-299	-332	-368	-212
Complete Sentences	042	123	146	135	-067	-171	037	142	148	076
Grammatical Errors	492*	449*	450*	338	311	226	304	542*	104	467*
Indeterminate Utterances	-174	-255	-090	-080	-136	-144	-211	-123	-126	-298
Run-on Sentences	514*	377	529*	481*	381†	262	429†	395†	308	579**
Speech Style Measures										
Speech Volume	-015	-070	069	004	-099	106	036	-081	323	053
Speech Rate	-008	119	-056	135	-024	-023	066	067	-008	-001
Lexical Diversity	671**	599**	666**	575**	639**	475*	654**	397†	324	595**
Disfluent Utterances	520*	476*	506*	427†	318	528*	361	430†	327	572**
Unintelligible Utterances	435†	525*	324	293	090	265	229	340	276	632**
Total Degraded Utterances	567**	576**	503*	434†	255	452*	342	476*	332	678**

(Continued ....)

Table 1 (cont'd)

Syntax (cont'd)	LRT	SCT	DCT	PPVT	MLU	DSS	EPM	COMP	TTR	AGE
Sentence Constructions										
Total Questions	-502*	-483*	-478*	-450*	-473*	-190	-490*	-401†	-170	-523*
Wh Questions	-479*	-491*	-450*	-574**	-480*	-438†	-426†	-459*	157	-502*
Yes/No Questions	-228	-186	-226	-091	-189	-121	-255	-128	-340	-234
Aux-fronted Questions	000	-099	051	059	-040	176	-084	-018	126	-141
Tag Questions	-163	-226	-130	033	-057	-023	-036	-187	-359	114
Rising Intonation Ques.	-264	-072	-326	-209	-238	062	-311	-087	-414†	-281
Total Declaratives	027	010	047	142	136	-162	049	-065	-307	090
Deictic Statements	-089	-242	075	029	017	260	-056	007	227	-068
Other Declaratives	055	081	027	141	139	-248	068	-071	-391†	114
Total Imperatives	010	-222	183	051	050	088	-087	272	-021	028
Full Imperatives	-194	-336	-035	-125	-106	-185	-129	191	126	-344
'You' Deleted Imperatives	092	-166	265	126	137	181	-036	261	-053	134
Negative Imperatives	044	084	057	028	-059	169	018	207	430†	-366
Nouns	-396†	-265	-435†	-270	-427†	-003	-413†	-314	-529*	-059
Pronouns	552*	396†	543*	444*	241	321	330	505*	416†	448*
Conversational Features										
Mother Utts./Turn.	327	229	352	321	238	198	321	091	304	492*
Null Responses	403†	270	422†	397†	257	156	335	281	382†	383†
Back Channels	207	216	168	226	133	098	245	195	453*	116
Token Responses	196	216	154	223	118	172	219	151	419†	104

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Table 1 (cont'd)

Conversational (cont'd)	LRT	SCT	DCT	PPVT	MLU	DSS	EFM	COMP	TTR	AGE
Total Non-inform. Resps.	361	280	354	368	227	183	325	258	447*	306
Simultaneous Talk	-609**	-511*	-606**	-742**	-559*	-512*	-685**	-574**	-545*	-312
Child Over-talk	-446*	-391†	-418†	-465*	-349	-272	-455*	-397†	-572**	-219
Mother Over-talk	-518*	-420†	-535*	-692**	-522*	-516*	-620**	-507*	-328	-273
Tutorial Features										
Quiz Questions	-825**	-733**	-765**	-821**	-700**	-530*	-780**	-642**	-323	-639**
'What's that?'	-573**	-559*	-560*	-677**	-548*	-604**	-588**	-623**	-076	-382
'Where's NP?'	-713**	-450*	-785**	-737**	-697**	-456*	-704**	-655**	-302	-545*
Completions	209	224	208	272	323	290	410†	036	037	449*
Prods	-214	-124	-260	-389†	-058	-248	-244	-554*	-327	041
Clarifications	-279	-154	-328	-350	-227	-103	-248	-535*	-249	-072
Occasional Questions	-044	-046	-035	-060	-028	012	-066	-144	035	-315
Corrections	098	171	065	091	239	206	211	002	-165	223
Self-answers	130	093	082	181	020	110	065	210	161	264
Yes-No Replies	-094	-046	-097	-063	-093	-292	-166	-228	-245	-076
Attentionals	-556*	-483*	-483*	-461*	-545*	-300	-549*	-255	-221	-272
Stock Expressions	-539*	-413†	-589**	-537*	-431†	-417†	-498*	-550*	-225	-494*

† p < .05, 1tt

\* p < .05, 2tt

\*\* p < .01, 2tt



suggests further that the mothers were generally adjusting more sensitively to the children's linguistic abilities than to their ages. Of the 62 features that were significantly correlated with one or other of the child measures, 45 were more highly correlated with one of the linguistic measures than with age. Step-wise multiple regression analyses and first and third order partial correlations for these features supported this conclusion. When linguistic levels were controlled, only two of the 62 features were still moderately correlated with age. This is strong support for the conclusion that the mothers were primarily making their speech adjustments to increments in their children's linguistic abilities — or at least to their communicative proficiency in comprehension and expression.

The results of this correlational study have important ramifications for the design of future studies of the role of input, as well as their more obvious implications for the theory of the way mothers' speech adjustments may assist and shape development. However, as this latter aspect has been dealt with in previous publications (Cross 1975, 1977a & 1978), only the methodological implications will be discussed here.

The results highlight the problems posed by the two-way cause and effect interaction that applies in any dyadic relationship. In this case it is obvious that there is a complex inter-relationship between aspects of the child's linguistic abilities and the mother's speech, which may in turn affect aspects of his/her development, and so on. The question of what is the cause in this process is almost impossible to disentangle from what caused the cause. For many features examined in this study, it seems that any positive effect of a mother's speech features in producing linguistic growth in the child will also have the effect of altering the feature itself and may do so within a relatively short developmental span. This interaction will present obvious problems to researchers who use correlational follow-up designs (such as Brown, Cazden & Bellugi 1969 and Newport, Gleitman & Gleitman 1977) to determine whether aspects of the input are related to growth in the child assessed some months later. Any attempt to order samples of mothers on their tendency to use this or that feature will depend, to a large extent, on the child's initial linguistic level and will change over the intervening period,

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during which correlations between the children's linguistic gains and their mothers' initial adjustments are investigated. This type of study, therefore, does not control for the **changes** in maternal speech which may then differentially influence the child's development.

Moreover, the results indicate that many of the discourse features (as well as some others) are highly correlated with the child's development, often decreasing rapidly as the child matures. Such a trend is evident for all expansion-type responses, most forms of maternal self-repetitions, several question forms and tutorial devices, and suggests that mothers may not find it necessary to make adjustments of this kind after the child has reached the relatively early point in development represented by the most developed children in this sample.

In other analyses, the author has attempted to find explanations for the strength of these correlations (Cross 1975 & 1977a). The results of these studies showed that expansions and semantic extensions are significantly associated with the maturity of the child's preceding utterance: relatively well-formed child utterances elicited semantic extensions or semantically-new utterances in reply, and telegraphic utterances elicited expansions or other interpretive responses. Self-repetitions, on the other hand, were associated with the child's receptive immaturity. Most repetitions were frequently a maternal response to the child's failure to respond to the mother's original utterance or, at least, to some sign that the child had not completely understood it. These findings help to explain both the strength and the negative direction of the correlations. They suggest that such features are 'cued in' by the child's immature communicative performance. Improvement in these abilities will eventually obviate the mother's need to employ them. On this reasoning, it would be unlikely that any beneficial effects of these features would be observable later in the developmental process. It has been argued elsewhere (Cross 1975) that the evidence of several recent studies, which used children of different ages, suggests that, over a wider slice of development, some of the mothers' discourse adjustments (e.g., expansions and questions) show a curvilinear relation to development; at first, they appear to increase with linguistic advances, and then they gradually decline as the need for them disappears.

Thus, different sets of speech features may be facilitative at different stages of development. This suggests a stage-related hypothesis of the effects of at least some features, with stage possibly being a much shorter period than has been usual in child language study.

There is a less obvious implication of these correlations. They mean that many features are present in the mothers' speech in their highest or lowest proportions when the children are least mature. However, it is often claimed that this is the stage when children will progress most rapidly in terms of many linguistic measures. Thus, naturalistic follow-up studies run a great risk of confusing the rapid developmental rates of immature children with the effects of extreme concentrations of several speech features in their inputs. Merely by choosing to investigate different initial developmental stages, researchers will obtain different results for the effects of parent speech.

The finding that the strength of some of these correlations is attributable to the child's immature communicative behavior is borne out by a study by Snow (1972b). She found that mothers who were asked to tape-record instructions for their children in their absence did not make as detailed adjustments as they did when they instructed them face to face. Thus, it does seem that the child plays an active role in influencing the quality of his input. The character and maturity of his/her communicative and conversational skills may quite directly shape the incidence of several potentially facilitative features in the input. This hypothesis is given further support by a more recent finding (Cross 1977b) that older, language-delayed children, matched with children in the present sample on several criteria (including linguistic level) receive fewer expansions, more exact repetitions and perhaps, more importantly, a much lower rate of verbal interaction altogether from their mothers. However, these same mothers responded to their normal, younger two-year-olds in much the same ways as the present mothers. An examination of the data suggested that it is the language-delayed child's own failure to initiate conversational interactions with his mother that may be responsible for the paucity of facilitative interchanges in his/her input.

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In future research, then, it will be necessary to build quite strict controls into experiments designed to assess the effect of mothers' speech variables. Ideally, the solution seems to be to select only children of precisely the same level of communicative and linguistic ability before undertaking experimental manipulations or naturalistic investigations of variation in the input, and to examine its effects stage by stage. But, because of the fineness of the mothers' tailoring to very small differences and the rapidity of child development, the equating of children must be precise and will necessitate a time-consuming large-scale screening process to obtain even small samples. Therefore, perhaps it would be better to recommend a compromise — that the range of abilities in child samples be restricted as far as possible. This step would at least reduce the risk of confounding the influence of the child on the mother's speech with the effect of her speech adjustments on the child's development.

However, experimental studies will run into further difficulties. The finding that the child's spontaneous communicative behavior is instrumental in shaping the mother's responses seems to indicate that, despite the risks, it may be preferable to continue to use the method of exploiting natural variation in maternal sensitivity to cues from this source, rather than to prematurely isolate input variables in experimental procedures. Where the effects of such naturally-occurring variation are being assessed, more precision in control could be obtained by constructing research designs that permit the matching of groups of children within samples for initial stages of linguistic development. In this way, correlational follow-up studies could be used more confidently to determine the effect of variation in input features on subsequent child development, without confounding the effects of such development on the mothers' adjustments. Of course, it will require another research step to ascertain the role of the child itself in influencing the mother and, therefore, indirectly influencing his/her own development.

Most, if not all, previous studies of the effects of adult speech on child language development have neglected one or other of these methodological considerations, and this may go a long way towards explaining the inconsistency and inconclusiveness of their results. The results of the present study suggest that much of the confusion may

be resolved by detailed explorations of the relationships between stage of development, the child's communicative behavior, and the adult's responsiveness in adapting his/her speech and conversation styles to these factors.

## NOTES

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- 1. Details of the complete code used in recent analyses can be obtained from the author at the Department of Psychology, University of Melbourne, Parkville, 3052, Australia.
- 2. Further details of this test are provided in Cross 1975 & 1977a, or may be obtained from the author.

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