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MATERNAL SPEECH TO NORMAL AND DOWN'S SYNDROME CHILDREN MATCHED FOR MEAN LENGTH OF UTTERANCE

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One man may have some special knowledge at first hand about the character of a river or a spring, who otherwise knows only what everyone else knows. Yet, to give currency to this shred of information he will undertake to write on the whole science of physics. From this fault many great troubles spring.

Michel Eyquem, Seigneur de Montaigne

Essais.

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This dissertation reports a comparative investigation into the maternal linguistic environment of normal and Down's syndrome children. The research stemmed out of an awareness of the several conceptual and methodological problems that exist in this area of research and from a will to gather new informations and help solving some of these problems.

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INTRODUCTION

Statement of the problem

Interest has arisen recently in the nature of the linguistic environment within which children develop linguistic competence. A number of studies have shown that language addressed to normal children is characterized by phonological, morphological, syntactical and semantical features that render it simpler, more regular and easier to process than language addressed to adults.

Intriguingly, in the area of mental retardation, a few studies have suggested that the linguistic environment of retarded children may be different from that of normal children. In some cases, recommendations have been made to work toward modifying the linguistic environment of retarded children. The studies have compared mothers' speech to normal and retarded children matched for chronological age. These normal and retarded children were usually very different in language ability and, therefore, they were not likely to be conveying the same kind of message, particularly from a structural point of view, to the adult interlocutor in the verbal exchange. As the latter is, by definition, an interpersonal process, it can be assumed that differences in children's speech are capable of

affecting the speech of the adult interlocutor. None of the previous studies have controlled for a possible confounding between type of children and level of language development. Therefore, these studies have never really been in a position to answer the question they were asking. It is clear that before one concludes that the linguistic environment of normal and retarded language learning children is different and proposes steps to remedy to this situation, comparisons should be made of the linguistic environment of normal and retarded children matched for level of language development. The purpose of the present study was to implement such a control.

Review and Discussion of the Literature

The literature on the environmental aspects of language development in relation to mental retardation is rich in a small but important body of research. Curiously, the interpretations made by the authors of their results appear to have arbitrarily privileged one of at least two possible points of view. In the following, a report of the data and the interpretations offered by previous investigators will be presented. Then, an alternative explanation for the same data will be offered, along with some supportive literature for this alternative explanation. Finally, a way to submit the two positions to an empirical test will be presented.

Siegel (1963a) studied the verbal behavior of two adults,

a 44-year-old housewife and a 22-year-old male college senior, assembled in dyadic play sessions with male or female institutionalized retarded children of approximately ten years of age. The children varied in verbal ability (as assessed by the Parson Language Sample and the Templin-Darley Screening Test of Articulation). The play sessions lasted for 15 minutes and were tape recorded. Results indicated that the adults used more words and more questions but lower mean length of response (MLR) when assembled with children classified as "low" in verbal level. However none of the differences was statistically significant. A measure of conversational exchanges, the number of times one utterance by one of the participants in the session was followed or interrupted by an utterance of the other person, revealed that significantly more of these exchanges took place when adults were assembled with children classified as "high" in verbal ability. Siegel further noted that the adults' MLR in his study were considerably lower than those reported by Templin (1957) for normal eight-year-olds. On this basis, Siegel asked himself whether the low MLR values for adults in the study were more related to the research procedure used than to a possible "general depression of adult verbal behavior in interpersonal contacts with retarded children" (p. 38).

In a second study (Siegel & Harkins, 1963), 21 male college students each met one high verbal and one low verbal child in a tutorial and free situation. The children were 42 male

residents of a State hospital whose chronological ages (CA) ranged from 7 to 15 years. Results indicated that with children higher in verbal ability, adults used more responses (i.e., more vocal response units), greater MLR and higher type-token ratio (TTR, i.e., the ratio obtained by dividing the number of different words by the total number of words sampled). More questions were posed to low level children but the difference was not significant. More words were used by adults with high level children in the tutorial condition but the reverse trend was observed in the free condition. None of these differences was significant. In terms of other situational differences, significantly fewer questions were asked and more responses were made during the tutorial condition than during the free condition. Adults also used significantly more words, higher MLR and lower TTR in the tutorial condition. It must be noted, however, that the effects of condition and order were confounded since the tutorial condition always preceded the free condition. In discussing their results, Siegel and Harkins speculated that while it might have been proper for the adults to modify their speech appropriately to the verbal characteristics of the children, it might also be the case that these modifications were "reflective of linguistic deprivation which the retarded child suffered earlier at home" (p. 45).

In a third study (Siegel, 1963b), ten female college students met individually for 15 minutes with 20 high verbal and

20 low verbal retarded girls from a State hospital. The children aged between 13 and 17 years. Two situations were used. In the interview or information seeking condition, the adults were provided with a list of suggested topics for conversation and instructed to interview the children. In the clinical condition, they were encouraged to use only a few questions and to allow the child to direct the conversation as much as possible. Adults were found to use more words, greater MLR and higher TTR in both conditions with children higher in verbal ability. More responses were made and more questions were asked of high verbal children than of low level children in the interview condition but the reverse trend was observed in the clinical condition. In terms of situational differences, only on two measures (number of questions and TTR) did the adults assigned to the clinical condition differ significantly from those in the interview condition. Siegel concluded that the findings of this study supported those of Siegel and Harkins (1963).

In a fourth study, Siegel (1963c) controlled for the effect on the adults' verbal behavior of labels "high" and "low" in verbal ability randomly given to an homogeneous sample of severely language impaired institutionalized retarded without regard to actual verbal level of the children. The adults were 20 housewives with a mean age of 37 years. The children were 40 male and female residents of a State hospital with a mean age of approximately 10 years. The effects on adult verbal

behavior of arbitrarily labeling the children were investigated in both a tutorial and a free situation. Each condition lasted for 5 minutes. The measures of adult behavior were word, response, and question counts and TTR. On the four measures, there were significant differences between the tutorial and the free situation. However, there were no marked nor significant differences in adult verbal behavior on the basis of the labels assigned. Siegel noted further that the adult verbal behaviors in this study were similar to the adult verbal behaviors to low level children in the Siegel and Harkins study. This was interpreted as an indication that the actual verbal level of the children as assessed by the Parsons Language Sample was a more powerful variable in influencing adult behavior than the labels given to the children.

Siegel summarized and commented upon his data in another paper (Siegel, 1967). He therein reiterated his suggestion that the kind of spontaneous speech modifications adults appear to make to retarded children discrepant in verbal ability may "serve to maintain rather than to enhance the children's poor communication skills" (p. 114).

Spradlin and Rosenberg (1964) observed the verbal behavior of 12 male and female college students assembled with 48 institutionalized mentally retarded children characterized in advance as high or low in verbal ability on a standardized test devised by Spradlin. The children's CA's ranged from 6 to 16 years.

Each adult was asked to interact verbally with one child at a time for 1/2 hour. The measures of adult behavior were TTR, total number of questions and binary proportion (i.e., ratio of binary--or Yes or No questions--to sum of binary and multiple--or WH--questions). Results confirmed those of Siegel in similar studies in that adults assembled with low level children had a significantly lower average TTR than those assembled with high level children. However, measures of the number and type of questions did not show any significant difference between high and low level children. In discussing their results, Spradlin and Rosenberg acknowledged as plausible the suggestion that certain simplifications in the speech of adults interacting with retarded children are detrimental to the language development of the children. They also seemed to be sensitive to the question that the language level of the children cannot be completely disregarded.

More recent studies have compared the maternal linguistic environment of normal and mentally retarded children.

Marshall, Hegrenes, and Goldstein (1973) observed a sample of 20 mentally retarded children and 20 nonretarded children matched for CA in a 15-minute play situation with their mothers in a laboratory setting. The retarded children ranged from 3 to 5 years in CA and from 13 to 67 in intellectual quotient (IQ) with an average IQ of 48.55. The families of the retarded and nonretarded children were described respectively as having

middle-class and upper-middle class status. The tape recordings were analyzed using Skinner's classification of verbal operants (Skinner, 1957). The verbal operants were classified into four categories: mand, tact, intraverbal, and echoic. Tacts included naming, labelling or describing as verbal responses to a stimulus. Mands included demanding, commanding, requesting, and asking verbal behaviors. Intraverbals were defined as those verbal responses that are under the control of verbal stimuli but have no point-to-point correspondence with them. Echoic responses were defined as those repetitions of a response made by another person when there is a point-to-point correspondence between the verbal stimulus presented by the first person and the verbal response of the second speaker. Nonretarded and retarded children were found to differ with regard to verbal operants. Tacts, mands and intraverbals were significantly more frequent and echoics significantly less frequent in the speech of the nonretarded than in the speech of the retarded children. The mothers of retarded children used more echoics and mands but fewer tacts and intraverbals than the mothers of normal children. However, only the difference in mands was significant ($p < .001$). On the whole, mothers of retarded children had significantly greater total frequencies of use of verbal operants. The authors also contrasted the patterns of usage of each verbal operant in the two groups of children and in the two groups of mothers. The orders of verbal operant from highest to lowest

frequency were tacting, intraverbal, manding and echoic for the two groups of children and manding, tacting, intraverbal and echoic for the two groups of mothers.

Buium, Rynders, and Turnure (1974a) studied the early maternal linguistic environment of five 24-month-old normal and six 24-month-old Down's syndrome children in a play situation and in two teaching situations (table setting) in a laboratory setting. No duration was reported for the play condition. The two teaching conditions lasted 2 minutes each. The children's families were from a middle class socioeconomic background. The speech of the mothers was tape recorded and analyzed according to 21 parameters related to grammatical complexity and structure of utterances, vocabulary diversity and speech productivity. No information was reported on the speech of the children. The authors summarized the significant differences observed in the following way: "The Down's syndrome children were exposed to (a) a higher number of utterances yet a lower mean length of utterances; (b) a higher number of sentences, yet a lower mean length of sentences; (c) a higher frequency of grammatically incomplete sentences, imperative sentences, and single word responses. On the other hand, they were exposed to a lower frequency of indefinite pronouns, conjunctions, WH type questions, and the grammatical forms that are associated with Levels 3 and 4 of the main verb classification (i.e., a modified version of Lee and Canter's Developmental Sentence Scoring Procedure, 1971,--

addition mine--): present and past tense markers; irregular past forms; copula and auxiliary am, are, was, were; can, will, may + verb; obligatory do + verb; and emphatic do + verb" (pp. 56-57). Other differences going in the same direction but not significantly so were in frequency of interrogative reversals (i.e., Yes-No inverted questions), personal pronouns and TTR that all were higher in the speech of mothers of normal children and in frequency of raised intonation questions that was lower in the speech of mothers of Down's syndrome children. The authors did not report any analysis of the Conditions x Population interaction effects that may have existed as suggested by a close examination of the mean frequencies of the different linguistic parameters in the three situations. Also the authors did not report on the order in which the three conditions were given to the subjects. In the hypothesis that the play situation was actually followed by the two teaching conditions for all the subjects (which is the order adopted by the authors in reporting their data), a possible order effect or a Condition x Population x Order interaction effect might be suspected as all the significant differences between means were found in the two teaching situations and as more differences reached statistical significance in the second table-setting than in the first table-setting situation.

The authors interpreted their results as showing that the linguistic environment of language-learning Down's syndrome

children is different (stress mine) from that of normal children, and, therefore "is worthy of careful consideration in any attempt to understand their language acquisition process" (p. 57). They did not specify, however, what they meant by the term "different" with respect, for example, to the type of matching (matching on CA) performed on the two groups of children as a basis for the study. I will return to this question later in the chapter.

Kogan, Wimberger, and Bobbitt (1969) studied the verbal and nonverbal interaction patterns of six mentally retarded children and ten normal children and their mothers in a behavior-observation laboratory. Only the data on verbal interaction will be reported here. The retarded children were three boys and three girls aged from 3 to 7 years and ranging in IQ from 29 to 70. Their families ranged from category I to category IV on the Hollingshead Two-Factor Index of Social Position (Hollingshead, 1957). The normal children were five girls and give boys, 4 and 5 years of age, whose families were classified as belonging to social class Categories I and II. Thus, they were not perfectly matched with the retarded group on the socio-economic-class variable allowing for a possible confounding between type of children and cultural level in the results of the study. Each mother-child pair was observed and their interactions recorded for 36 minutes on each of two occasions. They were given standardized selections of toys and told that they might play

with anything they wanted to play with. From the somewhat informal report of the authors it appears that 22 percent of the vocalizations of the retarded children were unintelligible versus only 2 percent for the normal children. The second and third most frequent kinds of interaction used by the retarded children were expressive exclamations and brief factual answers to questions. Retarded children assumed a "low status" role in the conversational exchange via nonverbal compliance, by echoing words that their mothers had said and by asking for information. In contrast, normal children assumed low status role twice as often as did the retarded children. Moreover, they did this in a different way, by asking questions, requesting help or guidance and expressing ideas tentatively.

Mothers of retardates asked questions for which they supplied the answer or to which they knew the answer more often than the comparison mothers. They also solicited leadership on the part of the child less often than the comparison mothers. Given specific orders and telling the child what to do ranked second in order of absolute frequency of types of interactive verbal behavior on the part of the mothers of retarded children. This type of interaction occurred half as often and ranked only number five for the mothers of normal children. This observation certainly supports Marshall et al.'s report of a higher incidence of manding behavior and Buium et al.'s report of a higher incidence of imperative sentences in the speech of mothers of re-

tarded children than in the speech of mothers of normal children of corresponding CA's. Finally, the two most frequent types of verbal interaction among the mothers of normal children were statement of agreement with or acknowledgment of the child's activity and statement of their own thoughts and ideas in connection with the child's activity. In contrast, these types of interaction ranked only number 6 and 7 for the mothers of retarded children.

In summary, according to the studies reviewed above there is a possibility that mentally retarded children and adolescents are exposed to less adequate models from which to start or to continue learning the structural principles of the language.

Despite the interest of the studies reviewed, it is fair to mention, however, that the evidence accumulated so far in favor of the above conclusion is not overwhelmingly impressive. The studies by Siegel, and Siegel and Harkins clearly show that verbal communication is an interpersonal process in which the formal as well as the content aspects of the speech of one interlocutor are partially under the control of the other interlocutor's speech. As they did not use any normal comparison group, the Siegel, and Siegel and Harkins studies certainly fail to show, except indirectly (for example, in Siegel, 1963a, the comparison between measures of adults' speech and Templin's data on normal eight-year-olds' speech) that this phenomenon is specific to the communication process between normal adults and retarded children

or, in other words, that this phenomenon is not regularly found in the communication between adults and normal children when the difference in level of language ability between the interlocutors is important. Failure to establish this point prevents any demonstration that the retarded are typically exposed to restricted linguistic models. The same remarks apply to the investigation conducted by Spradlin and Rosenberg.

Marshall et al., Kogan et al., and Buium et al. have reported higher frequencies of manding or giving specific orders to the children in the speech of mothers of retarded children while failing at the same time to obtain or to report information on the children's relative compliance with the tasks and adaptation to the laboratory setting. It might have been the case, one could argue, that relatively less mature children like the retarded children, when compared to their CA-matched normal peers, proved less manageable during the time of the study and, consequently, obliged their mothers to use more controlling, hence linguistically simpler, speech.

Buium et al. reported other significant differences than just a difference in the number of imperative sentences. However, several of the differences reported could still be accounted for in terms of the necessity for the mothers of Down's syndrome children to resort to more and more controlling speech with the time elapsing in the experience. Indeed, a type of speech that rates higher in absolute number of utterances

and sentences, in number of incomplete sentences, single-word responses, personal pronouns and TTR, and lower in mean length of utterance and sentence, number of indefinite pronouns and conjunctions, as reported by Buium et al., is particularly adapted to a direct controlling function. One remembers that, in the Buium et al. study, no significant difference in the speech of the two groups of mothers was found in the play situation whereas seven significant differences (on 21 linguistic parameters investigated) were found in the first teaching situation and nine significant differences in the second teaching situation. Assuming that, in this study, the play situation was actually followed by the two teaching conditions, an explanation of at least part of the results in terms of an increased necessity for the mothers of retarded children to resort progressively to more monitoring speech in order to keep the children under control and cooperative cannot be rejected on the basis of the data available. In other words, a possible alternative explanation would state that at least part of the results reported might have been due to a set of interaction effects between order and repetition of conditions and type of children rather than just to a difference in maternal speech to normal and retarded children. Still another possible alternative explanation is that the differences observed in the play situation by Buium et al., and favoring the speech of mothers to normal children, would have been significant had the investigators

used a larger number of subjects in each group (only five normal and six Down's syndrome subjects and their respective mothers participated in the study), or had they based their statistical analysis on a larger number of observations (only 100 randomly selected utterances were analyzed for each mother-child pair in computing several of the linguistic parameters; the number of utterances analyzed for computing the other parameters was not reported).

But even supposing that new and more refined investigations would come to support and expand the findings of the studies reviewed above, it is still not at all clear why mothers of retarded children or adults interacting with retarded children should not simplify their speech according to the language level of their retarded interlocutors.

The unexpressed belief of the authors whose research I have reviewed above appears to be that mothers of retarded children and adults should not simplify their speech according to the language level of their retarded interlocutors, because these speech modifications are potentially detrimental to language development in the retarded. This belief itself is based on two assumptions. First, adult linguistic input to retarded children, modified according to the language level of the children, is truly different from adult input to normal children; which leads us to question the procedure of matching children on CA with respect to the problem under discussion. Second, a more

simplified input--when "simplified" is defined in terms of a comparison with the input to which CA-matched normal children are exposed--is necessarily less favorable to language development than a less simplified type of input. This second assumption, in turn, presupposes that an answer has been given to the question of what constitutes appropriate input for language development. These two assumptions will be discussed further later in the chapter.

Conversely, there are at least two reasons why adults may have to simplify their speech to retarded children. First, it is known that retarded children, particularly moderately and severely retarded children, are markedly delayed in almost all and every aspect of language development (cf., Rondal, 1975, for a review of this literature). Therefore, at corresponding CA's, retarded children will not, by far, talk in the same way and convey similar types of messages (from a structural point of view) to the interlocutor as normally developing children. For example, it is known that most noninstitutionalized Down's syndrome children do not start talking at all before two years CA and do not start combining two words in utterances before three or four years CA (Lenneberg, Nichols, and Rosenberger, 1964; Fisher, Share, and Koch, 1964; Strazzula, 1953; Zisk and Bialer, 1967; Share, 1975). The same thing is true of moderately and severely mentally retarded children other than Down's syndrome children (Karlin and Strazzula, 1952). At similar

ages, normal children are producing sentences sometimes as long as ten or twelve words (cf. Brown, 1973, for example), and have often begun exploring, sometimes very successfully, the intricacies of the English auxiliary system, just to take one example. Looking back on the Buium et al. study, it seems likely that, on the one side, several mothers were assembled with practically nonverbal or early one-word-stage Down's syndrome children while, on the other side, other mothers were assembled with talkative normal children already at the two-word stage of language development. In such a situation, it is hardly surprising that maternal speech to the two groups of children was found to differ.

Second, there is little doubt that among the body of implicit rules followed by mature speakers in order to maximize communication efficiency, must figure a rule requiring one interlocutor to set his message at a formal and content level close to what he knows of the other interlocutor's level of code mastery and referential knowledge. Such a strategy is ascribable to what Hymes (1972) has called "communicative competence." The use of such a strategy has been well documented in recent years in the literature on parental speech and language acquisition in normal children. A now respectable number of studies have shown that mothers' speech to normal language-learning children is simplified in every respect: phonological, morphological, lexical, syntactical, and semantic structural (Brown and Bellugi, 1964;

Slobin, 1969; Erwin-Trip, 1971; Snow, 1972; Broen, 1972; Nelson, 1973; Philips, 1973; Berko, 1973; Baldwin and Baldwin, 1973; Fraser and Roberts, 1975; Holzman, 1974; Moerk, 1974; Ling and Ling, 1974; Glanzer and Dodd, 1975; Lord, 1975; Longhurst and Stepanich, 1975; Seitz and Stewart, 1975). Mothers' speech to young children is also lower in rate of dysfluencies (Broen, 1972; Fraser and Roberts, 1975) and contains sentences that are well marked by pauses (Broen, 1972; Dale, 1974).

Very importantly, mothers' speech changes in every respect as the children's linguistic capabilities progressively develop (Broen, 1972; Snow, 1972; Philips, 1973; Baldwin and Baldwin, 1973; Nelson, 1973; Fraser and Roberts, 1973; Moerk, 1974, 1975; Glanzer and Dodd, 1975; Lord, 1975; Longhurst and Stepanich, 1975; Seitz and Stewart, 1975). One way in which mothers alter speech to children is by reducing grammatical complexity as reflected in a reduced mean length of utterance (MLU). All investigators have found marked and most often significant differences in mothers' MLU as a function of the age of the children interacted with, although there is a good deal of variation reported as shown in Table 1. Among the extraneous variables that come to mind for explaining such a variation are differences between the studies in the way of computing MLU (using words or morphemes, the latter leading to higher MLU estimates), differences in setting (home versus laboratory setting), and differences in context of activity (free--or structured--play situation, teach-

Table 1

Summary of Current Literature on MLU in Verbal Interaction Between Mothers and Their Normal Language-Learning Children

Investigator(s)	Number of mother-child pairs	Average children's CA in months	Average MLU		Basis for computing MLU	Setting	Context
			Children	Mothers			
Philips (1973)[a]	10	8		3.56	W	L	FP
Longhurst & Stepanich[a] (1975)	12	12		3.69		L	FP
Nelson (1973)	18	13	1.00	3.24	M	H	SP
Fraser & Roberts (1973)[a]	8	18		5.0	W	L	SP
				5.5			ST
Philips (1973)[a]	10	18		3.47	W	L	FP
Glanzer & Dodd (1975)	6	22	1.46	3.53	M	H	FP
Seitz & Stewart (1975)	9	23	1.37	3.62	W	L	FP
Rondal[b]	7	23	1.27	4.24	M	H	FP

Note. Key: W: Words; M: Morphemes; L: Laboratory; H: Home; FP: Free play; SP: Structured play; ST: Storytelling.

[a]Children's MLU not reported.

[b]Present study (only the MLU's of normal children and their mothers are reported).

Table 1 (continued)

Summary of Current Literature on MLU in Verbal Interaction Between Mothers and Their Normal Language-Learning Children

Investigator(s)	Number of mother-child pairs	Average children's CA in months	Average MLU		Basis for computing MLU	Setting	Context
			Children	Mothers			
Snow (1972)[a]	12	24		6.60	W	L	ST, TA[c]
Longhurst & Stepanich[a] (1975)	12	24		3.85	W	L	FP
Nelson (1973)	18	24	1.90	4.03	M	H	FP
Glanzer & Dodd (1975)	6	25	2.21	4.03	M	H	FP
Rondal[b]	7	27	1.96	4.64	M	H	FP
Philips (1973)[a]	10	28		4.01	W	L	FP
Glanzer & Dodd (1975)	6	29	2.95	4.24	M	H	FP
Rondal[b]	7	30	2.88	4.84	M	H	FP

Note. Key: W: Words; M: Morphemes; L: Laboratory; H: Home; FP: Free play; ST: Story-telling; TA: Teaching activity.

[a]Children's MLU not reported.

[b]Present study (only the MLU's of normal children and their mothers are reported).

[c]MLU scores were pooled by Snow for the two tasks.

Table 1 (continued)

Summary of Current Literature on MLU in Verbal Interaction Between Mothers and Their Normal Language-Learning Children

Investigator(s)	Number of mother-child pairs	Average children's CA in months	Average MLU		Basis for computing MLU	Setting	Context
			Children	Mothers			
Baldwin & Baldwin (1973)	20	30	2.97	4.67	W	L	FP
Fraser & Roberts (1973)[a]	8	30		6.4	W	L	SP
				9.0			ST
Longhurst & Stepanich[a] (1975)	12	36		4.70	W	L	FP
Fraser & Roberts (1973)[a]	8	48		7.0	W	L	SP
				9.0			ST
Seitz & Stewart (1975)	9	56	3.84	5.24	W	L	FP
Fraser & Roberts (1973)[a]	8	72		7.5	W	L	SP
				8.8			ST
Snow (1972)[a]	12	120		9.63	W	L	ST, TA[b]

Note. Key: W: Words; L: Laboratory; H: Home; FP: Free play; SP: Structured play; ST: Storytelling; TA: Teaching activity.

[a]Children's MLU not reported.

[b]MLU scores were pooled by Snow for the two tasks.

ing situation, storytelling).

It is not known until what children's chronological age or linguistic level (as the two variables are confounded in normal language development) mothers continue to modify their speech when addressing the children. Broen (1972) observed significant differences in maternal speech to their 21-month and 60-month old children (the ages are mean ages), in rate of speech (more words per minute to the older children), percent of words in dysfluencies (less words in dysfluencies to the younger children), and TTR (higher TTR to the older children). With the younger children pause location almost always marked sentence boundary, whereas, in speech to the older children, approximatively 90% of the pauses followed sentences (or single words used as sentences). Broen also compared mothers' speech to their older children with mothers' speech to the investigator. She reported that the latter had a higher rate, contained a good deal more words in dysfluencies, and had a higher TTR. Moreover, in talking with the adult, only approximatively 50% of the pauses used by the mothers marked a sentence boundary. On this basis, it is reasonable to make the hypothesis that continual simplifications are present in maternal speech, at least until the children are five years and probably older. In order to test this hypothesis, it would be necessary, however, to control for the differences in situational context between mothers' speech to children and to adults. For example, in Broen's study mothers

engaged in free play and in storytelling with the children but they conversed with the investigator. Such differences in situational context may, and probably do, affect the speech and language parameters.

Blount (1971; 1972) made a study of child-directed speech in Kenyan Luo adults and analyzed similar and unpublished data obtained by Kernan for one Samoan family. It appeared that the Samoan and Luo parents and relatives also tailored their speech to language-learning children with regard to words used, number of morphemes per utterance, syntactic structures used and semantic distinctions expressed. Similar observations were reported by Omar (1973) for Egyptian Arabic and, with particular attention to phonological and lexical modifications in infant and children directed speech, by Kelmar (1964) for Marathi and by Ferguson (1964) for Syrian Arabic, Marathi, Commanche and Gilyak. This indicates that parental modification of speech addressed to language-learning children is not likely to be a phenomenon restricted to the Occidental cultures.

A few additional findings are of great interest in this literature. Philips (1973), and Fraser and Roberts (1975) found practically no difference in mothers' speech to girls and boys at the same ages. Interestingly, actual mothers proved only slightly superior to nonmothers at modifying their speech when addressing young children (Snow, 1972). Similarly, Sachs, Brown, and Salerno (1972) found that male and female college students

spontaneously simplified their speech in a significant way when addressing a 22-month old child listener rather than an adult although they did not know the listeners and were inexperienced in talking with children. Sachs et al. suggested that adults do not need to "learn" how to talk to children, but that they "know" how to talk in a way that helps the child. This may be true but it also seems (and there is no contradiction between the two findings) that the modifications in adult speech are contingent to a certain extent upon the reactions of the children who are being addressed. Indeed, Snow (1972) found that modifications in mothers' speech were more marked, i.e., maternal speech was simpler, in the presence rather than in the absence of the child. Children after four years of age have been observed to modify their speech in several respects when addressing babies or younger siblings (Weeks, 1971; Shatz and Gelman, 1973; Garvey and BenDebba, 1974; Berko, 1973; Waterhouse, 1973). Interestingly, it is between 4 and 8 years that children are reported to begin to be able to reliably judge sentences for grammaticality (Brown, 1973; de Villiers and de Villiers, 1972, 1974; Scholl and Ryan, 1975), thus, exhibiting, in a rudimentary and nonreflective form, the same kind of metalinguistic ability that is necessary for judging utterances for relative structural complexity.

The above data clearly demonstrate the generality and apparent natural character of the mothers' and other adults'

tendency to modify their speech when addressing language-learning children. One should, therefore, expect the verbal exchanges between mothers and their retarded children and between adults and retarded children or adolescents to be regulated by the same basic mechanism, and this is actually what has been observed if not always appreciated in the studies reviewed in the first part of this chapter.

The key question, as far as the simplifications in adult and maternal speech to retarded children are concerned, has to do with the nature of these simplifications or differences with respect to maternal speech to CA-matched normal children. As mentioned above, Siegel, Buium et al. and others apparently believe that the linguistic environments of normal and retarded children are different and that this difference operates unfavorably on retarded children in their language development. Such a belief has been largely echoed in the recent literature (see, for example, Seitz, 1975; Mahoney, 1975; Mahoney and Seely, 1976; and Mitchell, 1976), sometimes without nuance as, for example, in Dolley (1974) who flatly identifies adult and maternal speech to retarded children with restricted linguistic codes, as defined by Bernstein's early work in lower-social-class individuals and parents (Bernstein, 1961, 1964). However, a close examination of the Siegel, Siegel and Harkins, Spradlin and Rosenberg, Buium et al., Marshall et al., and Kogan et al. procedures and data reveals that these studies fail to establish, except in a trivial

sense, that adult speech to retarded children is different from adult speech to normal children. What these studies have established is that retarded children observed at different levels of language development than normal children (or than other retarded children in the Siegel's studies and in the Siegel and Harkins study) are spoken to in a different way by their mothers (or by unrelated adults). This is what would be expected based on the findings supplied by the literature on parental and adult speech to normal language-learning children. The differences found so far in adult speech to normal and retarded children of corresponding CA's--which means being at different levels of language development--are probably of the same nature as the differences found in adult speech to normal children at different levels of language development. Nobody has claimed that adult speech to younger normal children was less appropriate for language development than adult speech to older normal children, or that the simplifications observed in adults' speech to normal children may deprive these children of the opportunity for further language development. When differences in maternal speech to normal children at different levels of language development are concerned, one usually considers that, since mothers adjust their speech to their child listeners, maternal speech scores are not otherwise comparable across mothers whose children differ as listeners (Newport, Gleitman, and Gleitman, 1975). Why, therefore, should one favor another inter-

pretative strategy in the study of the verbal exchanges between adults and retarded children?

When placed in the proper perspective, the differences observed so far in adult speech to normal and retarded children matched for CA probably need not be interpreted as other than "normal differences" in input to children being at unequal levels of code mastery.

Although the information available on maternal speech to retarded children is far from being sufficient at the present time, it appears that, just as for maternal speech to normal children, the simplifications that occur in mothers' speech are by no means random. Rather, they are of the kind that would be expected from a progressive language-teaching program. Second, mothers' speech to normal as well as to retarded children, though simplified, is always phonologically, syntactically and semantically more complex than the children's speech. Mothers' speech, thus, provides an opportunity for enrichment of children's speech. In other words, mothers' speech addressed to normal as well as to retarded children does not simply duplicate children's speech. For example, Buium et al. reported only 14.5 percent of the total number of mothers' utterances to 24-month-old Down's syndrome children to be single-word utterances in the play situation and 25.6 percent and 21.5 percent in the two tutorial situations at a time when, very likely, the children were producing only a few words, one at a time.

Another and more meaningful way to raise the difference question is to reformulate the question in relative rather than in absolute terms. Rather than asking whether retarded and normal children matched for CA are spoken to in different ways, which should be expected as indicated above, the problem is to determine whether the differences existing in maternal speech to normal and to retarded children matched for CA are of the same magnitude as the corresponding differences in maternal speech to normal children at different stages of language development. It is possible to rephrase the same question in the following and somewhat more answerable way: are there marked differences in maternal speech to the normal and to retarded children when they are at similar stages of language development, thus disregarding differences in normal and retarded children's chronological ages? In implementing such a control, the way mothers talk to their normal children would still be taken as the quality standard for assessing maternal speech to retarded children--there is to date no other way of assessing the quality of maternal speech to retarded children as no definition of a good linguistic environment for language development has been formulated yet--but this time one would avoid confounding type of children and children's linguistic level in the research design.

Thus, in order to answer the difference question in a non-trivial way, new investigations will have to be conducted exploiting a matching procedure on level of language development

between normal and retarded children. Supposing that differences can be found in maternal speech to normal and retarded children matched for level of language development or in the way maternal speech changes as a function of the developments that take place over a period of time in the normal and retarded children's linguistic ability, then, and only then, would a "difference" interpretation be supported. The present research implemented such a control.

The scheme used in the present study for analyzing mothers' and children's speech contains a semantic-structural analysis of mothers' and children's speech based on Chafe's semantic-generative grammar (Chafe, 1970), and an approach toward analysing mothers' speech for those semantic-pragmatic aspects related to the requests for action based on Garvey's analysis of the requests for action in the verbal exchange (Garvey, 1975) as well as the more standard measures used in previous work. As these two approaches are relatively new in their application to the analysis of maternal speech, they will be briefly described at this point. The importance of structural semantics for the understanding of language development has been repeatedly stressed in recent years (e.g., Brown, 1973). Therefore, there is hardly a need to justify a semantic-structural analysis in the present study. The scheme used is based on Chafe (1970) because at the present time this seems to be the most complete system available for the analysis of structural meaning.

In Chafe's grammar, semantic structures are seen as built around central predicative elements (surface structure verbs, adjectives, adverbs, and prepositions) which are accompanied by nominal elements related to the verbs in several ways (for a similar theoretical position on verbs and verb-noun relations, see Fillmore, 1968).

Chafe distinguishes between six basic verb types. States are first opposed to Events, and Events are further specified as Process, Action, or Process-action. Another basic verb type is Ambient which is further distinguished as State-ambient and Action-ambient. But such verbs are rare and will not be considered here. This leaves four major semantic verb configurations. State verbs (unless Ambient), Process verbs, and Process-action verbs are always accompanied by a noun which is the Patient. Action verbs, unless Ambient, and Process-action verbs are always accompanied by a noun which is the Agent of the action. Consider the following examples. They are from Chafe (1970).

(1) The wood is dry

(2) The wood dried

(3) Harriet sang

(4) Michael dried the wood

(5) It's hot

(6) It's raining

The verb <u>dry</u> in sentence (1) is a State verb and is accom-

panied by the Patient noun wood. Additionally, this sentence illustrates another point in Chafe's theory. The copulative verb be as well as the auxiliaries and modals are regarded as a special kind of verbs, surface structure or postsemantic verbs. According to Chafe, such verbs exist only in surface structure. (For a similar treatment of the English auxiliaries, see Fillmore, 1968). These surface structure verbs will not be considered here. In sentence (2), the Patient has undergone a change of state and the verb is specified accordingly as a Process verb. In sentence (3), Harriet is the Agent of the verb sing. The verb, in this sentence, expresses an action and is specified as an Action verb. Nonstate verbs may be specified as action and process at the same time. In that case, they are referred to as Process-action verbs and require both Agent and Patient accompanying nouns as in sentence (4). In sentence (5), the particular state expressed (hotness) covers the total environment rather than just some subject within it. Of course, there is another sentence in which the "it" of "It's hot" reflects the presence of some semantic element (the coffee pot, for example). Similarly, sentence (6) expresses an action that covers the total environment. These sentences are specified by Chafe as containing Ambient verbs.

Additional and optional verb specifications to be considered are Experiential, Benefactive, Instrumental, Complement-

able, and Locative, which are accompanied by nouns specified respectively as Experiencer, Beneficiary, Instrument, Complement, and Location. Consider the following sentences. They are from Chafe (1970) and they list and examplify different verb types in Chafe's model.

(7) Tom wanted a drink (State-experiential verb and related nominal elements).

(8) Tom saw a snake (Process-experiential verb).

(9) Tom has the tickets (State-benefactive).

(10) Tom found the tickets (Process-benefactive).

(11) Mary sent Tom the tickets (Process-Action-benefactive).

(12) Mary sang for Tom (Action-benefactive).

(13) Tom opened the door with a key (Process-action-instrumental).

(14) The door opened with a key (Process-instrumental).

(15) He jumped with a pole (Action-instrumental).

(16) Mary sang a song (Action-complementable).

(17) The candy costs ten cents (State-complementable).

(18) The knife is in the box (State-locative).

(19) Tom fell off the chair (Process-locative).

(20) Tom sat in the chair (Action-locative).

(21) Tom threw the knife into the box (Process-action-locative).

Chafe does not specify any State-instrumental, Process-

complementable, and Process-action-complementable verbs.

In sentence (7), although Tom looks as if it were an agent from a surface structure point of view, he is not actually the instigator of an action. Rather, he is someone with respect to whose mental experience a drink was wanted. The verbs in sentence like (7) are said by Chafe to be Experiential verbs. Such verbs must be accompanied by an Experiencer noun. Sentences like (8) involve events rather than states. The verbs in such sentences are defined as Process-experiential verbs. In sentences (9) to (12), Tom is not the instigator of an action any more than he was in sentences (7) and (8). On the other hand, he does not seem to be an experiencer either, as no mental experience on Tom's part is involved. In sentences (9) to (12), Tom is said by Chafe to be a Beneficiary. In such sentences, the verbs are called Benefactive. There can be State-benefactive, Process-benefactive, Process-action-benefactive, and Action-benefactive verbs according to the major semantic specification of the verb. In sentences (13) to (15), another relation between a noun and a verb is exemplified, that of Instrument. Key and pole is these sentences are neither Patients, Agents, Experiencers, or Beneficiaries. They are termed Instruments by Chafe, and the verbs in these sentences are defined as Instrumental. In sentences (16), the verb describes an action "which, by its very nature, implies the coexistence of a certain nominal concept" (Chafe, 1970, p. 156). Typically, in such cases

the action expressed by the verb has the result of creating something. Singing, for example, implies the rendition of a song. Apparently, certain State verbs must also be accompanied by a complement, as exemplified in sentence (17). In sentences like (16) and (17), the verbs are said to be Completable and they are accompanied by a Complement noun. In sentences (18) to (21), a last relation between noun and verb is exemplified. This is the relation of Location. State, Process, Action, and Process-action verbs may be specified as Locative and they are accompanied by a noun which bears to them the relation of Location.

Chafe's grammar also deals with the processes of derivation and inflection but these will not be considered here.

According to Chafe, a State or a Process verb dictates the presence of a Patient noun. An Action verb dictates the presence of an Agent noun. A Process-action verb dictates the presence of both an Agent and a Patient noun. Similarly, an Experiential verb calls for an Experiencer, a Benefactive verb for a Beneficiary, a Complementable verb for a Complement, and a Locative verb for a Location. These nouns are the verb-related nouns accompanying obligatorily (at least in deep structure) the verbs in order to insure the semantic well-formedness of the utterances. By contrast, an Action, Process, or Process-action verb may be accompanied by an Instrument noun, and consequently be defined as Instrumental verbs, but the relation

Instrument differs noticeably from the other verb-noun relations in that it is not associated with a particular selectional unit within the verb.

The rationale for the semantic-pragmatic analysis of the requests for action in mothers' speech will be presented now.

The nature of linguistic competence extends beyond mere knowledge of the syntactic and semantic structure of sentences. Cognitive operations of inference are required for the interpretation of another person's nondirect verbal act (Garvey, 1975). A Speech Act approach (Austin, 1962; Searle, 1969) provides a technique for studying the joining of linguistic means with classes of communicative intent or, in other words, for treating utterances as the realization of purposive social gestures. According to Garvey (1975), there is a large family of social gestures called Interventions. This family includes suggestions, invitations, prohibitions, requests for permission and requests for action. The Request-for-action category was selected for this study because of the frequency of occurrence of such requests in conversation and because there is, at least, one model available in the literature for analysing the structure and content of such requests (Garvey, 1975).

The theory of Speech Act on which the model is based defines an Intervention as an illocutionary act whereby a speaker (S) conveys to an addressee (H) that S wishes H to perform an act (A). The theory proposes that an utterance is composed of a proposi-

tion and a modality. Both elements are subject to the grammatical rules of the language. For example, the request "Close the door" is made of the preposition "H will close the door" and the modality "imperative" which deletes you or H, will, and assigns appropriate intonation to the utterance. Simultaneously, the utterance conveys a force or illocutionary force (Austin, 1962). This force may vary. Compare, for instance, "Open the door" with "Open the door, please" or "Would you mind opening the door" or "I wish that door would be open."

According to Garvey (1975), the force of an utterance derives from a set of necessary and sufficient conditions relating on the one hand, to the beliefs and attitude of S and H, and, on the other hand, to their mutual understanding of the use of linguistic devices for communications. The conditions for a sincere request or sincerity conditions are:

1. S wants H to do A (e.g., "I want you to open the door").
2. S assumes that H can do A (e.g., "Can you open the door?").
3. S assumes H is willing to do A (e.g., "Would you be willing to open the door?").
4. S assumes H will not do A in the absence of the request (e.g., "Will you open the door?").

Sincerity condition 1 is speaker-based. Sincerity conditions 2 to 4 are hearer-based.

Garvey (1975) distinguishes between direct requests, indirect requests and inferred requests. Direct requests express the con-

tent "H will do A" in an imperative utterance or in an utterance with a performative marker (e.g., "I order you to open the door"). Indirect requests express the same content "H will do A" without actually enjoining H to perform the action (e.g., "You have to open the door", or "Can you open the door?"). Instead of expressing directly or indirectly his wish that "H will do A", a speaker can simply indicate a desire for state of affairs and let H infer that he is the one who is to bring about that state (e.g., "That door should be open"). Such requests are defined as Inferred requests by Garvey. In such situations, the speaker leaves a considerable amount of the work of interpreting accurately the request to the addressee himself.

From Direct request to Inferred request, more understanding of certain pragmatic aspects of speech are needed in order to comply with the requests given the sincerity conditions hold. Such a knowledge is a normal part of a cooperative conversation and is generally taken for granted by the mature participants in everyday verbal interactions. As a justification for studying this aspect of mothers' speech, it is felt that the best way for the children to acquire this communicative knowledge is through repeated expositions to indirect and inferred requests in maternal speech coupled with clear contextual situations.

Garvey's research (Garvey, 1975) has also centered on the structure of the requests. This research showed that the requests for action are often accompanied by a clause, a phrase, or

another sentence relating to the request. In order to examine the clustering of verbal behaviors around the request utterance, Garvey proposed a structural unit, the Domain of the request of which one component, called the Adjunct to request is of particular interest (see Garvey, 1975, for other details on the Domain of the request). A study of the meaning factors recurring in the Adjuncts to request identified three factors:

1. S's reason for making the request, i.e., a justification for S's wish of having "H to do A" (e.g., Request: "Stop it"; Adjunct: "You hurt my head").

2. S's desire or need for the outcome of the action (e.g., Request: "Give me that"; Adjunct: "I need that").

3. H's willingness to do A (e.g., Request: "Here, do that"; Adjunct: "Okay").

An adjunct may either immediately precede or follow the request, with the exception of Tags which only follow the request.

These meaning factors constitute the domain of relevance of the request (or, more exactly, part of it as we borrow only a part of Garvey's extensive analytical scheme for the study of requests). They appear to be shared by S and H and provide a basis for helping understand utterances as requests even when these utterances are not formulated as direct requests. They are of interest in a study related to language development and will be included in the analysis.

Statement of Research Questions

A good way of matching children for level of language development is through the use of MLU (Moorehead and Ingram, 1973). This measure appears to be a reliable indicator of linguistic development, at least until MLU 4.00, or approximately three years of age in normal children, because almost every new kind of linguistic knowledge in the child up until there increases utterance length (Menyuk, 1969; Bloom, 1970; Brown, 1973). After MLU 4.00, the index starts losing its value as an indicator of grammatical development as the children are increasingly able to make constructions of a great variety that are not always reflected in an increase in utterance length and which may depend more on the character of the verbal interaction the child is engaged in than on what he knows about grammar (Brown, 1973).

The present research implemented a matching of normal and retarded children at three linguistic levels using MLU as a basis for the matching operation. It was assumed that MLU is as good an indicator of level of language development for mentally retarded children as it is for normal children according to the authors cited above. A test of this assumption was made by computing other measures of children's speech and comparing the outcome across normal and retarded children. The results of this test are reported in the Results chapter.

Mothers' speech to their normal children and mothers' speech to their retarded children were analysed for different

aspects related to the formal and semantic structure of the language used and its supposed value as a language-teaching instrument. The retarded children were all Down's syndrome children. Down's syndrome children were selected for the study for four reasons. First, they constitute a relatively well defined and homogeneous group of subjects. Second, they are usually identified at birth. Third, Down's syndrome represents the most prevalent form of clinical mental retardation. And fourth, the developmental aspects of Down's syndrome have been relatively well studied already (cf., for example, Koch and de la Cruz, 1975; Rynders and Horrobin, 1975; and Stedman and O'Mey, 1969).

Two related research questions served as the basis for the study.

The two research questions were as follows:

(1) Are maternal linguistic environments of normal and Down's syndrome children similar when the children are matched for MLU? To answer this question, comparisons were made using retarded and normal children at three different levels of MLU?

(2) Do maternal linguistic environments of normal and Down's syndrome children change in similar ways with increase in children's MLU from the first to the third MLU level investigated?

Within the limits of the study, a negative answer given to the two research questions would be interpreted as supporting the hypothesis that the maternal linguistic environment of language-learning Down's syndrome children is different from

that of normal children at the same levels of language development. A positive answer to the two research questions would be interpreted as supportive for a nondifference position.

Chapter 2

METHOD

Subjects

The subjects of this study were 21 Down's syndrome children and their natural mothers and 21 normal children and their natural mothers. As a condition for participating in the study it was required that none of the mothers in the two groups had been or were currently engaged in any early education curriculum for parents with special emphasis on promoting early language abilities in children. All of the normal children and their mothers and 14 of the identified Down's syndrome children lived in the Minneapolis-St. Paul area. The seven remaining Down's syndrome children and their mothers lived in other towns in Minnesota. Verification was provided by a physician that the Down's syndrome children had Down's syndrome. The Down's syndrome children were identified in early infancy through the Pediatrics Department of the University of Minnesota Hospital or the Pediatrics Department of other hospitals in the State of Minnesota. Karyotypes were obtained for all the Down's syndrome children and all were reported to be Trisomy 21's.

They were 12 girls and 9 boys among the Down's syndrome children, and 8 girls and 13 boys among the normal children. No effort was made to balance the two groups of children for sex.

Sex of the children was not thought to be an important variable as several studies (Philips, 1973; Fraser and Roberts, 1975; Moerk, 1975) failed to find significant differences in maternal speech addressed to boys and girls between 8 months and 6 years of age. In order to participate in the study, the children could not have any debilitating heart condition, obvious sensory impairment, or more generally any medical condition (other than Down's syndrome for the Down's syndrome children) which might seriously limit their development.

The normal and Down's syndrome children were matched on three levels of linguistic development as measured by MLU. The children's MLU was computed using the criterion given in Brown's (1973), a count based on morphemes. The only exception to Brown's criterion was that MLU was based on the total sample (i.e., one-hour speech recording) rather than the first 100 utterances as suggested by Brown. On the basis of the children's MLU, the mother-child pairs were divided into three language-level categories for each population of normal and Down's syndrome children. Specified MLU ranges for the three language levels were 1.00 - 1.50, 1.75 - 2.25, 2.50 = 3.00. In a few instances, and due to the difficulty of programming group composition on a MLU basis, MLU calculated for the child was minimally outside of the specified range. At language level 1 (specified MLU range 1.00 - 1.50), two Down's syndrome and two normal children's MLU were minimally beyond 1.50. The two MLU's were

respectively 1.53 and 1.55 for the Down's syndrome children, and 1.53 and 1.54 for the normal children. Similarly, at language level 2 (specified MLU range 1.75 - 2.25), one Down's syndrome and one normal child had MLU slightly inferior to 1.75. The two MLU's were respectively 1.73 for the Down's syndrome child and 1.75 for the normal child. Similarly, at language level 3 (specified MLU range 2.50 - 3.00), two Down's syndrome and two normal children had MLU slightly above 3.00, and one normal child had MLU slightly below 2.50. The MLU's were respectively 3.05 and 3.07 for the Down's syndrome children and 3.01, 3.04, and 2.49 for the normal children.

Table 2 summarizes the information on average MLU and standard deviation (SD) for normal and Down's syndrome children at each of the three language levels. It also contains information on average CA and SD of normal and Down's syndrome children at each language level. As a group, normal children ranged in CA from 20 to 32 months. Down's syndrome children ranged in CA from 3 to 12 years. A t test was performed on MLU for normal and Down's syndrome children at each of the three language levels and overall for the two groups of children, and all tests failed to reach statistical significance.

The mothers of normal children and the mothers of Down's syndrome children were matched on the following criteria: ethnic group (Caucasian), familial monolingualism, familial structure (both husband and wife living at home), mother free

Table 2

Means and Standard Deviations of Children's MLU's and CA's

Language level	Index	Children	
		Down's Syndrome	Normal
1	MLU[a]		
	M	1.26	1.27
	SD	.23	.22
	CA[b]		
	M	48.71	22.86
	SD	9.25	2.04
2	MLU[a]		
	M	1.94	1.96
	SD	.19	.21
	CA		
	M	78.14	26.57
	SD	25.20	1.51
3	MLU		
	M	2.87	2.88
	SD	.14	.19
	CA		
	M	116.57	29.86
	SD	21.26	3.07

Note. No difference in MLU between Down's syndrome and normal children is significant.

[a]In morphemes.

[b]In months.

of any major sensory handicap, maternal intelligence not obviously outside the normal range (no IQ test was given), and socio-economic status (the families selected for the study were predominantly drawn from the middle class). Perhaps more important than socio-economic status (usually based on occupational and educational level of the head of the household) for a research of this type, is the mother's educational level since there is at least one study that reported a significant relationship between the number of years of schooling the mother had attained and several aspects of her verbal input to her infant (Cohen and Beckwith, 1975). The mothers selected for this study were matched on the Educational Scale supplied by Hollingshead in his Two Factor Index of Social Position (Hollingshead, 1957). The overall means of the mothers of Down's syndrome children on the Hollingshead's Educational Scale was 2.67 (SD 1.02) versus 2.71 (SD .90) for the mothers of normal children. This difference was tested by means of a t test and was not found significant.

No effort was made to match mothers of normal and retarded children for age, nor to match normal and retarded children for birth order, number of siblings, and age differences between the children in the family as it is known that, in the cases of Trisomy 21, the mean age of the mother at the birth of the child is significantly older than in control populations (Hamerton, Briggs, Giannelli, and Carter, 1961; Knobloch and Pasamanick, 1962). This, in turn, affects birth order and family composition

for Down's syndrome children as they are more likely to be later-born children than are normal children. The average age of the mothers of Down's syndrome children in this study was 514.86 months (SD 100.84 months) versus 338.29 months (SD 49.42 months) for the mothers of normal children. The average birth order was 3.76 (SD 2.30) for the Down's syndrome children and 1.76 (SD .89) for the normal children. From language level 1 to language level 3, respectively, approximately 12 to 40% of the siblings of the Down's syndrome children were no longer living in the family home at the time of the study.

Procedure

The verbal interaction between mother and child was tape recorded at home in a free-play situation. The investigator was present in the home during the tape recording and made every effort to keep his presence as discreet as possible. The mothers were told that the study was primarily about child language development in a plausible attempt to keep them as unconcerned as possible about their own speech. Moreover, the mothers were asked not to engage the investigator in conversation during actual recording.

Although only limited research is available on the effect of the type of setting on mother-child interaction, there are some indications that the behavior of mothers observed at home somewhat differs from the behavior of the same mothers observed in a laboratory setting (Schalock, cited in Zunich, 1971). It

is also possible that mother-child interactions in the presence of an observer are somewhat different from what they are "behind closed doors." Patterson and Reid (1970), and Zegiob, Arnold, and Forehand (1975) reported differences in maternal behavior as a function of observer's presence or absence, or informed and uninformed observation condition. For example, mothers were more positive in their verbal behavior and structured the children's activities more during the observer's presence than during the observer's absence condition. However, Hoover and Rinehart, and Harris (both cited in Patterson, Cobb, and Ray, 1973) failed to find differences in the data collected by mothers and those collected by official observers in similar situations.

On the other hand, even if mothers modified their behavior toward the children in the observer's presence, it is improbable that they would be able to invent, at once, new and different mother-child interaction patterns (Moerk, 1972). Besides, there is no reason to expect the observer's presence effect to affect differentially the verbal behavior of mothers of normal and Down's syndrome children.

In order to preserve as much spontaneousness and naturalness in the mother-child interactions as possible, no specific instruction other than "do what you usually do when you play and talk with the child and use whatever kind of toys or material you want to use, only avoid recitations" was given to the mothers as to what they should do with the child during the free-play situation.

It turned out that the free-play situations and the material used by the mothers were surprisingly similar from home to home particularly for those normal and Down's syndrome children at language level 1 and 2. The use of play-doh games, shape-matching or shape-folding games, play-action games such as the farm game, the airport, the village, the school, Sesame Street and McDonald's games by Fisher-Price, PlaySkool and others, looking at picture and storybooks, alternated in one way or the other during all recording sessions. The contents of the free-play situations were somewhat more heterogeneous for the two groups of children at the third language level, with several mothers of normal and Down's syndrome children spending part or all of one or the two recording sessions in conversation with the child using toys and pictures as a support for conversation.

There were two recording sessions each lasting half-an-hour for each mother-child pair. The two recording sessions took place on two different days at approximately one-week interval. They were preceded, on another day, by a 20-minute "get acquainted session" during which the investigator familiarized himself with the mother and the child, obtained first-hand information on the child's language level, and gave the child an opportunity to extinguish most of his or her orientation reactions to the tape recorder by having it displayed and functioning in the room, which additionally supplied information on the effects of the acoustics of the room on the tape recording.

Analytical Scheme

The mother-child verbal interactions were recorded using a standard T-1500 Wollensack Magnetic Tape Recorder. A verbatim transcription of the speech of the mothers and of the speech of the children was made by the investigator using the instructions for preparation and marking of the transcripts from Siegel (1963a). No phonetic transcription was made. A separate transcription was made of each recording session. The first page of the transcription of each recording session was not included in any count, following Brown's suggestion (1973). An utterance or vocal response unit was defined according to Siegel, as "a unit of spoken language marked off on either side by a pause or by some change in inflection" (1963a, Appendix H, p. 101). Additional (secondary) criteria for identifying utterances are provided by Siegel.

The two research questions were investigated in the form of a set of specific hypotheses related to 20 measures (indexes) of maternal speech in its output-numerical, lexical, syntactical, semantic-structural, semantic-pragmatic, and supposed language-teaching aspects. Seven measures of child's speech related to output-numerical, lexical, syntactical, semantic-structural aspects and imitativeness of maternal speech were computed on the data from the transcripts as a means of testing the validity of the MLU-matching performed on the children as a basis for the study. The analysis of maternal speech and child's speech will be explained separately.

Analysis of maternal speech

Output-numerical aspect

Index 1: Total number of words. This index was computed on the total sample of speech recorded. Siegel's set of criteria for counting words was used (Siegel, 1963a, Appendix I, p. 103).

Lexical aspect

Index 2: Type-token ratio (TTR). TTR, a measure of lexical diversity was computed by dividing the number of different words (types) by the number of words sampled (tokens), according to Siegel and Harkins (1963). It was computed on 200 words, 100 words randomly selected from each recording session. The only difference with Siegel and Harkins was that rather than adopting spelling as the only basis for deciding whether two words were identical or different (which led Siegel and Harkins to count, for example, house and houses as two different words), only dictionary entries were counted as different words. The Webster's New Collegiate Dictionary, 1974, by G. & C. Merriam Co., was taken as a basis for this count.

Syntactical aspect (within utterances or sentences)

The speech samples analyzed in this category contained 400 utterances. The utterances used were the first 200 utterances from each recording session.

Index 3: Mean length of utterance. MLU (in morphemes) was computed by the criteria of Brown (1973) adapted for application to adult speech, and based on 400 utterances, as indicated above,

rather than on 100 utterances as indicated by Brown. The adaptations consisted in eliminating from Brown's criteria those criteria related to the children's limited knowledge on some morphological matters. For example, rather than counting all irregular past tenses (e.g., got, did, went, saw), all diminutives (e.g., doggie, mommie) and all catenatives (e.g., gonna, wanna, hafta) as one morpheme as suggested by Brown for the children, they were counted as two morphemes (three morphemes for gonna) in this count on the ground that these units function as such in mature speakers. The second edition of Nida's (1970) book on morphological analysis was taken as a basis for the counting decisions in matter of adult morphological knowledge.

Index 4: Proportions of utterances of specific lengths. The proportions of utterances of specific lengths was calculated. The categories were respectively 1, 2-3, 4-6, 7-9, and 10 or more morphemes long.

Index 5: Sentence complexity. Ratio of the number of compound verbs plus subordinate clauses to the total number of utterances (after Snow, 1972).

Index 6: Mean preverb length. Ratio of the total number of morphemes before the main verb in all clauses to the total number of clauses. Imperatives were excluded from this count (after Snow, 1972, but modified as Snow's count was in words).

Index 7: Proportion of utterances without verb. Ratio of the number of utterances that did not contain verbs to the total

number of utterances (after Snow, 1972).

Index 8: Number of modifiers per utterance. Ratio of the number of modifiers to the total number of utterances (after Philips, 1973). Modifier was defined as adverb and/or adjective, after Miner (1969). Adjectives functioning as nouns (e.g., "red" in "some more red") were not counted. Conversely, nouns or verbs (infinitives and participles) used in an adjectival manner (e.g., "a bike ride", "a dump truck") were counted as modifiers. Yes, no, and well when used as fillers (Broen and Siegel, 1971) or as starters (Miner, 1969) were not counted as modifiers.

Syntactical aspect (between sentences)

The speech samples analysed in this category contained 400 utterances. The utterances used were the first 200 utterances from each recording session.

Index 9: Types and subtypes of sentences. Proportions of different types and subtypes of sentence. A complete sentence was defined as having at least a noun and verb in subject-predicate relationship (Lee and Canter, 1971). The following and mutually exclusive types and subtypes of sentences were counted: Declarative sentences, Imperative sentences, Yes/No questions formed by inverting the subject noun phrase and the first element of the auxiliary verb (e.g., "Can the man sit there?"), Raising intonation questions (e.g., "He ate it all up?"), Occasional WH-questions (e.g., "He did what?" or "You went where?", cf. Brown, Cazden, and Bellugi-Klima, 1968), Other WH-questions, Tag or

truncated questions appended to the propositions as a request for confirmation (Brown and Hanlon, 1970), and Grammatically incomplete sentences. The Tag-question category was further subdivided in two subcategories: so-called "mature" and "immature" Tag questions. In mature Tag questions, the form of the request for confirmation varies with the structure of the sentence to which it is appended. Negative Tag questions are appended to affirmative propositions (e.g., "We went to grandma's, didn't we?") and affirmative Tag questions are appended to negative propositions (e.g., "He can't do that, can he?"). In immature Tag questions, the form of the request for confirmation is free and independent of the structure of the declarative sentence. Such immature Tag questions take the form of "Right?", and "Huh?" (see below however) (Brown and Hanlon, 1970).

The category Grammatically incomplete sentences was further subdivided in two subcategories: Yes/No inverted questions with deletion of the first element of the auxiliary verb (obligatory do or "be" verb) and sometimes of the pronoun-subject (e.g., "Wanna go ninight?", "You wanna go ninight?", "You gonna go ninight?") and other Grammatically incomplete sentences. As pointed out by Broen (1972), who used the same two subcategories, placing a sentence in the subcategory "Yes/No inverted questions with deletion involves a judgment as to what the expanded for for of the sentence would have been. The linguistic and extralinguistic contexts were used in making that judgment.

In some cases, it may be impossible to distinguish between an Intonation question and a Yes/No inverted question with deletion (e.g., "You work today?" can be a reduction of "Do you work today?" or a question formed by raising intonation contour. Such dubious cases were arbitrarily classified as Yes/No inverted questions with deletion. Following Broen, the single-word utterances were not included in the category of Grammatically incomplete sentences although it would be possible to say that some or most of these single-word utterances are, in some sense, incomplete sentences. In the same way, the two-word sentences "look at" could have been classified as Grammatically incomplete sentences. Actually, they were assimilated to (complete) one-word imperative sentences.

Two additional categories were computed. They are: Total percentage of questions and Total percentages of Yes/No questions (including Yes/No inverted questions with deletion). A very few (less than 1 in 1000 mothers' utterances in average value) Exclamatory sentences (e.g., "What a nice job you are doing!") were left out of the analysis. Certain compound sentences received double classification. These were, first, the Declarative sentences to which a Tag question was appended. They were classified as Declarative sentence and the Tag question was counted in the Tag-question category. Second, compound sentences such as "He is silly and what's this?" in which the two clauses do not pertain to the same category received double classification.

In the case of the example given above, "He is silly" would be classified as a Declarative sentence, and "What's this" would be classified as a WH-question.

A special problem arises in the counts under Index 9 with the "huh" words or utterances. The problem was treated in the following way. Distinction was made between three types of "Huh" words or utterances. Type 1 "Huh" were defined as these "Huh" always located in utterance final position (e.g., "You don't wanna eat, huh?"). They were counted as Tag questions (immature Tag questions). Type 2 "Huh" were these isolated "Huh" found immediately following a question (e.g., "What are you doing?"/ "Huh"). There were excluded from the counts under Index 9 but were counted as instances of attentional utterances (see Index 15). Type 3 "Huh" were defined as these isolated "Huh" following an utterance produced by the interlocutor and requesting repetition or clarification of the preceding utterance (e.g., Child: "I want ---"/Mother: "Huh?"). These "Huh" were considered as functionally equivalent to expanded requests for repetition or clarification like "What did you say?" and were classified accordingly as Grammatically incomplete sentences.

Another problem was with the interpretation that had to be made of these utterances beginning with "See" like, for example, in "See the truck (?)". Broen's approach to the same problem (Broen, 1972, pp. 31; 35) is not entirely clear. She seems to have counted certain utterances beginning with "See" as Yes/No

inverted questions with deletion and others as Imperative sentences (for example, "See the truck" as an equivalent for "Attend to the truck"). She acknowledges, however, (p. 35) that these "See" Imperative sentences are different from other imperatives in that they are spoken with a rising question intonation. In this study, all the isolated "See" utterances and all the utterances beginning with "See", that could not be replaced by "Let's see", were counted as Yes/No inverted questions with deletion. The assumption, made on a purely intuitive ground, was that these utterances were reductions of "Do you see?" types of sentence.

Semantic-structural aspect

Index 10: Semantic-structural analysis. Proportions of major and optional verb types. A semantic analysis was performed on 200 utterances (100 utterances randomly selected as a group from each recording session), excluding one-word utterances like yes, no, okay, hi, the vocatives, those single-word utterances echoing an immediately preceding child's utterance and the Tag questions. These productions were judged not to be interesting from a semantic point of view. The semantic analysis was based on Chafe's generative-semantic grammar as explained in the introductory chapter. In order to keep the analysis manageable, only the principle verb of the main clause and subordinate clause (when present) were analysed. Adjectives and adverbs, for example, which represent distinct ideas and are treated as verbs by Chafe

were not considered in the analysis. The set of verb-type categories used in this analysis and listed below is close to the one used by Glanzer and Dodd (1975) in their semantic analysis of maternal speech to normal children between 20 and 30 months.

The verb-type categories distinguished were as follows: (a) State, (b) State-experiential, (c) State-benefactive, (d) State-locative, (e) Process, (f) Action, (g) Process-action, (h) Process-experiential and Action-experiential, (i) Process-benefactive, Action-benefactive, and Process-action-benefactive, (j) Process-instrumental, Action-instrumental, and Process-action-instrumental, (k) State-completable and Action-completable, and (l) Process-locative, Action-locative, and Process-action-locative. These verb types have been defined in the introductory chapter. Two other categories were added: (m) Nominations and (n) Residual verb types. Following Glanzer and Dodd (1975) single-word utterances naming an object or a person in the environment (real, pictoral, or historical) were counted as instances of Nominations (Brown, 1973). The justification for doing so is that it permits one to avoid having to guess at the correct expansion of the single-word utterances in order to classify them within Chafe's system. For example, "Cow" may be an ellipsis for "That's a cow" which would have to be classified as State verb. However, it can also stand for "I see a cow" or "The cow is there" which would have to be classified as Process-experiential and

State-locative verbs, respectively. For this reason and because of their relatively high frequency of occurrence single-word utterances were given a different coding. A Residual category was also constituted in order to regroup more complex verb specifications than those considered above. This category regrouped those verb specifications involving more than one optional verb category at a time (e.g., "Tom saw a snake in the woods," Process-experiential-locative verb).

In case of omissions of obligatory verb-related nouns, and following Glanzer and Dodd (1975), the verb classification was made as if the necessary noun components had been present. This practice is justified in that, first, the interest is in semantic structures and not in the postsemantic processes, and, second, because it is reasonable to assume semantic well-formedness in normal adults for verbal concepts as common as those used by mothers when talking to their language-learning children.

Semantic-pragmatic aspect

Index 11: Requests for action. Proportions of different types of request for action and proportions of adjuncts to request were computed. The speech samples analysed in this category contained 400 utterances. The utterances used were the first 200 utterances from each recording session. For the purpose of this analysis, the verbal devices for requesting for action were classified in four categories according to Garvey (1975), plus one additional category. The five categories were as follows:

1. Direct requests. Express the content "H will do A" either in an imperative utterance (e.g., "Open the door") or in an utterance introduced by a performative marker (e.g., "I request, I order you, I command that you open the door").

2. Proposals for joint action. (e.g., "Let's play mother and father", or "Shall we play with the blocks now?"). In this additional category to the scheme developed by Garvey, Sincerity condition 1 (see introductory chapter) is not "H will do A" but "S will join H in doing A." Sincerity conditions 2 to 4 have to be modified accordingly. This type was included in the analysis because it constitutes unquestionably a form of requesting for action and because, once the Sincerity conditions have been rewritten in the way just indicated, this type of request appears to be passible of the same type of analysis as the other types of request for action.

3. Indirect request type 1. Embed the content "H will do A" into an utterance which makes reference to one of the four sincerity conditions (see introductory chapter).

4. Indirect requests type 2. Embed the content "H will do A" into an utterance which does not make reference to one of the four sincerity conditions in any obvious way. This type included utterances (a) which make reference to general conditions of participant status, (b) which specify some relevant property of the act such as its necessity (e.g., "You have to open the door"), or which embed the content "H will do A" into an imperative

clause whose scope, however, does not extend to the target act which S wishes H to perform (e.g., "See if you can open the door").

5. Inferred requests. Instead of expressing directly or indirectly his wish that "H will do A", the speaker can indicate a desire for some state of affairs without actually saying that H is to bring about that state (e.g., That door should be open"). Or, S can indicate a desire for something without specifying that H is to satisfy it not without stipulating what H is to do (e.g., "I want my coffee", or "Is there any coffee left?"). Some "Pretend" utterances function as Inferred requests (e.g., "Pretend this was my car?").

Besides computing the proportions of the different types of requests, the present analysis also computed the ratio of the number of Adjuncts to requests to the total number of request and the ratio of the number of Adjuncts to the total number of Indirect and Inferred requests. The Adjuncts to request were defined as those clauses, phrases, or sentences either immediately preceding or following the requests and expressing anyone of the following three meaning factors: (a) S's reason for making the request, (b) S's desire or need for the outcome of the action, or (c) S's check on H's willingness to do A.

Language-teaching aspect

The possible teaching value of mothers' speech for language development in the children was assessed by using the following measures borrowed or modified from present-day developmental

psycholinguistic literature. The following categories are not mutually exclusive.

Index 12: Words in dysfluencies. Ratio of the number of words in dysfluencies to the total number of words analysed. This index was computed on 1000 words. The words used were 500 words randomly selected from each recording session. According to Fraser and Roberts (1975), the number of words in disfluencies was a count of the words which occurred in "false start" to utterances, in interrupted utterances, and in ungrammatical repetitions or interjections within utterances. The only difference with Fraser and Robert's rule for counting words in dysfluencies was that the words occurring in "uncompleted utterances" (Fraser and Roberts, 1975, p. 12) were not counted as, by definition, there is no such thing as an uncompleted utterance.

Index 13: Acoustical clarity of maternal speech. Ratio of the number of totally or partially unintelligible utterances (judged from the tape recordings) to the total number of utterances (after Newport, Gleitman, and Gleitman, 1975). This index was computed on 400 utterances. The utterances used were the first 200 utterances from each recording session.

Index 14: Explicit direct verbal approvals and disapprovals of children's utterances. Ratio of the number of explicit verbal signs of approval and disapproval of children's utterances within three utterances of the original utterance to the total number of maternal responses to children's utterances (modified, after

Brown and Hanlon, 1970). This index was computed on 300 maternal responses to children's utterances. The maternal responses used were the first 150 responses to children's utterances in each recording session. Separate tallies were kept of verbal signs of approval and disapproval. The verbal signs of approval considered were: "(That's) right, (that's) correct, (that's) true, all right, (very) good, hmhm, yes, or yeah, (that's a)(good) boy (girl), okay, sure, of course", and the like, occurring as isolated words or clusters of words or embedded in longer utterances. The verbal signs of disapproval considered were: "(that's) wrong, (that's) not true, (that's) not correct, (that's) not so, no, (you're being) silly, you are silly (today), silly boy (girl), and the like. Only one instance of approval or disapproval could be scored per sentences.

Index 15: Attentional utterances. Ratio of the number of those maternal utterances that aimed at obtaining and retaining the child's attention to the total number of utterances (modified, after Shatz and Gelman, 1973, and Broen, 1972). This index was computed on 400 utterances. The utterances used were the first 200 utterances from each recording session. Attentional utterances were defined as those utterances containing one of the following words or expressions: "Hey, hi, mammy, the child's first name, (do)(you) see?, (let's) see, listen, (let's) look (at), come on, watch (out), well, now, okay, huh? (type 2 "Huh", see above). Also, isolated "Here" and "There" were counted as

attentional utterances.

Index 16: Mothers' exact repetitions of their own utterances. Ratio of the number of mothers' utterances that were exact repetitions of one of their preceding utterances within three utterances of the original utterance to the total number of utterances. Were also counted as exact repetitions: (a) the utterances including contracted auxiliary forms and repeating similar utterances in noncontracted forms, and vice versa, (b) the Yes/No inverted questions with deletion repeating similar nondeleted forms, and vice versa, and (c) the utterances similar to a preceding utterance but for one or several attentional, approval, disapproval, or vocative words, and vice versa. This index was computed on 400 utterances. The utterances used were the first 200 utterances from each recording session.

Index 17: Auxiliary development ratio. Newport, Gleitman, and Gleitman (1975) found that the more frequently mothers produced Yes/No inverted questions (i.e., auxiliary-fronted sentences) the more quickly their children learned to produce auxiliaries in their own speech. These authors further noted that the more frequently mothers produced affirmative imperative sentences, which lack auxiliaries (e.g., "Bring me a cookie"), the more slowly their children learned to produce auxiliaries in their own speech. This double finding is consistent with suggestions by Erwin-Tripp (1973) and Shipley, Smith, and Gleitman (1969) that the child pays some special attention to sentence-initial words.

It served as a basis for the present index. A ratio was computed of the number of Yes/No inverted questions to the number of affirmative imperative sentences. This index was computed on 400 utterances. The utterances used were the first 200 utterances from each recording session.

Index 18: Expansions and corrections. Ratio of the number of expansions and explicit corrective feedbacks to children's utterances within three utterances from the original to the total number of maternal responses to children's utterances. This index was computed on 300 maternal responses to children's utterances. The responses used were the first 150 responses to children's utterances in each recording session. Separate tallies were kept of expansions and explicit corrective feedbacks. Brown and Bellugi (1964) defined an expansion according to the following instruction: "...retain the words given in the order given and add these functors that will result in a well-formed simple sentence that is appropriate to the circumstances" (p. 313). In this study, and contrarily to the Brown and Bellugi's definition, all mothers' corrections of children's utterances for morphology, syntax, and/or semantics were counted as expansions. These corrections may proceed by adding to, subtracting from or transforming the linguistic material operated upon. Further, there is no need for the resulting utterance to be completely well-formed or "appropriate to the circumstances", assuming that there exists a criterion for judging of this appropriateness, or for

the added words to be functors rather than content words. However, in order for an expansion to be scored, the word order of the original utterance had to be preserved.

According to Moerk (1972), and quite naturally, expansions should include phonetic expansions as well (e.g., Child: "uck"; Mother: "ttrruck"). However, including such instances in the expansion counts requires the transcription of mothers' and children's speech to be phonetically exact, as each instance of maternal speech, particularly to younger children, is potentially an instance of phonetic expansion. As no effort was made in this study to insure exact phonetic transcription of mother's and children's speech, it was decided not to include purely phonetic expansions in the expansion count.

The explicit corrective feedbacks were defined as those maternal responses to children's utterances that contain an explicit correction of a preceding utterance by the child (e.g., Child: "Speaker"; Mother: "Wrong, tape recorder"), were considered those explicit corrections of a morphological, syntactical, and/or semantical nature. In order to keep a balance with the expansion count, the explicit corrective feedbacks of a purely phonetic nature were excluded from the correction count.

Index 19: Prodding. Ratio of the number of "prodding" utterances to the total number of utterances. This index was computed on 400 utterances. The utterances used were the first 200 utterances from each recording session. Prodding utterances

were defined as those utterances where the mothers made it verbally clear that they wanted the children to say or repeat something (Moerk, 1974). In this category, cases were counted only when the mothers invited their children with the following words: "Can you say ...", or "(You) say ...".

Index 20: Mothers' repetitions of children's utterances. Ratio of the number of mothers' repetitions of children's utterances within three utterances of the original to the total number of mothers' responses to children's utterances. This index was computed on 300 maternal responses to children's utterances. The responses used were the first 150 responses to children's utterances in each recording session. Maternal utterances needed not to be exact repetitions of preceding children's utterances in order to be counted. However, in order to be counted non-exact maternal "repetitions" of children's utterances had to be clearly related to children's utterances and not bring about any new information of any nature on the form and/or the content of children's utterances.

Analysis of children's speech

Output-numerical aspect

Index 21: Total number of words. Same as Index 1.

Lexical aspect

Index 22: Type-token ratio. Same as Index 2.

Syntactical aspect

Index 23: Upper bounds. The upper bound is the longest

utterance for a transcription calculated in number or morphemes (after Brown, 1973). This index was computed on the total sample of speech recorded.

Index 24: Incidence of utterances without verb. Same as Index 7 except that this index was computed on 300 utterances. The utterances used were the first 150 utterances from each recording session.

Index 25: Number of modifiers per utterance. Same as Index 8 except that this index was computed on 300 utterances. The utterances used were the first 150 utterances from each recording session.

Semantic-structural aspect

Index 26: Semantic-structural analysis. Same as Index 10. Excluded from this analysis were the children's direct and exact repetitions of maternal utterances, i.e., those utterances for which there was no sure ground for believing that the semantic intent basic to the utterance had been conceived by the child. In case of omissions of obligatory verb-related nouns, the verb-type classification was made as if the necessary noun components had been present. As said earlier, this does not constitute a serious problem when the analytical scheme is applied to adult-generated utterances, as semantic well-formedness can be safely assumed in normal adults for common concepts as those expressed in the speech of mothers to their young children. The same assumption is more questionable, however, when it is made about

the semantic structures that underlie child's speech. Such an assumption appears to be made regularly by developmental psycholinguistics in their semantically based analyses of child's speech (cf., for example, Bloom, 1970; Schlesinger, 1971; Bloom, Lightbown, and Hood, 1975; Edwards, 1973). The same assumption will be made in the present study but only the "clear cases" will be included in the analysis. The relative "clarity" of the cases will be established in using the information available in the linguistic and extralinguistic contexts (using maternal speech as a primary, but not infallible, source of information for disambiguating child's speech in this respect). It is useful, at this stage, to remind the reader of the fact that the author attended every recording session. On this opportunity, notes were taken on the extralinguistic context of mother-child verbal interactions to the purpose of being used in this semantic analysis.

Imitativeness aspect

Index 27: Children's repetitions of mothers' utterances. Percentage of children's exact and partial repetitions of an immediately preceding maternal utterance. This index was computed on the total sample of speech recorded.

Chapter 3

RESULTS

Reliability

Fifty-utterance samples randomly selected from the transcripts for 30 mother-child pairs randomly and equally selected from the two populations and the three language-level groups were independently transcribed by an assistant in order to assess transcription and utterance-segmentation reliability. The assistant was a native English-speaker with a Bachelor degree in Education and six years of experience as a teacher of normal and mentally retarded children (including Down's syndrome children). The percent agreement between the assistant and the author for these samples varied from 86 to 94%, with a mean of 92.13, in terms of morpheme agreement and from 84 to 96, with a mean of 90.07, for utterance segmentation.

Most indexes used in the speech analysis were simple counting procedures with clear-cut counting criteria. They were scored in all cases by the author and did not seem to require any reliability check. Since indexes 2 (Mothers' TTR), 11 (Requests for action), 12 (Words in dysfluencies), 13 (Acoustical clarity of maternal speech), 18 (Expansions and corrections), 20 (Mothers' repetitions of children's utterances), 22 (Children's TTR), and 27 (Children's repetitions of mother's utterances)

involved some subjective judgment, the same independent observer also scored these indexes for the same 30 mother-child pairs. The average percent of agreement was 95.87 for index 2, 94.07 for index 11, 97.87 for index 12, 86.20 for index 13, 91.80 for index 18, 94.80 for index 20, 98.00 for index 22, and 98.07 for index 27.

Analysis of Children's Speech

A two-way (type of children x language level) univariate analysis of variance (ANOVA) for nonrepeated measures was carried separately on indexes 21, 22, and 27. Whenever the ANOVA showed overall significance, cell means within the language-level factor were compared using the Newman-Keuls sequential-multiple-comparison procedure. As for the rest of this study, it was decided to reject the null hypothesis for a given statistic if the p-value obtained was equal to or less than .05. Means showing comparison of groups based on average scores are found in Table 3, together with a summary of the statistical analysis made on the data. Tables 4, 5, and 6 give further detail on the ANOVA's performed.

The analyses of variance for index 21 (Total number of words) and index 27 (Repetitions of mothers' utterances) indicate that children produced significantly more words during the two recording sessions and were significantly less repetitious of their mothers' utterances with the increase in language ability as

Table 3

Average Scores, Results of Two-Way ANOVA and Newman-Keuls Procedure for Indexes 21, 22, and 27 (Children's Speech)

Indexes	Means		ANOVA Significant effects			Newman-Keuls procedure
	DS[a]	Normal	Type of children	Language level	Type x level	Heterogeneous subsets in language levels[b]
21. (Total number of words)						
Language level 1	595.57	671.14	....	.000	....	1, 2, and 3
2	1207.43	1000.00				
3	1632.71	1541.71				
22. (Type-token ratio)						
Language level 1	.37	.36	.003	.000	....	1 and 2; 1 and 3
2	.50	.40				
3	.54	.47				
27. (Percent age of repetitions of mothers' utterances)						
Language level 1	25.70	28.17	....	.000	....	1, 2, and 3
2	7.71	11.49				
3	2.86	3.17				

[a] Down's syndrome.

[b] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Table 4

ANOVA for Index 21
(Children's Total Number of Words)

Source	df[a]	SS[b]	MS[c]	F-ratio	p-value
ANOVA ERROR	36	2673205.1	74255.698		
Type of children	1	57942.857	57942.857	.780	.383
Language level	2	6369307.2	3184653.6	42.888	.000
Type x Level	2	141622.43	70811.214	.954	.395

[a]Degree of freedom.

[b]Sum of squares.

[c]Mean squares.

Table 5

ANOVA for Index 22
(Children's Type-Token Ratio)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	.150	.004		
Type of children	1	.041	.041	9.944	.003
Language level	2	.143	.072	17.167	.000
Type x Level	2	.011	.006	1.423	.254

Table 6

ANOVA for Index 27
(Children's Repetitions of Mothers' Utterances)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	2604.383	72.344		
Type of children	1	50.310	50.310	.695	.410
Language level	2	4276.194	2138.097	29.555	.000
Type x Level	2	21.482	10.741	.148	.863

assessed by MLU. No other effect (including the Type of Children x Language Level interaction effect) is significant. The trend in cell means for index 27 is in favor of normal children. Normal children, as a group, were found to be more repetitious of maternal utterances than Down's syndrome children at the three language levels investigated. This trend is not significant, however, due to the relatively large variation in scores within groups of children. Results of the Newman-Keuls test show that the three language-level groups were significantly different from each other for total number of words produced and for repetitions of mothers' utterances.

The analysis of variance for index 22 (Type-token ratio) indicates, first, that Down's syndrome children had slightly but significantly superior TTR's than normal children, and, second, that there was a significant increase in TTR for both types of children with language development as assessed by MLU. The Type of Children x Language Level interaction is not significant. Results of the Newman-Keuls test show that language-level group 1 was significantly different from language-level groups 2 and 3 which were not significantly different one from the other.

The data from indexes 23 (Upper bounds), 24 (Proportion of utterances without verb), and 25 (Number of modifiers per utterance) were grouped to form a cluster of three variables related to the syntactical aspect of children's speech. Index

26 (related to the Semantic-structural aspect of children's speech) already constituted a cluster of 14 variables. These were the different major and optional verb types plus the Nomination and Residual categories. These two clusters of variables were analysed, following suggestion by Cramer and Bock (1966) and recommendation by Hummel and Sligo (1971), by using a two-way (type of children x language level) multivariate analysis of variance (MANOVA) carried out simultaneously on all the variables in each cluster (or family of variables). Following rejection of the overall null hypothesis, the MANOVA's were followed by univariate analyses of variance for nonrepeated measures run on each variable separately. Hummel and Sligo (1971) discourage analysing multivariate data in running an ANOVA on each variable separately, particularly when the number of variables and the proportion of variance these variables have in common increase. Indeed, in such cases, the experimentwise error rates (or familywise error rates), i.e., the probability that at least one comparison will be declared significant when, actually, the null hypothesis is true for all comparisons, increases to a level generally unknown. This and the fact that the errors tend to occur in sets can easily allow for a misinterpretation of the findings. Conversely, Hummel and Sligo recommend a "combination approach" to the analysis of multivariate data. The combination approach is made of a multivariate analysis of variance carried out simultaneously on all the variables

in the family and followed by univariate analyses of variance in case of rejection of the overall null hypothesis. This approach is recommended because it results in a familywise error rate which is reasonably consistent regardless of the number of variables analysed and the proportion of variance these variables have in common. Additionally, it was felt that the combination approach was appropriate for the study as it is not extremely conservative (Hummel and Sligo, 1971).

Means showing comparison of groups based on average scores are found in Table 7, for indexes 23, 24, and 25 (i.e., for the cluster of syntactic variables) and in Table 10 for index 26 (the cluster of semantic variables). Tables 8 and 11 summarize the MANOVA's performed on the clusters of syntactic and semantic variables, respectively. The distribution used to test the significance of the multivariate effects was based on the approximation of the Wilks' Lambda distribution to an F distribution. The Error Correlation Matrix of the two clusters of variables is shown in Appendix A 1 and A 2, respectively. Tables 9 and 12 summarize the ANOVA's performed on the language-level factor with the types of children combined, for the two clusters of variables following rejection of the overall null hypothesis for the language-level factor in the MANOVA's. Tables 9 and 12 also summarize the results of the Newman-Keuls procedure used for multiple comparison of the group means within the language-level factor. In these tables, F-ratios and p-values are supplied

Table 7

Average Scores for Indexes 23, 24, and 25 (Children's speech)

Indexes	Children					
	DS			Normal		
	Language level			Language level		
	1	2	3	1	2	3
23. (Upper bound in number of morphemes)	2.86	6.14	11.00	3.57	6.29	10.57
24. (Proportion of utterances without verb)	.87	.76	.58	.90	.74	.55
25. (Number of modifiers per utterance)	.21	.29	.43	.19	.35	.41

Table 8

MANOVA for the Cluster of Variables Related to the Syntactical Aspect of Children's Speech (Indexes 23, 24, and 25)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	3	34	.106	.956
Language level	6	68	27.212	.000
Type x Level	6	68	.898	.502

Table 9

Results of ANOVA[a] and Newman-Keuls Procedure on Language Level for the Cluster of Variables Related to the Syntactical Aspect of Children's Speech

Indexes	ANOVA MS	ANOVA F-ratio	ANOVA p-value	Newman-Keuls procedure Heterogeneous subsets[b] in language levels
23. (Upper bounds in number of morphemes)	.352	50.194	.000	1, 2, and 3
24. (Proportion of utterances without verb)	.172	21.825	.000	1, 2, and 3
25. (Number of modifiers per utterance)	203.524	150.847	.000	1, 2, and 3

[a] $df = 2$

[b] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Table 10

Average Scores for Index 26 (Proportions of Different Verb Types Plus Nomination and Residual Categories in Children's Speech)

Verb types	Children: DS Language level 1	DS Language level 2	DS Language level 3	Children: Normal Language level 1	Normal Language level 2	Normal Language level 3
A. (State)	.20	.28	.24	.21	.20	.26
B. (State-experiential)	.03	.07	.11	.04	.04	.06
C. (State-benefactive)	.00	.03	.04	.00	.02	.04
D. (State-locative)	.07	.10	.11	.07	.14	.10
E. (Process)	.01	.01	.02	.01	.02	.03
F. (Action)	.05	.04	.05	.01	.04	.03
G. (Process-action)	.02	.07	.08	.04	.06	.07
H. (Process-experiential and Action-experiential)	.03	.05	.07	.03	.04	.09
I. (Process-benefactive, Action-benefactive, and Process-action-benefactive)	.01	.02	.01	.00	.01	.03
J. (Process-instrumental, Action-instrumental, and Process-action-instrumental)	.00	.00	.01	.00	.00	.01

Table 10 (continued)

Average Scores for Index 26 (Proportions of Different Verb Types Plus Nomination and Residual Categories in Children's Speech)

Verb types	Children					
	DS Language level			Normal Language level		
	1	2	3	1	2	3
K. (State-completable and Action-completable)	.13	.09	.10	.05	.07	.10
L. (Process-locative, Action-locative, and Process-action-locative)	.03	.05	.10	.02	.13	.09
M. (Nomination)	.44	.18	.05	.53	.24	.07
N. (Residual)	.00	.01	.02	.00	.00	.02

Table 11

MANOVA for the Cluster of Variables Related to the Semantic Structural Aspect of Children's Speech (Index 26)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	14	23	.857	.609
Language level	28	46	3.563	.000
Type x Level	28	46	.944	.556

Table 12

Results of ANOVA[a] and Newman-Keuls Procedure on Language-Level for the Cluster of Variables Related to the Semantic Structural Aspect of Children's Speech

(Index 26) Verb types	ANOVA MS	ANOVA F-ratio	ANOVA p-value	Newman-Keuls procedure Heterogeneous subsets[b] in language levels
A. (State)	.009	1.223	.336	
B. (State-experiential)	.010	6.045	.005	1 and 3
C. (State-benefactive)	.006	15.032	.000	1, 2, and 3
D. (State-locative)	.008	1.911	.163	
E. (Process)	.001	3.112	.057	
F. (Action)	.000	.326	.724	
G. (Process-action)	.009	5.223	.010	1 and 2; 1 and 3
H. (Process-experiential and Action-experiential)	.009	5.748	.007	1 and 3; 2 and 3
I. (Process-benefactive, Action-benefactive, and Process-action-benefactive)	.001	1.939	.159	

[a] $df = 2$

[b] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Table 12 (continued)

Results of ANOVA[a] and Newman-Keuls Procedure on Language-Level for the Cluster of Variables Related to the Semantic Structural Aspect of Children's Speech

(Index 26) Verb types	ANOVA MS	ANOVA F-ratio	ANOVA p-value	Newman-Keuls procedure Heterogeneous subsets[b] in language levels
J. (Process-instrumental, Action-instrumental, and Process-action-instrumental)	.000	6.500	.004	1 and 3; 2 and 3
K. (State-completable and Action-completable)	.001	.302	.741	
L. (Process-locative, Action-locative, and Process-action-locative)	.026	11.088	.000	1 and 2; 1 and 3
M. (Nomination)	.650	42.636	.000	1, 2, and 3
N. (Residual)	.002	10.073	.000	1 and 3; 2 and 3

[a] $df = 2$.

[b] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

for the ANOVA's, although it is understood that as the Newman-Keuls procedure controls for the familywise risk of Type 1 error, it does not need a significant F to justify its use (Games, 1971). Mean squares (MS) for the language-level factor are also supplied in Tables 9 and 12 as an information allowing the interested reader to retrieve the value used to compare mean (I) to mean (J) in the Newman-Keuls multiple-comparison procedure and, hence, to compute a confidence interval for the differences between means. The value used to compare mean (I) to mean (J) was obtained by computing the following formula:

$$\text{Range} \sqrt{.5\ (MS)\ \left[(1/N(I) + 1/N(J)\right]}$$

where Range is the tabular value that corresponds to the number of steps two means (or totals) are apart on an ordered scale (Winer, 1971). In these analyses, the Newman-Keuls procedure ranges for the .05 level of significance were 2.86 and 3.44 for a range of one and two steps, respectively.

As shown in Table 7, Down's syndrome and normal children have higher upper bounds (index 23), produce less utterances without verbs (index 24), and use more modifiers per utterance (index 25) with the increase in language ability as assessed by MLU. The multivariate analysis of variance for this cluster of variables related to the syntactical aspect of children's speech (Table 8) reveals no significant difference according to

type of children (Down's syndrome versus normal children). The Type of Children x Language Level interaction is not significant. However, the same multivariate analysis of variance indicates that the children are significantly different on the cluster of syntactic variables according to their level of language development as measured by MLU. This was confirmed for the three indexes by a subsequent univariate analysis of variance carried separately on each index (Table 9). Results of the Newman-Keuls multiple-comparison procedure show that the children were significantly different at the three levels of language development for each of the three indexes.

As shown in Table 10, there is a steady and similar modification in the average categorical proportions for the semantic structural variables (Index 26) in the two populations of children as a function of development in language ability. The multivariate analysis of variance performed on this cluster of semantic-structural variables (Table 11) reveals no significant effect of the type of children and no interaction between Type of Children and Language Level. However, it reveals a significant language-level effect. Subsequent and separate analyses of variance for this cluster of semantic structural variables were carried on the language-level factor with the types of children combined. They indicate (Table 12) that, with the increase in language ability, Down's syndrome and normal children use significantly more verb types of the following sorts:

State-experiential, State-benefactive, Process-action, Process-experiential and Action-experiential, Process-benefactive, Action-benefactive, and Process-action-benefactive, Process-locative, Action-locative, and Process-action-locative, and significantly more of these more complex verb specifications grouped in the Residual category, but significantly less nominations. Results of the Newman-Keuls procedure as applied to these differences (Table 12) indicated that children's speech was often significantly different on these semantic variables at the three levels of language development studied.

In sum, it appears, on the one hand, that, except for Type-token ratio which slightly but significantly favors Down's syndrome children, the results of the analysis of children's speech validate the matching on children's MLU used as a basis for studying maternal speech in this research. On the other hand, the speech produced by Down's syndrome and normal children appears to differ significantly in its output-numerical, lexical, syntactical, semantic-structural, and imitativeness aspects, according to the three levels of language development studied.

Analysis of Mothers' Speech

Indexes 1 (Total number of words) and 2 (Type-token ratio) were analysed separately with a two-way (type of children x children's language level) univariate analysis of variance for nonrepeated measures. Whenever the ANOVA showed overall signifi-

cance, cell means for mothers' speech within the children's language-level factor were compared using the Newman-Keuls multiple-comparison procedure. Means showing comparison of groups based on average scores are found in Table 13, together with a summary of the statistical analysis made on the data. Tables 14 and 15 give further detail on the ANOVA's performed.

An inspection of the upper portion of Table 13 reveals that mothers' means for Total number of words are close for the two populations of children at the three language levels. The analysis of variance indicates that no main effect or interaction effect is significant for this index. The total number of words expressed by the mothers to the children during the two recording sessions appears to be remarkably similar for the normal and the Down's syndrome children at the three language levels studied.

As shown in the lower portion of Table 13, mothers of the Down's syndrome children and mothers of the normal children have TTR's that are close at each of the three children's language levels, except, perhaps, for the third language level where the difference between the average TTR of mothers of the Down's syndrome children and mothers of the normal children somewhat widens in favor of the former. However, the type of children factor yielded no significant difference. Nor was the Type of Children x Language Level interaction significant. But, mothers' TTR was significantly different according to the language level

Table 13

Average Scores, Results of Two-Way ANOVA and Newman-Keuls Procedure for Indexes 1 and 2 (Mothers' Speech)

Indexes		Means		ANOVA Significant effects			Newman-Keuls procedure
		DS[a]	Normal	Type of children	Language level	Type x level	Heterogeneous subsets[b] in language levels
1. (Total number of words)							
Language levels	1	3643.00	3650.00	....	....	....	
	2	3811.00	3475.43				
	3	3862.86	3606.86				
2. (Type-token ratio)							
Language level	1	.44	.44	....	.004	....	1 and 2; 1 and 3
	2	.49	.49				
	3	.52	.49				

[a]This boxhead must be read as "Means of mothers of the Down's syndrome children," on the one side, and "Means of mothers of the normal children," on the other side.

[b]Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

[c]Children's language level.

Table 14

ANOVA for Index 1
(Mothers' Total Number of Words)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	20348381.	565232.82		
Type of children	1	398677.71	398677.71	.705	.407
Language level[a]	2	75675.571	37837.786	.067	.935
Type x Level	2	224998.43	112499.21	.199	.820

[a]Children's language level.

Table 15

ANOVA for Index 2
(Mothers' Type-token ratio)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	.096	.003		
Type of children	1	.001	.001	.258	.614
Language level	2	.035	.017	6.517	.004
Type x Level	2	.003	.002	.570	.570

of the children addressed. Results of the application of the Newman-Keuls procedure show that mothers' TTR's are significantly lower for children at language level 1 than for children at language level 2 and 3. Further, mothers' TTR is not significantly different for the children at these last two language levels.

The data from indexes 3 (MLU in number of morphemes), 4 (Proportions of utterances of specific lengths in number of morphemes), 5 (Sentence complexity ratio), 6 (Mean preverb length in number of morphemes), 7 (Proportion of utterances without verb), and 8 (Number of modifiers per utterance) were grouped to form a cluster of variables related to the syntactical within-utterance aspect of mothers' speech. This cluster was analysed using the "combination approach" defined earlier for the analysis of clusters of variable in children's speech.

Means showing comparisons of groups of mothers based on average scores are found in Table 16. Table 17 summarizes the two-way (type of children x children's language level) MANOVA performed on this cluster of syntactic variables for which the Error Correlation Matrix is found in Appendix A 3. Table 18 summarizes the results of the univariate analyses of variance for nonrepeated measures performed on the language level factor (i.e., the factor related to the language-levels of the children addressed by their mothers) with the types of children combined for the cluster of syntactic variables following rejection of

Table 16

Average Scores for Indexes 3, 4, 5, 6, 7, and 8 (Mothers' Speech)

Indexes	Childred addressed: DS Language level 1	DS Language level 2	DS Language level 3	Normal Language level 1	Normal Language level 2	Normal Language level 3
3. (Mean length of utterances)	3.96	4.39	5.52	4.24	4.64	4.84
4. (Proportions of utterances of specific lengths)						
Morpheme length: A. 1	.23	.22	.16	.19	.17	.19
B. 2-3	.30	.26	.17	.26	.22	.21
C. 4-6	.32	.31	.32	.37	.38	.32
D. 7-9	.10	.13	.22	.14	.16	.19
E. 10+	.05	.07	.14	.05	.07	.09
5. (Sentence-complexity ratio)	.06	.07	.12	.06	.08	.10
6. (Mean preverb length in morphemes)	1.96	2.15	2.43	1.86	2.11	2.43
7. (Proportion of utterances without verb)	.31	.32	.28	.28	.25	.28
8. (Number of modifiers per utterance)	.57	.58	.84	.55	.68	.68

Table 17

MANOVA for the Cluster of Variables Related to the Syntactical Within-Utterance Aspect of Mothers' Speech (Indexes 3, 4, 5, 6, 7, and 8)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	10	27	1.243	.309
Language level[a]	20	54	1.910	.031
Type x Level	20	54	1.123	.355

[a]Children's language level.

Table 18

Results of ANOVA[a] and Newman-Keuls Procedure on Language Level[b] for the Cluster of Variables Related to the Syntactical Within-Utterance Aspect of Mothers' Speech

Indexes	ANOVA			Newman-Keuls Procedure
	MS	F-ratio	p-value	Heterogeneous Subsets[c] in language levels
3. (Mean length of utterances)	4.197	8.208	.001	1 and 3; 2 and 3
4. (Proportion of utterances of specific lengths)				
Morpheme length: A. 1	.004	1.434	.252	
B. 2-3	.028	8.143	.001	1 and 3; 2 and 3
C. 4-6	.003	1.041	.364	
D. 7-9	.027	13.634	.000	1 and 3; 2 and 3
E. 10+	.105	6.996	.003	1 and 3; 2 and 3
5. (Sentence complexity ratio)	.010	6.887	.003	1 and 3; 2 and 3
6. (Mean preverb length in morphemes)	.957	15.777	.000	1, 2, and 3
7. (Proportion of utterances without verb)	.001	.187	.830	
8. (Number of modifiers per utterance)	.140	5.086	.011	1 and 3

[a] $df = 2$

[b] Children's language level.

[c] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

the overall null hypothesis for the language-level factor in the MANOVA. Table 18 also supplies the results of the Newman-Keuls procedure as applied to the group means within the language-level factor following rejection of the null hypothesis on the language-level factor in the ANOVA's.

As shown in Table 17, the differences between the speech of the mothers addressing their normal children and the speech of the mothers addressing their Down's syndrome children at each of the three levels of language development in the children are not significant for this cluster of syntactical variables according to the MANOVA performed on the data. The Type of Children x Language Level interaction is not significant either. However, the children's language level effect is significant. Subsequent and separate univariate analyses of variance carried on the language level factor (Table 18) confirm that both mothers of normal children and mothers of Down's syndrome children increased significantly their MLU's and the complexity of their sentences, and used significantly more modifiers per utterance, as a function of augmented language ability in the children as assessed by children's MLU. Although there exists a decrease in proportion of utterances without verb for the mothers of normal children and the mothers of Down's syndrome children with the increase in children's MLU, this trend was not significant. An inspection of the data gathered under Index 4 reveals that mothers significantly decreased their proportions

of utterances containing 2 and 3 morphemes and significantly increased their proportions of utterances containing 7 morphemes and more as a function of development in children's MLU. There is also a trend with increase in children's MLU toward decrease in the proportions of those maternal utterances containing only one morpheme and in the proportions of those maternal utterances containing 4 to 6 morphemes. But this trend is not significant. Results of the application of the Newman-Keuls procedure show that maternal speech was significantly different at language levels 1 and 3, and 2 and 3, for mean length of utterance, proportions of utterances containing 2 and 3, and 7 and more morphemes, sentence complexity, and mean preverb length, but significantly different only at language levels 1 and 3 for number of modifiers per utterance.

Index 9 (Proportions of different types and subtypes of sentence) already constituted a cluster of variables related to the syntactical between-utterance aspect of mothers' speech. Except for categories 9 K and 9 L which represent totals (Total proportion of yes/no questions and Total proportion of questions, respectively), it was analysed using the combination approach. Categories 9 K and 9 L were excluded from the MANOVA in order to conform to the rule excluding summations of the categories and, thereby, avoid needlessly increasing the proportion of variance in common among variables in the cluster. Categories 9 K and 9 L were analysed separately using an univariate analysis

of variance.

Means showing comparisons of groups of mothers based on average scores are found in Table 19. As shown in Table 19, there were only relatively minor fluctuations in the proportions of different types and subtypes of sentence, including Total proportion of yes/no questions and Total proportion of questions, across language-level groups and between the two populations of children. The only two exceptions to this general observation concern the proportions of Declarative and Imperative sentences. The former increases and the latter decreases in mothers' speech from children's language level 1 to 3, and rather similarly for the two populations of children.

Table 20 summarizes the MANOVA performed on Index 9, categories A to J. The Error Correlation Matrix for these variables is found in Appendix A 4. Results of the MANOVA indicate no significant difference in this cluster of syntactical variables according to type or language level of the children. Similarly, the Type of Children x Language Level interaction effect is not significant. As shown in Tables 21 and 22, the ANOVA's carried separately on Index 9, categories K and L, reveal no significant main effect of type of children or language level of the children nor any Type of Children x Language Level interaction on total proportion of yes/no questions and total proportion of questions in maternal speech.

As for Index 26 (Children's speech), Index 10, which con-

Table 19

Average Scores for Index 9
(Proportions of Different Types and Subtypes of Sentence in Mothers' Speech)

Sentence categories		Children addressed					
		DS Language level			Normal Language level		
		1	2	3	1	2	3
A.	(Declarative)	.23	.25	.33	.24	.33	.32
B.	(Imperative)	.18	.11	.06	.16	.13	.09
C.	(Inverted yes/no question)	.14	.13	.14	.17	.14	.12
D.	(Intonation question)	.01	.01	.01	.01	.02	.01
E.	(Immature tag question)	.01	.01	.02	.01	.01	.01
F.	(Mature tag question)	.01	.01	.02	.01	.02	.01
G.	(Occasional wh-question)	.00	.00	.01	.00	.00	.01
H.	(Other wh-question)	.26	.30	.23	.25	.18	.27
I.	(Yes/no inverted question with deletion)	.03	.01	.01	.03	.04	.02
J.	(Other grammatically incomplete sentence)	.13	.17	.16	.12	.13	.14
K.	(Total yes/no questions)	.21	.17	.21	.24	.22	.17
L.	(Total questions)	.47	.47	.45	.49	.41	.45

Table 20

MANOVA for the Cluster of Variables Related to the Syntactical Between-Utterance Aspect of Mothers' Speech (Index 9 Minus Categories K and L)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	10	27	.935	.518
Language level[a]	20	54	1.595	.089
Type x Level	20	54	.940	.543

[a]Children's language level.

Table 21

ANOVA for Index 9 K
(Mothers' Total Proportion of Yes/No Questions)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	.135	.004		
Type of children	1	.003	.003	.719	.402
Language level[a]	2	.008	.004	1.069	.354
Type x Level	2	.016	.008	2.187	.127

[a]Children's language level.

Table 22

ANOVA for Index 9 L
(Mothers' Total Proportion of Questions)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	.327	.009		
Type of children	1	.002	.002	.238	.628
Language level[a]	2	.009	.005	.513	.603
Type x Level	2	.014	.007	.774	.469

[a]Children's language level.

stituted a similar cluster of 14 variables related to the semantic-structural aspect of mothers' speech, was analysed by a combined approach of multivariate analysis of variance followed by separate univariate analyses of variance in case of rejection of the overall null hypothesis. Means showing comparisons of groups based on average scores are found in Table 23. As shown in Table 23, the similarity in mothers' proportions of different verb types (including residual verb types) plus nominations is rather striking across the two populations of children at each level of children's language development. There are also neat and general trends toward decrease or increase (depending on the category considered) in proportions of verb types and nominations with developing linguistic skills in the two populations of children.

The MANOVA performed on this cluster of semantic variables (Table 24), for which the Error Correlation Matrix is supplied in Appendix A 5, reveals no significant effect of type of children and no Type of Children x Language Level interaction effect on the proportions of different verb types plus nominations in maternal speech. It reveals, however, a significant effect of language level of the children on maternal speech. Subsequent and separate ANOVA's for this cluster of semantic structural variables were carried on the language-level factor with the types of children combined. They confirmed (Table 25) the statistical significance of the observed increases in proportions of

Table 23

Average Scores for Index 10 (Proportions of Different Verb Types Plus Nomination and Residual Categories in Mothers' Speech)

Verb types	Children addressed: DS Language level 1	DS Language level 2	DS Language level 3	Normal Language level 1	Normal Language level 2	Normal Language level 3
A. (State)	.31	.28	.21	.27	.23	.21
B. (State-experiential)	.08	.07	.09	.06	.07	.07
C. (State-benefactive)	.03	.02	.04	.02	.03	.03
D. (State-locative)	.06	.09	.05	.10	.10	.08
E. (Process)	.01	.03	.03	.02	.02	.04
F. (Action)	.05	.04	.05	.04	.03	.05
G. (Process-action)	.03	.05	.06	.05	.06	.09
H. (Process-experiential and Action-experiential)	.07	.08	.11	.07	.09	.08
I. (Process-benefactive, Action-benefactive, and Process-action-benefactive)	.02	.03	.02	.04	.05	.02
J. (Process-instrumental, Action-instrumental, and Process-action-instrumental)	.01	.00	.01	.01	.00	.01

Table 23 (continued)

Average Scores for Index 10 (Proportions of Different Verb Types Plus Nomination and Residual Categories in Mothers' Speech)

Verb types	Children addressed					
	DS Language level			Normal Language level		
	1	2	3	1	2	3
K. (State-completable and Action-completable)	.13	.14	.14	.13	.10	.11
L. (Process-locative, Action-locative, and Process-action-locative)	.06	.07	.13	.07	.16	.13
M. (Nomination)	.10	.03	.01	.10	.03	.02
N. (Residual)	.05	.06	.07	.02	.04	.05

Table 24

MANOVA for the Cluster of Variables Related to the Semantic-Structural Aspect of Mothers' Speech (Index 10)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	14	23	1.508	.185
Language level[a]	28	46	2.786	.001
Type x Level	28	46	.678	.862

[a]Children's language level.

Table 25

Results of ANOVA[a] and Newman-Keuls Procedure on Language Level[b] for the Cluster of Variables Related to the Semantic-Structural Aspect of Mothers' Speech

(Index 10) Verb types	ANOVA MS	ANOVA F-ratio	ANOVA p-value	Newman-Keuls procedure Heterogeneous subsets[c] in language levels
A. (State)	.021	2.657	.084	
B. (State-experiential)	.001	.370	.693	
C. (State-benefactive)	.000	.919	.408	
D. (State-locative)	.003	1.629	.210	
E. (Process)	.001	3.583	.038	1 and 3
F. (Action)	.001	.799	.458	
G. (Process-action)	.004	2.524	.094	
H. (Process-experiential and Action-experiential)	.003	2.081	.140	
I. (Process-benefactive, Action-benefactive, and Process-action-benefactive)	.001	1.780	.183	

[a] df = 2

[b] Children's language level.

[c] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Table 25 (continued)

Results of ANOVA[a] and Newman-Keuls Procedure on Language Level[b] for the Cluster of Variables Related to the Semantic-Structural Aspect of Mothers' Speech

(Index 10) Verb types	ANOVA			Newman-Keuls procedure
	MS	F-ratio	p-value	Heterogeneous subsets[c] in language levels
J. (Process-instrumental, Action-instrumental, and Process-action-instrumental)	.000	1.038	.365	
K. (State-completable and Action-completable)	.001	.173	.842	
L. (Process-locative, Action-locative, and Process-action-locative)	.017	6.357	.004	1 and 2; 1 and 3
M. (Nomination)	.028	19.826	.000	1 and 2; 1 and 3
N. (Residual)	.002	4.445	.019	1 and 3

[a] $\underline{df} = 2$

[b] Children's language level.

[c] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Process verbs, Process-locative, Action-locative, and Process-action-locative verbs, Residual verb types, and the statistical significance of the observed decrease in proportions of Nominations in mothers' speech as a function of language development in the children. No other difference in mothers' proportions of verb types according to language level of the children was significant. Results of the Newman-Keuls procedure as applied to these differences indicate that for proportions of Process verbs and Residual verb types mothers' speech was significantly different for the children at the first and third language levels, whereas for proportions of Process-locative, Action-locative, and Process-action-locative verbs and for proportions of Nominations, mothers' speech was significantly different for language levels 1 and 3, and 1 and 2 but not for language levels 2 and 3.

Index 11, which constituted a cluster of 8 variables related to the semantic-pragmatic aspect of mothers' speech, was analysed using the combination approach. Means showing comparisons of groups based on average scores are found in Table 26. Table 27 summarizes the MANOVA performed on this cluster of semantic-pragmatic variables excluding category 11 F (Total proportion of requests). This category was excluded from the MANOVA in order to conform to the rule excluding summations of the categories and, thereby, avoid needlessly increasing the proportion of variance in common among variables in the cluster. Category

Table 26

Average Scores for Index 11 (Proportions of Different Types of Request for Action and Proportions of Adjuncts to Request in Mothers' Speech)

Categories	Children addressed					
	DS			Normal		
	1	2	3	1	2	3
A. (Direct request)	.11	.07	.03	.12	.08	.06
B. (Proposal for joint action)	.02	.01	.02	.03	.02	.02
C. (Indirect request type one)	.04	.01	.01	.03	.03	.01
D. (Indirect request type two)	.01	.01	.01	.01	.01	.01
E. (Inferred request)	.00	.00	.00	.00	.00	.00
F. (Total requests)[a]	.18	.11	.07	.19	.13	.10
G. (Total adjuncts to request)	.10	.15	.13	.12	.19	.22
H. (Adjunct to indirect and to inferred requests)	.14	.30	.17	.17	.26	.19

Note. The basis for computing the last two proportions was not the total number of utterances in the sample, as this was the case for categories A to F, but the total number of requests and the total number of indirect plus inferred requests, for category G and H, respectively.

[a]Including Proposals for joint action.

Table 27

MANOVA for the Cluster of Variables Related to the Semantic-Pragmatic Aspect of Mothers' Speech (Index 11 Minus Category F)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	7	30	1.632	.165
Language level[a]	14	60	3.468	.000
Type x Level	14	60	.864	.599

[a]Children's language level.

11 F was analysed separately by an univariate analysis of variance (Table 28). The Error Correlation Matrix of this cluster of semantic-pragmatic variables (excluding category 11 F) figures in Appendix A 6. Table 29 summarizes the results of the ANOVA's performed on the language-level factor with the types of children combined for this cluster of variables following rejection of the overall null hypothesis for the language-level factor in the MANOVA. The same table also summarizes the results of the Newman-Keuls procedure applied following rejection of the null hypothesis in the ANOVA's.

As shown in Table 26, the proportions of different types of request for action and the proportions of adjuncts to request in mothers' speech are remarkably similar for the two populations of children at each of the three language levels. Further, and both for mothers of Down's syndrome children and for mothers of normal children, there is a decrease in average proportions of Direct requests, Indirect requests type one, and in Total proportions of requests, with augmented language ability in the children. There is also increase in Total proportions of adjuncts to request with augmented language ability in the children. Curiously, there is an increase in proportions of Adjuncts to indirect and inferred requests from language level 1 to 2 and a decrease from language level 2 to 3 in maternal speech for the two populations of children. The average proportions of Indirect requests type two, Proposals for joint action, and

Table 28

ANOVA for Index 11 F
(Mothers' Total Proportion of Requests)

Source	df	SS	MS	F-ratio	p-value
ANOVA ERROR	36	.134	.004		
Type of children	1	.005	.005	1.291	.263
Language level[a]	2	.074	.037	9.844	.000
Type x Level	2	.002	.001	.218	.805

[a]Children's language level.

Table 29

Results of ANOVA[a] and Newman-Keuls Procedure on Language Levels[b] for the Cluster of Variables Related to the Semantic-Pragmatic Aspect of Mothers' Speech

Index 11[c]	ANOVA			Newman-Keuls procedure
	MS	F-ratio	p-value	Heterogeneous subsets[d] in language levels
A. (Direct request)	.028	10.144	.000	1 and 2; 1 and 3
B. (Proposal for joint action)	.001	3.159	.054	
C. (Indirect request type one)	.002	8.559	.001	1 and 2; 1 and 3
D. (Indirect request type two)	.000	.222	.802	
E. (Inferred request)	.000	.265	.769	
G. (Total adjuncts to request)	.015	2.619	.087	
H. (Adjunct to indirect and to inferred request	.060	4.429	.019	1 and 2; 2 and 3

[a] df = 2.

[b] Children's language level.

[c] As category F (Total proportion of requests) was excluded from this cluster for the statistical analysis, category G follows directly category E in the table.

[d] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Inferred requests are low or null.

The MANOVA (Table 27) reveals a significant effect of children's language level on this cluster of semantic-pragmatic variables in mothers' speech. The effects of type of children and the Type of Children x Language Level interaction are not significant. Separate ANOVA's carried on the language-level factor with the types of children combined and subsequent application of the Newman-Keuls procedure (Table 29) confirmed that mothers used significantly less Direct requests and Indirect requests type one when addressing children at language level 1 than when addressing children at language level 2 or 3. Mothers also used significantly more Adjuncts to indirect and inferred requests when addressing children at language level 2 than children at language level 1 or 3.

Results of the separate ANOVA carried on category 11 F (Total proportion of requests, including Proposals for joint action, Table 28) reveals no effect of type of children and no Type of Children x Language Level interaction. However, the language level effect is significant. Results of the Newman-Keuls procedure applied to this category indicates that a significantly higher Total proportion of requests was made by the mothers to the children at language level 1 than to the children at language level 2 or 3.

It was hypothesized, in chapter 1, that the adjuncts to request could help the child to understand utterances as requests

when these utterances are not formulated as direct requests. Such an hypothesis predicts higher proportions of Total adjuncts to request and higher proportions of Adjuncts to indirect and inferred requests in maternal speech to those children who are less advanced in language development, as it can be assumed that, if anything, they are less likely to understand nondirect requests. The results offer some support for the hypothesis but the proportions are probably too low to warrant any conclusion. Proportions of Total adjuncts to request increase, although not significantly, from language level 1 to language level 3. This is in accordance with the hypothesis. Proportion of Adjuncts to indirect and inferred requests is significantly higher in maternal speech to children at language level 1 than to children at language level 2, which is also in accordance with the hypothesis but it decreases significantly from language level 2 to language level 3. The reason behind this curvilinear trend in proportions of Adjuncts to indirect and inferred requests with increase in children's language ability is not clear.

Indexes 12 (Proportion of words in dysfluencies), 13 (Proportion of unintelligible utterances), 14 A (Proportion of explicit direct verbal approvals of children's utterances) 14 B (Proportion of explicit direct verbal disapprovals of children's utterances), 15 (Proportion of attentional utterances), 16 (Proportion of mothers' exact repetitions of their own utterances),

17 (Auxiliary development ratio), 18 A (Proportion of expansions of children's utterances), 18 B (Proportion of explicit corrections of children's utterances), 19 (Proportion of prodding utterances), and 20 (Proportion of mothers' repetitions of children's utterances) constituted a cluster of 11 variables related to the language-teaching aspect of mothers' speech and were also analysed using the combination approach.

Means showing comparisons of groups based on average scores are found in Table 30. Table 31 summarizes the MANOVA performed on this cluster of variables for which the Error Correlation Matrix is supplied in Appendix A 7. Table 32 summarizes the results of the ANOVA's carried on the language-level factor with the types of children combined for this cluster of variables following rejection of the overall null hypothesis for the language level factor in the MANOVA. In the same table are also found the results of the Newman-Keuls procedure applied following rejection of the null hypothesis in the ANOVA's.

As Table 30 shows, the trends in average mothers' scores according to language development in the children are often similar in the two populations of children. Also the differences in average mothers' scores on the indexes are commensurable for the two populations of children at each language level. The MANOVA carried on this cluster of variables (Table 31) reveals a significant effect of language level of the children on mothers' speech. The effect of type of children as well as the

Table 30

Average Scores for Indexes 12, 13, 14, 15, 16, 17, 18, 19, and 20
(Mothers' Speech)

Indexes	Children addressed					
	DS Language level			Normal Language level		
	1	2	3	1	2	3
12. (Proportion of words in dysfluencies)	.01	.01	.03	.01	.01	.01
13. (Proportion of unintelligible utterances)	.01	.02	.04	.03	.03	.04
14. A. (Proportion of explicit direct verbal approvals of children's utterances)	.27	.21	.23	.20	.14	.17
B. (Proportion of explicit direct verbal disapprovals of children's utterances)	.06	.04	.03	.03	.02	.04
15. (Proportion of attentional utterances)	.17	.10	.12	.13	.14	.09
16. (Proportion of mothers' exact repetitions of their own utterances)	.09	.03	.02	.08	.04	.03

Table 30 (continued)

Average Scores for Indexes 12, 13, 14, 15, 16, 17, 18, 19, and 20 (Mothers' Speech)

Indexes	Children addressed					
	DS Language level			Normal Language level		
	1	2	3	1	2	3
17. (Auxiliary development ratio)	1.38	2.34	3.14	1.50	3.08	2.19
18. A. (Proportion of expansions of children's utterances)	.15	.09	.06	.13	.11	.04
B. (Proportion of explicit corrections of children's utterances)	.03	.03	.00	.04	.02	.02
19. (Proportion of prodding utterances)	.04	.00	.00	.02	.01	.00
20. (Proportion of mothers' repetitions of children's utterances)	.14	.10	.09	.11	.08	.06

Table 31

MANOVA for the Cluster of Variables Related to the Language-Teaching Aspect of Mothers' Speech (Indexes 12, 13, 14, 15, 16, 17, 18, 19, and 20)

Source	df Hypothesis	df Error	F-ratio	p-value
Type of children	11	26	.963	.502
Language level[a]	22	52	3.686	.000
Type x Level	22	52	.900	.595

[a]Children's language level.

Table 32

Results of ANOVA[a] and Newman-Keuls Procedure on Language Level[b] for the Cluster of Variables Related to the Teaching-Language Aspect of Mothers' Speech

Indexes	ANOVA			Newman-Keuls procedure
	MS	F-ratio	p-value	Heterogeneous subsets[c] in language levels
12. (Proportion of words in dysfluencies)	.000	2.397	.105	
13. (Proportion of unintelligible utterances)	.001	1.968	.154	
14. A. (Proportion of explicit direct verbal approvals of children's utterances)	.012	1.668	.203	
B. (Proportion of explicit verbal disapprovals of children's utterances)	.001	1.110	.340	
15. (Proportion of attentional utterances)	.008	2.541	.093	
16. (Proportion of mothers' exact repetitions of their own utterances)	.014	21.615	.000	1 and 2; 1 and 3

[a] $df = 2$

[b] Children's language level.

[c] Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Table 32 (continued)

Results of ANOVA[a] and Newman-Keuls Procedure on Language Level[b] for the Cluster of Variables Related to the Teaching-Language Aspect of Mothers' Speech

Indexes	ANOVA			Newman-Keuls procedure
	MS	F-ratio	p-value	Heterogeneous subsets[c] in language levels
17. (Auxiliary development ratio)	7.237	1.076	.352	
18. A. (Proportion of expansions of children's utterances)	.030	15.389	.000	1, 2, and 3
B. (Proportion of explicit corrections of children's utterances)	.002	6.548	.004	1 and 3, 2 and 3
19. (Proportion of prodding utterances)	.004	7.973	.001	1 and 2; 1 and 3
20. (Proportion of mothers' repetitions of children's utterances)	.009	2.192	.126	

[a] $df = 2$.

[b] Children's language level.

[c] Subsets of group, no pair of which have means that differ by less than the shortest significant range for a subset of that size.

Type of Children x Language Level interaction are not significant. As shown in Table 32, the significance of the differences in mothers' speech according to language level of the children is confirmed by separate ANOVA's on this factor for Proportion of mothers' exact repetitions of their own utterances (Index 16), Proportion of maternal expansions and explicit corrections of children's utterances (Index 18 A and 18 B, respectively), and for Proportion of prodding utterances (Index 19). Despite noticeable differences in average scores, Proportion of mothers' explicit direct verbal approval of children's utterances and Proportion of mothers' attentional utterances were not found to differ significantly along the three language levels of the children.

Results of the Newman-Keuls procedure as applied to these differences indicate that mothers repeated significantly more their own utterances and prodded significantly less children's utterances when interacting with the children at language level 1 than with the children at language levels 2 and 3. The results also indicate that maternal expansions were significantly less frequent with development in children's language ability for the three language levels. Finally, mothers' explicit corrections of children's utterances were significantly more frequent for the children at language level 1 than for the children at the other two levels of language development.

In sum, maternal speech to normal and to Down's syndrome

children matched for MLU was not found to differ significantly in Total number of words, Type-token ratio, and on the clusters of variables related to syntactical (both within and between utterances), semantic-structural, semantic-pragmatic, and language-teaching aspects of speech. However, maternal speech, both for mothers of normal children and for mothers of Down's syndrome children, was found to differ significantly on the variables listed above, except for the cluster of variables related to the syntactical between-utterance aspect of speech (i.e., the proportions of different types and subtypes of sentences) as a function of language level of the children as assessed by children's MLU. The statistical significance of these differences considered in isolation one from the others was confirmed for many variables in the subsequent and separate univariate analyses of variance carried on the language-level factor with the types of children combined.

One might be tempted to consider that a "combination approach" like the one used in the statistical analysis of the data reported here is simply a more conservative approach for analysing multivariate data than the approach, not uncommon in psychological research, that consists in analysing multivariate data by testing the null hypothesis on each variable separately with an univariate analysis of variance. This position is not the one adopted in this research, as stated above, because the combination approach is not extremely conservative, according to

Hummel and Sligo (1971), and because an univariate approach does not control for the grouping of errors and the increase in the experiment- or family-wise error rates that occur when the number of variables studied and the proportion of variance these variables have in common, increase. It is interesting to notice that, even in deciding to analyze the above data by running a two-way univariate analysis of variance on each linguistic variable, therefore accepting the risk of rejecting the null hypothesis when, in fact, it is true in an indeterminate number of cases, the number of times one would reject the null hypothesis for differences in mothers' speech according to types of children at corresponding language levels, is still very limited. Such an univariate approach would lead to rejecting the null hypothesis for differences in maternal speech according to type of children for the following indexes: 4 A (Proportion of utterances of 4-to-6 morpheme length; this index favors mothers of normal children), 10 L (Proportion of process-locative, action-locative, and process-action-locative verbs; favoring mothers of normal children), 10 N (Proportion of residual verb types, i.e., those verb types involving more than one optional verb category at a time; this measure favors mothers of Down's syndrome children), 11 G (Total proportion of adjuncts to request; favoring mothers of normal children), and 14 A (Proportion of explicit direct verbal approval of children's utterances; favoring mothers of Down's syndrome children).

With the same univariate approach, three Type of Children x Language Level interactions and two more language level effects on maternal speech would be significant. The interaction effects are in indexes 9 H (Proportion of other WH-questions, i.e., other WH-questions than the occasional WH-questions), where the trends in average scores are rather curvilinear but in a reverse way for the mothers of normal children and for the mothers of Down's syndrome children, 11 C (Proportion of indirect requests type one), where there is a decrease in average scores from language level 1 to 3 in maternal speech to Down's syndrome children, but a slight increase from language level 1 to 2, followed by a decrease from language level 2 to 3 in maternal speech to normal children. The three additional effects of children's language level on maternal speech that would be significant in an univariate approach are in the following indexes: 9 A (Proportion of declarative sentences; this proportion increases from language level 1 to 3 in mothers' speech to normal and to Down's syndrome children), 9 B (Proportion of imperative sentences; decreasing from language level 1 to 3 in mothers' speech to both types of children), and 9 G (Proportion of occasional WH-questions; increasing from language level 1 to 3 in mothers' speech to both types of children).

The same univariate approach would lead to rejecting the null hypothesis for differences in children's speech in the case of the Type of Children x Language Level interaction for

index 26 L (Proportion of process-locative, action-locative, and process-action-locative verbs) where there is an increase in average scores from language level 1 to 3 in the speech of Down's syndrome children and an increase in average scores from language level 1 to 2 followed by a decrease from language level 2 to 3 in the speech of normal children.

Chapter 4

DISCUSSION

The purpose of the analysis of children's speech was to allow for a control of the validity of the matching performed on normal and Down's syndrome children at three language levels using MLU as a basis for the matching operation. The three language levels considered were, in terms of MLU range, 1.00 - 1.50, 1.75 - 2.25, and 2.50 - 3.00, respectively. The results of the analysis of children's speech validated the MLU-matching performed on the children as a basis for the study. The measures used in this analysis were related to the output-numerical, lexical syntactical, semantic-structural, and imitativeness aspects of children's speech. On none of the measures computed, except for Type-token ratio, that slightly but significantly favored the Down's syndrome children, were normal and Down's syndrome children found to differ significantly. This slight but significant superiority in TTR of Down's syndrome children over normal children of corresponding MLU must probably be attributed to the differences in chronological age between the two populations of children in the present study. As shown in Table 2 (p. 46), the two populations of children were largely different in terms of CA. This was an unavoidable consequence of the operation of matching the children on MLU as a basis for

the study. It is possible that such large differences in CA between Down's syndrome and normal children are reflected in the differences in diversity of vocabulary used as measured by TTR. Presumably, older children have had richer life experiences and are currently engaged in more complex kinds of activity (e.g., attending kindergarten or elementary school) than younger children. These experiences and activities need richer and more diversified vocabulary to be described than the relatively simple home routines of the 20- to 32-month-old children. Moreover, it seems reasonable to believe that simple quantative developments in vocabulary such as those tapped by the TTR measure would be more likely to have occurred in retarded children as a result of mere exposure to a variety of verbal contexts than would major developments in syntactical and semantic-structural aspects of language development. It is interesting to note that despite significant differences in children's TTR, the differences in TTR between mothers of normal children and mothers of Down's syndrome children are minimal and nonsignificant. The product-moment correlation coefficient for mothers' and children's TTR is only -.22 (nonsignificant).

Aside from the difference in TTR, the similarities in the speech of normal and Down's syndrome children matched for MLU were often striking at each of the three language levels studied. Such similarity in the output numerical, imitativeness, and more importantly in the syntactical and semantic-structural

aspects of the speech of Down's syndrome and normal children matched for MLU has important implications for the question of knowing whether language development in mentally retarded children is simply delayed, and ultimately incomplete, or whether it proceeds in a truly different way from that in normal children. The delay-difference distinction originated in the cognitive domain where it has been refined by Zigler (1968). When the distinction is applied to language development, one usually considers that a difference theory is supported if it can be shown that retardates are different from normal children matched for mental age (MA). If it is not the case, this is considered to be supportive for a delay theory (Mittler, 1972). Several studies have indicated that the retarded children perform much in the same way as normal children of corresponding mental age on tasks related to quantitative aspects of lexical development (e.g., word definition, basic vocabulary of use and understanding, word repetition, word recognition) and to some aspects of syntactical development (e.g., progressive use of declarative, negative, interrogative, negative-interrogative, and passive sentences with increasing MA, relationships between imitation, comprehension, and production of linguistic material, recognition of syntactic similarity). The reader is referred to Rondal (1975) for a comprehensive review of this literature. According to the rationale mentioned above, it should be concluded that language development, at least in the aspects indicated, is

simply delayed in mentally retarded children.

For several other aspects, however, there seems to exist specific deficits in the language development and functioning of retarded subjects. This seems to be the case for phonological development, grammatical morphological development, lexical organization (e.g., paradigmatic word-associations), and for certain aspects of syntactical development (e.g., intuitive knowledge of transitional probabilities between words in sentences, as exemplified in the cloze tasks, use and comprehension of major grammatical categories, comprehension of complex sentences). According to the above rationale, those aspects of language development in retarded children should be considered as proceeding in a different way from that of normal children. Menyuk (1974) has expressed such an opinion in a recent paper. It is worth noting that the issue delay-difference, as set above, revolves largely around mental age matching procedures. However, the assumptions behind MA-matching and the efficacy of MA-matches have been questioned (e.g., Baumeister, 1967). The main problem with MA-matching is that MA is not a pure measure of intellectual level but a composite of a variety of factors. Comparisons in terms of MA may be artificial because two people may obtain the same MA-score for different reasons. Therefore, it may be incorrect to assume that two groups are developmentally matched because they have been given identical MA-scores. These criticisms, contrary to what Mittler contends (Mittler,

1972, p. 132), do not demonstrate the artificiality of the "delay versus difference" controversy. They simply point toward the possibly limited value of using MA-matches in investigating this issue.

A better strategy would be to match normal and retarded subjects for level of language development, by using MLU, for example, as was done in this study, and then to look as much in depth as possible at the characteristics of the language used by the two groups of children. If the language they use can be characterized in the same way, this would have to be considered as strongly supportive for the delay position. Such an approach has the obvious advantage of avoiding the assumptions associated with the MA-matching procedure. In the present study, the striking similarities found in the syntactical and semantic-structural aspects of the language of normal and Down's syndrome children, once the speech of those children was matched for mean length, certainly provides support for a delay position as a characterization of language development in Down's syndrome children between MLU 1 and MLU 3.

The results of the semantic-structural analysis performed on children's speech according to type of children also supports and expands the findings of Buium, Rynders, and Turnure (1974b). These investigators tape recorded three pairs of mothers and their Down's syndrome child weekly in a natural play situation involving verbal interaction, for a period of 11 months. The

children were 48-month olds at the beginning of the study. The corpora of utterances gathered for each child were evaluated semantically using the semantic-relational concepts listed by Brown (1973). These semantic relational concepts were: agent and action, action and object, agent and object, location, possession, attribution, demonstrative and entity, experiencer, indirect object dative, recurrence, and the combinations of these elementary relations into more complex ones like agent-action-object, agent-action-location, etc. Buium et al. found that the three Down's syndrome children lagged at least two years behind normal children in the emergence and development of these relational concepts according to the data published by Brown (1973) for normal children. However, the Down's syndrome children appeared to make use of the same range of relational concepts as those underlying the two- and three-word utterances of normally developing children.

In contrast with the virtual absence of significant differences in the speech of normal and Down's syndrome children at corresponding MLU levels, there were numerous significant differences between the children in the different aspects of speech considered according to language level. The children produced significantly more words in one-hour recording, increased significantly their TTR, repeated mothers' utterances significantly less, had significantly higher upper bounds and numbers of modifiers per utterance, significantly lower proportions of utter-

ances without verbs, and modified significantly their proportions of use of different verb types with increasing language ability as assessed by MLU. The difference observed with language level in talkativeness or total number of words produced in the one-hour recording time appears to be in conflict with Seitz and Stewart's finding (1975) that 22-month-old children (in mean age) were equally as talkative as 55-month-old children in a 15-minute verbal interaction with their mothers in a play situation in a laboratory setting. However, the conflict is more apparent than real as Seitz and Stewart scored talkativeness in counting the total number of utterances produced during the recording session. This procedure does not take into account the difference in mean length of utterances between the two groups of children. When this difference is used to correct the talkativeness index, an important difference in total verbal output is revealed between younger and older children.

The finding on children's repetition of mothers' utterances is in accord with those of Moerk (1975), Seitz and Stewart (1975), and Lord (1975), in indicating a decrease in exact or partial repetitions of mothers' utterances with language level of the child. Nelson (1973) in her one-year longitudinal study of 18 mother-child pairs found that repetition of maternal utterances by the children increased from approximately 5 to 10% between 13 and 24 months. Based on these findings, it is possible to

hypothesize that spontaneous imitation of mothers' utterances by the children increases from around one year to around two years or more exactly, and as shown by the data on Down's syndrome children in this research, until a MLU of 1.50 or whereabouts is reached, before decreasing relatively rapidly after that stage.

The data on children's proportions of use of different verb types appear to be largely in accord with those Glanzer and Dodd (1975) obtained in a study of verbal interaction in a play situation at home between 18 mother-child pairs. The children were distributed in three MLU groups with MLU range (in morphemes) being 1.25 - 1.75, 2.00 - 2.50, and 2.75 - 3.25 from group 1 to group 3, respectively. Glanzer and Dodd analysed their data using Chafe's semantically based grammar as a model. As in the present study, Glanzer and Dodd found that State verbs predominated in relative frequency of use surpassed only by Nominations in the first language-level group. Also relatively frequent in Glanzer and Dodd's study as in this study were State-locative, Process-action, and Action verbs. State-completable and Action-completable verbs which were relatively frequent in the present study could not be compared as these categories appear to be inexplicably missing from the scheme used and the data reported by Glanzer and Dodd. As in the present investigation, Glanzer and Dodd observed a marked decrease with language level in proportions of Nominations, and a marked increase in proportions

of Process-action verbs, State-locative verbs, Action-locative verbs, and Residual verb types. The increase they observed in proportions of State verbs with language level, particularly from language level 1 to 2, was not observed in the present investigation in the speech of normal children but was obvious in the speech of Down's syndrome children. Unfortunately, Glanzer and Dodd did not report any significance test of the differences observed according to language level of the children. Additionally, the present study found other marked and significant modifications in proportions of use of verb types with language level. These were the proportions of State-experiential, State-benefactive, Process-experiential and Action-experiential, and Process-instrumental, Action-instrumental, and Process-action-instrumental verbs.

No attempt was made to relate the data on children's use of verb types in the present study with those of Bloom, Lightbown, and Hood (1975), the only other major study available to date on the development of verb types or verb relations in early child speech (see also Brown, 1973, however, for a review of a few other available data on the same topic). This is for the following reasons. First, Bloom's categories of verb relations are somewhat different from those used in the present study (e.g., she does not differentiate between four basic types of verb but only between two basic types of verb, State and Action verbs). Second, contrasting with the cross-sectional nature of the present

study, her study was a seven-month longitudinal study of three children plus some additional data from a fourth child, all between MLU 1 and MLU 2.5 in morphemes. Third, Bloom et al., apparently decided to use the frequencies of utterance types rather than tokens as a basis for the counting (i.e., an utterance with one given verb relation was counted only one time regardless of how many times it actually occurred in the speech sample if the semantic interpretation of the utterance was the same each time it occurred) which makes a comparison with the present data very difficult or impossible.

The two research questions asked at the beginning of the present study were as follows: (1) Are maternal linguistic environments of normal and Down's syndrome children similar when the children are matched for MLU? (2) Do maternal linguistic environments of normal and Down's syndrome children change in similar ways with increase in children's MLU? The answer is clearly yes to the first question and yes to the second question. Indeed, none of the comparisons made of mothers' speech to normal and to Down's syndrome children in their output numerical, lexical, syntactical, semantic-structural, semantic-pragmatic, and language-teaching aspects led to differences that were statistically significant or even close to being statistically significant for any of the three language levels studied. It would appear, within the limits of this investigation, that a "difference" position as to the maternal linguistic environ-

ment of language-learning Down's syndrome children is not supported. On the contrary, the maternal linguistic environments of normal and Down's syndrome children of corresponding MLU, regardless of CA, appear to be remarkably similar in most respects. Of course, one can always argue that the maternal linguistic environment of Down's syndrome children is still markedly different from that of normal children of corresponding CA. The easy reply is that this is also true for normal children of different CA. However, this last fact has never led anybody to suggest that the maternal linguistic environment of younger normal children is less adequate for language development than the maternal linguistic environment of older normal children.

Siegel (1963a, 1963b, 1963c), Siegel and Harkins (1963), and Spradlin and Rosenberg (1964) did not actually compare adults' speech to normal and to retarded children or adolescents. Therefore, their findings cannot be directly related to the results of the present investigation. Siegel, Siegel and Harkins, and Spradlin and Rosenberg did find, however, significant differences in adults' speech to high and low verbal children or adolescents. The differences favored high verbal retardates and were in number of conversational exchanges, mean length of responses, and type-token ratio. These differences in adults' speech according to the language level of the retardates interacted with appear to be in agreement with similar

differences obtained in the present investigation in maternal speech to children at different levels of language development.

Marshall, Hegrenes, and Goldstein (1973), Buium, Rynders, and Turnure (1974a), and Kogan, Wimberger, and Bobitt (1969) have consistently found that mothers of retarded children use significantly more imperative sentences and behavior requests when they interact with their children than mothers of normal children matched for CA with the retarded children. Additionally, Buium et al. have reported mothers' speech to Down's syndrome children to contain more incomplete sentences, more single-word responses, less WH-questions, less present and past tense markers, less irregular past forms, less do and other auxiliary constructions, less personal and indefinite pronouns, less conjunctions, and to be characterized by inferior MLU and TTR than mothers' speech to normal children matched with the Down's syndrome children for CA.

Marshall et al., Kogan et al., Buium et al. attributed their findings to a difference in the quality of the early linguistic environment in which retarded children learn their language as compared to the early linguistic environment of normal children. In the introductory part of this report, three alternative explanations for the findings of Buium et al., Marshall et al., and Kogan et al. were advanced. It was indicated, first, that the differences obtained in these studies might be more reflective of differences between children who

are at different levels of general development and, particularly, at different levels of language development rather than of differences per se between mothers' speech to different types (normal versus mentally retarded) of children. Also indicated as an alternative explanation for the findings of Marshall et al., Kogan et al., and Buium et al. was the possibility of inferior compliance of the retarded children (relatively less mature than their CA-matched normal peers), particularly with the time elapsing in the laboratory setting, obliging their mothers to resort to a more controlling type of speech. For the Buium et al. study, it was further suggested that at least part of the results might be due to an uncontrolled interaction between order and repetition of the experimental conditions and type of children rather than just to a difference in maternal speech to normal and retarded children.

It would seem that the absence of noticeable and/or significant differences in the present investigation between mothers' speech to normal and to Down's syndrome children matched for MLU in those aspects of mothers' speech studied by Buium et al., Kogan et al., Marshall et al., and in many other aspects of mothers' speech is supportive of an explanation of the data reported by these authors in terms of one or several of the reasons stated above. Although the other two alternative explanations cannot be ruled out, alternative explanation one appears to be a strong candidate for explaining most if not all

of the Buium et al., Marshall et al. and Kogan et al. data. Indeed, significant differences corresponding to the differences found by these authors between their two groups of mothers were found in the present investigation between mothers' speech to children at different levels of language development, regardless of type of children. The only exception to this statement is for the trend in proportions of imperative sentences which, although exhibiting a diminution in maternal speech to both types of children with increasing linguistic capability in the children, was not significant according to the statistical approach adopted in the present study.

At this stage, it may be useful to state the implications of the results obtained in the present investigation for the current attempts at designing optimal intervention programs for enhancing language development in mentally retarded children. The following would be only hypothetically valid for mentally retarded children other than Down's syndrome children, as the latter were the target population in the present study.

Based on the data reported by Siegel (1963a, 1963b, 1963c), Siegel and Harkins (1963), Spradlin and Rosenberg (1964), Buium, Rynders, and Turnure (1974a), Marshall, Hegrenes, and Goldstein (1973), and Kogan, Wimberger, and Bobitt (1969), and based on the interpretations these authors offered for their data, a number of authors have begun referring more or less explicitly to the familial linguistic environment of mentally retarded

children as deficient (e.g., Mitchell, 1976; Dolley, 1974; Seitz, 1975; Mahoney, 1975; Mahoney and Seely, 1976). These authors have also indicated that this state of affairs ought to be changed, without specifying, however, what exactly should be changed, how it could be changed, by whom, when, and by what it should be replaced.

What the results of the present investigation indicate is that the maternal linguistic environment of Down's syndrome children between MLU 1 and 3 is an appropriate one, if by appropriate it is meant the kind of linguistic environment that is generally the one of normal middle-class children at corresponding MLU. The preceding sentence remains the only, even if circular, definition that is available today of a "good" linguistic environment for first language acquisition. According to the present investigation, and within its limitations, the connotation of deficit that has become associated with the familial linguistic environment of mentally retarded children in the last ten years should be seriously reconsidered, and note should be taken, once more, of the great difficulty involved in making an appropriate and rigorous comparative investigation in matters related to normal and abnormal children. Summarizing, it may be that the major implication of the present research for language intervention is the possibility that the familial linguistic environment of language-learning mentally retarded children may prove to be as appropriate for the language development of those

children as the familial linguistic environment of normal children at corresponding levels of language development.

In contrast to the absence of significant differences in maternal speech to normal and to Down's syndrome children at corresponding MLU levels in the present investigation, there were numerous significant differences between mothers' speech according to the language level of the children addressed. This clearly indicates that the language level of the children, as expressed in speech production, is a far more powerful factor in influencing maternal speech than the type (normal versus Down's syndrome) of child. Those differences in maternal speech related to the language level of the children will be discussed now and will be related to the current literature that attests to the changes taking place in every aspect of maternal speech as the children's linguistic capability develops. In the present study, apparently as a result of augmented linguistic capability in the children, mothers were found to increase significantly their TTR and MLU (and, correlatively, to decrease significantly their proportions of utterances of 2 and 3 morphemes length and to increase significantly their proportions of utterances of 7 and more morphemes length), to increase significantly the ratio of their compound verbs plus subordinate clauses to the total number of utterances (so-called sentence complexity ratio), to increase significantly their mean preverb length and their number of modifiers per utterance, to modify significantly their pro-

portions of direct requests for action and their total proportions of requests for action, to increase significantly their proportions of indirect requests for action type one, to increase significantly their proportions of adjuncts to indirect and inferred requests for action, to decrease significantly the proportions of exact repetitions of their own utterances, and to expand, explicitly correct, and prod significantly fewer children's utterances. Noticeable among those differences in mothers' speech to children at different language levels that did not reach statistical significance, even if there were sometimes clear differences in the group means, were the differences in total number of words produced during the one-hour recording time, proportions of utterances of one, and of 4-to-6 morphemes length, proportions of utterances without verb, proportions of different types and subtypes of sentences, total proportions of adjuncts to request for action, proportions of words in dysfluencies, proportions of unintelligible utterances, proportions of explicit direct verbal approvals and disapprovals, proportions of attentional utterances, ratios of the number of yes/no inverted questions to the number of affirmative imperative sentences (so-called auxiliary development ratio), and proportions of mothers' repetitions of children's utterances.

The data on mothers' TTR are in accord with those obtained by Broen (1972) in verbal interaction between 10 mother-child pairs during a free play situation in a laboratory setting and

by Philips (1973) in a similar study with 30 children between 8 and 28 months, although the TTR's reported here are somewhat lower than those obtained by Broen. This may reflect a difference in the criterion used for deciding whether two words are to be considered identical or different. Broen appears to have used Siegel and Harkins (1963) criterion based on word spelling for solving the identity-difference issue. As stated earlier, this criterion differs from the one used in the present study which was based on dictionary entries. The latter criterion is more prone to lead to lower TTR's than the former. As in the present study, both Broen and Philips found that mothers' TTR were significantly lower when addressing younger children (mean ages: 21 months in Broen's study, 8 and 18 months in Philips' study) than when addressing older children (mean ages: 60 and 28 months in Broen's and Philips' study, respectively).

The trends and figures in mothers' MLU according to children's language level in the present study are in agreement with the current literature on maternal speech in language development. As indicated in Table 1 (p. 20), all investigators have found marked and most often significant differences in mothers' MLU as a function of age of the children interacted with.

The indexes Sentence complexity ratio, Mean preverb length, and Proportion of utterances without verb, used in this study, were borrowed from Snow (1972). They show the same significant trend in average scores with increase in children's language

level as the data obtained by Snow except for Proportion of utterances without verb. The comparisons in Snow's study, however, were between maternal speech to normal children at 2 and 10 years of age. The figures obtained in the present study are slightly inferior to those obtained by Snow in maternal speech to two-year-olds for Sentence complexity ratio and noticeably superior for Proportion of utterances without verb. Possible slight variation between Snow's study and this study in utterance segmentation might be responsible for the first difference. As to the second difference, it is difficult to indicate a reason, although the settings and contexts of activity differed in Snow's study (laboratory setting, storytelling and teaching activity) and in the present study (home setting and free-play situation). In the present study, the average proportions of utterances without verb in maternal speech with the two populations of children combined were .30, .29, and .28 for language levels 1, 2, and 3, respectively, versus .17 in maternal speech to the two-year-olds in Snow's study.

The index Number of modifiers per utterance was borrowed from Philips (1973). The trend observed in maternal speech with increase in children's language level and the average scores obtained on this index appear to be largely in accord with those obtained by Philips in maternal speech to 18- and 28-month-old children.

Proportions of different types and subtypes of sentence was

the only cluster of variables related to mothers' speech the multivariate analysis of variance of which did not yield a significant difference on the language level factor, although the p-value obtained (.089) was not very far from the significance level and there were noticeable differences in means for the different language levels in proportions of declarative sentences (increasing with language level) and imperative sentences (decreasing with language level). Neither were the separate univariate analyses of variance run on Total proportions of yes/no questions and Total proportions of questions significant for the language level factor. The proportions of different types and subtypes of sentence in mothers' speech for children at language level 1 obtained in this study are largely in agreement with Broen's data on proportions of types and subtypes of sentence in mothers' speech to their children aged between 18 and 26 months. (Broen did not publish similar data for her older group of children.) The only two exceptions to this statement concern, first, the proportions of WH-questions (less frequent in Broen's data, where 23.5% of all questions were WH-questions versus 55.7% in the present investigation) and, second, the proportions of yes/no inverted questions with deletion (more frequent in Broen's data, where 33.9% of all questions were yes/no inverted questions with deletion versus only 7.3% in the present investigation).

The data on mothers' proportions of use of different verb types appear to be partially in accord with those of Glanzer and

Dodd (1975). As in the present investigation, Glanzer and Dodd found that State verbs dominated in relative frequency of use. Also relatively frequent in the two studies, were State-experiential verbs, State-locative verbs and Nominations (particularly at language level 1 in the two studies). State-completable and Action-completable verbs which were relatively frequent in the present investigation could not be compared as these categories were not computed by Glanzer and Dodd, as mentioned earlier (except, perhaps, within the Residual verb type category which, indeed, had higher frequencies of occurrence for the three language groups in Glanzer and Dodd's study than was the case in the present study). Categories that had somewhat higher relative frequencies of occurrence in the present study than in the Glanzer and Dodd's study included Process-experiential and Action-experiential verbs, and Process-locative, Action-locative, and Process-action-locative verbs.

Glanzer and Dodd, however, did not observe much change in average proportions of different verb types in mothers' speech with language level of the children. They did not report any statistical test of these differences but an examination of their group means reveals that, except for proportions of Nominations (decreasing markedly from language level 1 to 2), mothers' proportions of different verb types remained stable across the three language levels investigated (MLU range, 1.25 - 1.75, 2.00 - 2.50, and 2.75 - 3.25, respectively). This relative stability

an increase in mothers' proportions of words in dysfluencies with increasing children's age. Fraser and Roberts' data also show that these proportions are markedly lowered in storytelling as opposed to free-play speech except in the case of mothers' speech to the older children in the study (mean age 72 months). A slight increase in proportions of words in dysfluencies with language level is also apparent in the present study in the speech of mothers of Down's syndrome children. The same phenomenon is more apparent in the present investigation in the increase (nonsignificant) in mothers' proportions of unintelligible utterances as a function of children's language level.

In view of Nelson's hypothesis and initial evidence that maternal acceptance of children's speech is positively correlated with optimal early language development in normal children (Nelson, 1973), it is interesting to mention that, in the present study, at each language level, around 20 percent of children's utterances were followed by verbal signs of approval from the mothers within three utterances from the original, not to talk of nonverbal signs of approval and support that could not be tape recorded. These figures contrast sharply with the 2 to 6 percent of children's utterances across the different language groups that were followed by verbal signs of disapproval from the mothers.

Maternal speech to young language-learning children has been found to be repetitive by all investigators (Erwin-Tripp,

1971). However, it is necessary to distinguish between mothers' repetitions of their own utterances and mothers' repetitions of children's utterances. As to the first aspect, Kobashigawa (cited in Slobin, 1969) reported that mothers repeated either exactly or in an approximately way as much as one third or one half of their utterances to children aged between two and three years. Broen (1972) found that mothers produced an average of 16% of sentences more than once in a five-minute sample of speech to their 21-month old children. Snow (1972) reported an average proportion of .19 of complete and partial repetitions (summed) of their own utterances by mothers in interaction with their 2-year old children. Unlike Broen, Snow counted only those repetitions that occurred within three utterances of the original. Unfortunately, Snow's criteria for defining complete and partial repetitions are ambiguous as presented in her published report (1972, pp. 551). In the present study, the proportions of mothers' exact repetitions of their own utterances were computed for those repetitions occurring within three utterances of the original utterance. Expectedly, the figures obtained are inferior to those reported by Broen and by Snow. Snow also found evidence for a decrease in mothers' complete and partial repetitions of their own utterances with increasing age of the children addressed (from 2 to 10 years). The same trend exists in the data reported here, particularly from language level 1 to language level 2, and it was found to be significant.

The function of mothers' repetitions of their own utterances for sustaining the verbal exchange and for language development in the children is obvious. The function of mothers' repetitions of children's utterances is less easy to specify. Seitz (1975) has suggested that mothers' repetitions of children's utterances could convey confirmation of one or all of the following aspects of those utterances: "a) correctness of the auditory signal; b) correctness of its perceptual and cognitive referent; c) an understanding of its communication intent" (p. 176). Rees (1975) has suggested that the purpose of these repetitions is not so much to check on the message than to indicate that the message has been received and that the exchange of information may proceed. Quite obviously, any form of sustained verbal exchange must rely on reciprocal acknowledgment. The clearest and most certain form of verbal acknowledgment consists of a direct repetition. As it is known, and as reported earlier, the children at each language level repeat exactly or partially a certain amount of maternal utterances. Complementarily, mothers also repeat exactly or partially a certain amount of children's utterances. Seitz and Stewart (1975) reported the average percentages of mothers exact repetitions of children's utterances within three utterances of the original to be 3.6% and 1.1% for children aged 23 and 56 months respectively. The proportions of mothers' repetitions of children's utterances within three utterances of the original obtained in this study were notably higher (.13, .09, and .08 in

average value for the two populations of children combined at language levels 1, 2, and 3, respectively), but the repetitions did not need to be exact repetitions to be included in the count. Although there was a decrease in proportions of mothers' repetitions of children's utterances with language level of the children, it did not turn out to be significant.

The proportions of expansions of children's utterances by the mothers obtained in this study are considerably lower than the figure (an average 30% rate for expansions) reported by Brown and Bellugi (1964). Their report is based on data for two children, summed across a 12-month period of time, beginning when the children's MLU in morphemes were 1.84 and 1.40. As stated earlier, the criterion used by these authors for identifying an expansion was somewhat different from the one used in the present study, but, on this basis alone, one would have expected the figures obtained in this study to be larger than that of Brown and Bellugi. Of course, there is always the possibility that Brown and Bellugi's percentage of expansions, obtained for only two children, may be atypical. Seitz and Stewart (1975) obtained percentages of expansions ranging from 1.5 to 10.3 (mean value not reported) in maternal speech to 23-month old children, which is closer to the figures reported in this study. Seitz and Stewart also mentioned that the percentages of expansions dropped significantly in the speech of mothers to 56-month old children but they did not report any score for this group of chil-

dren. A significant decrease in proportions of mothers' expansions (as well as in proportions of mothers' explicit corrections and prodding of children's utterances) with increasing language level in the children was also found in the present study.

SUMMARY

Previous studies had found the maternal linguistic environments of normal and mentally retarded children to differ markedly in several respects. These studies compared maternal speech to normal and to retarded children matched for chronological age. It is known, however, that, at corresponding CA, retarded children, particularly moderately and severely retarded children, do not, by far, talk in the same way as normal children. Consequently, normal and retarded children do not convey the same kind of message, particularly from a structural point of view, to the interlocutor in the verbal exchange. Such differences, it can be assumed, are capable of affecting the speech of the adult interlocutor. None of the previous studies controlled for a possible confounding between type of children and children's level of language development. They, therefore, never really were in a position to answer the question they were asking about the maternal linguistic environments of normal and retarded children. The purpose of the present research was to implement such a control in comparing the maternal linguistic environments of normal and Down's syndrome children at three levels of language development, as assessed by children's mean length of utterances. The three MLU levels were 1.00 - 1.50, 1.75 - 2.25, and 2.50 - 3.00, respectively.

Two related research questions served as the basis for the study. They were as follows: (1) Are maternal linguistic environments of normal and Down's syndrome children similar when the children are matched for MLU? (2) Do maternal linguistic environments of normal and Down's syndrome children change in similar ways with increase in children's MLU?

The subjects of the study were 21 Down's syndrome children and their natural mothers and 21 normal children and their natural mothers. They were 12 girls and 9 boys among the Down's syndrome children, and 8 girls and 13 boys among the normal children. Normal children ranged in CA from 20 to 32 months. Down's syndrome children ranged in CA from 3 to 12 years. The mothers of normal children and the mothers of Down's syndrome children were matched on the following criteria: ethnic group (Caucasian), familial monolingualism, familial structure (both husband and wife living at home), mother free of any major sensory handicap, maternal intelligence not obviously outside the normal range, socio-economic status (predominantly middle-class), maternal educational level.

The verbal interaction between mother and child was tape recorded at home in a free-play situation. There were two recording sessions, each lasting half-an-hour for each mother-child pair. The two recording sessions took place on two different days at approximately one-week interval.

The two research questions investigated were in the form

of a set of specific hypotheses related to 20 measures (indexes) of maternal speech in its output-numerical, lexical, syntactical, semantic-structural, semantic-pragmatic, and language-teaching aspects. Seven measures of children's speech related to the output-numerical, lexical, syntactical, semantic-structural aspects, and to imitativeness of maternal speech were computed as a means of testing the validity of the MLU-matching performed on the children as a basis for the study. The data were analysed by two-way (type of children x language level) multivariate analyses of variance followed by univariate analyses of variance for nonrepeated measures in case of rejection of the overall null hypothesis in the multivariate analyses. It was decided to reject the null hypothesis for a given statistic if the p-value obtained was equal to or less than .05.

The results of the analysis of children's speech validated the MLU-matching performed initially. On none of the measures of children's speech computed, except for Type-token ratio that favored Down's syndrome children, were normal and Down's syndrome children found to be significantly different. In contrast with the almost absence of significant differences in the speech of normal and Down's syndrome children at corresponding MLU levels, there were numerous significant differences between the children in the different aspects of speech considered according to language level. The children produced more words in one-hour recording time, increased their TTR, repeated mothers' utterances

less, had higher upper bounds, higher numbers of modifiers per utterance, and lower proportions of utterances without verb, and modified their proportions of different verb types with increasing language ability.

None of the comparisons made of mothers' speech to normal and to Down's syndrome children led to differences that were significant or close to statistical significance for any of the three children's language levels studied. It appeared that the maternal linguistic environments of language-learning Down's syndrome and normal children of corresponding MLU were similar in most respects. The answer to each one of the two research questions was thus clearly "yes."

In contrast to the absence of significant differences in maternal speech to normal and to Down's syndrome children at corresponding MLU levels, there were numerous significant differences in mothers' speech according to the language level of the children addressed. This confirmed that the expressive language level of the children is a far more powerful factor in influencing maternal speech than the type (normal or Down's syndrome) of child. As a result of augmented linguistic capability in the children, mothers were found to increase their TTR and MLU, and correlatively to modify their proportions of utterances of specific morpheme lengths, to increase the ratio of their compound verbs plus subordinate clauses to the total number of utterances, to increase their mean preverb length and

their number of modifiers per utterance, to modify their proportions of use of different verb types, to decrease their proportions of direct requests for action and their total proportions of indirect requests for action, to increase their proportions of adjuncts to indirect and inferred requests for action, to decrease the proportions of exact repetitions of their own utterances, and to expand, explicitly correct, and prod fewer children's utterances.

The implications of these findings were related to various interpretations of the effects of maternal linguistic input for language development and for intervention programs of language enhancement in the retarded children.

REFERENCES

Austin, J. How to do things with words. New York: Oxford University Press, 1962.

Baldwin, A., & Baldwin, C. The study of mother-child interaction. American Scientist, November 1973, pp. 714-721.

Baumeister, A. Problems in comparative studies of mental retardates and normals. American Journal of Mental Deficiency, 1967, 71, 869-875.

Berko, Gleason J. Code switching in children's language. In T. Moore (Ed.), Cognitive development and the acquisition of language. New York: Academic Press, 1973, pp. 159-168.

Bernstein, B. Social class and linguistic development: A theory of social learning. In A. Halsey, J. Floud, & C. Anderson (Eds.), Education, economy, and society. Glencoe, Ill.: Free Press, 1961, pp. 288-324.

Bernstein, B. Elaborated and restricted codes: Their social origins and some consequences. American Anthropologist, 1964, 66(6), 55-69.

Bloom, L. Language development: Form and function in emerging grammars. Cambridge, Mass.: M.I.T. Press, 1970.

Bloom, L., Lightbown, P., & Hood, L. Structure and variation in child language. Monographs of the Society for Research in Child Development, 1975, 40 (2, Serial No. 160).

Blount, B. Parental speech and language acquisition: Some Luo and Samoan examples. Anthropological Linguistics, 1972, 14, 119-130.

Blount, B. Socialization and pre-linguistic development among the Luo of Kenya. Southwestern Journal of Anthropology, 1971, 27, 41-50.

Broen, P. The verbal environment of the language-learning child. American Speech and Hearing Association Monographs, (Whole) No. 17, December 1972.

Broen, P., & Siegel, G. Variations in normal speech dysfluencies (Research Report No. 15). Minneapolis, Minnesota: University of Minnesota, Research and Development Center in Education of Handicapped Children, January 1971.

Brown, R. A first language: The early stages. Cambridge, Mass.: Harvard University Press, 1973.

Brown, R., & Bellugi, U. Three processes in the child's acquisition of syntax. Harvard Educational Review, 1964, 34, 133-151.

Brown, R., Cazden, C., & Bellugi-Klima, U. The child's grammar from I to III. In J. Hill (Ed.), The 1967 Minnesota Symposium on Child Psychology (Vol. 2). Minneapolis, University of Minnesota Press, 1968, pp. 28-73.

Brown, R. & Hanlon, C. Derivational complexity and order of acquisition in child speech. In J. Hayes (Ed.), Cognition and the development of language. New York: Wiley & Sons, 1970, pp. 11-53.

Buium, N., Rynders, J., & Turnure, J. Early maternal linguistic environment of normal and Down's syndrome language-learning children. American Journal of Mental Deficiency, 1974, 79, 52-58. (a)

Buium, N., Rynders, J., & Turnure, J. A semantic-relational-concepts based theory of language acquisition as applied to Down's syndrome children: Implication for a language enhancement program (Research Report No. 62). Minneapolis, Minnesota: University of Minnesota, Research and Development Center in Education of Handicapped Children, May 1974. (b)

Chafe, W. Meaning and the structure of language. Chicago: The University of Chicago Press, 1970.

Cohen, S., & Beckwith, L. Maternal language input in infancy. Paper presented at the annual meeting of the American Psychological Association, Chicago, August 1975.

Cramer, E., & Bock, R. Multivariate analysis. Review of Educational Research, 1966, 36, 604-617.

Dale, P. Hesitations in maternal speech. Language and Speech, 1974, 17, 174-181.

de Villiers, P., & de Villiers, J. Early judgments of semantic and syntactic acceptability by children. Journal of Psycholinguistic Research, 1972, 1, 299-310.

de Villiers, J., & de Villiers, P. Competence and performance in child language: Are children really competent to judge? Journal of Child Language, 1974, 1, 11-22.

Dolley, D. Mothers as teachers: Instruction and control patterns observed in interaction of middle-class mothers with trainable mentally retarded and nonretarded children (Report No. 7.32). Bloomington, Ind.: University of Indiana, School of Education, Center for Innovation in Teaching the Handicapped, March 1974.

Edwards, D. Sensory-motor intelligence and semantic relations in early child grammar. Cognition, 1973, 2, 395-434.

Erwin-Tripp, S. An overview of theories of grammatical development. In D. Slobin (Ed.), The ontogenesis of grammar. New York: Academic Press, 1971, pp. 189-214.

Erwin-Tripp, S. Some strategies for the first two years. In T. Moore (Ed.), Cognitive development and the acquisition of language. New York: Academic Press, 1973, pp. 261-281.

Ferguson, C. Baby talk in six languages. American Anthropologist, 1964, 66(6), 103-114.

Fillmore, C. The case for case. In E. Bach & R. Harms (Eds.), Universals in linguistic theory. New York: Holt, Rinehart, & Winston, 1968, pp. 1-88.

Fisher, K., Share, J., & Koch, R. Adaptation of Gesell Developmental Scales for evaluation of development in children with Down's syndrome (Mongolism). American Journal of Mental Deficiency, 1963, 68, 642-646.

Fraser, C., & Roberts, N. Mothers' speech to children of four different ages. Journal of Psycholinguistic Research, 1975, 4, 9-16.

Games, P. Multiple comparisons of means. American Educational Research Journal, 1971, 8, 531-565.

Garvey, C. Requests and responses in children's speech. Journal of Child Language, 1975, 2, 41-63.

Garvey, C., & BenDebba, M. Effects of age, sex, and partner on children's dyadic speech. Child Development, 1974, 45, 1159-1161.

Glanzer, P., & Dodd, D. Developmental changes in the language spoken to children. Paper presented at the Biennal meeting of the Society for Research in Child Development, Denver, April 1975.

Hamerton, J., Briggs, S., Giannelli, & Carter, C. Chromosome studies in detection of parents with high risk of second child with Down's syndrome. Lancet, 1961, 2, 788-791.

Hollingshead, A. Two-factor index of social position. Unpublished manuscript, 1957. (Available from A. Hollingshead, 1965 Yale Station, New Haven, Connecticut, 06520).

Holzman, M. The verbal environment provided by mothers for their very young children. Merril-Palmer Quarterly, 1974, 20, 31-42.

Hummel, T., & Sligo, J. Empirical comparison of univariate and multivariate analysis of variance procedures. Psychological Bulletin, 1971, 76, 49-57.

Hymes, D. On communicative competence. In J. Pride & J. Holmes (Eds.), Sociolinguistics: Selected readings. Harmondsworth, England: Penguin, 1972, pp. 269-293.

Karlin, I., & Strazzula, M. Speech and language problems of mentally deficient children. Journal of Speech and Hearing Disorders, 1952, 17, 266-294.

Kelmar, A. Marathi baby talk. Word, 1964, 20, 40-54.

Knobloch, H., & Pasamanick, B. The developmental behavioral approach to the neurologic examination in infancy. Child Development, 1962, 33, 181-198.

Kogan, K., Wimberger, H., & Bobitt, R. Analysis of mother-child interaction in young mental retardates. Child Development, 1969, 40, 799-812.

Lee, L., & Canter, S. Developmental sentence scoring: A clinical procedure for estimating syntactic development in children's spontaneous speech. Journal of Speech and Hearing Disorders, 1971, 36, 315-340.

Lenneberg, E., Nichols, I., & Rosenberger, E. Primitive stages of language development in Mongolism. In D. McRioch & E. Weinstein (Eds.), Disorders of Communication. Baltimore: Wilkins & Williams, 1964, pp. 119-137.

Ling, D., & Ling, A. Communication development in the first three years of life. Journal of Speech and Hearing Research, 1974, 17, 146-159.

Longhurst, T., & Stepanich, L. Mothers' speech addressed to one-, two-, and three-year-old normal children. Child Study Journal, 1975, 5(1), 3-11.

Lord, C. Is talking to baby more than baby talk? A longitudinal study of the modification of linguistic input to young children. Paper presented at the biennial meeting of the Society for Research in Child Development, Denver, April 1975.

Mahoney, G. An ethological approach to delayed language acquisition. American Journal of Mental Deficiency, 1975, 80, 139-148.

Mahoney, G., & Seely, P. The role of the social agent in language acquisition: Implications for language intervention. In N. Ellis (Ed.), International review of research in mental retardation (Vol. 8). New York: Academic Press, 1976, in press.

Marshall, N., Hegrenes, J., & Goldstein, S. Verbal interactions: Mothers and their retarded children versus mothers and their nonretarded children. American Journal of Mental Deficiency, 1973, 77, 415-419.

Menyuk, P. Sentences children use. Cambridge, Mass.: M.I.T. Press, 1969.

Menyuk, P. The bases of language acquisition: Some questions. Journal of Autism and Childhood Schizophrenia, 1974, 4, 325-345.

Miner, L. Scoring procedure for the Length-Complexity Index: A preliminary report. Journal of Communication Disorders, 1969, 2, 224-240.

Mitchell, D. Parent-child interaction in mental handicap. In P. Berry (Ed.), Language and communication in the mentally handicapped. London: Arnold, 1976, in press.

Mittler, P. Language development and mental handicap. In M. Rutter & J. Martin (Eds.), The child with delayed speech. Philadelphia: Lippincott, 1972, pp. 136-146.

Moerk, E. Principles of interaction in language learning. Merril-Palmer Quarterly, 1972, 18, 229-257.

Moerk, E. Changes in verbal child-mother interactions with increasing language skills of the child. Journal of Psycholinguistic Research, 1974, 3, 101-116.

Moerk, E. Verbal interactions between children and their mothers during the preschool years. Developmental Psychology, 1975, 11, 788-794.

Morehead, D., & Ingram, D. The development of base syntax in normal and linguistically deviant children. Journal of Speech and Hearing Research, 1973, 16, 330-352.

Nelson, K. Structure and strategy in learning to talk. Monographs of the Society for Research in Child Development, 1973, 38 (1-2, Serial No. 149).

Newport, E., Gleitman, L., & Gleitman, H. Contributions to the theory of innate ideas from learning: A study of mothers' speech and child language acquisition. Paper presented at the biennial meeting of the Society for Research in Child Development, Denver, April 1975.

Nida, E. Morphology: The descriptive analysis of words (2nd ed.). Ann Arbor, Mich.: The University of Michigan Press, 1970.

Omar, M. The acquisition of Egyptian Arabic as a native language. The Hague: Mouton, 1973.

Patterson, G., & Reid, J. Reciprocity and coercion: Two facets of social systems. In C. Neuringer & J. Michael (Eds.), Behavior modification in clinical psychology. New York: Appleton-Century-Crofts, 1970.

Patterson, G., Cobb, J., & Ray, R. A social engineering technology for retraining the families of aggressive boys. In H. Adams & I. Unikel (Eds.), Issues and trends in behavior therapy. Springfield, Ill.: Thomas, 1973.

Philips, J. Syntax and vocabulary of mothers' speech to young children: Age and sex comparisons. Child Development, 1973, 44, 182-185.

Rees, N. Imitation and language development: Issues and clinical implications. Journal of Speech and Hearing Disorders, 1975, 40, 339-350.

Rondal, J. Development du langage et retard mental: Une revue critique de la litterature en langue anglaise. L'Annee Psychologique, 1975, 75, 513-547.

Rynders, J., & Horrobin, M. Project EDGE: The University of Minnesota communication stimulation program for Down's syndrome infants. In B. Friedlander, G. Sterritt, & G. Kirk (Eds.), Exceptional infant: Assessment and Intervention (Vol. 3). New York: Bruner/Mazel, 1975, pp. 173-192.

Sachs, S., Brown, R., & Salerno, R. Adult's speech to children. Paper presented at the International Symposium on First Language Acquisition, Florence, Italy, September 1972.

Schlesinger, I. Production of utterances and language acquisition. In D. Slobin (Ed.), The ontogenesis of grammar. New York: Academic Press, 1971, pp. 63-101.

Scholl, D., & Ryan, E. Child judgments of sentences varying in grammatical complexity. Journal of Experimental Child Psychology, 1975, 20, 274-285.

Searle, J. Speech acts: An essay in the philosophy of language. London: Cambridge University Press, 1969.

Seitz, S. Language intervention - Changing the language environment of the retarded child. In R. Koch & F. de la Cruz (Eds.), Down's syndrome. New York: Bruner/Mazel, 1975, pp. 157-179.

Seitz, S., & Stewart, C. Imitations and expansions: Some developmental aspects of mother-child communications. Developmental Psychology, 1975, 11, 763-768.

Share, J. Developmental progress in Down's syndrome. In R. Koch & F. de la Cruz (Eds.), Down's syndrome. New York: Bruner/Mazel, 1975, pp. 78-86.

Shatz, M., & Gelman, R. The development of communication skills: Modifications in the speech of young children as a function of listener. Monographs of the Society for Research in Child Development, 1973, 38(5, Serial No. 152).

Shipley, E., Smith, C., & Gleitman, L. A study in the acquisition of language: Free responses to commands. Language, 1969, 45, 322-342.

Siegel, G. Adult verbal behavior in "play therapy" sessions with retarded children. Journal of Speech and Hearing Disorders Monograph, 1963, 10, 34-38. (a)

Siegel, G. Verbal behavior of retarded children assembled with pre-instructed adults. Journal of Speech and Hearing Disorders Monograph, 1963, 10, 47-53. (b)

Siegel, G. Adult verbal behavior with retarded children labelled as "high" or "low" in verbal ability. American Journal of Mental Deficiency, 1963, 3, 417-424. (c)

Siegel, G. Interpersonal approaches to the study of communication disorders. Journal of Speech and Hearing Disorders, 1967, 32, 112-120.

Siegel, G., & Harkins, J. Verbal behavior of adults in two conditions with institutionalized retarded children. Journal of Speech and Hearing Disorders Monograph, 1963, 10, 39-46.

Skinner, B. Verbal behavior. New York: Appleton-Century-Crofts, 1957.

Slobin, D. (Ed.), The structure of linguistic input to children (Working Paper No. 14). Unpublished manuscript, University of California, 1969.

Snow, C. Mothers' speech to children learning language. Child Development, 1972, 43, 549-565.

Spradlin, J., & Rosenberg, S. Complexity of adult verbal behavior in a dyadic situation with retarded children. Journal of Abnormal and Social Psychology, 1964, 68, 694-698.

Strazzula, M. Speech problems of the mongoloid child. Quarterly Review of Pediatrics, 1953, 8, 268-273.

Templin, M. Certain language skills in children. Minneapolis: Institute of Child Welfare, Monograph (Serial No. 26). University of Minnesota Press, 1957.

Waterhouse, L. The acquisition of code-switching. Paper presented at the winter meeting of the Linguistic Society of America, San Diego, December 1973.

Stedman, D., & O'Mey, J. Bibliography on the world's clinical and research literature on Down's syndrome: Behavioral, social, and educational studies through 1968 (Papers and Reports, Vol. 6, 2). Nashville, Tenn.: George Peabody College for Teachers, J. F. Kennedy Center for Research on Education and Human Development, 1969.

Weeks, T. Speech registers in young children. Child Development, 1971, 41, 1119-1131.

Winer, B. Statistical principles in experimental design (2nd ed.). New York: McGraw-Hill, 1971.

Zegiob, L., Arnold, S., & Forehand, R. An examination of observer effects in parent-child interactions. Child Development, 1975, 46, 509-512.

Zigler, E. Developmental versus difference theories of mental retardation and the problem of motivation. American Journal of Mental Deficiency, 1968, 73, 536-556.

Zisk, P., & Bialer, I. Speech and language problems in mongolism: A review of the literature. Journal of Speech and Hearing Disorders, 1967, 32, 228-241.

Zunich, M. Lower-class mothers' behavior and attitudes toward child rearing. Psychological Reports, 1971, 29, 1051-1058.

APPENDIX A

Error Correlation Matrices

1. Error Correlation Matrix for the Cluster of Variables Related to the Syntactical Aspect of Children's Speech

Indexes	23	24	25
23	1.00	-.23	-.31*
24	-.23	1.00	-.05
25	-.31*	-.05	1.00

Note. Indexes: 23: Upper bounds; 24: Proportion of utterances without verb; 25: Number of modifiers per utterance.

*$p \leq .05$ ($df = 40$).

2. Error Correlation Matrix for the Cluster of Variables Related to the Semantic-Structural Aspect of Children's Speech

Index 26	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	1.00	-.07	-.08	-.15	-.21	-.05	-.15	-.30*	-.30*	-.21	-.11	-.15	-.26	-.11
B	-.07	1.00	-.04	-.16	.14	-.15	-.06	.14	-.18	.15	.27	-.30*	-.19	.00
C	-.08	-.04	1.00	-.34*	-.15	.21	-.02	.19	-.03	-.10	.05	.01	-.04	.09
D	-.15	-.16	-.34*	1.00	.13	.01	.07	-.28	.16	.00	-.01	.42*	-.44*	.09
E	-.21	.14	-.15	.13	1.00	-.02	.05	.04	.26	-.05	-.14	.09	-.08	-.19
F	-.05	-.15	.21	.01	-.02	1.00	.05	.16	.17	-.01	.06	.01	-.36*	.03
G	-.15	-.06	-.02	.07	.05	.05	1.00	-.11	.04	.26	-.11	.16	-.27	.12
H	-.30*	.14	.19	-.28	.04	.16	-.11	1.00	.07	.27	.06	-.37*	.06	-.17
I	-.30*	-.18	-.13	.16	.26	.17	.04	.07	1.00	-.16	.18	.18	-.21	.08
J	-.21	.15	-.10	.00	-.05	-.01	.26	.27	-.16	1.00	-.07	-.01	-.09	.42*

Note. Verb types: A: State; B: State-experiential; C: State-benefactive; D: State-locative; E: Process; F: Action; G: Process-action; H: Process-experiential and Action-experiential; I: Process-benefactive, Action-benefactive, and Process-action-benefactive; J: Process-instrumental, Action-instrumental, and Process-action-instrumental; K: State-completable and Action-completable; L: Process-locative, Action-locative, and Process-action-locative; M: Nomination category; N: Residual category.

*$p \leq .05$ ($df = 40$).

2. Error Correlation Matrix for the Cluster of Variables Related to the Semantic-Structural Aspect of Children's Speech (continued)

Index 26	A	B	C	D	E	F	G	H	I	J	K	L	M	N
K	-.11	.27	.05	-.01	-.14	.06	-.11	.06	.18	-.07	1.00	-.31*	-.38*	.13
L	-.15	-.30*	.01	.42*	.09	.01	.16	-.37*	.18	-.01	-.31*	1.00	-.23	.08
M	-.26	-.19	-.04	-.44*	-.08	-.27	-.27	.06	-.21	-.09	-.38*	-.23	1.00	-.18
N	-.11	.00	.09	.09	-.19	.03	.12	-.17	.42*	.42*	.13	.08	-.18	1.00

Note. Verb types: A: State; B: State-experiential; C: State-benefactive; D: State-locative; E: Process; F: Action; G: Process-action; H: Process-experiential and Action-experiential; I: Process-benefactive, Action-benefactive, and Process-action-benefactive; J: Process-instrumental, Action-instrumental, and Process-action-instrumental; K: State-completable and Action-completable; L: Process-locative, Action-locative, and Process-action-locative; M: Nomination category; N: Residual category.

*$p \leq .05$ ($df = 40$)

3. Error Correlation Matrix for the Cluster of Variables Related to the Syntactical Within-Utterance Aspect of Mothers' Speech

Indexes	3	4 A	4 B	4 C	4 D	4 E	5	6	7	8
3	1.00	-.65*	-.63*	-.04	.74*	.93*	.72*	.62*	-.68*	.80*
4 A	-.65*	1.00	.06	-.40*	-.35*	-.46*	-.37*	-.28	.76*	-.43*
B	-.63*	.06	1.00	-.14	-.67*	-.55*	-.38*	-.53*	.35*	-.63*
C	-.04	-.40*	-.14	1.00	-.27	-.30*	-.14	-.11	-.45*	-.04
D	.74*	-.35*	-.67*	-.27	1.00	.63*	.34*	.63*	-.35*	.67*
E	.93*	-.46*	-.55*	-.30*	.63*	1.00	.77*	.55*	-.49*	.72*
5	.72*	-.37*	-.38*	-.14	.34*	.77*	1.00	.25	-.46*	.62*
6	.62*	-.28	-.53*	-.11	.63*	.55*	.25	1.00	-.25	.53*
7	-.68*	.76*	.35*	-.45*	-.35*	-.49*	-.46*	-.25	1.00	-.40*
8	.80*	-.43*	-.63*	-.04	.67*	.72*	.62*	.53*	-.40*	1.00

Note. Indexes: 3: MLU; 4: Proportions of utterances of specific lengths: 4A: 1 morpheme, 4B: 2 to 3 morphemes, 4C: 4 to 6 morphemes, 4D: 7 to 9 morphemes, 4D: 10 or more morphemes; 5: Sentence complexity ratio; 6: Mean preverb length; 7: Proportion of utterances without verb; 8: Number of modifiers per utterance.

*$p \leq .05$ ($df = 40$).

4. Error Correlation Matrix for the Cluster of Variables Related to the Syntactical Between-Utterance Aspect of Mothers' Speech

Index 9	A	B	C	D	E	F	G	H	I	J
A	1.00	-.19	-.24	-.21	-.41*	.17	.09	-.47*	-.07	.02
B	-.19	1.00	-.20	.00	-.18	-.11	-.02	-.43*	-.05	-.08
C	-.24	-.20	1.00	.36*	-.04	.09	-.28	-.17	.05	-.06
D	-.21	.00	.36*	1.00	.16	.13	.11	-.15	.06	-.22
E	.41*	-.18	-.04	.16	1.00	-.09	-.01	.23	.02	.07
F	.17	-.11	.09	.13	-.09	1.00	.22	-.22	.27	-.27
G	.09	-.02	-.28	.11	-.07	.22	1.00	-.03	.12	-.13
H	-.47*	-.43*	-.17	-.15	.23	-.22	-.03	1.00	-.08	-.28
I	-.07	-.05	.05	.06	.02	.27	.12	-.08	1.00	-.27
J	.02	-.08	-.06	-.22	.07	-.27	-.13	-.28	-.27	1.00

Note. Types and subtypes of sentences: A: Declarative; B: Imperative; C: Inverted yes/no questions; D: Intonation questions; E: Immature tag questions; F: Mature tag questions; G: Occasional WH-questions; H: Other WH-questions; I: Yes/no inverted questions with deletion; J: Other grammatically incomplete sentences.

*$p \leq .05$ ($df = 40$)

5. Error Correlation Matrix for the Cluster of Variables Related to the Semantic-Structural Aspect of Mothers' Speech

Index 10	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	1.00	-.23	.18	-.28	-.03	-.23	-.35*	-.11	-.14	-.23	-.37*	-.42*	.24	-.16
B	-.23	1.00	-.06	-.10	.11	.15	.05	-.27	.04	.25	-.02	-.05	-.26	-.08
C	.18	-.06	1.00	.02	-.03	.10	.12	-.24	.00	.24	-.23	-.36*	-.14	.03
D	-.28	-.10	.02	1.00	-.15	-.20	.13	.14	-.02	-.07	-.06	.01	-.36*	-.03
E	-.03	.11	-.04	-.15	1.00	-.08	-.10	-.17	-.17	-.03	-.01	.03	.13	-.13
F	-.23	.15	.10	-.20	-.08	1.00	-.02	-.16	.25	.07	-.16	.26	-.34*	.05
G	-.35*	.05	.12	.13	-.10	-.02	1.00	-.29	.05	.36*	.06	.01	-.35*	-.04
H	-.11	-.27	-.24	.14	-.17	-.16	-.29	1.00	-.03	-.20	-.16	-.11	.29	.30*
I	-.14	.04	.00	-.02	-.17	.25	.05	-.03	1.00	-.04	-.24	.00	-.20	.06
J	-.23	.25	.24	-.07	-.03	.07	.36*	-.20	-.04	1.00	.15	-.28	.00	-.11

Note. Verb types: A: State; B: State-experiential; C: State-benefactive; D: State-locative; E: Process; F: Action; G: Process-action; H: Process-experiential and Action-experiential; I: Process-benefactive, Action-benefactive, and Process-action-benefactive; J: Process-instrumental, Action-instrumental, and Process-action-instrumental; K: State-completable and Action-completable; L: Process-locative, Action-locative, and Process-action-locative; M: Nomination category; N: Residual category.

*$p \leq .05$ ($df = 40$).

5. Error Correlation Matrix for the Cluster of Variables Related to the Semantic-Structural Aspect of Mothers' Speech (continued)

Index 10	A	B	C	D	E	F	G	H	I	J	K	L	M	N
K	-.37*	-.02	-.23	-.06	-.01	-.17	.06	-.16	-.24	.15	1.00	.02	-.08	-.12
L	-.42*	-.05	-.36*	.01	.03	.26	.01	-.11	.00	-.28	.02	1.00	-.17	-.10
M	.24	-.26	-.14	-.36*	.13	-.34*	-.35*	.29	-.20	.00	-.08	-.17	1.00	-.02
N	-.16	-.08	.03	-.03	-.13	.05	-.04	.30*	.06	-.11	-.12	-.10	-.02	1.00

Note. Verb types: A: State; B: State-experiential; C: State-benefactive; D: State-locative; E: Process; F: Action; G: Process-action; H: Process-experiential and Action-experiential; I: Process-benefactive, Action-benefactive, and Process-action-benefactive; J: Process-instrumental, Action-instrumental, and Process-action-instrumental; K: State-completable and Action-completable; L: Process-locative, Action-locative, and Process-action-locative; M: Nomination category; N: Residual category.

*$p \leq .05$ ($df = 40$).

6. Error Correlation Matrix for the Cluster of Variables Related Semantic-Pragmatic Aspect of Mothers' Speech

Index 11[a]	A	B	C	D	E	G	H
A	1.00	.05	.15	.36*	.19	.03	.26
B	.05	1.00	.11	.38*	-.12	-.19	-.05
C	.15	.11	1.00	.14	.03	.07	-.03
D	.36*	.38*	.14	1.00	-.03	-.19	.26
E	.19	-.12	.03	-.03	1.00	.02	.15
G	.03	-.19	.07	-.19	.02	1.00	.29
H	.26	-.05	-.03	.26	.15	.29	1.00

Note. Categories: A: Direct request; B: Proposal for joint action; C: Indirect request type one; D: Indirect request type two; E: Inferred request; G: Total proportion of adjuncts to requests; H: Adjunct to indirect and to inferred requests.

[a]As category F (Total proportion of requests) was excluded from this cluster for the statistical analysis, category G follows directly category E in the table.

*$p \leq .05$ ($df = 40$).

7. Error Correlation Matrix for the Cluster of Variables Related to the Language-Teaching Aspect of Mothers' Speech

Indexes	12	13	14A	14B	15	16	17	18A	18B	19	20
12	1.00	.03	.18	.04	.11	-.12	.06	.31*	-.12	-.16	.07
13	.03	1.00	-.14	-.19	-.20	-.19	.14	-.03	.04	-.19	-.25
14 A	.18	-.14	1.00	.42*	.22	-.09	.04	.42*	.29	-.11	.42*
B	.04	-.19	.42*	1.00	.06	.26	.06	.16	.58*	.14	.53*
15	.11	-.20	.22	.06	1.00	.11	-.41*	.01	-.01	.18	-.04
16	-.12	-.19	-.09	.26	.11	1.00	-.22	-.20	.15	.50*	.04
17	.06	.14	.04	.06	-.41*	-.22	1.00	-.08	.02	-.04	-.14
18 A	.31*	-.03	.42*	.16	.01	-.20	-.08	1.00	.26	-.37*	.35*
B	-.12	.04	.29	.52*	-.01	.15	.02	.26	1.00	-.04	.29
19	-.06	-.19	-.11	.14	.18	.50*	-.04	-.37*	-.04	1.00	-.09
20	.07	-.25	.43*	.53*	-.04	.04	-.14	.35*	.29	-.09	1.00

Note. Indexes: 12: Proportion of words in dysfluencies; 13: Proportion of unintelligible utterances; 14 A: Proportion of explicit direct verbal approvals of children's utterances; 14 B: Proportion of explicit verbal disapprovals of children's utterances; 15: Proportion of attentional utterances; 16: Proportion of mothers' exact repetitions of their own utterances; 17: Auxiliary development ratio; 18 A: Proportion of expansions of children's utterances; 18 B: Proportion of explicit corrections of children's utterances; 19: Proportion of prodding utterances; 20: Proportion of mothers' repetitions of children's utterances.

*$p \leq .05$ ($df = 40$)