THE EFFECTS OF TWO ELICITING MODES ON SYNTACTIC STRUCTURE OF MILDLY RETARDED CHILDREN AT DIFFERING LEVELS OF SHORT-TERM MEMORY

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PREFACE

This study was concerned with the effects of two modes of eliciting language responses from mildly retarded children. The study involved three major areas of focus: the responses of the subjects to the imitation and generation model sentences, the response of subjects in high or low level short-term memory groups, and the responses utilizing content and transformation rules. An analysis of variance procedure was used to analize the data.

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CHAPTER I

INTRODUCTION

A common factor of human behavior which serves as a basis for the majority of activities in the school is that of language. The inability to comprehend and express concepts using an abstract symbolization process is a primary dimension for identifying those individuals who will most likely have difficulty in school. It is generally accepted that incompetence in language is a major distinguishing characteristic of inadequate intellectual and social functioning (Schiefelbusch, Copeland, Smith, 1967). Language behaviors are not identical with intelligence or social competency, but they are interrelated human activities that reflect and affect each other. Language competency is indicative of the presence of intellectual activity and certain social behaviors. The limitation of language is usually accepted to indicate a limitation of intellectual and social behavior as these latter functions are evaluated largely on the basis of language skills.

The development of language is an extremely complex process that is reliant on physical and functional factors both internal and external to the individual. To gain linguistic competency, persons must have adequate physical structures, efficient processing mechanisms, some concepts and content, and an environment that allows or encourages the reception and production of messages. Limitation in any or all of these areas affects negatively the development of an effective language

system.

Initially, the children gain skill in reception, that is, they receive a message through their physical sensory mechanisms, make sense of it, store it for future use and retrieve the data to use in understanding subsequent messages. As this occurs, the child internalizes a system of rules, a language code, to interpret and then to produce linguistically appropriate messages. The person's effectiveness in developing such a code that will allow comprehension and generation of "grammatical" utterances that are acceptable to other language users depends, in part, on the input received and on organizational and memory capabilities. The emphasis is not on the individual simply reproducing previously received language messages, but on the distillation of rules from those messages received.

Chomsky (1965) theorizes that the child has an innate capability to develop language since an instrumental conditioning theory cannot possibly account for the myriad of language constructions understood and generated by the speaker. Rather, children have an innate ability to discover an abstract theory of language usage, a generative grammar, that allows them to receive and produce sentences they have never heard. This generative grammar theory involves a system of rules that language users internalize to develop competence in language behavior. This system, part of the individual's mental processes, is not necessarily at a conscious level, but it is demonstrated in his overt language behavior.

This generative grammar is composed of a system of rules that allow for the generation and comprehension of an infinite number of sentences. This system of rules can be characterized by three major

areas of analysis: phonology, semantics, and syntax. Phonology refers to the distinctive sound features of language, a string of phones that compose an utterance. Semantics involves the meaning of language, a study of the relations of referents and referends. Syntax is that system of rules that structures the elements in such a manner that they appear "grammatical" to the competent native speaker. It can be seen that these three components are not discrete; the syntax of a string of words has both phonological and semantic interpretations. The order of an utterance has semantic relevance as well as a surface representation, the sequential phonological aspects. In language acquisition, the child learns to use grammatical transformations to generate surface representations which reflect underlying meaning or semantic representation.

The child, who for some reason has memory limitations, therefore, would be disadvantaged in retaining syntactic structures for a sufficient time to distil the rules involved in them. This child would seem to have less "storage space" in short-term memory for holding information for immediate use and, thus, would be limited in remembering and generating elements in complex or elaborated sentence strings. Short-term memory restrictions implicitedly would seem to indicate limitations in syntactic competence.

Need for the Study

Since the educational activities in schools are so strongly dependent on language, there is a need to investigate the basic elements of the language system to develop a more definitive model of the factors which affect language performance and competence. Recent

theories of linguistics such as that proposed by Chomsky (1965) provide a framework for investigating the language acquisition process, and a large number of experimenters are applying his theories in the investigation of language development in normal children. These types of studies will hopefully, provide a more useful base for diagnostic and teaching approaches for the improvement of language performance.

Some limited research has been executed with mentally retarded children that is focused on delineating the nature of their language performance. These studies have investigated, in only a limited way, the syntactive rules governing the language produced by the retarded. However, many researchers (Brown and Bellugi, 1964; Goulet, 1968; Graham, 1968) have proposed that short term memory has extensive influence on the syntactic behavior of the language user, particularly the mentally retarded child. Some research (Graham, 1968) has been carried out on short term memory and imitation of syntactic structures with results which support strongly the importance of the role short term memory plays in comprehending transformations. However, the effects of short term memory on the generation of certain transformation types have not been investigated.

Statement of the Problem

This study was designed to determine the effect of modes of eliciting on syntactic structures at low and high short term memory levels in mildly retarded children. To observe the effects of the eliciting mode, the research was divided into three areas of concern. The first area was to determine the effect of two different modes of eliciting, imitation models and generation models, on the responses of the

subjects. The second area of focus was on the effect of the modes of eliciting at low level short-term memory and high level short-term memory. The third area of interest was to determine whether the surface representation responses and the semantic representation responses differed.

Purpose of the Study

The primary goal in this study was to assess the relationship of short-term memory level with performance in imitating and generating ten transformation structures. Are the languages limitations of mildly retarded children due to restrictions in short-term memory level?

Two pertinent variables were assumed to influence the study: the short-term memory level and the type of transformation structure. It is accepted generally that as the child gets older, his short-term memory level increases. As the short-term memory level increases, the child has more "space" to process particular transformation rules and, therefore, demonstrates higher performance in imitating and generating sentences containing those particular transformations. The mentally retarded child, as investigated by various studies, appears generally to have a more limited short-term memory level (Spitz, 1973). Moreover, the verbal expression of these children is apparently restricted in the number and range of transformation structures used (Speen, 1963).

Assumptions of the Study

The assumptions of this study were as follows:

(1) By controlling sentence length of the imitation

transformation sentence types, length of utterance is not confounded with the transformations.

(2) Semantic representation and surface representation are two different syntactic processes.

(3) The transformation types presented in the models for imitation and generation of sentences are valid forms of the prescribed transformations.

Limitations of the Study

This study limited its scope of investigation to mildly retarded institutionalized children between the ages of 7 and 13 years presently residing at Hissom Memorial Center, Sand Springs, Oklahoma. The children in this population were from northeastern Oklahoma and were placed in the institution by request of their parents, guardians or by other state agencies. Children must be six years of age upon admission, in part, to allow for better language development opportunity previous to their placement in an institution. Only verbalizing children who had no physical limitation which impede language acquisition, including gross articulatory disorders, were included. Any generalizations made from this study should be limited to similar populations.

Definition of Terms

Short Term Memory Level

The highest number of digits recalled correctly with two trials for each span length was designated as the short term memory level of the subjects. The digit span backwards from the Wechsler Intelligence

Scale for Children were used in order to include a two signal presentation. However, the recall of the digits by the subjects was in a forward rather than backward sequence.

Transformations

A transformation was a systematic procedure which governed word order, deletions, and/or additions of words to arrive at a desired surface representation.

Surface Representation

Imitation or generation of a sentence string with the presence of the prescribed transformation in the indicated pattern was defined as surface representation. If the transformation role of the model was for a negative passive form, the response of the subject must contain a verb in passive voice and a word or contraction indicating negation to be a surface representation.

Semantic Representation

The semantic representation of the sentence was indicated by a response which demonstrated the subject comprehended the meaning or content. For example, knowledge of semantic representation was evidenced if the subject produced a sentence with the same underlying meaning but not necessarily the same surface representation; i.e. That is the boy's dog, That dog is the boy's, The dog belongs to the boy, all convey the same content or semantic representation although the surface representations differ. The response need not be verbal to indicate comprehension of the meaning of the sentence.

Imitation Models

This mode of eliciting was a means of gaining responses in which the subject was given a sentence with both specific content and specific transformation rules presented verbally.

Generation Models

This was a mode of eliciting responses in which model sentences with specified transformation rules were presented verbally and content stimuli were presented visually.

Imitation

This was a response in which the subjects reproduced the specific transformation rules and the specific content of models.

Generation

This was a response in which the subject distilled specific transformation rules from the models and produced a sentence by applying these rules to new content.

Mildly Retarded

Individuals who score between 50 and 75 on an individually administered intelligence test with a mean of 100 and a standard deviation of 15 or 16 are defined as mildly retarded.

CHAPTER II

REVIEW OF THE LITERATURE

Theoretical Overview

In studying the acquisition of language by children, researchers have been concerned with three areas of importance to this study: the developmental process involved in comprehension and production, the child's perception of the parameters of the language of his culture, and how the child used these perceptions with his particular psychological and physical attributes to develop and perform language behavior. Language is a symbolization process which is based on abstract systems of rules. To gain competency in language, the child must be aware of the underlying structure and rules of the utterance. As Menyuk (1969) indicates:

> Since this knowledge cannot be derived from the physical signal per se, it must be presumed that the child has the capacity to detect and recognize "abstract" features in the signal. The child, therefore, must have the innate capacity to search for the abstract syntactic, phonological, and semantic rules from which sentences are generated (p. 5).

In the developmental course of language, children begin putting words together in an order used by the adult speaker. These first sentences are generally "telegraphic" in nature, a topic-modifier with function words omitted. However, the word order is preserved (Brown and Bellugi, 1964). This ordering of elements of the utterance

facilitates the meaning and gives indication that the child is internalizing a system of rules regarding syntax. It is the innate capacity to abstract a system of rules for ordering language that enables children to generate an indefinitely large number of sentences to which they have never been exposed previously (Chomsky, 1957, 1965). Competence in language is developed through distilling or abstracting rules that allow the child to understand and produce structures that are grammatical.

Syntax is a way of ordering elements of language, and this ordering influences the meaning of the utterance. The syntactic component determines both the semantic (meaning) interpretation as well as the surface (phonological) interpretation. Therefore, the system of rules the language learner abstracts regarding syntax will determine a semantic representation which indicates the content interpretation and a surface representation which indicates the phonological interpretation. Chomsky (1957) has indicated that basic sentences are transformed into new constructions by a system of rules which governs the order, insertion and deletion of the elements of the sentence. Children need not be aware of these activities nor describe them to apply rules they have internalized both in understanding and producing utterances.

Menyuk (1969) observed and described the acquisition of syntactic structures of young children, age two to seven years, and theorized that children in her studies performed according to the following developmental process.

1. He acquires some rules to understand and reproduce sentences.
2. Using the rules of his grammar he samples the

utterances and by some matching procedures he determines the structural description of the utterance.

3. Using the rules of his grammar he generates an utterance but sometimes does not complete the order of rules needed to generate the completely well-formed sentences.

4. He stores the rules of his grammar but only has enough computing space or memory to store a subset of the rules of the grammar of his language.

5. The set of rules of his grammar is expanded when computing space increases number of rules increases and when computing space is reorganized additional restrictions, types of properties of lexical items, types of operations (Menyuk, 1969, pp. 154-155).

Based on Chomsky's theory of generative grammar, Menyuk (1969) indicates that as memory capacity expands the quantity of transformation rules used by the child increases. Memory capacity involves not just the length or number of elements, but the capacity for a larger number of increasingly differentiated rules for dealing with elaborated syntactic structures. In examining the repetition of sentences of nursery school and kindergarten children, she found that recall deviations from the prescribed structure presented where related to the structure of the sentence but not its length.

Syntactic Development

In support of Menyuk's theory, the majority of studies indicate that children show an increase of ability to incorporate syntactic rules (Berry, 1972). By age eight the child has normally demonstrated fair mastery of skills in complex syntactic forms. Chomsky (1969) observed that the rate but not the order of acquisition varies considerably.

Various authors have investigated the acquisition of syntax in children (Menyuk, 1969; Brown and Bellugi, 1964; Lovell and Dixon, 1967). These authors conclude that a specific structure is not mastered before other emerging structures appear in the child's language. The implication is that errors in syntactic structure occur as it is being developed.

Fraser, Bellugi and Brown (1963), in their study of three-year-old children, found that comprehension of syntactic features of an utterance precedes the production of those features. Imitation of syntactic forms, however, was more advanced than comprehension. They theorized that in imitation, the child depends only on the perception of the surface representation and the motor ability to produce the utterance. Comprehension, on the other hand, entails referential distinctions, while production of a surface representation entails perception, motor activities and referential distinctions.

Lovell and Dixon (1967) support these findings with average children age two and six years and mentally retarded children of six and seven years of age. Additionally, they found consistency for the rank order difficulty of specific syntactic structures across age levels, intellectual ability and type of task (imitating comprehending, producing) performed.

The mentally retarded child can be defined as one who continually learns and develops at a slower rate than the average person. Therefore, the mentally retarded child can provide a "slow motion" picture of the development process of language acquisition (Carroll, 1967). Although the mentally retarded are a heterogeneous group, certain characteristic learning variables, supported by research, are related to

the present study, specifically slower acquisition of language and deficient short term memory. Studies on the relationship of language development and mental retardation were reviewed by Speen (1963) who concluded that the lower the IQ score of an individual the more likely he is to have a language deficiency. Beck (1970), and Graham and Graham (1971) in their investigations of syntactic development in mentally retarded children, found that the mentally retarded develop syntactic rules in a similar order to children of normal intelligence. The rate of development is slower, however, and more closely related to but frequently below the mental age of the individual. Both studies concluded that the internalization of rules of syntactic structure are qualitatively the same as normal children but quantitatively different when matched on chronological age. Goda and Griffiths (1962) analyzed speech samples of retarded adolescents and concluded that only 11% of all utterances were of a complicated structure. Therefore, the research to date suggests strongly that the mentally retarded child gains competence in language in the same manner as the non-retarded child but at a slower rate of development.

Miller and Chomsky (1963) indicate that any language producing device would be limited in producing an infinite number of sentences if the device were not given an exhaustive system of language rules or if the storage or computing space was insufficient. As related to the retarded, both could apply as bases for their slower language development, lack of knowledge of the rules or limitations on short term memory capacity.

Short-Term Memory

It would appear that the ability to distil a system of syntactic rules is related to one's short-term memory skills. If short-term memory is limited or defective, the individual does not hold information long enough for it to be put in long-term storage. Thus an individual who demonstrates limited short-term memory retention would be deficient not only in receiving rules for long-term storage but also in terms of space available to process acquired information (Scott and Scott, 1968).

Graham (1968) found that independent of age and score on an intelligence test, an individual who remembers a three signal representation has more difficulty reproducing an eight-word sentence than a person who has a short-term memory span of five signals. Moreover, not only the length of the sentence but the complexity of the syntactic structure affected the proficiency of recall. He concluded that the limitations of short-term memory recall restricted the comprehension of complex syntactic structures.

In a study with college student subjects recalling English sentences with three types of transformations, Mehler (1963) found that the errors made in recall were mostly due to syntactic confusion. He suggested that listeners analyze an utterance in terms of the semantic components plus the grammatic transformations. The general meaning of the sentence is easier to recall than the specific surface components.

Supporting Mehler's study, Savin and Perchonock (1965) found evidence that certain surface representations require a greater short-

term memory capacity than "kernal" sentences of basic content and that certain transformations are encoded independently of the rest of the sentence. The type of transformation affects the memory performance of the individual. They administered to their subjects various types of transformational structures in sentences followed by a string of eight unrelated words. They found that more words of the unrelated string were remembered after a kernal sentence than after sentence transformations to passive, negative, question, etc. The indication here is that an individual's short-term memory capacity is constant and activities of short-term memory involving processing of transformational structures require a larger portion of memory capacity than other syntactic constructions. Haslett (1973) also found that adults, when asked to recall only the content of sentences, were slower in responding when the stimulus sentence contained certain transformations, specifically passive and passive-negative structures.

Much research suggests that the short-term memory of retardates is impaired as a result of inefficient organizational activity during input, poor rehearsal strategies, inadequate labeling and grouping, lack of focus on the task and response competition (Ellis, McCarver, and Ashurst, 1970; Scott and Scott, 1968; Spitz, 1966; Goultet, 1968; Fagan, 1968). Scott and Scott (1968) in their research on short-term memory have provided a rationale for the influence of limited short-term memory span on syntactic competency in language.

> The empirical fact that memory is limited suggests that an individual with a brief span may lose much incoming information before he can process it into LTM (long-term memory); that is, a poor STM may provide a limited buffer storage system and thus reduce the probability that a given place of information is permanently stored (pp. 136-137).

Consequently, if a child is limited in short-term memory, the abstracting of syntactic rules will be impeded since the child who holds only a small amount of information in short-term memory will lose some of that information before it can be processed into long-term memory.

Research literature suggests the mentally retarded usually demonstrate limitations in short-term memory (Scott and Scott, 1968; Butterfield, Wambold, and Belmont, 1973; Spitz, 1966; Fagan, 1968; Ellis, McCarver, and Ashurst, 1970). Ellis, McCarver, and Ashurst (1970), and Spitz (1966, 1973) have found research support for organizational confusion at input as a major reason for short-term memory deficits in the retarded youngster. The three studies indicate that the mentally retarded do not organize material into manageable groups of signals and rehearse these groups as the non-retarded do. Spitz (1966) theorized that if signals are organized at input by the retarded individual, normal retrieval is more likely to occur.

Ellis, McCarver, and Ashurst (1970) have found evidence that the poor organization and rehearsal strategies are related to limited language development. In comparing memory on easily labeled and difficult to label stimuli, the retarded individual did no better on recall of easily labeled stimuli. It is suggested that language skills are subnormal for the mentally retarded, at least partially, as a result of poor short-term memory. However, the poor short-term memory of the retarded may result from inadequate language skills. Nevertheless, Butterfield, Wambold and Belmont (1973) found that teaching rehearsal strategies to retarded children did imporve short-term memory performance. They suggest that the retarded persist in passive rather than

active rehearsal of stimuli and this lack of spontaneous active rehearsal of stimuli accounts for much of the short-term memory deficit.

Summary

In the preceding review, it is suggested that the child in developing language internalizes a system of rules regarding syntax. These rules determine the comprehension and production of semantic representation and surface representation of an utterance. The rate of acquisition of this system of rules varies but the order is similar for all children with comprehension preceding production. Mentally retarded children's language development seems to provide a slow motion picture of this process since they learn at a slower rate than non-retarded children. Additionally, the retarded child tends to use a smaller number of transformations forms.

The internalization of a system of rules for syntax would seem to be related to the short-term memory capacity of the individual. Limitations of short-term memory appear to restrict the comprehension of certain transformations. Related research apparently affirms that these transformations are processed or stored separately from the semantic component and certain of these transformations require greater short-term memory capacity.

Short-term memory limitations of the retarded have been supported by many research studies. This limited short-term memory capacity may account for the slower rate of syntactic development and the deficiency in comprehending and producing certain transformations in mentally retarded children. Support is found in the literature for the negative

effects of short-term memory limitations on comprehension and imitation. However, no specific studies have investigated the generation of specific transformations.

CHAPTER III

METHOD AND PROCEDURE

Procedure for Data Collection

Introduction

All subjects were tested on short-term memory for digits, on imitation of the ten transformation types of eight-word sentences, and on generation of the same ten transformation types. The digit spans were administered to determine a level of short-term memory. On the basis of their performance on the digit span, the subjects were divided into two groups, low short-term memory group and high short-term memory group. The low short-term memory group was those subjects who reproduced digits spans of two signals or zero signals correctly. The subjects in the high short-term memory group were those who reproduced four or more digits correctly. In each short-term memory level group, one-half of the subjects were randomly assigned to be administered the imitation models first and the other half of the subjects were administered first the generation models. The ten types of transformations within each mode of eliciting were assigned randomly to each subject.

Two persons were involved as administrators in collecting the data. The author administered the digit spans to all the subjects. A second administrator presented the sentence models and recorded the responses of the subjects on modes of eliciting and representations.

The responses of the subjects were scored independently by both administrators.

Sample

The subjects were mildly retarded children presently residing at Hissom Memorial Center (HMC), Sand Springs, Oklahoma. The population in the Hissom Memorial Center is mentally retarded children age 6 to 18 years from the northeastern section of the state of Oklahoma. Children are placed in residential institution by their parents, guardians or by state agencies.

All verbal children between the ages of 7 and 13 years who had obtained an I.Q. score of between 50 and 75 on an individually administered intelligence test at HMC were considered. No children with gross articulatory defects or physical handicaps that directly affect language were included. The age range of the subjects was from 7 years 1 month to 12 years 11 months. Sex of the subjects was not controlled; a larger number of males than females were present in the population and in the sample. From a total of 20 subjects involved in the experiment, 16 were male and 4 were female. There were two females in each short-term memory level group. All subjects had been institutionalized for at least nine months previous to the experiment. The children who fell at the median break for short-term memory were those who correctly recalled 3 digits. These subjects were eliminated from the study.

The subjects in the low level short-term memory group were those children who correctly recalled no more than 2 digits with a two-trial presentation. The mean length of digits recalled correctly by the

subjects in this group was 1.2 signals. The subjects in the low short-term memory level group had an age range of 7 years 1 month to 11 years with a mean age of 9 years 6 months. The I.Q. score range of this group was 51 to 61 with a mean score of 57.90.

The subjects in the high level short-term memory group were those children who correctly recalled 4 or more digits correctly out of 2 trials. The mean length of digits recalled correctly by the subjects in this group was 4.2 signals. The subjects in the high short-term memory level group had an age range of 9 years to 12 years 11 months with a mean age of 11 years 9 months. The I.Q. score range of this group was 54 to 75 with a mean score of 61.00. The mean age of the total sample of 10.08 years. The mean I.Q. score of the total sample was 59.45.

Instrumentation

Short-Term Memory. Items from the Weschsler Intelligence Scale for Children digit span subtest were administered at the rate of one digit per second. The digits backwards items were used in order to include a two-signal presentation. However, the digit span was reproduced by the subjects in a forward sequence.

Imitation Models. Ten transformation types were chosen from the literature on syntactic structure (Chomsky, 1965; Menyuk, 1969; Graham, 1969; Savin and Perchonoch, 1965). An eight-word sentence was composed for each rule. These sentences are found in Appendix A. Discretion was used in selecting the vocabulary to include words familiar to mentally retarded children. Ten black and white line drawings were selected to illustrate the content of the ten sentences and to measure

semantic representation. Two extra pictures were included to control the selection of a correct response by a simple elimination process. The following transformations were used:

1. Kernal - Present Progressive
2. Direct/Indirect Object
3. "There" Transformation
4. Negative
5. Question
6. Passive
7. Negative Passive
8. Negative Question
9. Compound Sentence
10. Complex Sentence.

The sentence models were recorded on language master cards to control administration variance and to allow for random presentation for each subject.

Generation Models. The same ten transformation types used in the imitation models were presented to elicit subject generated sentences. For each transformation, two models of surface structure were presented with accompanying pictures. The models were recorded on language master cards. Then a third picture was used to generate that transformation from the subject. The sentence models appear in Appendix A. Black and white line drawings were used as picture stimuli.

Procedure

Subjects were seated at a table with an experimenter in a quiet room adjoining their living quarters. One administrator first presented the digit spans to all the children. A second administrator presented the imitation and generation models.

Digit Spans. Instructions for the digits were read as follows:

> I am going to say some numbers. Listen carefully. When I am through, I want you to say the numbers to me just the

way you heard them.

The administrator recorded the exact response of the child on a form. A second trial was given if the subject failed on the first trial. If both trials were failed, testing was discontinued.

Imitation Models. On the imitation models the following instructions were read:

> You're going to hear a person saying something. Listen carefully. I want you to say the same thing to me. Don't wait for me to tell you to say it. Listen and then you say it exactly the same way.

Cards with the sentences recorded on them were then presented. One demonstration sentence was used to adjust the volume for each subject. The demonstration sentence was administered and corrected, if necessary, to ensure that the subject understood what was required. The model sentences were presented in a different random order for each subject. The experimenter repeated before each presentation, "Listen and then you say it exactly the same." Sentences were presented only one time. The administrator recorded the exact response of the subject on a prepared form. This form is presented in Appendix C. After the response of the subject to the sentence, 12 pictures were presented and the child was asked to point to the picture that illustrated the meaning of the sentence. "Point to the picture that the person was talking about." The experimenter recorded on the form the number of the picture to which the child pointed. If the subjects spontaneously corrected their response, the correction was the response which was recorded.

Generation Models. In administering this mode of eliciting sentences, two models of the transformation were presented with picture

stimuli. The model sentences were presented on recorded cards in a different random order for each subject. The following instructions were read to each subject before the presentation:

> I am going to show you some pictures. You will hear a person say something about each picture. Then, I want you to tell me something about another picture.

One set of demonstration models and a stimulus picture were presented first and explained, if necessary, to ensure the subject understood the task. The demonstration was also used to adjust the volume for each subject. The model sentences were played on the recorder with a picture being shown simultaneously. The stimulus picture was then placed before the child with the following instructions: "Now, you tell me about this one." The exact response for each transformation type was recorded on a prepared form for each subject.

Scoring

Responses were recorded on prepared forms. Scoring of each activity was as follows:

Digit Spans. The score was the highest number of digits repeated correctly on either trial. If the highest number of digits repeated without error was three, then the score was three.

Imitation Models. Each sentence was scored on two factors, surface representation and semantic representation. A reproduction of the designated transformation was scored (+) on surface structure. Reproductions which deviated from the prescribed model was scored (-) on surface representation. A procedure for scoring surface representation is included in Appendix B. The surface representation score was the total number of (+) for each subject. The imitation of sentences was

also scored on semantic representation. A (+) was assigned if the subject pointed to the correct picture illustrating the meaning of the sentence. The response was scored (-) if an incorrect picture was chosen. The semantic representation score was the total number of (+) for each subject.

Generation Models. A subject scored (+) on surface representation in generating sentences if the designated transformation was present as indicated on the scoring procedures in Appendix B. The same scoring procedure was followed on this factor as that used in imitation of sentences. The total surface representation score was the total number of (+) earned by the subject. The subject scored (+) on semantic representation if the basic content of the sentence was verbalized as indicated on the scoring procedures for generation-semantic representation in Appendix B. The semantic representation score was the total number of (+) for each subject.

After the responses of the subjects were recorded on the forms, the two administrators scored the responses independently. The responses for the imitation and generation modes of eliciting were scored on both semantic representation and surface representation. The score for each subject as rated by each administrator is listed in Appendix D. The number of correct responses to imitation-semantic representation, imitation-surface representation, generation-semantic representation, and generation-surface representation was obtained for each subject.

Previous to the collection of data, the two administrators practiced scoring responses of children to the sentence models used in the study. After the practice in rating responses, no discrepancies in

scoring were found in the final results.

Procedure for Data Analysis

Hypotheses

The following hypotheses were tested:

H_1 There is no significant difference between performance on the imitative mode of eliciting and the generative mode of eliciting responses.

H_2 There is no significant difference in performance on imitation and generation at high level short-term memory and low level short-term memory.

H_3 There is no significant difference between surface representation and semantic representation production.

Analysis of the Data

Following the collection of data, hypotheses One, Two and Three were each tested by means of an analysis of variance 2 x 2 x 2 design with repeated measures on the last two factors (Winer, 1962). Since no carry-over effect was assumed because of the randomized presentation of treatments to each subject, this design was analogous to a split-split-plot design (Kirk, 1968). Short-term memory level, modes of eliciting, and representations were all fixed factors.

CHAPTER IV

RESULTS

The analysis of the data from the experiment which pertain to Hypotheses One, Two and Three are presented in the Analysis of Variance Source Table (see Table I).

With respect to hypothesis One, the results of the analysis of variance revealed that performance on the imitative mode of eliciting was significantly higher than performance on the generative mode of eliciting ($F(1, 18) = 61.831$, $p < .0001$). On hypothesis Two, the analysis of variance indicated that there was no significant difference in performance on modes of eliciting at different levels of short-term memory ($F(1, 18) = 2.922$, $p < .1013$). In regard to hypothesis Three, the ANOVA revealed that performance on semantic representation was significantly higher than performance on surface representation ($F(1, 18) = 79.859$). See Table II for a summary of mean scores.

Additional Results

Of the four remaining F tests in the analysis of variance, three were significant and one, the modes X representations interaction, was not significant. The high level STM group performed higher on the dependent variables overall than the low level STM group ($F(1, 18) = 16.326$, $p < .001$). The representations X STM interaction was significant at $p < .0001$ ($F(1, 18) = 13.729$). The STM X modes of eliciting X

TABLE I

ANALYSIS OF VARIANCE SOURCE TABLE

Sources	SS	df	MS	F	P
Between Subjects	217.637	19	103.000		
A (Short Term Memory)	103.512	1	103.512	16.326	0.0010
Subj w. groups	114.125	18	6.340		
Within Subjects	541.750	60			
B (Modes of Eliciting)	165.312	1	165.312	61.831	0.0001
AB	7.812	1	7.812	2.922	0.1013
B X Subj w. groups	48.125	18	2.674		
C (Representations)	189.112	1	189.112	79.859	0.0001
AC	32.512	1	32.512	13.729	0.0019
C X Subj w. groups	42.625	18	2.368		
BC	1.012	1	1.012	0.532	0.5187
ABC	21.012	1	21.012	11.051	0.0040
BC X Subj w. groups	34.225	18	1.901		
Total	759.387	79			

TABLE II

SUMMARY OF MEAN SCORES

	Low STM	High STM	Total
Modes of Eliciting			
Imitation	6.20	9.10	7.65
Generation	3.95	5.60	4.78
Total	5.08	7.35	6.21
Representations			
Surface	2.90	6.45	4.68
Semantic	7.25	8.25	7.75
Total	5.08	7.35	6.21

representations interaction was significant at $p < .0040$ ($F(1, 18) = 11.051$).

In regard to the representations X STM interaction, simple effects tests indicated that the high STM group was not significantly different than the low level STM group on the semantic representations ($t(18) = 1.52$, $p > .05$). However, the high level STM group performed significantly better than the low level STM group on the surface representations ($t(18) = 5.38$, $p < .05$) (See Figure 1).

Since the STM X modes of eliciting X representations interaction was significant, tests of simple interaction effects were made (See Figure 2). This test revealed that the STM X representations

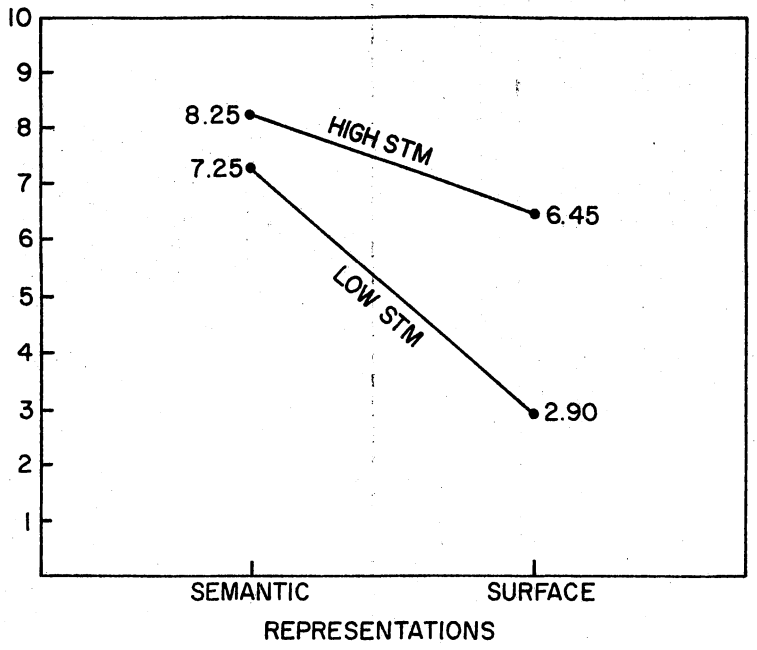

Figure 1. Effects of Representations on Performance at High and Low Level STM

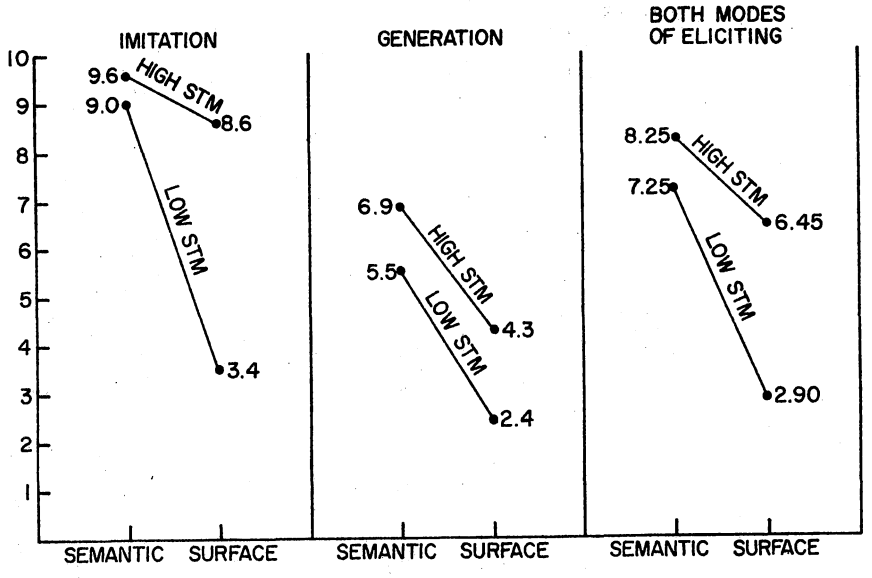

Figure 2. Interaction of STM X Modes of Eliciting X Representations

interaction for the generative mode of eliciting was not significant ($F(1, 18) = .60$, $p > .05$), but the STM X representations interaction for the imitative mode of eliciting was significant ($F(1, 18) = 52.90$, $p < .05$). A further probe into this simple interaction effect indicated no significant difference of performance between high level and low level STM groups on semantic representations with the imitative mode of eliciting ($F(1, 18) = .54$, $p > .05$). However, the simple simple main effects test on surface representation responses revealed significantly better performance by the high level STM group than the low level STM group on the imitative mode of eliciting ($F(1, 18) = 40.72$, $p < .05$). Since it was questionable that the analysis assumptions used in the tests of simple simple main effects were met, the lower limits for degrees of freedom were employed which resulted in more conservative tests (Winer, 1963).

Summary

A 2 x 2 x 2 analysis of variance was used to determine whether significant differences existed in the performance of syntactic language tasks with two modes of eliciting at high and low level short-term memory in the mildly retarded subjects. A significant difference was found between the performance on imitation and generation modes of eliciting. Performance on surface and semantic representations was also significantly different. The interactive effect of imitation and generation modes of eliciting and level of short-term memory was not found to be significant. Hypotheses One and Two were rejected at the .05 level of significance. Hypothesis Three was not rejected at the .05 level of significance.

The raw data used in the statistical analysis appears in Appendix C.

CHAPTER V

SUMMARY, DISCUSSION AND RECOMMENDATIONS

Summary

This study was an experimental investigation of modes of eliciting on language performance at two levels of short-term memory. Twenty institutionalized mildly retarded children, age 7 to 12 years, were the subjects in the experiment. The subjects were placed into high and low level short-term memory groups on the basis of their performance on the digit spans. All subjects received all treatment combinations of imitation and generation modes of eliciting and surface and semantic representation. The same ten transformation sentence types were administered in both imitation and generation modes of eliciting. Two repsonse measures were taken on each task, performance on surface representation and performance on semantic representation. The order of presentation for modes of eliciting was randomly assigned for subjects within each short-term memory level group. The ten transformation type sentences were randomly assigned for presentation to each subject. The responses of the subjects were scored independently by the two administrators using the specified scoring procedures.

Three hypotheses were tested in this study by means of an analysis of variance statistical procedure. The research design used was a 2 x 2 x 2 experiment with repeated measures on the last two factors.

Two of the research hypotheses were rejected at the .05 level of confidence: it was found that performance on the generation mode of eliciting was significantly lower than performance on the imitative mode of eliciting; semantic representation performance was significantly higher than surface representation performance. A third hypothesis was not rejected; no significant interaction was indicated between modes of eliciting and differing levels of short-term memory.

Discussion

Hypothesis One concerned the effect of mode of eliciting on the responses of mildly retarded children. A significantly higher performance was found on the imitative mode of eliciting than on the generative mode of eliciting. These results support the previous study by Fraser, Bellugi and Brown (1963) in which it was found that imitation of syntactic language patterns was more advanced than production of those same syntactic forms. In the imitation mode the content of the sentences was specified and provided to the children in the vocabulary used to imitate the sentence and the sequence of words were given. The children did not need to understand the meaning of all the words in the sentences nor was it necessary for them to understand the transformation rules. The imitation mode of eliciting required only minimal recognition of words, the general meaning of the whole sentence, and arrangement of the words in sequence. It would seem that the subjects would not need to understand, learn and apply the rules of transformation in the model sentences, but rather they need produce only the words of the sentence in the same sequence as the model to receive a correct score on surface representation and motorically indicate the

general meaning of the model sentence for a correct score on semantic representation.

When the rules of transformation were abstracted from model sentences of different content and applied to a new content, performance of the subjects in the study was decreased significantly. Significantly lower performance of the subjects was observed when presented with the generation mode of eliciting. The generation mode of eliciting was designed to parallel more closely than the imitative mode the language acquisition process proposed by Chomsky (1965). The child must be cognizant of the transformation rules in the model sentences, distill the rules, and then apply the rules to other content. The processes involved in generation of a response were found to be more difficult and less developed than imitation of a response in the subjects included in the study.

Some possible implications for diagnostic procedures and educational programs may be made related to this finding. It is suggested that the use of imitation to elicit language from children does not provide an appropriate measure of their ability to spontaneously use both simple and complex transformation rules in their language. Assessment of sentence production skills in children would be more useful if a generative approach were developed in contrast with an imitative approach which is employed frequently at the present time. The procedures which were developed to elicit generation of sentences from the subjects appear also to provide a basis for a diagnostic instrument which would allow for a more spontaneous response without the time-consuming effort presently involved in collecting language samples of spontaneous discourse.

The purpose of hypothesis Two was to evaluate the interaction of the imitative and generative modes of eliciting and high and low level short-term memory. Results show no significant interactive effects were present. The short-term memory level of the subjects did not significantly affect their responses differently under different modes of eliciting. Parallel performance was observed at high and low level short-term memory on the modes of eliciting. Subjects with high level memory made more correct responses on both modes; subjects at both levels of memory demonstrated higher performance on the imitation mode.

Hypothesis Three dealt with the performance of the subjects on surface and semantic representations. There was a significant difference between performance on surface representation and performance on semantic representation. The mildly retarded children in the study demonstrated significantly higher performance on response to semantic representation than on response to surface representation. In other words, correct responses indicating the meaning of the sentences exceeded correct responses employing the appropriate transformation rules.

It appeared to the researcher that the subjects in the study tended to produce sentences which contained the appropriate content yet simplified the form or structure of the utterance. Previous studies on the language of retarded children as reviewed by Speen (1963) have indicated that retarded children are slower in development of all aspects of language. However, the results of this present study provide support for the relatively higher development in language skills relating to communicating meaning and lower development in language skills relating to use of syntactic transformation rules.

The author suggests that when the surface representation of an utterance is in a simpler form, the meaning of the message appears to be less complex. This may occur because the relationships of the elements of content in the sentence are expressed more directly and concretely, lacking the nuances of more complex structures. The language of the retarded is usually considered to be of a simpler nature than that of the more intellectually able individual. Perhaps it is possible that the content of the language of the mildly retarded is not that divergent from the non-retarded; yet, the more limited use of complex transformation rules in the grammar of the retarded limits them in communication.

The fewer number of correct responses made in the application of the transformation rules in surface representation may be accounted for by two reasons. First, certain types of transformations may be encountered less frequently by the subjects in the study. The subjects, therefore, had fewer opportunities to learn these rules. An alternative explanation is that the rule systems of certain transformations are more complex and require a larger short-term memory capacity than other types of transformation rule systems. The results of this study provide partial support for the second explanation; further investigation in this area is indicated.

The results of the F tests on the three hypotheses should be considered in relation to the A posteriori comparisons which were made. The short-term memory level of the subjects had less effect on communication of the meaning of a sentence than on the way structure of the sentence. Performance on semantic representation as elicited by the imitative models was similar for subjects with high level and low level

memory. When presented imitative models with specific transformation rules, subjects with low level short-term memory made significantly fewer correct responses on surface representations than subjects with high level STM. Memory limitations did appear to affect the subjects' use of transformation rules in language performance.

A limitation of this study is a possible confounding of short-term memory level with age. The age range of the low level STM group was approximately 7 to 11 years with a mean age of 9 years 6 months. The high level STM group had an age range of approximately 9 to 13 years with a mean age of 11 years 9 months. This two year difference in average age of the groups could partially account for overall performance differences between the two groups since it is expected that both language skills and STM increase with age.

The STM indicators were developed from auditory and verbal activities. This limited definition of STM and the possible confounding of age should be considered when the findings of this study are viewed.

Recommendations

Based on the results of this study, further investigation in research is suggested.

1. Expansion of this study to include a larger and more inclusive group of retarded and non-retarded children would allow for application of the questions which were studied to a less limited population.

2. If, as Chomsky theorizes, the child develops a grammar by distilling language rules from speakers in his environment, exploration of the language of the immediate care personnel of institutionalized retarded youngsters might provide insight into the types of models from

which the child learns.

3. Since the communication of content of mildly retarded children's sentences appears to exceed the development of the use of complex transformation rules, investigation of a comparison of the content of the language of retarded and non-retarded children would be appropriate.

4. This study suggests that mildly retarded children tend not to use complex transformation rules in surface representations. Therefore, applied research on teaching methods to develop the use of these rules is recommended.

5. In order to determine the relationship between responses to the generation mode of eliciting and the spontaneous discourse used in daily activities by mildly retarded children, language samples could be recorded for comparison with performance on specific sentences elicited.

6. Since age and STM may have been confounded in the study, further research in this area should provide better control of the age factor.

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APPENDIX A

MODELS FOR IMITATION AND GENERATION OF SENTENCES

Imitation Models

Demonstration

The girls had some flowers.

1. Kernal-Present Progressive

   He is taking his dog for a walk.

2. Direct/Indirect Object

   The boy gave the girl a big push.

3. "There" Transformation

   There is the big boy on the sofa.

4. Negative

   The boy did not step on the line.

5. Question

   What is the woman washing in the sink?

6. Passive

   The balloon was held by all the girls.

7. Negative Passive

   The candles were not blown out by her.

8. Negative Question

   Which girl did not talk on the phone?

9. Compound Sentence

   The boy is hammering and she is, too.

10. Complex Sentence

    The girl sits down when she is coloring.

Generation Models

Demonstration

The boy pats his dog.

The cat sits in the tree.

The girl climbs the stairs.*

1. Kernal Present Progressive

   The girl is dusting the table.

   The boy is fixing a car.

   The woman is painting the house.*

2. Direct/Indirect Object Models

   The girl showed the boy her cat.

   The man showed the boy his tie.

   The boy showed the girl his dog.*

3. "There" Transformation Models

   There is a box on the sofa.

   There is a pencil on the box.

   There is a chair on the table.*

4. Negative Models

   This man has a hat. - The man does not have a hat.

   This cat has a tail. - This cat does not have a tail.

   This boy has a bat. - The boy doesn't have a bat.*

5. Question Models

   Who is going to build something?

   Who is going to dry the dishes?

   Who is going to paint the house?*

6. Passive Models

The toys were picked up by the girl.

The leaves were raked by the boy.

The boy was kicked by the girl.*

7. Negative Passive Models

The cheese was not eaten by the mouse.

The flowers were not picked by the boys.

The tree was not climbed by the boy.

8. Negative Question Models

Which car doesn't have wheels?

Which tree doesn't have fruit?

Which girl doesn't have a doll?*

9. Compound Sentence

The girl is in the swing and the boy is pushing.

The boy has a cat and the girl has a cat.

The girl has a balloon and the boy has a kite.*

10. Complex Sentence

The dog will eat when it is hungry.

The girl went to bed when she was tired.

The kids washed the car when it got dirty.*

---

*These sentences contain elements which would be scored as correct on both surface and semantic representation.

APPENDIX B

SCORING PROCEDURES

Surface Structure: Imitation and Generation

The response is scored (+) on imitation and generation surface structure under the following conditions:

1. Correct ordering of words with appropriate additions and/or deletions of words as prescribed by the rules governing a particular transformation.

a. Kernal - Present Progressive

The response must contain a noun or pronoun subject, a present progressive active voice verb, and a direct object. The auxiliary verb must be present tense, but can be in the form of a contraction.

b. Direct/Indirect Object

The response must contain a noun or pronoun subject, an active verb, an indirect object and a direct object, in that order.

c. "There" Transformation

The response must contain the word order of There, a form of to be verb and a noun subject.

d. Negative

The response must contain an insertion of a negative word such as no and not, or the contraction of a verb and negative word. The basic sentence elements of subject verb and direct object must be present.

e. Question

The models are to elicit wh question forms. The response must contain a wh word such as what, who, which, why. The

e. Question (cont'd.)

remainder of the response must include a verb phrase and a noun or pronoun subject if the wh word is one other than who. A direct object should be present if the verb form indicates one.

f. Passive

The response must contain a subject (noun phrase), a verb in passive voice with a to be auxiliary verb, and a prepositional phrase which indicates the performer(s) of the action.

g. Negative Passive

The response must contain the same elements listed in the Passive transformation with the inclusion of a negative word or contraction such as not, no, wasn't, ain't, weren't.

h. Negative Question

The response must contain the same elements listed in the Question transformation with the inclusion of a negative word or contraction.

i. Conjunction "And"

The response must be in the form of a compound sentence using the conjunction and as a connector. Each clause of the sentence must contain a noun phrase and a verb phrase.

j. Relative Clause

The response must be in the form of a complex sentence. One clause of the sentence must be independent with the second clause modifying one of its elements. The models

j. Relative Clause (cont'd.)

are designed to elicit a clause which modifies the verb phrase.

2. Grammatical errors and minor deviations are ignored if they do not affect the transformation rules. The following examples are responses in which differences in grammar and word forms are present yet the transformation surface structure is present in the prescribed form.

Examples:

Model: The boy has a balloon and the girl has a kite.

(+) Response: The girl has a kite and the boy doesn't have one.

(+) Response: The boy gots a balloon and she gots a kite.

Model: The candles were not blown out by her.

(+) Response: The candles ain't blowed out by the girl.

(+) Response: The candles wasn't blown out by her.

3. The content can be incorrect or different if the appropriate transformation surface structure is present.

Examples:

Model: The boy doesn't have a bat.

(+) Response: He does not have a stick.

(+) Response: The girl doesn't have a bat.

Model: The boy showed the girl his dog.

(+) Response: The girl showed the boy his dog.

(+) Response: He showd the lady his cat.

The response is scored (-) under the following conditions:

1. The model is changed to another transformation form.

Examples:

Model: The boy gave the girl a big push.

(-) Response: The boy pushed the girl.

(-) Response: The boy gave the push to the girl.

(In both responses, the indirect object is eliminated.)

Model: The boy hammers and the girl hammers, too.

(-) Response: Both the kids are hammering.

(The sentence is changed from a compound to simple structure.)

Model: The balloon was held by all the girls.

(-) Response: The girls all held the balloon.

(Change from passive to active voice.)

Model: What is the woman washing in the sink?

(-) Response: She's washing in the sink?

(Change from question to statement form.)

2. Only a portion of the model is produced in the response.

Examples:

Model: The girl sits down when she is coloring.

(-) Response: Sit down - color.

(-) Response: When she is coloring.

(Deletions of major elements of the surface structure.)

Semantic Structure: Generation

The sentence is scored (+) if the following elements are contained in the verbal response of the subjects.

1. <u>Kernal - Present Progressive</u>

female - paint - house

2. Direct/Indirect Object

   male - show - female - dog

3. There - Transformation

   chair - on - table

4. Negative

   male - without bat

5. Question

   person - paint - house

6. Passive

   female - kick - ball

7. Negative Passive

   male - not climb - tree

   or tree - not climb - by male

8. Negative Question

   female - without doll

9. Conjunction "And"

   male - possess - balloon

   female - possess - kite

10. Relative Clause

    kids - wash - car - reason (car dirty)

Semantic Structure: Imitation

The subjects receive a (+) score if they point to the correct picture illustrating the content of the model sentence, regardless of the verbal response.

The subjects will receive a (-) score if they point to a picture which does not correctly illustrate the content of the model sentence, regardless of the verbal response.

NAME:_____ COTTAGE:_____

ELICITING MODE:_____

		Surface	Semantic

SURFACE TOTAL _____

SEMANTIC TOTAL_____

APPENDIX C

RAW SCORE DATA ON SUBJECTS USED IN STATISTICAL TESTS

TABLE IV

RAW SCORE DATA

Subjects	Imitation		Generation		Total
	Surface	Semantic	Surface	Semantic	
1	3	10	2	6	21
2	10	9	5	6	30
3	1	7	2	8	18
4	3	9	1	4	17
5	0	9	2	3	14
6	7	10	4	6	27
7	3	10	1	3	17
8	3	10	3	8	24
9	3	8	2	7	20
10	1	8	2	4	15
	34	90	24	55	203
11	5	10	4	6	25
12	7	9	2	6	24
13	7	10	4	7	28
14	10	10	9	9	38
15	10	10	4	5	29
16	10	9	5	9	33
17	10	10	6	8	34
18	9	8	3	8	28
19	8	10	1	4	23
20	10	10	5	7	32
	86	96	43	69	294
					497

APPENDIX D

SCORE FROM TWO RATERS

	Rater I					Rater II				
	Imitation		Generation			Imitation		Generation		
Subject	Semantic	Surface	Semantic	Surface	Total	Semantic	Surface	Semantic	Surface	Total
1	10	3	6	2	21	10	3	6	2	21
2	9	10	6	5	30	9	10	6	5	30
3	7	1	8	2	18	7	1	8	2	18
4	9	3	4	1	17	9	3	4	1	17
5	9	0	3	2	14	9	0	3	2	14
6	10	7	6	4	27	10	7	6	4	27
7	10	3	3	1	17	10	3	3	1	17
8	10	3	8	3	24	10	3	8	3	24
9	8	3	7	2	20	8	3	7	2	20
10	8	1	4	2	15	8	1	4	2	15
Subtotal	90	34	55	24	203	90	34	55	24	302
11	10	5	6	4	25	10	5	6	4	25
12	9	7	6	2	24	9	7	6	2	24
13	10	7	7	4	28	10	7	7	4	28
14	10	10	9	9	38	10	10	9	9	38
15	10	10	5	4	29	10	10	5	4	29
16	9	10	9	5	33	9	10	9	5	33
17	10	10	8	6	34	10	10	8	6	34
18	8	9	8	3	28	8	9	8	3	28
19	10	8	4	1	23	10	8	4	1	23
20	10	10	7	5	32	10	10	7	5	32
Subtotal	96	86	69	43	294	96	86	69	43	294
Total	186	120	124	67	497	186	120	124	67	497

VITA[2]

Peggy Sommers Glass

Candidate for the Degree of

Doctor of Education

Thesis: THE EFFECTS OF TWO ELICITING MODES ON SYNTACTIC STRUCTURE OF MILDLY RETARDED CHILDREN AT DIFFERING LEVELS OF SHORT-TERM MEMORY

Major Field: Elementary Education

Biographical:

Personal Data: Born in Heavener, Oklahoma, May 9, 1940, the daughter of Mr. and Mrs. Howard Sommers.

Education: Graduated from Poteau High School, Poteau, Oklahoma in May, 1958; received the Bachelor of Arts degree from Oklahoma State University in May, 1961, with a major in English; received the Master of Science degree from Oklahoma State University in May, 1973, with a major in Special Education; completed the requirements for the Doctor of Education degree at Oklahoma State University in December, 1975.

Professional Experience: Junior high school teacher, Stockton Public Schools, Stockton, California, 1961-1962; high school teacher, Stratford Public Schools, Stratford, Connecticut, 1962-1964; speech therapist, Des Moines Public Schools, Des Moines, Iowa, 1965-1967; speech and language therapist Austin Independent School District, Austin, Texas, 1967-1971; graduate teaching assistant in special education, Oklahoma State University, 1971-1975; currently instructor in Special Education, Oklahoma State University.

Professional Organizations: Council for Exceptional Children.