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THE MOTHER-CHILD COMMUNICATIVE INTERACTIONS OF EDUCATIONALLY ADVANTAGED DOWN SYNDROME AND NORMAL CHILDREN MATCHED FOR AUDITORY COMPREHENSION

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The Mother-Child Communicative Interactions of Educationally Advantaged Down Syndrome and Normal Children Matched for Auditory Comprehension

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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The Ohio State University

1985

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Patricia O. Connard
To Scott who inspired all the interactions
TABLE OF CONTENTS

ACKNOWLEDGMENTS ...................................................... v
VITA ................................................................. vi
LIST OF TABLES ........................................................ x
CHAPTER PAGE

I. INTRODUCTION ......................................................... 1

II. REVIEW OF THE LITERATURE ........................................ 7
   Background .......................................................... 7
   Mother-Normal Child Language Interactions ................. 10
   Language of Down Syndrome Individuals ................. 21
   Mother-Down Syndrome Child Language Interactions .. 24

III. PROCEDURES ........................................................... 33
   Subjects ............................................................. 33
   Instruments .......................................................... 38
   Method ................................................................. 40
   Transcript Preparation ............................................. 43
   Variables to be Studied .......................................... 44
   Reliability of Data Collection .................................. 53
IV. RESULTS.............................................................................. 55

Results of Analysis of Children's Data......................... 57
Results of Analysis of Mother's Data......................... 63

V. DISCUSSION......................................................................... 78

Children's Language............................................................. 78
Mothers' Language.............................................................. 83
Summary................................................................................. 91
Conclusions........................................................................... 94
Implications............................................................................ 95
Recommendations for Further Study............................. 96

LIST OF REFERENCES.......................................................... 97

APPENDICES

A. Parent Materials............................................................... 107
B. Guidelines for Transcription........................................... 110
C. Sample Transcription Page............................................. 115
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1976 Cleveland Speech and Hearing Center, "Language All Around You."
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1977 NDSC Convention, New Orleans, "Speech and Language in Syndrome."
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1979 Campus Day Care Convention, Columbus, "Day Care and the Child With Handicaps."
1979 AAMD, Miami, "Phonology and the DS Child."
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1983 NDSC Convention, Providence, RI, "Early and Later Language of Children with Down Syndrome."

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LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Children's Sex, Age and Test Scores</td>
<td>35</td>
</tr>
<tr>
<td>2. Mothers' Educational Levels</td>
<td>37</td>
</tr>
<tr>
<td>4. MANOVA on Volume Variables (Number of Words and Utterances and MLU) in Children's Language by Type of Child by Language Level</td>
<td>59</td>
</tr>
<tr>
<td>5. Univariate F-tests as Followup Procedures to MANOVA on the Volume Cluster in Children's Language</td>
<td>59</td>
</tr>
<tr>
<td>6. MANOVA on Structure Variables (Verbs per Utterance, Modifiers per Utterance, Morphemes per Words) in Children's Language by Type of Child by Language Level</td>
<td>61</td>
</tr>
<tr>
<td>7. Univariate F-tests as Followup Procedures to a MANOVA on the Structure Cluster in Children's Language</td>
<td>61</td>
</tr>
<tr>
<td>8. MANOVA on Discourse Variables (Verbal Turns, Utterances and Words per Turn, Simultaneous Utterances, Pauses, Nonverbal Turns)</td>
<td>62</td>
</tr>
<tr>
<td>9. Univariate F-tests as Follow-up Procedures to a MANOVA on the Discourse Cluster of Variables in Children's Language</td>
<td>62</td>
</tr>
<tr>
<td>10. ANOVA on Child Unintelligibility by Type of Child by Language Level</td>
<td>64</td>
</tr>
<tr>
<td>11. Means and Standard Deviations of Mothers' Language for Volume, Structure, and Discourse Variables</td>
<td>66</td>
</tr>
</tbody>
</table>
12. MANOVA of Volume Variables (Number of Words and Utterances and MLU) in Mothers' Language by Type of Child by Language Level..........................67

13. Univariate F-tests as Follow-up Procedures to a MANOVA on the Volume Cluster of Variables in Mothers' Language..............................67

14. MANOVA on Structure Variables (Sentence Complexity, Modifiers per Utterance, Morphemes Per Word) in Mothers' Language by Type of Child by Language Level..............................................68

15. Univariate F-tests as Follow-up Procedures to a MANOVA on the Structure Cluster in Mothers' Language..............................................................68

16. MANOVA on Discourse Variables (Verbal Turns, Words and Utterances per Turn, Simultaneous Utterances, Pauses, Nonverbal Turns) in Mothers' Language by Type of Child by Language Level.................................70

17. Means and Standard Deviations of Frequencies and Proportions of Mothers' Responses to Children's Unclear Speech............................................72

18. MANOVA on Mothers' Responses (Frequencies) to Children's Unclear Speech by Type of Child by Language Level............................73

19. MANOVA on Mothers' Responses (Proportions) to Children's Unclear Speech by Type of Child by Language Level............................73

20. Means and Standard Deviations of Combined Categories (Contingent, Mother-Understood, Feedback) of Mothers' Responses to Children's Unclear Speech........................................75

21. MANOVA of Combined Categories of Mothers' Responses to Children's Unclear Speech by Type of Child by Language Level............................75
CHAPTER I

INTRODUCTION

In the last decade interest has been shown in the communicative and linguistic environment provided by parents and others to language learning children. Studies have shown that adults alter their language when interacting with young children so that it is simpler, more immediate, more concrete and uses shorter utterances compared to language addressed to adults (Broen, 1972, 1975; Cross, 1972, 1977, 1978; Nelson, 1973, 1975; Phillips, 1973). These language modifications change with the age and language level of the child addressed (Moerk, 1974, 1975; Nelson, 1973; Phillips, 1973). Researchers are currently attempting to relate various features of mothers' speech to the acquisition of child language (Chapman, 1981; Cross, 1978; Moerk, 1980; Nelson, 1973; Jones, 1977).

Studies of the changes observed in maternal speech while normal children are learning communicative skills have been applied to the speech of parents addressing children with mental retardation. Essential to the evaluation of these studies is the basis for comparison between normal children and children with mental delay. The first studies (Buim, Rynders & Turnure, 1974; Kogan, Wimberger & Hobbitt, 1969; Marshall, Hegrenes & Goldstein, 1973) used chronological age of
children as a basis for comparison of mothers' speech. Using chronological age matches, mothers of delayed children were said to provide deficient linguistic environments when compared to mothers of normal peers. However, in 1976 Rondal matched delayed and normal children for expressive language levels by using mean length utterance (morphemes per phrase or utterance) and found the linguistic environment provided by both groups of mothers was very similar. Most studies of linguistic input to mentally delayed children currently use the child's mean length utterance (MLU) as the basis for comparisons (Lombardino & MacDonald, 1978; Owens & MacDonald, 1982; Petersen & Sherrod, 1982).

Using MLU poses problems when studying the language of delayed children. First, the growth of expressive language does not necessarily parallel the mental growth of the child. Down Syndrome (DS) children, cited in most studies, evidence even more mental age-MLU gap than non-Down's delayed children (Fishler, 1964; Share, 1975). The cognitive level of the DS children may be higher than their normal MLU counterparts. If the mental abilities of DS children are judged by the phrase length of their expressive language, adults may underestimate their comprehension and ability to respond. Second, children with Down Syndrome often have speech intelligibility problems due to physical and other factors which may depress their expressive language scores even more than other children with mental retardation (Sanger, 1975). Dodd (1975) found that children with Down Syndrome made over twice as many articulation errors when matched to children with other types of retardation.
MLU may be an inadequate measure of expressive language, also. Definitions of utterances and morphemes are not standard in the literature. While sensitive to beginning morphology, Brown (1973) warns that at MLU's greater than 4.5, speakers can make constructions of greater syntactical complexity without adding utterance length. In addition, the MLU of older children can vary with observation situations. Appropriate ellipses common with casual speech may cut down on a child's calculated MLU. Therefore, even researchers using MLU extensively warn that more structural analysis should be done to determine the child's expressive developmental status (Chapman, 1981).

Expressive language is only one part of a child's linguistic competence. In analyzing communicative interactions between child and mother, the child's understanding or receptive linguistic competence must play a role. It is quite possible that receptive ability may be a very important factor in determining the appropriateness of a particular linguistic environment. A child with motor involvements affecting his speech may continue to rapidly develop comprehension skills. Although the widely held assumption that comprehension always precedes production in normal language learning has been challenged (Bloom & Lahey, 1978), a study by Miller, Chapman and MacKenzie (1981) concludes that in mentally retarded children, comprehension always precedes production, but that production does not always follow the development of comprehension. Miller notes that significant deficits in production relative to comprehension frequently occur (1985). Therefore, a comparison based on comprehension abilities might reflect a more accurate picture of the children's interactions with their mothers.
It is proposed to study the linguistic environment of children with Down Syndrome matched for auditory comprehension ability with normal children. A specific population of educable DS children who have had educational advantages will be used. The above population was chosen as representative of DS individuals who have been expected to communicate and have received educational services such as early education and at least part-time education with normal children.

In the last 10 to 15 years, expectations for DS children have changed. In 1969 Johnson and Abelson asserted that 81% of those with Down Syndrome were unable to communicate understandably. Many similar assertions were based on studies done with institutionalized or home reared individuals who had little opportunity for education or support services. Most DS children were considered severely retarded and educated in separate trainable schools, if educated at all. The last decade, however, has brought the advent of infant stimulation, early preschools, and the provisions of speech and language therapy and related services to the developmentally delayed. Rynders, Spiker, and Horrobin (1976), after an extensive review of the literature and management of a project servicing DS children, asserted that 30-55% of DS children, especially those with good early education, are educable (D.Q. 50-68, appropriate adaptive behavior and other considerations) at regular school entrance age. Some educable DS children have entered the regular public school system and are being educated in regular or educable developmentally handicapped classrooms, including mainstreaming with normal children. Children who have had early intervention and educational advantages have probably not been studied for linguistic
competence. These educationally advantaged Down Syndrome (EADS) children may be affected less by environmental low expectations and the stereotyped image which has followed the "mongoloid child" (Bondine, 1974). The EADS population probably represents the type of DS child that will confront professionals in the next decades (Fredericks, 1985; Miller, 1985).

Objectives of Current Study

The current study was designed to investigate maternal-child language in several dimensions with school-aged Down Syndrome children matched with non-delayed children for auditory comprehension. The questions of interest are as follows:

1. How do the volume and structural features of mothers' and DS children's language compare with the volume and structural features of mothers' and normal children's language when the children are matched for auditory comprehension?

2. How do the discourse features of mother-DS child communication compare with those of mother-normal child communication when the children are matched for auditory comprehension?

3. How does unintelligibility differ between Down Syndrome and matched normal children matched for auditory comprehension and what are mothers' responses to the children's unintelligibility?
Definition of Terms:

a. **Volume** refers to the amount of words, utterances, and the length of utterances.

b. **Structure** refers to the organization or syntactical complexity of the utterance.

c. **Auditory comprehension** is used to indicate the individual's understanding of both the meaning and structure of others' language (receptive language).

d. **Discourse** refers to the strategies used to maintain conversational dialogue such as turn-taking.

e. **Turntaking** is the orderly passing of the conversational ball from one person to another.

f. **Unintelligibility** refers to those utterances that are unclear in meaning because of the way they are articulated.
CHAPTER II

REVIEW OF THE LITERATURE

BACKGROUND

For many years children were assumed to develop language by acquiring an appropriate vocabulary and using the vocabulary in sentences according to correct rules of grammar. In the 1950's two conflicting theories of language development focused researchers' attention on the language learning child. Skinner (1957) proposed the behavioral model. Behaviorists assume that children learn language from their parents who train them to perform verbal behaviors. The adults provide the child with both mature speech examples and training in the imitation of adult speech. Correct imitations are reinforced by adults, creating stimulus-response (S-R) learning chains. Language learning is viewed as limited only by the amount of S-R language learning chains that can be acquired through training, not maturation.

Chomsky (1957,1965), on the other hand, argued that language acquisition is an innate characteristic of humans. All native speakers of a language are assumed to know the rules without being deliberately taught. The linguistic argument assumes that the environment of the child does not provide sufficient language data. Adult language is grammatically complex and fragmentary so that it would
be impossible for children to discover the operating principles. As the child matures, the social environment activates genetically determined structures for language formation.

Essentially the debate was between the rule of nature versus nurture in language acquisition. Neither theory provides a total explanation of significant individual variation in language development. The behavioral approach does not adequately explain the evidence that children produce utterances that have no plausible adult models (Cazden, 1972). The innate view does not explain the variation in the forms of various languages and dialects. Both theories also concentrate on the structure of language with little consideration of the meanings or functions behind children's linguistic productions (Cherry, 1976).

The developmental or interactional model, proposed in the 1970's, integrates the influence of nature and nurture. The assumption is that many factors (e.g., social, linguistic, maturational/biological, and cognitive) affect the course of development, and that these factors are mutually dependent on, interact with, and modify one another.

Two developmental schools have arisen, differing mainly in their views of the prerequisites and motivations of child language learning. The cognitive school of developmental theory (Bloom, 1973; Brown, 1973; Bowerman, 1973; and Morehead and Morehead, 1974) assumes that language development is primarily dependent on nonlinguistic cognitive development. This approach relies heavily on Piaget's theory of cognitive development. The child's cognitive abilities are assumed to be qualitatively and quantitatively different from those of adults. The way in which the child views the world affects the way in which the task
of learning language is approached. Hence, the complex structures of
language are neither innate nor learned. Instead, these structures
develop as a result of the interaction between the child's current level
of cognitive functioning and his present linguistic and nonlinguistic
environment.

The social school of developmental theory (Cherry, 1976) believes
that the structure of human language emerges from the social-
communicative functions that languages plays in human relations. The
interaction between child and adult as both prerequisite to language
development and as the source of motivation for child language
development. According to Bates (1976) and Bruner (1978), the child's
primary motivation for learning to speak is to communicate intentions
to others. The child learns the structure and vocabulary of language in
order to best achieve the effective communication of meanings and
intentions within a given communication situation. Those conversational
skills which regulate discourse are learned from interactions with
adults, especially mothers. Children cue their parents to supply the
appropriate language experience that is required for language growth.
The position recognizes that children's parents usually assume the
responsibility for communication, phonetically emphasizing important
content words, slowing the rate of speech, and supplying critical cues to
aid communication (Snow, 1972). The mother's role in providing the child
with appropriate language experience is emphasized as well as the role of
the child's language environment throughout development. That is,
children who are linguistically naive receive grammatically simple input.
As the child grows in language skill, the language provided by the
environment also increases in complexity. While there is no conscious
effort by the parents to directly provide language instruction, there is
an effort to facilitate communication (Bates, 1982). Since the complexity
of language addressed to children is largely determined by cues from the
children themselves, language acquisition from this view is self-paced.

The theoretical view for this study of mother-child communicative
interactions of educationally advantaged Down Syndrome and normal
children is largely based on the social interaction approach. The
language environment is viewed as a dynamic system with mother and child
each requiring the other for efficient social communication in order for
the child to improve in structure, content, and use of language.

MOTHER-NORMAL CHILD INTERACTION

Language Characteristics

The initial developmental research in the area of mother-child
dialogue concentrated on the structure and semantic meanings of the
mothers' speech to young children. Attempts were also made to associate
features of mothers' speech to specific areas of language development in
the child.

In a landmark article, Snow (1972) described her research with
mothers of 2 year olds and mothers of 10 year old children. Each
mother did three verbal tasks with a 2 year old and a 10 year old child.
In addition, the mothers also audiotaped the instructions for the tasks
as if they were giving them to a 2 and a 10 year old child. Several
adult women who had no children also did the above tasks. Snow
determined that all the adult women used language that had more repetitions, fewer pronouns, and reduced length of sentences with less use of compound verbs and subordinate clauses for the 2 year olds than for the 10 year olds. The modifications in adult speech occurred for both mothers and nonmothers, though experienced mothers modified their speech slightly more. Simplifications occurred in tape recorded speech to children but to a significantly lower level. Snow postulated that modifications in maternal speech were somewhat contingent on child feedback. Snow also concluded that the modifications in adult speech were valuable in two ways. First, the speaker's language was more understandable to the child, and second, the simplified speech served to aid the children in language learning.

Broen (1972) had each of ten mothers talk to their language learning children (18-26 months), older children and adults. Mothers talking to language learning children produced slower speech with pauses located at sentence boundaries, and a smaller vocabulary. They also produced less broken sentences (disfluencies) and repeated themselves frequently. Garnica (1976) studied 24 women, half of whom had a language learning child and the other half who had an older child (mean age 5;4). The women were recorded talking to their own children and the investigator. Parts of the taped conversations were selected for perceptual and acoustic analysis. Results showed that the average fundamental frequency (pitch) of the speaker's voice was higher to a 2 year old than to a 5 year old. The variations in frequency were also greater when addressing the children. Speech to the 2 year old had more instances of rising pitch intonation, as well as more whispering, drawing-out of content
words, and instances of primary stress. Garnica felt that some of the
above features were for emphasis or attention getting.

Juliet Phillips (1973) conducted a study similar to that of Snow.
Phillips, however, compared speech to 8, 18, and 28 month old children as
well as the mothers' conversations with the experimenter. No differences
was found between language addressed to boys or girls of comparable age.
Phillips also found that vocabulary used to language learning children
was more concrete than that to adults. No significant difference was
found between 8 and 18 month old children. She concluded that mothers
might depend on verbal feedback for language adjustments which could not
be given by the nonverbal 8 month old. There were significant
differences in the complexity of the syntax and vocabulary of the speech
addressed to 18 month and 28 month old children.

Variations on the situations and variables have continued to be
investigated (Shatz & Gelmen, 1973; Gleason, 1973; Baldwin & Baldwin,
1973). Attention began to focus on seeing whether "motherese" functions
as a teaching language and the effects of specific features of mother's
language on the child's rate of language development. Nelson,
Causkaddon, & Bonvillian (1973) designed an intervention where one group
of children received expansions (syntactically more complete phrases) of
their telegraphic utterances as well as recasts of their sentences in new
syntactical forms. The control group received the same amount of
interaction with an adult but no expansions or recasts. The mean scores
of the measures of language ability assessed were lower for the control
group than the experimental group, but the difference did not reach
statistical significance. Nelson concluded that specific intervention
could be effective, but simply more verbal interaction with an adult was an important factor in more effective language development in children.

Nelson (1973) also conducted observations of 18 mother-child dyads. Observations were scheduled at regular intervals from the time the children were age 1 until they were 2 years old. She focused particularly on the acquisition of the first 50 vocabulary words. Nelson proposed an interactional model where a child learning vocabulary either labelled objects and actions (referential) or used speech for social contact purposes (expressive). The child who had the fastest rate of development of vocabulary was a referential child with a referential mother who frequently labelled objects and actions. Mismatch of child and mother strategies in any combination tended to show itself in low vocabulary scores and low MLU.

Correlational studies of mother-child language have been conducted to study areas of relationship. Two hypotheses have been proposed concerning the relationship of motherese to child language acquisition. 1. The fine-tuning hypothesis states that adult input is closely tailored to the linguistic maturity of the child. Therefore, a high degree of correlation would be observed between mother and child speech features (Cross, 1974).

2. The multifactored hypothesis proposed by Newport, Gleitman, and Gleitman (1977) suggests that "many features of the mother's speech change in accordance with the child's age, not his competence with the constructural features of the language" (Newport et al, 1977, p. 145). Therefore, correlations would be low on most of the mother-child linguistic characteristics.
Newport observed 15 mother-daughter pairs where the children were 12-27 months of age and again 6 months later. She coded both child and mother language for syntactic complexity and vocabulary size. Mothers' language was analyzed for sentence type, repetitions, expansions, and intelligibility. Newport found that the syntactic complexity of motherese was not the type of teaching language optimal for second language teaching. For example, the simplest sentence is the declarative sentence, e.g. "I pushed the car". However, adults use only 30% declarative sentences with young children as contrasted with 87% declaratives in adult directed speech. Commands account for 24% of the child-addressed speech while questions were used 33-44% of the time. Since commands omit the subject of the sentences and questions involve changes in word order, children are not getting the simple subject-verb-object sentences which are considered ideal for language teaching. Lastly, Newport did not find that maternal speech grew syntactically more complex during the second year of the child's life. Newport, therefore, concluded that mothers adapted their speech in an attempt to get children to follow directions, not to teach language. Indeed, motherese was not an ideal teaching language.

The fine tuning hypothesis was adopted, with some modifications, by Snow (1976). She studied the semantic relations (e.g. agents, actions) of nine mother-child pairs when the children were 23-35 months. She found that the mothers' semantic constructions were limited to the constructions the child had already mastered. Snow felt that the above semantic limitation put a constraint on the mothers' syntax that accounted for its relative insensitivity to child grammatical growth.
Other studies have shown a significant correlation between mothers' and children's MLU from 18 months and older (Seitz & Stewart, 1975; Cross, 1977). Chapman (1981) summarizes various studies which show that the mothers' MLU is about 2.4 morphemes longer than that of the child throughout the second year of life. Furrow, Nelson and Benedict (1979) reported on correlations between mothers' speech and their children's language 9 months later. In general Furrow et al. indicated that the greater the number of words, pronouns, contractions and copulas per utterance used by mother, the less language advancement in syntax and MLU shown by the child over the 9 month period measured. Greater use of yes/no questions and use of nouns instead of pronouns were significantly correlated with child language achievement. Furrow concluded that the above correlations suggested that the linguistic environment has a much greater effect on child linguistic growth than was suggested by Newport. Furrow et al. also discovered that correlations that were significant at 1;6 were not always significant at 2;3. They, therefore, concluded that the relationship of mother speech to child speech must take into account the child's state of linguistic development. Those features of mother language which are facilitating to a child of 1 1/2 years who is at a one word production stage may not be facilitating when the child reaches 2 1/2 years old and is putting together three or four word phrases.

Cross (1976) conducted a study on 16 mother-child dyads. The children were 19 to 32 months and had shown signs of rapid language development. The children were pretested for comprehension and vocabulary. The MLU of the children ranged from 1.49 to 3.44.
Cross also measured the intelligibility of the children, their conversational vocabulary (type token ratio), and the length of the 50 longest utterances. She analyzed the mothers' structural features such as MLU, preverbal complexity, disfluencies, and distribution of different sentences types such as questions and imperatives. Discourse features including the mother utterances semantically related to the child's utterances, expansions and repetitions, and immediacy of content were analyzed. Aspects of conversational style such as proportion of mother utterances per turn, and volume of mother output were included.

Of all the correlations made between child-mother variables, 15 mother measures correlated strongly with the children's receptive abilities, 7 with intelligibility, 7 with age, and only 1 with child MLU. Cross concludes that the deep concern of mothers to understand their children and be understood results in an input that contains features which assist the child language acquisition. Cross found that many correlations decreased or increased with more advanced receptive ability or advancing age over the year range studied. Mother discourse features such as expansions and repetitions decreased with receptive ability. Semantically new utterances increased with both age and receptive ability. Conversational style remained somewhat constant over the year period. Mother's references to child activities decreased as receptive ability increased, but references to non-immediate events increased with both receptive ability and age. Syntactic abilities showed a more uneven picture. Cross, who considered MLU as a syntactic measure, found mother MLU related to child receptive ability, child MLU, and age. Preverb complexity increased only with age while use of questions decreased with
Cross suggested that the child's receptive ability may predict some of the discourse features used by the mother while age may predict how well formed the mothers' input may be. She summarized that the fine tuning hypothesis explains many features of mother-child dialogue, but that the syntactic features are less well tuned to the child's growing linguistic ability at the 1 1/2 to 2 1/2 year age range.

Other investigators have studied the differences in mother-child dialogues with increasing language skills of the child. Moerk (1974) observed 5 children ranging in age from 2;2 to 5;0 and their mothers. Moerk postulated three teaching stages from his data. Mothers label objects and activities for their children between the ages of 1;9 to 2;4 years. The next stage has the mother prodding the child to label with questions such as "What is that?" Mothers then often confirm the answer with an imitation or expansion. The child often seeks input with his own questions such as "What's that?" The final stage has the child spontaneously explaining activities to the mother and asking less stereotyped questions while mothers' replies are more tuned to the content of the child's message.

Frazer and Roberts (1975) also observed children over a greater age range than other studies. Thirty-two mothers with children ranging from 1 1/2 to 6 years were tape recorded in a lab setting doing a building and a story task. They found the sex of the child was not significantly related to the mother speech variables. The investigators determined that the greatest change in motherese occurred as the child progressed from 1 1/2 to 2 1/2 years of age. Gradual changes did occur from 2 1/2 to 6 years. Mother MLU increased from 5.5 to 8.8 at age 6. Grammatic
complexity scores increased three times, while disfluencies doubled in the building task and increased five fold in the story task. Reichle (1976) also concluded that mothers of 3 year olds use significantly more complex expiations (direct comments on the child’s utterances without imitation or expansion) and less direct imitations and expansions than mothers of 2 year olds.

Increased focus on the child’s contributions to the communication dialogue caused investigators to observe interactions between mothers and preverbal children. Reciprocal exchanges using direction of gazes, facial expressions, smiling, and vocalizing were observed. Lewis and Rosenblum (1977) and Bruner (1978) noted the similarities of these preverbal exchanges to rules of social conversation. Bates (1982) and Mahoney (1975) postulated that turntaking, shared reference to objects and events, interactive play routines, and selective listening set the ground rules over which language communication was built. Few studies, however, have tested the above social theories, especially with longitudinal data.

Lewis and Freedle (1977) observed 97 mother-child dyads when the infants were 3 months old with followups on some of the dyads at 2 years of age. Children whose mothers initiated turns at 3 months but allowed the child to end the turn demonstrated higher MLUs at 2 years. Freedle and Lewis felt that the above mothers had a distinct influence on their children’s language growth rate.

Schaeffer, Collis, and Parsons (1977) examined early preverbal dialogues to find the extent that the two partners were able to regulate their turntaking so as to avoid overlapping. It was the purpose of the
investigation to study whether or not prelinguistic dialogues were marked by the same characteristics found in later verbal interactions. Sixteen mothers and their 1 and 2 year old children were video recorded in a laboratory setting. Schaeffer's data revealed that mother-child vocal exchanges were smooth, and overlaps occurred relatively infrequently, averaging about 11-12 episodes in 10 minutes. Some of the overlap episodes were of a noninterruption nature, such as warnings, distress occasions, and laughter so that the real turntaking disruptions were at an even lower rate. Observations on pauses made for speaker switches revealed that most pauses were brief, lasting less than one second. Mothers tended to reply more quickly than did the children. Schaeffer, Collis and Parson concluded that participants regulate their turntaking, even in preverbal exchanges.

Kaye (1982) has studied the phenomenon of turntaking in mother-infant/toddler dyads. Four phases were observed. First, mothers use newborn infants' pauses in sucking as occasions for jiggling motions. Second, when the children are 3-6 months old, the mothers systematically placed their smiles, head motions, and vocalizations during the child's attentive periods. During phase two there is often an overlap of response such as "uh-huh" or a nod of the head. Chorusing, where the mother tries to get the child to vocalize with her, occurred often. Third, parents seemed to try to teach the child by presenting a model with pauses for the infant's trials and sometimes physical assistance.

Mom: (pushes the top toward the child)

"You do it."

Child: (Pushes button on the top.)
Top falls over)  
MOM: "You have to hold it with the other hand too."
(Puts child's hand on top)  
CHILD: (Pulls away hand)  
"Me."

Teaching turns were verbal or nonverbal actions. The fourth phase demonstrated verbal turntaking wherein one partner got the other's attention, communicated his message and signaled for the other partner to respond. Kaye noted that the turntaking appeared very smooth by the time the child was communicating verbally. However, a study conducted by Kaye and Carney (1982) revealed that the mothers continued to carry the leadership role even during this apparently smooth turntaking period.

Twenty-eight children and their mothers were videotaped in the home at 26 and again at 30 months. Less than 3% of the mothers' turns and 5% of the children's turns were interruptions. Utterances were categorized as mands in which it would be rude in adult discourse not to respond (chiefly questions and commands and responses that were contingent on the partner's preceding turn. When an utterance was both a mand and a response, it was called a turnabout. Turnabouts were considered very facilitating for continuing dialogue. The speaker was sensitive in response to the partner's interests and utterances. Yet the speaker also used a mand which put obligation on his partner to respond verbally or nonverbally. Mothers averaged 55% turnabouts while children averaged only 20% of the dialogue-encouraging turnabouts. Therefore, mothers do more of the work of maintaining the dialogue while the child participates
largely on topics dictated by his own interests. The above study was replicated with 2 and 4 year olds and their mothers. Mothers accepted the responsibility for continuing the dialogue while neither the 2 or 4 year olds did so. Kaye and Carney theorized that as children grow, they become governed by social rules, but only gradually. Turntaking in an adult dialogue does not require a large quantity of mands to maintain the dialogue. Pauses with appropriate gestural cues are sufficient. Progression to adult turntaking requires more and more equality in the responsibility for conversational dialogue.

MOTHER-HANDICAPPED CHILD INTERACTION

Language of Down Syndrome Individuals

The interest in mother-child language has extended to investigation into the linguistic environment of children with mental retardation. Over the past twenty years, conflicting points of view have evolved about the language development of children with mental retardation. However, the majority of research supports the view that children with mental retardation follow the same sequence of language development as normal children but at a slower rate (Miller, 1985). This slower rate can be influenced by the environment, including the child's experiences and the quality of the language stimulation received.

Many of the studies have involved children with Down Syndrome (DS), partly because they are identified at birth or early infancy and partly because the syndrome makes up a large portion of the mentally retarded population. However, it is possible that children with Down Syndrome
have a language delay that exceeds what would be expected by examination of their mental development. Several factors may be responsible. First, DS children have a high incidence of hearing loss. Balkany, Downs, Jafek, and Krajicek (1979) reported that 78% of the DS individuals tested had a significant hearing loss; 64% of whom had a binaural loss. Over 80% of the losses were conductive in nature with degree of loss ranging from 15-50 dB. Various investigators have found that losses of this magnitude are associated with language delay in otherwise normal children (Holm & Kunze, 1969; Needleman, 1977). It can be assumed that language development problems from hearing loss would be even more pronounced in DS children who already have mental and physical delays. Much of the loss was attributed to serous otitis media (fluid-filled middle ear) which is often present in DS children.

Physical problems with face shape, mouth and tongue size, and muscle control for articulatory structures may contribute to speech difficulties (Sanger, 1975). In a study on motor planning, Frith and Frith (1974) found that DS children did well at motor tasks executed slowly and repetitiously (a tapping sequence) but scored poorly on tasks requiring motor planning (visual pursuit). Motor planning is required for sentence construction, a problem area for individuals with Down Syndrome. Hartly (1982) found that DS individuals as compared to matched mentally retarded and normal persons did poorly at tasks requiring comprehension of sequences in directions, a difficulty that could be attributed to a memory or a processing deficit. Other evidence of memory deficits as compared to mental age matches were given by Lincoln and Courchesne (1985) demonstrating evidence of differences in brain responsiveness.
Marcell and Armstrong (1982) indicated that there is evidence of deficits in short term memory for items presented orally. Since much of language learning is based on auditory information, a memory deficit in auditory recall could delay language development.

The above factors that show the child with Down Syndrome at specific risk for language delay beyond that expected by his cognitive delay. A summary of 16 studies involving individuals with Down Syndrome by Miller (1985) demonstrated that as chronological age advances, deficits in language beyond mental age expectation are more and more likely to occur. Other studies reveal that not all areas of communication are equally affected by Down Syndrome. Layton and Sharifi (1978) obtained language samples from nine DS and normal children matched on mental age. The DS children's actual ages ranged from 7-12 years and their MLU averaged 5.37. The normal children were divided into a low and a high utterance group. The investigators concluded that there was more similarity than difference in semantic and syntactic structures used by the DS and normal children. They found that there were more differences between the low and high utterance normal groups than with the DS group versus the normal group. For example, the DS children used similar semantic and syntactic features, but they were not consistent in their use. It seems that they differed most in the frequency of use of features such as pronouns and location words.

Weigel-Crump (1981), however, used Lee's Developmental Sentence Scoring (1971) procedure to analyze the language of 80 DS children aged 6-12 years. Significant differences were found between the DS children and the DSS test norms for the appropriate mental ages. For example, DS
children used level one pronouns (I and me) as contrasted to the appropriate level two pronouns (he and they). Rondal (1976) demonstrated that DS children matched with normal children for MLU had better vocabularies but displayed no difference in syntax or semantic characteristics. Cornwall (1974) tested 38 DS children ranging in age from 5-19 years in language concepts such as labelling and function of objects. Results demonstrated showed wide differences between language comprehension and production tasks. Over 75% of the children recognized functions of objects like a car but less than 50% verbalized those functions.

Most investigators reported substantial articulation disorders in individuals with Down Syndrome, even exceeding those of non-DS mentally retarded matches. In a study by Schlanger (1957) 95% of the institutionalized population of DS individuals had substantial articulation defects. Dodd (1975) observed that children with Down Syndrome made over twice as many articulation errors as children matched for mental age with other types of mental retardation. DS children had 1 1/2 to 2 times as many error inconsistencies such as using different phonemes (sounds) to substitute for one incorrect phoneme than their mental age matched pairs. Silverstein (1985), investigating the adaptive behavior of adults with retardation reported that DS subjects showed greater social competence in every area except in the clarity of their speech.

Unintelligibility disrupts the communication between dyads. Brown (1980) stated that parents rarely correct their children except for errors of fact. However, Brown defined a correction as a specific "No,
that's wrong" type statement. Other type of responses such as "What did you say?" or adult repetitions of child incorrect statements using question intonation could function as corrections (Gerenser & Serotta, 1982).

Down Syndrome Child-Mother Interaction

Early mother-child studies matched DS and normal children by chronological age. Marshall, Hegrenes, and Goldstein (1973) observed 20 DS mother-child pairs and 20 normal pairs matched for the chronological ages of 3-5 years. Mothers of DS children used significantly more mands (commands, requests) than mothers of normal children. Buium, Rynders, and Turnure looked at 11 mothers of 2 years olds, 6 of whom had Down Syndrome and and 5 who were normal. The mothers of the DS children talked faster, used more utterances but had a lower MLU, issued more imperative sentences but used less grammatically complex statements. Confirmation of the directive behavior of mothers of mentally retarded children 3-7 years of age and of the less mature grammatic input given to the delayed children was made by a study by Kogan, Wimberger and Bobbitt (1969) using chronologically matched normal children as controls. In addition, they found that mothers of mentally retarded children asked more questions for which they knew the answers or supplied the answers. Rondal (1976), however, proposed that the differences in maternal input were due more to maternal adjustment to the child’s language delay than the provision of a deficit model. Since normal maternal input is simplified more at the early language learning stages of the normal child, input for a mentally retarded child in those same early language learning stages might be
similarly adjusted. Rondal divided 21 DS mother-child dyads into three groups based on the child’s MLU and matched them with mother-normal child dyads. The DS children ranged in age from 3-12 years while the normal children were 2-32 months. Verbal interaction was recorded at home in a free play setting. His comprehensive variables observed both mother and child lexical-numerical input (volume and type-token measures), semantic relations, and syntactical features. In addition, maternal speech was analyzed for pragmatic functions such as use of requests and language teaching functions such as expansions, imitation, and words in dysfluencies. Statistical analysis of the children’s speech found no significant differences. The only exception was a greater diversity of vocabulary for the DS children which Rondal attributed to the experience gained by the chronologically older DS children. However, an analysis of language levels revealed that all the children with higher MLU produced significantly more words per recording, increased vocabulary, repeated their mother less, and used more modifiers and verbs per utterance.

Analysis of maternal input showed that volume of words and TTR were similar as were the syntactic cluster of compound verbs plus subordinate clauses, preverb length, modifiers, and utterances without verbs. No differences were demonstrated in the types of sentences used by mothers, including use of imperatives. Examination of semantic categories found both groups strikingly similar as were language teaching features such as repetitions and expansions. However, effects of increasing language level were found in all the variables listed above, except for the types of sentences used. Rondal concludes that maternal linguistic environment of DS children is not deficient when
compared to that of middle class children at corresponding MLU.

Petersen and Sherrod (1982) report a similar study with 10 DS children (2-3 years), 10 non-delayed children (18-30 months), and 10 language delayed intellectually normal children (2-4 years) matched on MLU. Each group was divided into high and low language level groups. Audio recordings made in the home during free play were analyzed. Families were primarily middle class so lower social economic status would not confound the findings. Maternal language categories included TTR, semantically related utterances, request behaviour, language teaching behaviors such as labelling and expansions, and judgmental responses. Petersen found that 1/3 to 1/2 of the maternal utterances to the language delayed children were unrelated to the child's activities. Mothers of DS children used 1/4 to 1/2 unrelated utterances compared to 1/4 to 1/10 for normal children. Since children learn language by relating words they hear to objects, gestures, and events that co-occur (MacNamara, 1972), Petersen and Sherrod stated that unrelated language may be a partial explanation for language delay. Mothers of language delayed children also made fewer approving comments while parents of DS youngsters made slightly more approving comments than mothers of normal children. Mothers of DS or language delayed children did not demonstrate differences from mothers of normal children in request or command behaviors as cited in other studies. Mothers of DS children also sought more imitation from their children, an effect the authors postulated might stem from participation in early intervention programs. Examination of the effects of higher language level showed that mothers of the more competent children used more complex questions, requested
nonverbal acts less, and offered more approving and disapproving comments indicating, a decrease in physical action and an added emphasis on verbal language in the interactions.

The social basis for language theory has been applied to the communication of mentally handicapped children. As with the research on mother-normal child discourse strategies, observations have been mainly with prelinguistic or early language learning children and their mothers. Studies with young DS infants have looked at interactional aspects of mother-child dialogue. Jones (1977) investigated turntaking interactions with six normal mother-child dyads and six DS dyads, matched for mental age. The DS children were 1-2 years old while the normal children were from 8 to 18 months. Observations were in the home while playing with toys. Jones found that DS children did not initiate interactions as often as normal children, and that their vocalizations were longer leaving little time for their mothers to respond. Often their vocalizations clashed with their mothers' speech, and they made less eye contact. Jones concluded that the DS children had poor use of turntaking skills.

Schwer and Owings (1984) investigated DS children's responses to their mothers' requests in an attempt to see how children learn to relate their responses to preceding utterances. Four DS children, mean age 6;3, and their mothers were observed during free play at home. Data showed that responses to requests accounted for the majority of contingent speech with the DS children as with normal children previously investigated. A wider range, 50-80%, was found for the children with Down Syndrome compared to the 70-80% found for normal
developing children. More conversational breakdown occurred because of the DS children's unintelligibility, but DS children employed the same strategies for clarification as did the normally developing children.

Berger and Cunningham (1983) investigated turntaking behavior under conditions of mother talking and mother silent. Six DS and seven normal mother-infant dyads were used. Both DS and normal infants were approximately 2 weeks at the first observation to 6 months at the last observation. The mothers of the DS infants increased their vocalizations as the child grew older, a trend not followed by mothers of normal children. More turntaking was shown by the normal infants in the first three months of life, a difference probably accounted for by the fact that the DS babies were slower to start consistent vocalizations. In the fourth month, however, vocal clashes increased in the DS group compared to a decrease of vocal clashes in the normal group. Berger and Cunningham suggest that these findings suggest a distortion of the interactive process already beginning in the infant-toddler stage of life. They feel that the increasing intensity of mother talk may contribute to a interaction deficit and suggest that waiting for the DS infants response may be particularly important as DS children have longer response latencies.

Cardoso-Martins and Mervis (1985) observed the linguistic environment of five prelinguistic children with Down Syndrome who were considered cognitively ready to talk. Two groups were matched with the DS dyads. In the first group the children were matched for mental age. The second group of children were matched for chronological age. Interactions were at home with observer supplied toys. Cardoso-Martins
concluded that the mother-child interactions were mother-oriented for
the DS dyads as contrasted to child-oriented for normal child dyads
because of the high incidence of imperatives and low incidence of child
appropriate labels used by the mothers of DS children. Cardoso-Martins
stated that reduced maternal expectations for their handicapped
children might have been a contributing factor as was the higher verbal
output of the normal children.

Leifer and Lewis (1984) investigated DS children's responses to
questions. Four normal children were matched with four DS children
(ages 18-23 months) for chronological age and six different DS children
(ages 3;5-4;5) for an MLU match. Observation was made of mothers and
children in a lab setting during free play. None of the groups showed a
high percentage of appropriate responses. However, the older DS group
matched for MLU showed a significantly higher appropriate response level
on all question types than either of the other groups. The CA matched
delayed group responded mainly with action to directive questions. Since
these children have little expressive language, it seems appropriate for
mothers to use directives and expect action responses. Leifer and Lewis
found that older delayed children had fewer no responses than the other
groups, a trend they suggested demonstrated more advanced turntaking
skills. They also concluded that experience plays an important role in
the development of linguistic social interactions since the MLU-matched
DS children were more advanced than their normal peers.

Mahoney (1975) collected mother-delayed child language interaction
samples from 20 each in the age groups of 1 year, 2 years, and 3 years.
90% of the children were Down Syndrome. He divided his dyads into three
categories based on child response: responsive, attentive, and ignoring. No significant differences were seen in the frequency of maternal responses or in utterances related to child utterances. However, responsive mothers (Responders) used one word utterances, labelled more frequently and continued on the child's topic often. Mahoney believes that Responder mothers have more sensitivity to the child's interests. However, his data is based on communicative response of 2.5% or less of the mother utterances.

Mother-child interactions involving 2 year old children with Down Syndrome were investigated by Crawley and Spiker (1983). Eighteen dyads were observed in play at home. Likert rating scales were developed emphasizing areas of directiveness and sensitivity. Comparisons showed that directive mothers were not necessarily intrusive (blocking child interests and behaviors). One half of the mothers were rated as highly sensitive to their child's cues. Mother with high sensitivity and high directiveness ranked high on stimulation value. Mothers rated high on stimulation value and mother appeal had children with higher Bayley Mental Development scores. Neither sensitivity or directiveness alone correlated positively or negatively with child competence. Crawley and Spiker emphasized that there was a wide variance between the maternal styles of the mothers in the groups.

As can be noted from the above studies, most studies on interactional style and discourse skills have been conducted with infants or young DS children. Investigators have postulated that DS children's interactional deficits may begin at this early time period, and that parental strategies may contribute to the deficit. Before conclusions are
made about deficit parental environments, research should be conducted on older mother-DS child dyads to see if social interaction deficits continue to occur.

The following study investigates the mother-child communicative interactions from a developmental perspective, emphasizing the social viewpoint. Both the mother and child's language are analyzed. Variables sampling several areas of linguistic interest are observed, including the amount and structure of speech and the discourse features of turntaking and nonverbal communications. The interactive aspects of children's unintelligibility on mothers' responses are observed in the context of the turntaking dyad.
CHAPTER III

PROCEDURES

SUBJECTS

Subjects for this study were 16 Down Syndrome (DS) children and their mothers and 16 normal children matched with the DS children for auditory comprehension ability and their mothers. The DS subjects were selected from the population of DS children in the Central Ohio area who met the following criteria:

1. Diagnosis of Down Syndrome
2. Chronological age from 6-15 years.
3. At least two years of early education before kindergarten age. Early education is defined as infant and preschool programs for handicapped children as well as preschools which mainly serve normal children.
4. Education in developmentally handicapped (educable) classes in regular public schools with normal children.
5. Mainstreamed with normal children under teacher supervision for part of the regular school day for the present school year or two years previous.
6. No debilitating physical problems.
7. No hearing problems sufficient to interfere with communication as reported by the parents.
Contacts were made through parent groups and school districts in the area. Fourteen children were diagnosed as having the Trisomy 21 type of Down Syndrome. One child had Translocation Down Syndrome, and one child had a physician’s diagnosis of Down Syndrome, but no laboratory tests had been conducted.

The normal children were selected from preschool classes, and contacts made through mothers of both DS and normal children. The normal children also had no hearing difficulties or debilitating physical problems. The children were matched by scores on the Test for Auditory Comprehension of Language (TACL) (Carrow-Woolfolk, 1973) which tests comprehension of vocabulary, morphology, and beginning syntax.

Each group of children were divided into a low receptive language group and a high receptive language group according to their TACL scores. Those children scoring 5 years, 1 month and above were placed in the high receptive language level group, while those with scores of 5 years or below were placed in the low group. Means on the TACL scores in months were 44.50 for the low language level DS children and 44.30 for the matching normal group. Means for the high receptive language level group were 72.88 for both the DS and the normal children (Table 1). A t test (t=.13, t=.00, df=14. NS at .05 level) performed on each level determined that there were no significant differences between the scores of the DS children and the normal children at either the low or high receptive language levels, thus demonstrating comparable group matching.

The mothers of the normal children were matched for educational level with the mothers of the DS children. Educational level of the mother was
### Table 1

**Children's Sex, Age and Test Scores**

#### DS LOW LANGUAGE GROUP

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Mean: 90.00  
Std Dev: 7.54

#### NORMAL LOW LANGUAGE GROUP

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Mean: 36.88  
Std Dev: 8.87

#### DS HIGH LANGUAGE GROUP

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<td>24</td>
<td>M</td>
<td>182</td>
<td>63</td>
<td>71</td>
<td>52</td>
</tr>
</tbody>
</table>

Mean: 154.25  
Std Dev: 20.89

#### NORMAL HIGH LANGUAGE GROUP

<table>
<thead>
<tr>
<th>ID Number</th>
<th>Sex</th>
<th>CA (months)</th>
<th>TACL AGE (months)</th>
<th>PPVT AGE (months)</th>
<th>PPVT STD SCORE</th>
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<tbody>
<tr>
<td>25</td>
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<td>71</td>
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<td>F</td>
<td>52</td>
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</table>

Mean: 62.63  
Std Dev: 10.43

#### Mean and Standard Deviation

<table>
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<tr>
<th>Group Type</th>
<th>Mean CA (months)</th>
<th>Mean TACL AGE (months)</th>
<th>Mean PPVT AGE (months)</th>
<th>Mean PPVT STD SCORE</th>
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<td>44.50</td>
<td>48.88</td>
<td>115.63</td>
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<tr>
<td>DS HIGH LANGUAGE GROUP</td>
<td>154.25</td>
<td>72.88</td>
<td>90.88</td>
<td>67.38</td>
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<tr>
<td>NORMAL HIGH LANGUAGE GROUP</td>
<td>62.63</td>
<td>72.88</td>
<td>78.38</td>
<td>115.75</td>
</tr>
</tbody>
</table>

**Note:** The table includes children's ID numbers, sex, chronological age (CA), TACL age, PPVT age, and PPVT standard scores. The table is divided into four groups: DS LOW, NORMAL LOW, DS HIGH, and NORMAL HIGH, each with mean and standard deviation values for CA, TACL age, PPVT age, and PPVT standard scores.
considered more important than socioeconomic class (usually determined by occupational status of the head of the household). Cohen and Beckwith (1975) reported a significant relationship between the mother's schooling and several aspects of her verbal input with her child. Some of the children's parents were graduate students with low income but high educational level. Both high language level groups contained three mothers who had graduated from high school, two mothers with some college education or nurses training (one or more years), and three mothers who graduated from college or had started graduate work. The two low level language groups were comprised of four mothers who graduated from high school, three mothers with some college, and one in the college graduate plus group (Table 2). It was assumed that based on educational level both groups were middle class, as are the subjects of most of the prior research.

Fifteen of the children in each group came from two parent families. One child in each group had divorced parents who shared joint custody of the child. English was the only language spoken in the homes, and none of the parents manifested any speech or language problems when interviewed.

No attempt was made to balance for gender since Rondal (1976), Phillips (1973), Fraser and Roberts (1975), and Moerk (1975) show no significant sex difference in maternal speech during the language learning period on the variables which were to be explored. The sex distribution of the DS children was 9 boys and 7 girls while there were 10 boys and 6 girls in the normal group.
Table 2

Mothers' Educational Levels

<table>
<thead>
<tr>
<th></th>
<th>High School Degree</th>
<th>Some College</th>
<th>College Degree Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS Low Language Group</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Normal Low Language Group</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>DS High Language Group</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Normal High Language Group</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
The chronological ages of the DS children ranged from 6 years 9 months to 8 years 5 months in the low receptive language group with a mean of 7;6. The matched group of normal children had a mean CA of 3;1 with a range from 2;21 to 4;2. The DS high receptive language group were considerably older with a group mean of 12;10 and a range of 11;1 to 15;2 years. The matched normal group ranged from 4;4 to 6;4 years with the group mean at 5 years 3 months.

The children were also given the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1965) to assess their verbal intelligence. The PPVT test results were not used for matching purposes. The scores were used, however, to provide a more complete description of the children (Table 1). The mean PPVT standard score for the DS low language group was 57.5 (with 100 being the standard score assigned to the mean for each age level of the standardization sample) with the scores ranging from 85 to 20. The mean standard score for the matched normal group was 115.6 with a range of 94 to 135. The high receptive language DS group had a mean of 67.4 with a range of 86 to 52 while the matched normal group had a mean of 115.8 with scores from 97 to 132. The high PPVT scores of both normal groups of children indicated that they probably had above average verbal intelligence.

INSTRUMENTS

The Test of Auditory Comprehension (TACL) (Carrow-Woolfolk, 1973) is widely used with children as a test of comprehension (McLean and Snyder-McLean, 1978). The test consists of 41 vocabulary items including nouns, verbs, adjectives, and adverbs. The morphology section tests the
understanding of number, tense, voice, status of verbs, the comprehension of prepositions, interrogatives, pronouns, plurals, and the suffixes "er," "ist," and "est" with 48 items. Beginning syntax comprehension of imperative sentences, noun-verb agreement, complex and compound sentences, direct and indirect objects, and noun phrases with adjective modifiers are assessed in 12 items.

The entire test is administered regardless of the child's success/failure rate. The TACL test-retest reliability coefficient is high at .94. From the validity evidence given, TACL test scores significantly increase with age and also distinguish between normal and linguistically handicapped. It is acknowledged that a test of vocabulary, morphology and syntax does not comprehensively test auditory comprehension. However, Miller states in Darley's review of speech and language assessments, "The TACL remains the best commercially produced language comprehension test available to date" (Darley, 1979, p.74).

The children were matched on this widely used assessment that has proven reliability and validity.

Since the DS children came from various school districts, several tests had been used to determine their educability. Most of the normal children had not had developmental testing. Therefore, the Peabody Picture Vocabulary Test, Form A (Dunn, 1965) was given to establish the developmental status of the population being described. The PPVT was designed to provide an estimate of verbal intelligence through measuring comprehension of vocabulary (Dunn, 1965). The PPVT has the child choose the named picture out of a choice of four. It was chosen because of the lack of expressive language demands and its ease in administration.
The PPVT has relatively high correlations with the Stanford Binet at .71 (Terman, 1960) and the Wechsler at .79 (Wechsler, 1949).

METHOD

Letters were sent to each parent explaining the general purpose of the study and the observations and assessments that would be made (Appendix A). Permission forms for both mother and child were explained and signatures obtained.

The data was collected in two or three home visits. On the first visit, the TACL (Carrow-Woolfolk, 1973) was administered for matching purposes. On the second visit, the observations of mother-child interaction were made. The PPVT was given after observations of the older children were completed. Some of the younger children and those with short attention spans required an additional visit for the administration of the PPVT (Dunn, 1965).

During the second visit, two different observations were videotaped. Observations were videotaped in order to record nonverbal communications. Judgments on unintelligibility also required visual recording of the communicative context for the speech. One observation centered on common household interactions. The first situation was lightly structured around the mother and child doing a food preparation task such as making a sandwich, fruit gelatin, or pudding. The investigator made several suggestions to the parent, and the mother chose a suggested task or any other similar task which best fit her child. A second common household situation focused on the mother and child conversing without props, usually about past experiences. It is common for parents to talk to
their children about what they have done, e.g. "What did you do at school today?" Therefore, talking about a recent past event is a familiar mother-child interaction. The above situations were intended to reflect the task-oriented interactions of parents and children. These combined household situations were called the Daily Routine Observation.

The second observation was a lightly structured play interaction. Since the ages of the children ranged from 2 to 15 years, three packets of toys and objects appropriate to different ages levels were collected. Each packet had at least one male and one female doll, a building, a car or other transportation vehicle, and some parts which required set up or building. The materials that needed set up were intended to foster mother-child interaction as were the various dolls. One packet contained a western town which included a station-house, a stagecoach and wagon, horses, fences to set up and various play figures such as a sheriff. Another packet contained a fast food restaurant which included a food cooking center, a picnic table, food and a sports car. A boy and girl teenage dolls were supplied. The last packet contained a fantasy setting which included a castle, two riding cats, a dragon, and several hero dolls. Mothers were given a folder picturing the various packets and listing the contents. The mothers then chose the packet for their child. It was felt that in order to have comparable mother-child play interactions, it was important to have developmentally appropriate play materials for all ages.

Several types of mother-child interactions were used to more completely sample dialogues that were appropriate for all the dyads. Some parents play with their child and toys quite frequently. Other
parents interact with their child in mainly routine tasks and report-type situations. Therefore, the observations were structured to show both types of interactions.

Each observation (Daily Routine and Play) was videotaped for a minimum of six minutes or a maximum of ten minutes. The Daily Routine Observation was divided into three or more minutes of the talk situation while the food preparation was recorded until the task was concluded. Videotaping of the Play Observation was concluded after ten minutes.

Observation Schedule:

Visit One

1. Establishment of rapport
2. Administration of TACL
   for matching purposes

Visit Two

1. Familiarization with videotaping equipment
2. Daily Routine Observation
   a. Talk situation
   b. Food situation
3. Play Observation

Visit Two or Three

Administration of PPVT

Cameras were obtained from Ohio State University on an availability basis, resulting in a number of different cameras and recorders being used. Twenty to thirty minutes of each recording session was used to acclimate both mother and child to the camera equipment. The initial visit to the home for TACL administration was also used to help make the
mother and child comfortable with the investigator. The mothers were encouraged to interact naturally with their children.

TRANSCRIPT PREPARATION

Transcription was made from a Panasonic PV 6000 VHS video cassette recorder of the first 5 1/2 minutes of the Daily Routine and the Play Observations. The first 30 seconds of each situation was then discarded, yielding 10 total minutes of mother-child interaction per dyad. Most of the transcription was completed by the investigator; however, the scripts of seven children were transcribed by an assistant who was trained by the investigator. Two scripts were independently transcribed by both the investigator and the assistant. Differences were discussed and the relevant videotapes reviewed. Portions from 4 more scripts were independently done, and mean reliability (ratio of agreements to total words) of 89% was obtained with a range from 87-95%. Nonverbal communication reliability (ratio of agreements to total utterances) on 4 scripts was determined as 92%, ranging from 83 to 100%.

Segmentation into utterances from the videotapes was completed according to a modification of Schiefelbusch's criteria (1969) (Appendix B). Mean reliability on utterance segmentation on 6 scripts was shown to be 89% ranging from 83 to 96%.

After the verbal interactions were transcribed, the videotape was reviewed for all pertinent nonverbal actions needed to understand the dialogue. The written description was inserted in parentheses in the text. In addition, all nonverbal communicative actions that occurred without simultaneous verbalizations were written on the transcript and
labelled NV and circled. For example, the mother might say, "Put down that knife." The child would look at the mother and then drop the knife. The transcript would show:

Mother: Put down the knife.
Child: (looks at mother)
(Drops knife on table) NV

The videotape was reviewed a third time for those utterances where the mother waited at least 3 seconds for the child to take a turn. When the child failed to respond with a turn, the mother would resume talking. Similar information was recorded for the child's 3 second pauses. The intent of recording the 3 second pauses was to see how often one member of the dyad cued the other to take a turn, but resumed speaking because the turn was not taken.

VARIABLES TO BE STUDIED

The major purpose of this study was to compare the volume, structure, and discourse features, along with the responses to unintelligibility, of language interactions between mothers and normal language learning children contrasted to mothers and their children with Down Syndrome. Therefore, most of the dependent variables chosen were those which have either shown significant differences in earlier studies of mother-delayed child interactions or have shown change with increasing language level of normal children. The emphasis on change with increasing language level was used to investigate parents' sensitivity to child language change and also to provide a measure for indicating possible differences in strategies due to language delay. Each variable is only a sampling of
variables possible in each category. No indepth analysis was possible in any one area. However, by choosing key features of child and maternal speech identified as important in prior research, a more representative sampling should be possible.

Research question: How do the volume and structure features of mothers' and DS children's language compare with the volume and structural features of mothers' and normal children's language when the children are matched for auditory comprehension?

A. Volume

1. Number of Words (WD)

Words spoken in a measured observation time (Snow, 1972; Cross, 1976), indicated on the scripts as follows:

Mother: They go in this hole. __________________________ WD

2. Number of Utterances (UT)

An utterance (often a phrase or sentence) boundary is usually a discernable pause or intonational contour (Brown, 1973; Chapman, 1981; Schiefelbusch; Lombardo, 1978). Standards used for determining utterance boundaries are included in Appendix B.

Child: I don't want Ken // UT

I want Barbie //

// indicates end of utterance

3. Mean Length Utterance (MLU)

The average number of morphemes (meaningful units) per utterance.
Standards used for determining utterance boundaries are included in Appendix B. MLU is not a good indication of structural complexity since adults can make complex syntactical constructions without increasing utterance length and because the measure fails to account for appropriate conversational ellipses. However, MLU is used here as a basic measure of utterance length and for comparison with other research.

\[ \text{MR} \]

Mother: Don't put the harness on the cow's tail/\(10\)

It goes on his head/\(6\)

MR stands for morphemes. \(\text{MLU} = \text{MR}/\text{UT} \) or 8 in the example.

B. Structure

1. Sentence Complexity Index (SCX) (mothers only)

The ratio of the number of compound verbs plus subordinate clauses to the total number of utterances (Snow, 1972; Rondal, 1976). Since children seem to process sentences by seeking out subject and verb (Slobin & Welsh, 1968), the separation of the subject and verb with clauses or more than one verb could contribute to difficulties in understanding.

\[ \text{SCX} = \text{CV} + \text{SC}/\text{UT} \]

Mother: When you finish the fence, I'll get the horses out of the station house/\(1 \text{CV} 1 \text{SC}\)

Before He-Man can get on Battle Cat, you've got to put on this brown thing/\(2 \text{CV} 1 \text{SC}\)

\(\text{SCX} = \text{CV} + \text{SC}/\text{UT} \) or 2.5 in the example.

2. Utterances with Verb (VB) (children only)

The ratio of the number of utterances that do contain verbs to
the total number of utterances (Snow, 1972; Rondal, 1976). With increasing maturity children use more verbs in expressing their thoughts and building more mature sentences (Rondal, 1976).

Child: Want my car //

3. Modifiers per Utterance (MD)

The ratio of the number of modifiers to the total number of utterances (Phillips, 1973; Rondal, 1976). Modifiers are defined as adjectives or adverbs which add to the meaning of a noun, adjective or adverb. Increasing numbers of modifiers correlate with increasing syntactic complexity and increasing maturity of language.

Mother: Push Barbie down behind the wheel //
Child: Ken too big to drive //
Child's modifier count is circled.

4. Morphemes per Word

Number of morphemes like "ing", "er" per actual word. Children elaborate on their simple utterances by adding word endings (Clark & Clark, 1977). Although the above measure will not show function words as in Brown's (1973) expanded definition of morphemes, it can be used as a general measure of the child's use of morphemes as contrasted with syntax.

Research Question: How do the discourse features of mother-DS child communication compare with mother-normal child communication when the children are matched for auditory comprehension?
C. Discourse

1. Verbal Turns per Measured Time (VT)

A verbal turn is defined as a message-sending utterance spoken by one individual until the other member of the dyad begins to speak and includes intelligible and nonintelligible utterances (Bates, 1976).

\[
\begin{align*}
\text{Mother:} & \quad \text{Your birthday is in October}\text{\; UT} \\
\text{Child:} & \quad \text{No, tomorrow}\text{\; UT} \\
\text{Mother:} & \quad \text{You just want more presents}\text{\; VT} \\
\text{Child:} & \quad X	ext{\; UT}\text{\; VT}
\end{align*}
\]

Child's turns are circled. Unintelligible utterances are counted as turns.

2. Utterances per Verbal Turn (UT/VT)

A ratio of the number of utterances compared to the number of verbal turns (Cross, 1976).

3. Simultaneous Turns (S)

When both mother and child uttered the substantial part of their statements at the same time, the turn was coded simultaneous. No attempt was made to indicate who was speaking first. Jones (1977) and Berger & Cunningham (1983) used the term vocal clashes in describing similar behavior with mother-infant dyads.

\[
\begin{align*}
\text{Mother:} & \quad \text{Who is this man?} \quad \text{S}\text{\; S} \\
\text{Child:} & \quad \text{Skeletor in castle}\text{\; S}
\end{align*}
\]

4. Nonverbal Turns (NV)

In addition to the statements covered as verbal turns, nonverbal
sounds and actions which initiate communication or are responsive to messages sent by the other member of the dyad are counted as nonverbal turns. To be counted as a nonverbal turn, the action must be not be accompanied by speech and must be understandable as communication by the observer, not just by the parent (MacDonald, 1984a; Connard, 1984).

Mother: Bring me the book. //
Child: (Reaches for the book and gives it to mother) NV
Child: (Pokes mother until she looks at him and then starts turning the crank on the station house) NV
Mother: Well, what have you found? //

5. Pause Cues (TM)

Pauses of 3 seconds or more. Berninger and Garvey (1981) suggest that a pause longer than 1 second signals that the speaker is ready to transfer the speaking floor to another speaker. If one of the mother-child dyad pauses to give a turn to the other, and the cue is not picked up within 3 seconds, the original speaker can resume talking. Connard and Kantor (1984) use a 3 second pause turn boundary in describing mother-child interaction with normal and hearing impaired children. MacDonald (1984b) also uses a 3 second pause as a turn boundary although he defines turn in a more global manner than is done above.

Child: Cowboys ride horses /
    John Wayne ride horse // 3 sec. 1
    Horse fall down //
Mother: There he is //
// = less than 3 sec. Child’s pause cues are circled.

6. Words per turn (WD/T)
Words per turn is designed to show the actual length of the turns taken, as contrasted with utterances per turn which does not take into account short answer utterances versus long rambling statements.

Research Question: How does unintelligibility differ between Down Syndrome and normal children matched for auditory comprehension, and what are mothers’ responses to the children’s unintelligibility.

D. Intelligibility

1. Unintelligibility (UN) (child only)
Number of utterances of unclear meaning in a measured time. The above variable is intended to measure the child’s proficiency in getting the message across clearly. The standard of intelligibility will be determined by the observer. Some of the statements designated as unintelligible will be understood by the mother as indicated by subsequent remarks. The meaning of the utterance must not be clear. Some of the words in the statement could be understandable, but the meaning of the entire phrase could still be unclear. It is also possible that some words in a phrase would be unclear, but the entire phrase would be understandable enough to comment on or respond to.
Child: Man X__X //

Turn wheel//

X____X box //

2. Response to Unintelligibility (Mother only)

a. Reply

Mother's response is appropriate and cognitively related to
child utterance (Lombardino, 1978). Mother feels she has
understood the child's message and responds verbally.

Child: X____X

Mother: No, you can't // reply

b. Confirm/Correct

Mother's response repeats or expands child's utterances without
question intonation or presents a correct semantic, syntactic or
phonological unit intended to correct the preceding child
utterance (Lombardino, 1978).

Child: Ken X____X shoe

Mother: Ken lost his shoe under the fence // Confirm

c. General Question

Adult seeks information, verification or clarification from
child in a general manner.

Child: I X____X

Mother: Huh? // General Question
d. Interpretive Question

Adult attempts an interpretation of what the child has said and presents it as a question to the child. (Brown, 1968).

Child: Here X__X X__X

Mother: Red book here? // Interpretive Question

RS

e. Continue on Topic

Mother continues on appropriate topic but does not link her response to the child's last utterance. Mother often repeats or revises her own previous utterances without reference to child's previous utterance (Gallager, 1977).

Mother: What is the bus driver's name? // RS

Child: X__________X

Mother: The lady who drives the bus. //

What is her name? // Continue

f. Ignore

The mother may change the topic, do or say something not appropriate to the topic or give no response (Konefal, 1980; Gallager, 1978).

Mother: The fence and flowers must go somewhere // RS

Child: X_____X fries X_____X

Mother: Get Ken out of the bag there// Ignore

Data for all the above variables was compiled from both observations made of each mother-child dyad. A sample format for coding can be found in Appendix C.
RELIABILITY OF DATA COLLECTION

Reliability of utterance segmentation and nonverbal action recording had been computed when transcript reliability was being established. A separate procedure was set up to determine reliability of unintelligible child utterances. A stratified random selection of three scripts from each of the four groups (DS low language, DS high language, normal low language, normal high language) was made. Removable posting tape was put on the unintelligible utterances scored by the investigator on each of the 12 scripts, and the posting tapes were numbered. Clear child utterances one statement before or after the unintelligible phrase were also covered with posting tape and numbered. The independent observer knew that half of the statements had been judged clear and half unclear, but there was no pattern to how they were presented in the script. The independent observer viewed the 12 relevant videotapes, writing her transcriptions on the posting tape. Later, the investigator removed the tape and compared the transcriptions of the independent observer with the scripts as originally transcribed. Each utterance was judged as an agreement or disagreement on the basis of intelligibility. Reliability, based on the ratio of agreements to the total utterances, was 84.5%.

Reliability for the other variables was established by using the stratified random sample of 12 scripts used for the intelligibility judgments. Variables (3 second Pauses, Number of Words, and Number of Utterances with Verbs) which only required simple counting were not given a reliability check. An independent investigator received the
transcriptions of the 12 scripts with no coding. Instructions explaining the category definitions were given. Some sample coding was completed on scripts other than those selected for reliability checking. The independent observer then coded the relevant categories for the stratified randomly selected scripts. The final coding was compared with the original coding of the principal investigator. The average percentage of agreement per total number of utterances was 89.8 for morphemes, 95.1 for compound verbs, 95.3 for subordinate clauses, 80.5 for modifiers, 94.9 for verbal turns, and 80.3 for mother responses to unintelligible utterances. Reliability for number of utterances, nonverbal responses, and unintelligible utterances was established with transcript reliability described above.
CHAPTER IV

RESULTS

One purpose of the study was to compare the volume, structure, discourse, and unintelligibility features of the language of children with Down Syndrome and normal children matched for auditory comprehension. Another purpose of the study was comparison of volume, structure, and discourse features, along with the responses to unintelligibility, of mothers' language interactions with their DS or normal children. Transcripts of both the Daily Routine Observation and the Play Observation were compiled into a single summary script for each mother-child dyad. Mother and child language were tabulated separately, however.

Mother and child language were analyzed by a two-way multivariate analysis of variance by type of child (Down Syndrome or normal), by receptive language level (low or high), and interaction of type and level variables. The variables of Volume (Number of Words, Number of Utterances and Mean Length Utterance), Structure (Modifiers per Utterance, Morphemes per Word, Utterances with Verb, Sentence Complexity Index), and Discourse (Verbal Turns, Utterances per Turn, Simultaneous Turns, Nonverbal Turns, Words per Turn, Pauses) were compared for
children and mothers.

In addition, the mothers' responses to unclear speech were compared by their relative distribution in the 10 minute script. The mother responses which were contingent on the child's preceding utterance were combined into one measure and computed as a proportion of the total unintelligible utterances (Contingent Responses). Responses understood by the mother but not by the observer were combined into a category called Mother-Understood. Responses that gave the child correct speech models, especially on articulation, became a category called Feedback.

<table>
<thead>
<tr>
<th>Contingent Responses</th>
<th>Mother-Understood</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reply</td>
<td>Reply</td>
<td>Confirm/Correct</td>
</tr>
<tr>
<td>Confirm/Correct</td>
<td>Confirm/Correct</td>
<td>Interpretive Question</td>
</tr>
<tr>
<td>General Question</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpretive Question</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Two-way (type of child versus receptive language level) multivariate analysis of variance (MANOVA) was used on the clusters of Volume, Structure, Discourse, and Responses to Unintelligibility variables. After a rejection of the overall null hypothesis by the MANOVA, univariate analyses of variance (ANOVAs) were run on each category separately. Kennedy (1978) and Hummel and Sligo (1971) discourage running separate tests of significance on multivariate data, especially when the variables are similar and the proportion of variance that they may have in common may be substantial. Inflation of alpha risk may, therefore, occur. The decision was made to reject the null hypothesis for a given variable value if the p value obtained was equal
or less than .05. Analysis was run using the Statistical Package for the Social Sciences (SPSSx) software program.

RESULTS OF ANALYSIS OF CHILDREN'S DATA

One of the purposes of the study was to compare the language of DS children and normal children matched for auditory comprehension level. Comparisons were made of DS versus normal children (type of child) and of high receptive language level versus low receptive language level (language level). Possible interaction effects of the type of child versus language level were investigated.

Volume

The cluster Volume included the variables of Number of Words (in the 10 minute interval), Mean Length Utterance, and Number of Utterances. The MANOVA run on the cluster Volume indicated overall significance for both the main effects of language and type of child. Separate univariate analyses of each category revealed that the significant difference was due to the variable MLU. DS children had lower mean length utterances than normal children (p<.01). MLU was also longer for groups of children who had higher receptive language ages (p<.01). Analysis of the variables Number of Words and Number of Utterances did not show significant differences for either type of child or language level. Interaction effects of the factors type of child and language level were not found (Tables 3, 4 and 5).
### Table 3

Means and Standard Deviations on Children's Language for Volume, Structure, Discourse, and Unintelligibility

<table>
<thead>
<tr>
<th></th>
<th>LOW LANGUAGE</th>
<th></th>
<th>HIGH LANGUAGE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means Std Dev</td>
<td>Means Std Dev</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VOLUME</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of DS</td>
<td>185.13 104.41</td>
<td>205.00 89.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Words N</td>
<td>212.25 139.85</td>
<td>288.37 110.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Length DS</td>
<td>2.02 .65</td>
<td>2.80 .91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utterances N</td>
<td>2.87 .78</td>
<td>4.09 1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of DS</td>
<td>86.50 25.20</td>
<td>77.88 14.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utterances N</td>
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<td>75.38 21.93</td>
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<td></td>
</tr>
<tr>
<td><strong>STRUCTURE</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Verbs per DS</td>
<td>.25 .15</td>
<td>.42 .13</td>
<td></td>
<td></td>
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<tr>
<td>Utterance N</td>
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<td>.56 .12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifiers per DS</td>
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<td>.60 .20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utterance N</td>
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<td>.86 .27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphtmnes per Word</td>
<td>1.01 .12</td>
<td>1.08 .02</td>
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</tr>
<tr>
<td>Word N</td>
<td>1.12 .06</td>
<td>1.09 .16</td>
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<td><strong>DISCOURSE</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Turn</td>
<td>89.25 30.34</td>
<td>74.63 18.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 70.00 21.33</td>
<td>60.38 15.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utterances per Turn</td>
<td>1.00 .20</td>
<td>1.06 .18</td>
<td></td>
<td></td>
</tr>
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<td>Turn N</td>
<td>1.07 .19</td>
<td>1.24 .12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Words per Turn</td>
<td>2.13 1.07</td>
<td>2.86 1.32</td>
<td></td>
<td></td>
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<tr>
<td>Turn N</td>
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<td>4.85 1.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simultaneous Turns</td>
<td>2.13 2.30</td>
<td>2.00 2.20</td>
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<td></td>
</tr>
<tr>
<td>Turn N</td>
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<td>4.13 4.09</td>
<td></td>
<td></td>
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<tr>
<td>Pauses DS</td>
<td>1.13 2.47</td>
<td>.13 .35</td>
<td></td>
<td></td>
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<tr>
<td>N 2.13 4.12</td>
<td>1.63 1.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonverbal Turns</td>
<td>4.75 3.37</td>
<td>4.00 4.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 3.63 3.11</td>
<td>3.50 2.78</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>UNINTELLIGIBILITY</strong></td>
<td>15.50 12.91</td>
<td>10.13 5.64</td>
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<td></td>
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<tr>
<td>N 8.88 4.45</td>
<td>4.38 2.00</td>
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</tr>
</tbody>
</table>

DS = Down Syndrome children  
N = normal children
Table 4

MANOVA on Volume Variables (Number of Words and Utterances and MLU) in Children's Language by Type of Child and by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>3</td>
<td>26</td>
<td>4.121</td>
<td>.016*</td>
</tr>
<tr>
<td>Language Level</td>
<td>3</td>
<td>26</td>
<td>3.426</td>
<td>.032*</td>
</tr>
<tr>
<td>Type x Level</td>
<td>3</td>
<td>26</td>
<td>.183</td>
<td>.907</td>
</tr>
</tbody>
</table>

* significant at .05 level

Table 5

Univariate F-tests as Follow-up Procedures to MANOVA on the Volume Cluster in Children's Language

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis MS</th>
<th>Error MS</th>
<th>F-ratio**</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Words</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>244.205</td>
<td>126.765</td>
<td>1.926</td>
<td>.176</td>
</tr>
<tr>
<td>Language Level</td>
<td>184.320</td>
<td>126.765</td>
<td>1.454</td>
<td>.238</td>
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<tr>
<td>MLU</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>9.110</td>
<td>.875</td>
<td>10.417</td>
<td>.003*</td>
</tr>
<tr>
<td>Language Level</td>
<td>8.071</td>
<td>.875</td>
<td>9.230</td>
<td>.005*</td>
</tr>
<tr>
<td>Utterances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>2.940</td>
<td>5.960</td>
<td>.493</td>
<td>.488</td>
</tr>
<tr>
<td>Language Level</td>
<td>2.050</td>
<td>5.960</td>
<td>.344</td>
<td>.562</td>
</tr>
</tbody>
</table>

* significant at .05 level

** df = 1/28
Structure

The Structure cluster for the children consisted of Number of Utterances with Verbs, Modifiers per Utterance, and Morphemes per Word. The MANOVA run on the Structure cluster revealed significant differences between the main effects of type of child (Down Syndrome or normal) and receptive language level. No interaction effects of type of child versus language level were observed. Separate ANOVAs run on the Structure variables indicated that the Number of Utterances with Verbs was significantly different for type of child (p<.01) and for language level (p<.001). Normal children and children with higher language used more verbs. Likewise normal children and those with higher language comprehension scores used more modifiers per utterance (p<.01) and (p<.000). However, no difference was observed in the number of morphemes per word by language level or type of child (Tables 3, 6 and 7).

Discourse

The Discourse cluster of variables consisted of Verbal Turns, Utterances per Turn, Nonverbal Turns, Simultaneous Turns, Pauses, and Words per Turn. The total Discourse group of variables indicated a significant difference between type of children (p<.05) but no difference between receptive language levels. An interaction effect, type of child versus language level, was not found (Table 8).

DS children took more verbal turns than the matched normal children (p<.05), but no significant difference in verbal turns was found for the
Table 6

MANOVA on Structure Variables (Verbs per Utterances, Modifiers per Utterances, Morphemes per Word) in Children's Language by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>3</td>
<td>26</td>
<td>3.997</td>
<td>.018*</td>
</tr>
<tr>
<td>Language Level</td>
<td>3</td>
<td>26</td>
<td>8.778</td>
<td>.000*</td>
</tr>
<tr>
<td>Type x Level</td>
<td>3</td>
<td>26</td>
<td>1.035</td>
<td>.394</td>
</tr>
</tbody>
</table>

* significant at .05 level

Table 7

Univariate F-tests as Follow-up Procedures to MANOVA on the Structure Cluster in Children's Language

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis MS</th>
<th>Error MS</th>
<th>F-ratio**</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbs per Utterances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>.157</td>
<td>.018</td>
<td>8.716</td>
<td>.006*</td>
</tr>
<tr>
<td>Language Level</td>
<td>.246</td>
<td>.018</td>
<td>13.655</td>
<td>.001*</td>
</tr>
</tbody>
</table>

| Modifiers per Utterances |               |          |           |         |
| Type of Child           | .319          | .040     | 7.998     | .009*   |
| Language Level          | 1.108         | .040     | 27.779    | .000*   |

| Morphemes per Word     |               |          |           |         |
| Type of Child          | .026          | .011     | 2.327     | .138    |
| Language Level         | .002          | .011     | .198      | .660    |

* significant at the .05 level

** df = 1/28
Table 8

MANOVA on Discourse Variables (Verbal Turns, Utterances, Words per Turn, Simultaneous Utterances, Pauses, Nonverbal Turns) in Children's Language by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>6</td>
<td>23</td>
<td>2.714</td>
<td>.038*</td>
</tr>
<tr>
<td>Language Level</td>
<td>6</td>
<td>23</td>
<td>2.130</td>
<td>.089</td>
</tr>
<tr>
<td>Type x Level</td>
<td>6</td>
<td>23</td>
<td>0.432</td>
<td>.850</td>
</tr>
</tbody>
</table>

* significant at the .05 level

Table 9

Univariate F-tests as Follow-up Procedures to MANOVA on the Discourse Cluster of Variables in Children's Language

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis MS</th>
<th>Error MS</th>
<th>F-ratio**</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Turns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>2244.500</td>
<td>487.116</td>
<td>4.607</td>
<td>.041*</td>
</tr>
<tr>
<td>Utterances per Turn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>.124</td>
<td>.036</td>
<td>4.036</td>
<td>.054</td>
</tr>
<tr>
<td>Words per Turn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>14.634</td>
<td>1.980</td>
<td>7.402</td>
<td>.011*</td>
</tr>
<tr>
<td>Simultaneous Turns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>34.031</td>
<td>31.772</td>
<td>1.071</td>
<td>.310</td>
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<tr>
<td>Pauses</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>12.5000</td>
<td>6.370</td>
<td>1.960</td>
<td>.172</td>
</tr>
<tr>
<td>Nonverbal Turns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Child</td>
<td>5.281</td>
<td>11.335</td>
<td>.466</td>
<td>.500</td>
</tr>
</tbody>
</table>

* significant at the .05 level

** df = 1/28
two language levels. Children with Down Syndrome and normal children spoke essentially the same amount of utterances per turn. Significant differences were not found between language levels. However, normal children used more words per turn than DS children \( (p < .01) \). Higher language level children also had higher words per turn scores than those at lower receptive language levels \( (p < .01) \). No real difference was found in nonverbal turns between DS or normal children. Normal children were found, on the whole, to have more simultaneous utterances (vocal clashes) with their mothers than did DS children. This trend, however, was not significant due, in part, to the relatively wide variation in scores within groups of children. The number of 3 second pauses made by the children was compared by type of child and language level. No significant difference was found for either type of child or language level (Tables 3, 8 and 9).

Unintelligibility

A two-way ANOVA run on child unintelligibility found significant difference \( (p < .05) \) between DS and normal children in the amount of unintelligible utterances. The DS children had the most unclear speech. No difference was observed because of language level (Table 10).

RESULTS OF ANALYSIS OF MOTHER'S DATA

Volume

The Volume cluster of the mothers' speech included the same variables as that of the children (Number of Words, MLU, and Number of Utterances).
Table 10

ANOVA on Child Unintelligibility by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean Square</th>
<th>F-ratio**</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>306.281</td>
<td>5.513</td>
<td>.026*</td>
</tr>
<tr>
<td>Language Level</td>
<td>195.031</td>
<td>3.510</td>
<td>.071</td>
</tr>
<tr>
<td>Type x Level</td>
<td>1.531</td>
<td>.028</td>
<td>.869</td>
</tr>
</tbody>
</table>

* significant at the .05 level
** df = 1/28
Mothers of normal and DS children had no significant differences in Volume measures. However, language level of the children did make a difference. Mothers of children with higher language levels used longer sentences (greater MLU) than the mothers of the children with less mature receptive language (p<.01). No significant difference was found in the Number of Words used in the 10 minute period regardless of the language level of the child. However, mothers of lower language level children used more utterances in the measured time period (p<.01) (Tables 11, 12 and 13). There was no significant interaction between type of child and receptive language level for the Volume cluster.

Structure

The Sentence Complexity Index consisting of the number of compound verbs and subordinate clauses, Modifiers per Utterance, and Morphemes per Word comprised the Structure cluster for mothers. Differences between the speech of mothers talking with their normal children and the speech of mothers to DS children were not significant for this cluster of syntactical and morphological variables. However, the language level of the children addressed did make a significant difference (p<.01). Mothers speaking to children who had higher receptive language seemed to use more modifiers (p<.000), and more compound verbs and subordinate clauses (p<.05). However, they did not use more complex words as evidenced by the nonsignificance of the Morpheme per Word measure (Tables 11,14, and 15).
Table 11

Means and Standard Deviations of Mothers' Language for Volume, Structure and Discourse Variables

<table>
<thead>
<tr>
<th></th>
<th>LOW LANGUAGE</th>
<th></th>
<th>HIGH LANGUAGE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means Std Dev</td>
<td></td>
<td>Means Std Dev</td>
<td></td>
</tr>
<tr>
<td>VOLUME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Words</td>
<td>DS 691.63</td>
<td>259.86</td>
<td>DS 583.25</td>
<td>215.12</td>
</tr>
<tr>
<td></td>
<td>N 707.13</td>
<td>128.12</td>
<td>N 633.38</td>
<td>187.03</td>
</tr>
<tr>
<td>Mean Length</td>
<td>DS 4.84</td>
<td>.79</td>
<td>DS 5.69</td>
<td>.81</td>
</tr>
<tr>
<td></td>
<td>N 5.14</td>
<td>.95</td>
<td>N 5.94</td>
<td>.68</td>
</tr>
<tr>
<td>Number of Utterances</td>
<td>DS 189.88</td>
<td>64.88</td>
<td>DS 137.38</td>
<td>43.85</td>
</tr>
<tr>
<td></td>
<td>N 152.25</td>
<td>28.69</td>
<td>N 118.75</td>
<td>33.27</td>
</tr>
<tr>
<td>STRUCTURE</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Sentence Complexity</td>
<td>DS .37</td>
<td>.08</td>
<td>DS .52</td>
<td>.12</td>
</tr>
<tr>
<td></td>
<td>N .41</td>
<td>.13</td>
<td>N .54</td>
<td>.14</td>
</tr>
<tr>
<td>Modifiers per Utterance</td>
<td>DS .90</td>
<td>.19</td>
<td>DS 1.20</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>N .97</td>
<td>.27</td>
<td>N 1.26</td>
<td>.13</td>
</tr>
<tr>
<td>Morphemes per Word</td>
<td>DS 1.99</td>
<td>2.56</td>
<td>DS 1.73</td>
<td>1.78</td>
</tr>
<tr>
<td></td>
<td>N 1.10</td>
<td>.06</td>
<td>N 1.11</td>
<td>.02</td>
</tr>
<tr>
<td>DISCOURSE</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Turns</td>
<td>DS 90.13</td>
<td>30.33</td>
<td>DS 75.75</td>
<td>20.01</td>
</tr>
<tr>
<td></td>
<td>N 71.38</td>
<td>21.40</td>
<td>N 60.50</td>
<td>16.64</td>
</tr>
<tr>
<td>Utterances per Turn</td>
<td>DS 2.33</td>
<td>1.37</td>
<td>DS 1.83</td>
<td>.50</td>
</tr>
<tr>
<td></td>
<td>N 2.26</td>
<td>.69</td>
<td>N 2.02</td>
<td>.55</td>
</tr>
<tr>
<td>Words per Turn</td>
<td>DS 8.34</td>
<td>4.15</td>
<td>DS 8.30</td>
<td>3.64</td>
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<td>N 10.63</td>
<td>3.39</td>
<td>N 10.59</td>
<td>2.13</td>
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<td>Simultaneous Turns</td>
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<td>2.30</td>
<td>DS 2.00</td>
<td>2.20</td>
</tr>
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<td></td>
<td>N 4.50</td>
<td>10.04</td>
<td>N 4.13</td>
<td>4.09</td>
</tr>
<tr>
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<td>6.51</td>
<td>DS 10.13</td>
<td>6.20</td>
</tr>
<tr>
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<td>N 8.75</td>
<td>7.23</td>
<td>N 7.63</td>
<td>4.93</td>
</tr>
<tr>
<td>Nonverbal Turns</td>
<td>DS 4.13</td>
<td>2.90</td>
<td>DS 3.88</td>
<td>3.60</td>
</tr>
<tr>
<td></td>
<td>N 3.88</td>
<td>2.85</td>
<td>N 4.38</td>
<td>2.20</td>
</tr>
</tbody>
</table>

DS = mothers of Down Syndrome children
N = mothers of normal children
Table 12

MANOVA of Volume Variables (Number of Words and Utterances and MLU) in Mothers' Language by Type of Child and by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>3</td>
<td>26</td>
<td>1.216</td>
<td>.324</td>
</tr>
<tr>
<td>Language Level</td>
<td>3</td>
<td>26</td>
<td>4.101</td>
<td>.016*</td>
</tr>
<tr>
<td>Type x Level</td>
<td>3</td>
<td>26</td>
<td>.117</td>
<td>.949</td>
</tr>
</tbody>
</table>

* significant at the .05 level

Table 13

Univariate F-tests as Follow-up Procedures to MANOVA on the Volume Cluster of Variables in Mothers' Language

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis MS</th>
<th>Error MS</th>
<th>F-ratio**</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Words</td>
<td>66393.031</td>
<td>41300.147</td>
<td>1.606</td>
<td>.215</td>
</tr>
<tr>
<td>Language Level</td>
<td>5.431</td>
<td>.662</td>
<td>8.203</td>
<td>.008*</td>
</tr>
<tr>
<td>MLU</td>
<td>14792.000</td>
<td>2015.563</td>
<td>7.339</td>
<td>.011*</td>
</tr>
</tbody>
</table>

* significant at the .05 level
** df = 1/28
Table 14

MANOVA on Structure Variables (Sentence Complexity, Modifiers per Utterance, Morphemes per Word) in Mothers' Language by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>3</td>
<td>26</td>
<td>.906</td>
<td>.454</td>
</tr>
<tr>
<td>Language Level</td>
<td>3</td>
<td>26</td>
<td>6.003</td>
<td>.003*</td>
</tr>
<tr>
<td>Type x Level</td>
<td>3</td>
<td>26</td>
<td>.068</td>
<td>.976</td>
</tr>
</tbody>
</table>

* significant at the .05 level

Table 15

Univariate F-tests as Follow-up Procedures to MANOVA on the Structure Cluster in Mothers' Language

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis MS</th>
<th>Error MS</th>
<th>F-ratio**</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sentence Complexity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Level</td>
<td>.150</td>
<td>.014</td>
<td>10.474</td>
<td>.003*</td>
</tr>
<tr>
<td>Modifiers per Utterance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Level</td>
<td>.670</td>
<td>.039</td>
<td>17.108</td>
<td>.000*</td>
</tr>
<tr>
<td>Morphemes per Word</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Level</td>
<td>.105</td>
<td>2.429</td>
<td>.043</td>
<td>.837</td>
</tr>
</tbody>
</table>

* significant at the .05 level

** df = 1/28
Discourse

The Discourse cluster for the mothers was the same as that of the children (Verbal Turns, Utterances per Turn, Words per Turn, Nonverbal Turns, Simultaneous Turns, Pauses). The variables observed were all parts of turntaking, one aspect of the area of discourse. A MANOVA run on the Discourse cluster revealed that the mothers of DS children had similar turntaking skills compared to the mothers of the normal children. No significant differences were observed by looking at the type of child or the receptive language level. Interaction effect of the independent variables was nonsignificant.

Although the entire cluster of discourse variables did not achieve total significance, the variable Verbal Turns did achieve significance at the .05 level. Ordinarily, significance of individual variables is not tested if the total MANOVA does not show significance. However, the number of verbal turns of the mother and her child are essentially the same. Verbal turns achieved significance by the type of child in the analysis of the child's language so the similar data in the mother's language was examined.

Words per Turn and Utterances per Turn were essentially the same for the mothers of the normal and DS children. The normal dyads tended to have more simultaneous utterances than the DS dyads, but no significance was observed, due in part to the wide variance in individual scores. The number of 3 second pauses was similar for mothers of DS and normal children and for both high and low receptive language levels and between language levels (Tables 11 and 16).
Table 16

MANOVA on Discourse Variables (Verbal Turns, Words and Utterances per Turn, Simultaneous Utterances, Pauses, Nonverbal Turns) in Mothers’ Language by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>6</td>
<td>23</td>
<td>2.179</td>
<td>.083</td>
</tr>
<tr>
<td>Language Level</td>
<td>6</td>
<td>23</td>
<td>1.323</td>
<td>.287</td>
</tr>
<tr>
<td>Type x Level</td>
<td>6</td>
<td>23</td>
<td>.215</td>
<td>.968</td>
</tr>
</tbody>
</table>
The turntaking skills of both groups of mothers were essentially the same, in spite of the DS children's expressive language handicaps.

Mother Responses to Child Unintelligibilites

Mother responses to children's unclear speech were divided into six categories.

1. Reply - mother understands child and answers
2. Confirm/Correct - mother repeats or expands child utterance without question intonation
3. General Question - mother seeks clarification in general way, e.g. "Huh?"
4. Interpretive Question - mother attempts an interpretation of child utterance and presents it as a question, e.g. "The red book?"
5. Continue on Topic - mother continues on appropriate topic as if the child had not spoken
6. Ignore - mother changes the topic or gives no response

Analysis of mothers' replies to children's unintelligible phrases was handled in several ways. First, the relative distribution of each of the six categories of responses was calculated. Table 17 presents the proportions of the total responses occupied by each category by type of child and by high and low comprehension level. MANOVAs run on proportions and frequencies of mother responses revealed no significant differences between mothers of DS and normal children and between mothers of children with low or high language levels (Tables 18 and 19). While proportions may not always be considered interval measures suitable for multivariate analysis, all corresponding results by proportion
Table 17

Means and Standard Deviations of Frequencies and Proportions of Mothers' Responses to Children's Unclear Speech

<table>
<thead>
<tr>
<th>RESPONSES</th>
<th>LOW LANGUAGE</th>
<th></th>
<th></th>
<th>HIGH LANGUAGE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency Std</td>
<td>Proportion Std</td>
<td>Frequency Std</td>
<td>Proportion Std</td>
<td>Frequency Std</td>
<td>Proportion Std</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Dev</td>
<td>Mean</td>
<td>Dev</td>
<td>Mean</td>
<td>Dev</td>
</tr>
<tr>
<td>Reply</td>
<td>DS</td>
<td>3.38</td>
<td>3.42</td>
<td>.22</td>
<td>.19</td>
<td>4.63</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>3.50</td>
<td>1.41</td>
<td>.48</td>
<td>.24</td>
<td>1.88</td>
</tr>
<tr>
<td>Confirm/Correct</td>
<td>DS</td>
<td>2.13</td>
<td>2.36</td>
<td>.17</td>
<td>.17</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>1.50</td>
<td>2.07</td>
<td>.12</td>
<td>.16</td>
<td>.38</td>
</tr>
<tr>
<td>General Question</td>
<td>DS</td>
<td>2.13</td>
<td>1.73</td>
<td>.17</td>
<td>.12</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>1.13</td>
<td>1.36</td>
<td>.12</td>
<td>.13</td>
<td>.75</td>
</tr>
<tr>
<td>Interpretive Question</td>
<td>DS</td>
<td>2.75</td>
<td>2.97</td>
<td>.18</td>
<td>.17</td>
<td>1.88</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>1.38</td>
<td>1.30</td>
<td>.14</td>
<td>.10</td>
<td>.38</td>
</tr>
<tr>
<td>Continue</td>
<td>DS</td>
<td>3.13</td>
<td>3.98</td>
<td>.16</td>
<td>.15</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>.88</td>
<td>1.73</td>
<td>.09</td>
<td>.17</td>
<td>.50</td>
</tr>
<tr>
<td>Ignore</td>
<td>DS</td>
<td>1.88</td>
<td>2.70</td>
<td>.10</td>
<td>.15</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>.63</td>
<td>.92</td>
<td>.05</td>
<td>.08</td>
<td>.50</td>
</tr>
</tbody>
</table>

* Number of mothers' responses in the category per total number of children's unclear utterances

DS = mothers of children with Down Syndrome
N = mothers of normal children
### Table 18

MANOVA on Mothers' Responses (Frequencies) to Children's Unclear Speech by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>6</td>
<td>23</td>
<td>.806</td>
<td>.576</td>
</tr>
<tr>
<td>Language Level</td>
<td>6</td>
<td>23</td>
<td>1.072</td>
<td>.407</td>
</tr>
<tr>
<td>Type x Level</td>
<td>6</td>
<td>23</td>
<td>2.247</td>
<td>.075</td>
</tr>
</tbody>
</table>

### Table 19

MANOVA of Mothers' Responses (Proportions*) to Children's Unclear Speech by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>6</td>
<td>23</td>
<td>.474</td>
<td>.821</td>
</tr>
<tr>
<td>Language Level</td>
<td>6</td>
<td>23</td>
<td>.572</td>
<td>.748</td>
</tr>
<tr>
<td>Type x Level</td>
<td>6</td>
<td>23</td>
<td>1.251</td>
<td>.318</td>
</tr>
</tbody>
</table>

* Number of mothers' responses in the category per total number of children's unclear responses
supported the results based on frequencies. Replies were the largest
group of the responses for both the mothers of DS and normal children.
The mothers of the DS children with low receptive language had a
relatively low number of replies (22%). The mothers of both normal
groups and the mothers of the DS children with high language level had
very similar number of replies (40-53%). Confirmation/Correction,
General Question and Interpretive Question were the next three
categories, each receiving 13-14% of the total responses. The category of
Continue occupied 11% of the total, while the category Ignore was 8% of
the responses.

Several of the categories were combined to yield additional
information. The categories of Reply and Confirm/Correct were combined
to show the amount of speech judged unintelligible by the observer that
was actually understood by the mother. The index was called
Mother-Understood. It is, of course, impossible to specify exactly what
the mother understood. However, the content of the mothers' Replies and
Confirm/Correct responses indicate that for these phrases, at least, the
mother believes she understands her child. Frequencies of the
Mother-Understood category were compared with the total responses.
According to the MANOVA analysis, no significance is indicated for the
DS versus normal groups or for the low versus high receptive language
levels (Tables 20, 21). Since the above groups did not differ
significantly, all mother responses were collected into one total. 53%
of all the utterances judged unintelligible by an observer were
understood by the mothers.
### Table 20

Means and Standard Deviations of Combined Categories (Contingent, Mother-understood, Feedback) of Mothers' Responses to Children's Unclear Speech

<table>
<thead>
<tr>
<th></th>
<th>LOW LANGUAGE</th>
<th></th>
<th></th>
<th></th>
<th>HIGH LANGUAGE</th>
<th></th>
<th></th>
<th></th>
<th>COMBINED Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Std Dev</td>
<td>Mean Std Dev</td>
<td>Mean Std Dev</td>
<td>Mean Std Dev</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingent</td>
<td>DS .75 .22</td>
<td>.80 .17</td>
<td>.81</td>
<td>.81</td>
<td>N .86 .17</td>
<td>.83 .19</td>
<td>.81</td>
<td>.81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N .86 .17</td>
<td>.83 .19</td>
<td>.81</td>
<td>.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-understood</td>
<td>DS .40 .20</td>
<td>.63 .19</td>
<td>.55</td>
<td>.55</td>
<td>N .60 .19</td>
<td>.55 .23</td>
<td>.55</td>
<td>.55</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>DS .36 .24</td>
<td>.15 .15</td>
<td>.26</td>
<td>.26</td>
<td>N .26 .23</td>
<td>.27 .34</td>
<td>.26</td>
<td>.26</td>
<td></td>
</tr>
</tbody>
</table>

### Table 21

MANOVA of Combined Categories of Mothers' Responses to Children's Unclear Speech by Type of Child by Language Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>F-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Child</td>
<td>3</td>
<td>26</td>
<td>.493</td>
<td>.690</td>
</tr>
<tr>
<td>Language Level</td>
<td>3</td>
<td>26</td>
<td>.817</td>
<td>.496</td>
</tr>
<tr>
<td>Type x Level</td>
<td>3</td>
<td>26</td>
<td>1.627</td>
<td>.207</td>
</tr>
</tbody>
</table>
The mother response categories were combined into a category called Contingent Response consisting of the variables of Reply, Confirm/Correct, General Question and Interpretive Question. The mother utterances contained in the above categories were linked with the child's previous statements. Contingent Response is a category where the mother attended to the child's statement and responded to the content as she understood it. In contrast, the variable Continue was used when the mother went on with the agenda she had been pursuing before the child spoke, and the label Ignore was used when the mother introduced something inappropriate to the child's previous statement or did not reply at all. No significant difference was determined for receptive language level or type of child for the factor of Contingent Response to child unintelligibility. Since no significant differences exist between groups the proportion of Contingent Replies as part of the total responses of all of the mothers was calculated. Eighty percent of all the mothers' responses were contingent on the child's previous utterance. Mothers frequently responded to the child's statements whether the utterance was understood or not.

The categories of Confirm/Correct and Interpretive Question which may serve to give the children information on how their statements were understood as well as correct models for their speech were combined into the category Feedback. In the main, the Feedback category consisted of expansions and imitations of the child’s utterance or what the mother thought the child's utterance was. No significant differences were observed for high or low language levels or type of child. Twenty percent of all the mothers' responses provided feedback which gave a
correct model of unclear speech to the child.

A MANOVA performed using the combined variables of Mother-Understood, Contingent, and Feedback Responses indicated no significant differences either for interaction, language level, or type of child.
The purpose of the analysis of the children's speech was to compare the communication of DS and normal children matched for auditory comprehension level. First, it was shown that matching for auditory comprehension level was not the same as matching for mean length utterance (MLU). Significant differences were found between the MLU scores of the DS and normal children who had been closely matched on receptive language scores. Therefore, matching by receptive language is not the same as matching by mean length utterance, an expressive language measure.

Both Miller (1985) and Mahoney, Glover, and Finger (1981) have stated from reviews of the literature and their own studies that the language deficit of DS individuals falls increasingly more behind what would be expected from their mental age. At the low language level, the average lag of language age (as measured by the TACL) behind the verbal mental age (as measured by the Peabody Picture Vocabulary Test) was essentially the same for DS (5.25 months) and normal (4.38 months) children. At the higher receptive language level, however, the normal
children had a 5.5 month lag while the DS children had a language age 18 months behind their verbal intelligence age. The difference between language and verbal intelligence age varied greatly with each individual child. It ranged from no difference to almost 4 1/2 years. The present study reinforces the increasing language deficit when compared with verbal mental age for DS persons, but no specific predictions can be made because of wide variations between individuals.

**Volume**

Although a significant difference was found by type of child in the Volume cluster, individual analysis revealed that the difference derived from MLU, not Amount of Words or Utterances. Both low and high receptive language level groups of children spoke about the same number of words in a measured time. Rondal (1976) also did not discover differences in amount of words used by DS or normal children in his study based on a MLU matching procedure. Rondal, however, did discover a considerable difference in the number of words used by low and high language level children. Since his criteria for selection into the different groups was based on amount of morphemes (a similar measure to words) per utterance, it is, perhaps, understandable that the children in his different language levels groups showed differences in amount of words.

**Structure**

The syntactical variables were strikingly different in the speech of normal and DS children. They used significantly less verbs \( (p<.01) \) and modifiers \( (p<.01) \) than matched normal children. These structural
differences were maintained when comparing low and high language levels \( p<.001 \) and \( p<.000 \) respectively). Rondal, who matched for MLU, did not observe any differences in use of verbs or modifiers when comparing normal and DS children, but did discover significance with increasing language level. The discrepancy in the findings probably accentuates the difference between receptive and expressive language typical of DS children (Miller, Chapman & MacKenzie, 1981). Many studies document syntactical delay in DS children. Layton & Sharifi (1979) put DS children's use of adjectives intermediate between their mental age matched low and high utterance groups. Evans (1977) reported general language structure delay as did Weigel-Crump (1981).

It is, perhaps, interesting that the general measure of morphology did not show significant differences between types of children or language levels. The measure, of course, is not as broad as Brown's grammatical morphemes which includes function words like prepositions, but it does give an indication of how the child uses morphological inflections to convey meaning. Perhaps the measure, Morphemes per Word, is not sensitive enough to highlight differences in the two populations or language levels. Or perhaps the delayed or less mature language learner learns early how to add suffixes to convey some needed meanings to words but has a more difficult time with the relationships of words to each other, such as auxiliaries to main verbs, especially when the words may be separated by the structure of the sentence. From the measures used in the present study, children with Down Syndrome showed substantial deficit in syntax when compared with matched normal children but no deficit in simple morphology.
Discourse

It was thought, going into the present study, that DS children would have deficit discourse skills in the area of verbal turntaking due in part to their problems in expressive language. The mother's difficulty in eliciting responsive speech from her DS child was expected to result in less verbal turns per time period. However, it was felt that by adding the child's action response strategies (Leifer & Lewis, 1984) or nonverbal responses to the verbal interactions, DS individuals would be found to have similar dialogues with their mothers compared to language matched peers. However, the analysis of Verbal Turns did not show less turns for the DS child but significantly more (p<.05). Evidently, these verbal turns were shorter because the number of Words per Turn for DS children were also significantly less (p<.01) than for normal children. The number of Utterances per Turn were not different for either group of children, however. Therefore, the present study found receptively matched DS children took more turns using a similar number of shorter statements than matched normal peers.

Contrary to expectations (MacDonald, 1981), no differences were found in the number of nonverbal responses between DS and normal children. Nonverbal response was counted only when no verbalization occurred. Therefore, the children could do a action response accompanied by a verbalization and the measure NV would not be coded. It is possible that DS children used actions along with words in response to their mothers. It is also possible that the general impression of DS children acting out communications rather than speaking is not true of
the present population with their degree of language ability.

Jones (1977) and Berger-Cunningham (1983) presented a picture of the DS infant producing almost constant vocalizations, leaving little time for mothers to take a turn. In addition, the vocalizations often occurred at the same time as their mothers' speech. Findings in the present study using older children do not parallel Jones' and Berger-Cunningham's observations. DS children signaled turn cues with a similar number of three second pauses compared to the normal children. Simultaneous utterances were the same for both groups with the trend toward more vocal clashes for the normal, not the DS children. The delayed children observed in the present study exchanged turns with their mothers like their receptive language matched peers except that their statements were shorter. It would seem that the turntaking discourse strategies measured here are acquired between the infancy stages and the language learning stages represented by this population. Once these turntaking strategies are acquired, little growth may be observed, at least by the above discussed measures.

Unintelligibility

Children with Down Syndrome had approximately twice as many unintelligible utterances as the normal children (p<.05). The finding is in line with the study by Dodd (1976) who found that DS children made over twice as many errors as mental age matched normal or non-DS delayed children. Dodd's study, however, was conducted with selected words in the manner of an articulation test, not from connected speech initiated by the children as in the present study. It is possible that
unintelligibility in discourse may not be accurately represented by the figures given. As an artifact of the transcription process, a statement unclear at first hearing may become understandable when replayed. The mother does not have the benefit of replaying. However, she does have the benefit of looking at the child's expressions and articulations, of understanding the context completely, and of being familiar with the manner of speech which are benefits even videotaping can not always duplicate. It is possible that the finished transcription includes as clear statements that which might not be understood by the casual observer, but misses statements judged as clear by the mother. In summary, DS children have significantly more total unclear statements than receptively matched normal children.

MOTHERS' LANGUAGE

Another purpose of the present study was to compare the maternal linguistic environment of normal children and children with Down Syndrome who were matched for auditory comprehension ability. In general, the study found no significant differences between the language of both group of mothers.

Volume

No real differences were found in the Number of Words or Utterances used or in the MLU of the two groups of mothers according to the type of child. Significance was found in MLU and Utterances, but not in Number of Words between language levels. Rondal (1976) also did not find that the number of words increased significantly with the language level
of child addressed. Cross (1976) found the number of mother words remained somewhat constant over the year period of study. The findings indicate that although the children had significantly different MLUs, especially at the high language level, both mothers of DS and normal children had essentially the same utterance length.

Structure

No differences were found between the Sentence Complexity Index (compound verbs plus subordinate clauses), number of Modifiers per Utterance, or number of Morphemes per Word between the mothers of DS and normal children. Rondal (1976) also found no differences in mothers' speech to either type of child for sentence complexity or modifiers. Both studies found significantly greater syntactic complexity when the language level was higher. The Buim et al. study (1974), based on chronological age matching, had shown that the mothers of DS children used more utterances with a shorter MLU, less past and present tense markers, less auxiliary constructions, along with less pronouns, conjunctions, WH questions and more incomplete sentences. The present study based on receptive language matching does not find differences in the language of the mothers of DS and normal children in the structural variables studied. Rondal's (1976) study based on MLU matching has similar conclusions. The present study with receptive language matching gives added weight to the findings that the maternal linguistic environment is similar when the children are at comparable language levels. It can not specify from research findings, however, whether the DS child's maternal linguistic environment is appropriate, only that it
is similar to that of middle class children at comparable language levels.

It may be noted that the present study using receptive language matches and Rondal's study using expressive language matches are very similar in the areas of volume and structure. Even though the comprehension and production (MLU) matches for the children are significantly different, the mothers' language comparisons are very similar. It may be, as suggested by Snow (1976), that the fine tuning hypothesis does not hold for numerical syntactical features of a mother's speech. Mother's language structure may be only roughly proportional to child language maturity in the area of structure. Significant changes in mother language were found between language levels. The receptive language age differences between the low and the high group were quite substantial. The low group had a mean receptive language age of 44 months while the high level group had a mean of 73 months, a considerable span in receptive language age. The difference between the children's receptive and the children's expressive language levels was probably less than the 29 month span of language levels. Therefore, the differences shown between the two receptive language levels might not be duplicated between children matched for receptive language versus children matched for expressive language.

Matey and Kretchmer (1985) in a study featuring normal hearing, Down Syndrome, and hearing impaired (HI) children, found that the mothers of the HI children adjusted their speech like the mothers of the DS children, both groups in a manner correlated to child MLU. Since the hearing impaired children were probably closer in cognitive level to the
normal children than the DS children, Matey and Kretchmer concluded that mothers are particularly sensitive to the language levels of their children. The present study provides evidence that mothers adjust in similar ways to their child's auditory comprehension level as well as their expressive language level.

Discourse

One of the assumptions made when setting up the present study was that since it was usually more difficult to elicit speech from DS children, their mothers would have more statements or utterances per verbal turn. It was believed, however, that mothers paused to give the children time to take a turn and only extended the number of their utterances per turn when the child failed to pick up on the cue and continue the interaction.

Evidence revealed, however, that mothers of DS children did not make more utterances per turn than mothers of normal children. Indeed, the entire cluster of Discourse (turntaking) variables showed no significant differences between the mothers of both types of children. The maternal variable of number of Verbal Turns, essentially the same as that of the children, does show a difference for the type of child addressed even though the overall Discourse cluster does not. As with the DS children, their mothers took more turns. Since the measures Words and Utterances per Turn were not different for the mothers, DS children and their mothers probably had time for more turns because the children made shorter statements.
The number of 3 second pauses was the same for both groups. Berger and Cunningham (1983) noted increased vocal input with less pauses for the mothers of DS infants compared to maternal input given nonhandicapped infants. They suggested that a distortion of the interactive process beginning in the first half year of life leads to increasing maternal vocalizations significantly inhibiting the DS child's vocal output. The present investigation finds no maternal output increases in words or words per turn and no differences in 3 second pause cues given to the child. Although the DS children do use shorter MLU than their receptively matched peers, the mothers' input is remarkably alike for turn dominance (Utterances per Turn), Number of Words and Utterences, Pauses and Simultaneous Utterences. Both mother and child seem to maintain conversations with each other using similar strategies to peers matched in comprehension ability.

Mother Responses to Unclear Speech

Regardless of the children addressed, mothers understood about the same proportion of speech which was unclear to observers. Both groups (DS and normal) of mothers indicated by their subsequent responses that they understood 54% of the speech judged unintelligible by observers. The high percentage of Mother-Understood speech seems to indicate a substantial degree of mother comprehension of child expressive speech, probably due to familiarity with child style and context cues. Children who are developing normally will probably achieve conventional articulation by early school age even though their mothers understood more than one half of their unclear speech. Since the DS children were 7
to 15 years of age, it may not be advantageous for their mothers to understand such a high percentage of their unclear speech even though the behavior is similar to that of mothers of younger language-matched children. Several mothers of the older DS children remarked to the investigator that they knew they really understood too much of their DS child’s speech, indicating the child might not try as hard for clear speech when they and their families understood so much.

The combined variable of Contingent speech was intended to see if mothers related their responses to their child’s previous statement even if it was unclear. An average of 81% of the maternal responses of both groups (DS and normal) were related to the child’s previous statement. Mothers of both groups appear to be attending to the child’s communications and relating their part of the dialogue to the child’s interest and verbal expressions. The Contingent Responses do not increase as the receptive language level increases so the maternal skill of Contingent replies seems to be at a relatively consistent high level for the population studied. After an extensive review of studies in mother-child interaction in language development in the second year of life and her own studies, Robin Chapman concluded that contingent mother input was important in language acquisition. "Input seems to play a demonstrable role in the 2 year-olds language acquisition when it is specifically contingent on the child’s initiated actions or utterances. It in the linguistically responsive environment, rather than the linguistically stimulating one, that should accelerate language acquisition in the 1-to-2 year-old" (Chapman, 1981, p. 244). If her conclusions are valid for older language learning children, a high
percentage of contingent responses should be language facilitating, especially when they follow unclear child speech which requires close mother attention.

The Feedback Response was measured here for the purpose of seeing the extent to which mothers provide articulation models for unclear speech. The feedback category is very similar to the variables of expansions and imitations described in previous language studies. Language teaching features have been attributed to expansions and repetitions, however, the present study will not deal with the language aspects of the feedback category. Twenty-six percent of the mother utterances after unclear speech gave a more correct repetition of at least some part of the unintelligible statement. Mothers of both groups of children at low and high language levels provided a more correct model of the child's unclear speech over one-quarter of the time. Folger and Chapman (1978) found that children are more apt to imitate repetitions or expansions of their own utterances. Fifty-four percent of the child imitations followed parent repetitions or expansions. Although not studied in the present investigation, children may be likely to repeat, perhaps with clearer speech, parental idealized repetitions of the child's unclear statements.

It may be interesting to note that when each of the original categories of mother responses were listed separately, the category of Replies was by far the largest with 41% of the total mother responses. Confirm/Correct, General Question and Interpretive Question had similar percentages with 14, 14, and 13 respectively. The categories of Continue and Ignore were smaller with 11% and 8%. In her analysis of mother
speech directed to all types of child communication, Lombardino (1978) found that somewhat less of the mother responses were replies (30%). She also found 35% mother questions compared to the present study's 26%. It may be the differences in proportion are due to the specific nature of child stimulus of unclear speech in the present study. Both studies did not find any significance between mother replies or questions to DS or normal children or between language levels.

Mothers of DS children and mothers of normal children appear to use the same strategies when dealing with their children's unclear speech. Both groups of mothers focus their responses on what the child is saying and doing for a striking amount of the time. Mothers also provide correct models of unclear child speech, knowingly or unknowingly, one-quarter of the time. Mothers also tune in on their child's communication so that they understand over half of the speech that others can not.
SUMMARY

Recent years have seen considerable research on mother input during the child's language learning years. Some studies have been done attempting to link mother language characteristics to growth of language in the child. Mother-child language research has been extended to the interactions of mothers and handicapped children, especially those with Down Syndrome. Studies which matched the normal and DS children by chronological age found that mother language to DS children was indeed different with more directives, shorter utterances, simpler verb structures, and more incomplete sentences. Further studies matching the DS and normal children on Mean Length Utterance, an expressive language measure, found that there were essentially no differences in the language of the mothers of both types of children.

The present study uses a receptive language match for the normal and DS children and addresses the questions:

1. How do the volume, structure, discourse and unintelligibility features of Down Syndrome children's speech to their mothers compare with that of normal children matched for auditory comprehension?

2. How do the volume, structure, discourse, and responses to child unintelligibility features of mothers' speech to Down Syndrome children compare with that of mothers of normal children matched for auditory comprehension?
Sixteen Down Syndrome children were matched on a receptive language test, Test for Auditory Comprehension of Language (Carrow-Woolfolk, 1973) (TACL), with 16 normal children. The mothers of each group were matched for educational level. In addition, high and low receptive language groups were formed on the basis of the TACL scores. Observation of 10 minutes of mother-child interaction was videotaped and transcribed for each dyad. Volume measures of Number of Words, Number of Utterances, and Mean Length Utterance were tabulated. Structure indices of Sentence Complexity (compound verbs and subordinate clauses) (mothers only), Utterances with Verbs (children only), Modifiers per Utterance, and Morphemes per Word were calculated. Discourse features of Utterances and Words per Verbal Turn, Simultaneous Turns, Nonverbal Turns, and Pauses were tabulated for both mother and child. Mother responses to child unintelligibility represented by the categories of Mother-Understood, Feedback, and Contingent Responses were also observed. The data were analyzed by two-way (type of child x receptive language level) multivariate analyses of variance (MANOVA) on the clusters such as Volume. In case of rejection of the null hypotheses by the MANOVA, univariate analyses of variance followed for the measures in the cluster.

The children matched for their auditory comprehension of language did not match on the expressive measure of MLU. While Rondal (1976) found his DS and normal MLU-matched groups had no differences in the children's structural language, the present study, using a receptive match, found that DS children used significantly less verbs and modifiers when compared to their normal matches. The higher receptive language level
groups of both types of children had a higher MLU, and used more verbs and modifiers, showing that these skills increased as the child's developmental language level increased. Evidently DS children who comprehend language similarly to their normal matches are not able to use expressive language similarly. They do not increase the length of their utterances, especially with modifiers and verbs, on a level with the normal children who have a similar level of understanding.

DS children had very similar discourse turntaking skills to their normal matches. DS children took more turns than their matches, due mostly to the fact that they use less words per turn. Little evidence of vocal clashing or turn dominance as reported in DS mother-infant studies was seen at this age level. The DS children did not use nonverbal means to substitute for words more than the normal children. No difference was seen in discourse skills at the two language levels. It is possible that the turn taking skills measured are acquired earlier in the child's life, and no further growth can be shown.

None of the comparisons made between mothers' speech to Down Syndrome and to normal children showed any significant differences. The language interactions of the mothers of DS and normal children of comparable auditory comprehension were strikingly similar in all aspects surveyed. In contrast, there were many notable differences in mothers' speech according to the language level addressed. Those children who had developed the higher level of auditory comprehension were addressed by longer and fewer sentences, and more complex structure, including more modifiers, compound verbs, and subordinate clauses. No difference was
found between the way mothers of DS children treated unclear child statements compared to mothers of normal children. Since neither type of child or language level made significant differences, all scores were combined to show that more than 80% of the mothers' statements were built on the preceding child utterance (Contingent). Mothers also understood more than half of the child statements that were unclear to an observer. Almost one-fourth of the mothers' responses gave feedback that could be used as an articulation model for the unclear speech.

CONCLUSIONS

The research question asking how the volume, structure, discourse, and unintelligibility features of DS children's speech compares with that of normal children matched for auditory comprehension can be answered as follows:

Children with Down Syndrome who comprehend language similarly to normal children are not able to use expressive language similarly. The deficit in expressive language occurs in the structure and length of the DS children's utterances. More unintelligibility in the speech of DS children also impairs their expressive language. However, no deficits were documented in the social use of language. The discourse skills involved in turntaking were essentially the same as those of the normal children matches. No differences were observed in nonverbal communications.

The second research question asking how the volume, structure, discourse and unintelligibility features of mothers' speech to DS children compare to that of mothers of normal children matched for
auditory comprehension can be answered as follows:

Mothers of DS and normal children (matched for comprehension ability) displayed no differences in maternal communications. Both groups of mothers used essentially the same volume, structure, and turntaking discourse skills. Similar response strategies to the children's unclear speech were displayed by mothers of DS and normal children. In general, the communication of the mothers of DS children was strikingly similar to that of the mothers of normal children who were matched for auditory comprehension.

IMPLICATIONS

1. It is possible that judging a Down Syndrome child's understanding of language by his expressive language, especially its structure, will result in underestimating his comprehension. Perhaps intervention to improve the expressive language of DS children can take advantage of mothers' natural adjustments to their children's expressive language level. However, when interactions are based on the DS child's auditory comprehension abilities, adults can be encouraged to expect more of the child's understanding than indicated by his verbalizations.

2. Intervention with a similar population of elementary and middle school-aged DS children might be more profitably concerned with the formation of more mature sentences and with intelligibility of speech rather than with number of words or discourse turn taking skills. Lengthy intervention on turntaking skills at the preschool level may not be an effective use of time if the DS child is able to acquire the skills
without specific instruction.

3. Professionals can, perhaps, be less concerned about the natural communication skills of mothers of Down Syndrome and other handicapped children since they seem tailored to their children's language level. A possible exception to the above would be in the area of unintelligibility. It may be that the same strategies used by mothers' of normal children are not appropriate for older, more unintelligible Down Syndrome children.

RECOMMENDATIONS FOR FURTHER STUDY

1. Replications of the study could be done using normal children of average verbal intelligence and a randomized sample of the general population of DS children.

2. Future research correlating the categories of Mother-Understood and Feedback Responses with the degree of child unintelligibility might provide better evidence of the effectiveness of mother language strategies on children's unclear speech.

3. Additional research might be done looking at other discourse categories such as topic initiation and continuance or discourse strategies used for group interactions. In view of the social deficits which are often a part of mental retardation, the contribution of language discourse skills should be clearly delineated.
LIST OF REFERENCES


97


APPENDIX A

PARENT MATERIALS
Dear (Parent's name),

I am interested in finding out about the conversations between language learning children and their mothers. I am especially interested in observing those Down Syndrome children who have had the advantages of early education and are currently being taught in educable classes in the public school system. For comparison I will also need to observe conversations between children who are not developmentally delayed and their mothers.

In order to make the interactions as natural as possible, I would come to your home and videotape the two of you talking. All the data collected would be grouped together, and no names or individual data will be revealed.

If you agree, I would set up two appointments of about one hour each. At the first visit, I will assess your child with a test that does not require talking. Your child just has to point at the right picture. On the second visit, I would observe you just talking with your child, making a simple food like Jello or pudding, and playing with some toys that I will bring.

I will call you so we can discuss the observation more fully and set up an appointment at your convenience. I feel that valuable information can be gained from this study.

Sincerely,

[Signature]
CONSENT TO SPECIAL TREATMENT OR PROCEDURE

I, ________________________________, hereby authorize or direct Ms. Horstmeier or associates or assistants of his or her choosing, to perform the following treatment or procedure and any additional service or services as they may deem reasonably necessary in its performance (describe in general terms) videotape my child and myself talking about a household task, a new set of toys, and a topic of my choosing.

upon myself and my child

The experimental (research) portion of the treatment or procedure is: in the analysis of the data comparing interactions of Downs Syndrome children and normal children and their mothers.

This is done as part of an investigation entitled: The Mother-Child Communicative Interactions of Educationally Advantaged Downs Syndrome and Normal Children Matched for Auditory Comprehension Ability.

1. Purpose of the procedure or treatment:
Comparison of mother/child communication interactions of DS and normal children

2. Possible appropriate alternative methods of treatment:
   none - study is descriptive

3. Discomfort and risks reasonably to be expected:
   none

4. Possible benefits for subjects/society:
   more effective language intervention for children with Downs Syndrome—and
   possibly others with mental retardation—

5. Anticipated duration of subject's participation: 2-3 one hour home visits

I hereby acknowledge that Ms. Horstmeier has provided information about the procedure described above, about my rights as a subject, and he/she answered all questions to my satisfaction. I understand that I may contact him/her should I have additional questions. He/She has explained the risks described above and I understand them; he/she has also offered to explain all possible risks or complications.

I understand that the information obtained from me, or from the person I am authorized to represent, will remain confidential unless I specifically agree otherwise by placing my initials here _________. I understand that, where appropriate, the U.S. Food and Drug Administration may inspect records of this research project.

I understand that I am free to withdraw my consent and participation in this project at any time after notifying the project director without prejudicing future care. No guarantee has been given to me concerning this treatment or procedure.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: 5/14/84 Time AM  Signed ________________________________ (Subject)
Witness(ies) ________________________________ (Person Authorized to Consent for Subject - If Required)
Required ________________________________

I certify that I have personally completed all blanks in this form and explained them to the subject or his/her representative before requesting the subject or her representative to sign it.

Signed: Dr. Anna Horstmeier
(Signature of Project Director or Higher Authorized Representative)
APPENDIX B
GUIDELINES FOR TRANSCRIPTION
DESIGNATING UTTERANCES

In this study we are concerned with the speech behavior of the subjects rather than how their responses would look on paper. We are not interested in whether or not a given response was grammatically complete and accurate. Rather, we want to know whether it was functionally complete in terms of the on-going exchange between the adults and the children. In normal conversation we don't always have a well-defined predicate and nominative; and we indicate the beginning and end of our expressions by pauses, inflections, shifts in topic, etc. Below are some rules that will help you decide when an "utterance" has occurred:

1. In general, a vocal response unit (utterance) is a unit of spoken language marked off on either side by a pause or by some change in inflection.

2. A vocal response unit (utterance) is considered finished when the speaker comes to a complete stop and allows his voice to fall.

3. A vocal response unit (utterance) is considered finished when the speaker comes to a complete stop with either a questioning or exclamatory inflection.

4. A vocal response unit (utterance) is considered finished when the speaker in some manner clearly indicates he does not intend to complete the remarks.

5. A vocal response unit (utterance) is considered completed when one speaker terminates and the other begins speaking.

6. A vocal response unit (utterance) may include several simple utterances. If one simple utterance or remark is immediately followed by another with no pause for breath, they are considered only one utterance if the second remark is clearly subsidiary to the first.

7. A vocal response unit (utterance) may be a single word such as "yes" or "Uh huh," or it may comprise many words such as, "I'm going to the movies with my brother and sister and mother and father tomorrow if it doesn't rain."

8. A single expression of affirmation ("yeah, yep, uh huh, yes") or of negation ("no, nope, nah, naw") or of interrogation ("huh, what, eh") may be complete utterances. You are to determine by listening to the tape whether an utterance is
simply a non-communicative grunt (see No. 9 below) or serves communicatively to indicate affirmation, negation, or interrogation. Examples:

a) "Do you like me?" (one utterance).
b) "Huh?" (one utterance).
c) "I said do you like me" (one utterance).
d) "Oh yeah" (one utterance).

9. Expressions such as "aw," "aah," "ow," "haha," "uh," "oop" when they are not used as either affirmation, negation, or interrogation do not count as utterances and should not be counted in the transcript count of utterances.

(Adapted from Schiefelbusch, 1963.)

As used in Gordon (1975)

Additional Notes:

1. "Okay, all right, now" said without question intonation can be counted as a separate utterance if it is related to the child's previous utterance or is separated by a pause from other words. "Okay, all right, now" which serve to introduce following utterance and have little pause following them.

2. False starts or repetitions are counted with major sentence.

3. Unintelligible or partly unintelligible statements are not counted as utterances. (They are counted as turns, however.)
COUNTING MORPHEMES

Count as separate morphemes:

1. Inflectional endings:
   a) plurality: -s, -es (cats, wishes).
   b) possession: 's, -s' (Daddy's, Chris').
   c) third person singular, present tense (he/she walks, washes),
      of most verbs: -s, -es.
   d) present participle form of verbs: ing (walking).
   e) comparative and superlative degrees of many adjectives: -er,
      -est (prettier, prettiest).
   f) allomorphs of plural morpheme ( -s, -es, -en, sheep).
   g) n't: (can't, don't, doesn't) (do-es-n't).

2. Include all exact utterance repetitions. Stuttering is marked as repeated efforts at a single word; count the word once in the most complete form produced. In the few cases where a word is produced for emphasis ("no, no, no!") count each occurrence.

3. Do not count fillers such as "oh, mm, hey," but do count "no, yeah, hi."

4. Do not count "uh huh" (yes) or "huh uh" (no) where questionable. Where it seems to act or function as "yes" or "no," count as one morpheme.

5. All compound words (two or more free morphemes, proper names, and ritualized reduplications count as single morphemes. Examples:
   birthday pocketbook
   rackety- boom ABC's
   choo choo snowman
   night night snowball
   ticktock horseshoe
   playpen o'clock

   Justification is that there is no evidence that the constituent morphemes function as such for these children; to make a comparison possible, do not count them in the mothers' speech either.

6. Count as one morpheme all irregular pasts of the verb (got, did, went, saw, found, said, etc.). Justification is that there is no evidence that the child relates these to present forms. For comparison, count them as one morpheme in the mothers' speech also.

7. Count as two morphemes all regular past verbs (played, walked, etc.).

8. Count as one morpheme all diminutives (doggie, mommy) because these children at least use these as the standard form. Exception: when
both the diminutive and the standard form appear together in the same transcript, count the diminutives as two morphemes and put an asterisk (*) next to them.

9. Count as separate morphemes all auxiliaries (is, have, will, can, must, would). Also all catenatives (gonna, wanna, hafta). These will be counted as separate morphemes (going to, want to, have to), provided that they also appear in the same transcript as "going to," "want to," or "have to" (in the child's speech).

(Adapted from Brown, 1973.)

As used in Gordon (1975)
### Sample Transcription Sheet

<table>
<thead>
<tr>
<th></th>
<th>WD</th>
<th>UT</th>
<th>MR</th>
<th>SCX#</th>
<th>VB*</th>
<th>MD</th>
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<th>RS</th>
<th>CV</th>
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<tbody>
<tr>
<td>C. I don't want it//</td>
<td>4 1 5 1 1 1</td>
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<td>M. It won’t hurt you//</td>
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<td>It isn’t real//</td>
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<td>C. Dragon// 3 sec.</td>
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<td>Green dragon//</td>
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<td>M. If you hold him, you will see//</td>
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<td>C. No//</td>
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<tr>
<td>M. This is He-Man// (Mom offers doll)</td>
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<td>C. (Child takes doll)NU</td>
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<tr>
<td>M. You like him//</td>
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<td>C. Mark x_______x</td>
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<tr>
<td>M. Mark won’t take it away//</td>
<td>5 1 6 1 2</td>
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<td>Reply</td>
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</tbody>
</table>

* Child only
# Mother only
Child data circled

| WD=Word | SCX=Sentence Complexity Index |
| UT=Utterance | CV=Compound Verbs |
| MR=Morpheme | SO=Subordinate Clauses |
| VT=Verbal Turns | TM=Pauses |
| S=Simultaneous | UN=Unintelligible |
| NU=Nonverbal | RS=Mother Responses |
| Turns | |

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Sample transcription sheet for dialogue between child and mother. The transcription includes markers for various types of data such as word count, utterance, and morpheme count. The dialogue is a simple conversation where the child expresses disinterest in a dragon doll, and the mother responds with encouragement andishment. The transcription also includes notes on compound verbs, sentence complexity index, and response types.