1987

Comparison of Performance of Adolescent Hearing and Hearing-Impaired Children on Metalinguistic Tasks

Julia W. Reynolds
University of Central Florida

COMPARISON OF PERFORMANCE OF ADOLESCENT HEARING AND HEARING-IMPAIRED CHILDREN ON METALINGUISTIC TASKS

BY

JULIA WINIFRED REYNOLDS
B. A., University of Central Florida, 1985

THESIS

Submitted in partial fulfillment of the requirements
for the Master of Arts degree in Communicative
Disorders in the Graduate Studies Program
of the College of Health
University of Central Florida
Orlando, Florida

Spring Term
1987

ACKNOWLEDGMENTS

My sincere appreciation is extended to Dr. Dona Lea Hedrick, Chairman of my thesis committee, who provided me with continuous support and guidance throughout the preparation of this thesis.

I would also like to thank the other members of my committee, Dr. Linda Malone, statistical consultant, and Dr. Harold Utt for their insight and knowledge whenever requested. Appreciation is also extended to Dr. David L. Ratusnik and Dr. Roy Lukman for their interest and suggestions as well as Maggie LeClair for typing the manuscript.

Special thanks to Monica Spevitz, Kim Glodek and Kathy Patrick for their time and effort during their participation in the project.

Finally, I wish to express my gratitude to my family for the many ways they encouraged me in the preparation of this paper.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Various researchers have viewed metalinguistics as the ability to consciously reflect upon language (Van Kleeck 1984a; Franklin 1979; Cazden 1975; Dale 1976). Prior to schooling, children use language as a means of functional communication through developing an interaction with the environment. They are aware of the content of their messages but not the language they are using to communicate their ideas. The emergence of language is developed primarily through concrete operations according to Van Kleeck (1984a). However, Allan (1982) states that when children enter school and begin to read, metalinguistics is emphasized and the language evolves from an unconscious, experimental use to a conscious, metalinguistic use.

There is a growing interest among researchers in the study of metalinguistics. Smith and Flusberg (1982) employed judgment tasks to look at how the child attends to certain properties of language. This behavior is particularly important when studying the semantic, syntactic and pragmatic development of children.

The skills that are needed to use spoken language and the skills needed to make judgments about language do not develop at the same time according to Smith and Flusberg (1982). They also said that the skills in using language develop first during the preschool years and the skills in making judgments are delayed until the middle childhood years.

A pilot study of tasks using normal and hearing-impaired children was performed to elicit metalinguistic behaviors. The responses were elicited either graphically or manually.

Using the same procedure for elicitation of metalinguistic abilities of normal and hearing-impaired adolescent children, the comparison of the performances of metalinguistics was made through the elicitation of the tasks designed by Griffin and Hedrick (1986).

Metalinguistic Awareness

Language can be placed within the framework of such terminology as syntax--the ability to determine the sequencing of words which can have grammatic significance, semantics--combining language components to derive meaning, pragmatics--how language is used in social context. The formulation of these properties of language produce metalinguistic awareness which is the ability to think about language and to comment on it, as well as to produce and comprehend it, according to Van Kleeck (1982). Dale (1976) observed this ability as emerging at about five years of age through judging sentences as grammatical or ungrammatical and to correct ungrammatical sentences.

De Villiers and de Villiers (1972) investigated the ability to judge and correct word order in active sentences elicited from two and three-year-old children with hand puppets. Performance on the judgment and correction task was related to each child's mean length of utterance (MLU). Results indicated that semantic errors were

easier to judge and to correct than syntactic errors. In a similar study by Gleitman, Gleitman and Shipley (1972), with MLU of 4.0 to 4.5 indicated that reversed order in sentences could be recognized as wrong but the corrections generally change the meanings. In 1974, de Villiers and de Villiers did a second study in which the ability to correct reversed order was accomplished through comprehension of reversible passives. The corrections were related to the rearrangement of word order with placement of the subject as the last word of the sentence.

Dale (1976) concluded by stating that "these studies demonstrate that a child can construct and comprehend sentences when the only clue is the structure described by the rule before he/she can consciously state the rule or use it to make judgments of grammatical and ungrammatical sentences" (p. 128).

Van Kleeck (1982) reports that the development of metalinguistic awareness is an ongoing process which advances qualitatively from the preoperational to the concrete operational stage of cognitive development.

The relationship between language comprehension and developments in metalinguistic awareness has been reported in a study by Smith and Flusberg (1980). Six language-related judgment tasks to identify different features of metalinguistic awareness was administered to 36 three-and four-year-olds. Half of the items in each task were correct and half incorrect. Results indicated metalinguistic awareness by a criterion of 90% or better correct responses on a task.

This study revealed that metalinguistic performance was highly correlated with sentence comprehension, vocabulary score, and age. Therefore, according to Smith and Flusberg, a prediction of metalinguistic development is associated with these aspects of language development.

Odom, Blanton and Nunally (1967) and Charrow and Fletcher (1974) observed that the English language that the hearing-impaired learn is not only learned through the visual sense but is often a second language. Deily and Love (1974) comment further by saying that the hearing-impaired child who is not exposed to early auditory or visual language develops sensorimotor structures for organizing his environment that do not include language. Studies by Furth (1973a), Lennenberg (1968) and Chomsky (1969) indicate that the hearing-impaired child has images with which to code his world but lacks the symbol system to communicate these images which is crucial for the first six years of language development. As a result, Hart and Rosenstein (1964) emphasize that the exposure of a hearing-impaired child to a fraction of the linguistic stimuli, whether by lipreading, gestures, or facial expressions, creates a handicap in meaning of the utterance as well as structural meanings.

Syntax

Power and Quigley (1973) found that representative samples of hearing-impaired students were up to 10 years retarded in the acquisition of comprehension and production of passive voice sentences, that reversibility made the sentences more difficult to comprehend

and that agent-deleted passives were particularly difficult for the hearing-impaired subjects. Power and Quigley concluded that to an advanced age (17-18 years) a majority of hearing-impaired subjects interpreted passive sentences as active sentences in terms of surface subject-verb-object (Surface S-V-O) order.

Quigley, Power and Steinkamp (1977) conducted a six year study of syntactic structures in the language of deaf children age 10 through 18 years. The study was developed from administration of the TSA (Test of Syntactic Ability; Quigley, Steinkamp, Power and Jones, 1978) which is a battery of 22 tests designed to study deaf persons' comprehension and production of specific syntactic structure. Results indicated that for hearing-impaired children the most difficult structures were pronominalization, the verb system, complementation and relativization. When comparing these results with normal children, it was also found that these same metalinguistic skills were also difficult but to a much lesser degree. In conclusion, the researchers of this study went on to say that relativization and complementation are difficult because of the transformations involved and the delineation of the subject-verb-object surface order in which the hearing-impaired tend to impose on sentences. Quigley, Power and Steinkamp also emphasized the difficulty of the auxiliary verb and the passive voice for interpretation by the hearing-impaired.

Semantics

Literature pertaining to the semantic organizations in the hearing-impaired and normal subjects has been investigated by Bown and Mecham (1961); Forde (1977); Odom, Blanton and Nunnally (1967); Skarkis and Prutting (1977). They found a mild to profound delay of the acquisition of the semantic component.

Comprehension of semantic concepts was evaluated by Brenza, Kricos and Lasky (1981) with the Boehm Test of Basic Concepts (Boehm, 1971) for 15 orally trained, severely and profoundly hearing-impaired children, ages 13-14 years. The results revealed a deficit in the comprehension of semantic concepts by severely and profoundly hearing-impaired children. Four-fifths of the children scored lower than the tenth percentile for normal hearing second grade children and two-thirds of them scored at or below the first percentile. This data reveals a significant disparity between the language abilities of the hearing-impaired children and normal children.

Sixty-three profoundly deaf and sixty-three hearing adolescents participated in a study by Tweney, Hoemann and Andrews (1975) to explore the semantic organization of items in subjective lexicons. Subjects were required to sort noun words according to sounds and high and low imagery words. The results imply that there are no qualitative differences between the lexical structures of the hearing-impaired and hearing individuals except when experience with lexical items is an important factor. Therefore, there is less familiarity in hearing-impaired subjects than in the hearing subjects.

Di Simoni and Borino (1982) analyzed the semantic ability of the hearing-impaired using the Token Test (Di Simoni, 1978) for Children. Subjects ranged in age from 7 to 11 years. The Token Test was used to determine the auditory and visual memory capabilities as they relate to language. The findings of this study revealed difficulty of memorization with messages of increased length for the severely and profoundly hearing-impaired. In conclusion, Di Simoni and Borino showed that these individuals were delayed semantically as well as various aspects of language development.

Pragmatics

The exploration of pragmatic development in the hearing-impaired warrants investigation. Not enough research has received attention concerning this component part of metalinguistic awareness. However, a few studies have assessed the pragmatic abilities of the hearing-impaired.

A study by Curtiss et al. (1974) characterizes the early pragmatic-semantic communicative development of hearing-impaired children ranging in ages 22 to 60 months as coding pragmatic intentions primarily through nonverbal means such as gesture.

Skarkis and Prutting (1977) found that semantic functions appeared to be acquired more slowly than pragmatic intentions with hearing impaired children.

Curtiss et al. (1974) concluded that there are individual differences in the effect of hearing impairment on communicative

performances especially when comparing two children with similar hearing losses. Each may perform at very different levels as communicative language users.

Metalinguistics and Reading

During the administration of most metalinguistic assessments, subjects are usually given instructions orally or they are required to read the instructions for interpretation. For this particular study, all of the subjects were administered metalinguistic tasks through oral instruction first and then each subject was required to read the instructions before responding. This language-related activity makes valuable resource of a child's speaking ability. It cultivates metalinguistic ability and creates a transition between two different forms of language, utterance and text, according to Richgels (1982).

The ability to manipulate and comprehend both spoken language and written language is critical for communication. According to Hung and Tzeng (1981), it is unfortunate that the deaf are deprived of one and deficient in the other with the result that the average reading ability of the hearing-impaired child is far below that of normal children. Furth (1966) reported that by age 16, only 12% of deaf students read at or above the fifth-grade level, which is considered a functional reading level. Bornstein and Roy (1973) found that 16-year-old deaf student's reading ability is equivalent to a grade level of 4.66. Reynolds (1955) emphasized the increasing

gap of reading ability between normal and hearing-impaired children with each additional year of schooling.

Carroll (1966) points out some important differences between learning to speak and learning to read. She supported this by saying that reading is taught while speech is acquired informally; reading is broken down into components of the task and abstracted while speech is experienced in its full complexity and remains situational. Speech is functional and meaningful to a child because the speaker can tailor the message and receive feedback from the listener whereas reading is taught as a coding skill which requires a greater knowledge of syntax and vocabulary to comprehend (Carroll, 1966; Olson, 1977; Schallert, Kleinman and Rubin, 1977; Quigley and Kretschmer, 1982).

Conrad (1964) and Kintsch and Buschke (1969) experimentally showed that hearing persons tend to store visually acquired linguistic material in a phonetic form whereas this transformation required of reading is missing from the deaf child's reading behaviors.

There are two different suggestions that have been proposed to explain the role of phonetic recoding in reading comprehension by various researchers. The first proposal by Baddeley (1979), Baron (1976), Huey (1908), Kleiman (1975) and Liberman, Mattingly and Turvey (1972) suggest that the phonetic code is more effective in holding words within memory than visual coding until comprehension is accomplished. The other suggestion by Liberman, Shankweiler,

Liberman, Fowler and Fischer (1977) indicates that phonetic recoding projects comprehension of written language through the appropriate structuring of spoken language that is already developed for language comprehension.

Russell, Quigley and Power (1976) have found that the coding behavior of deaf persons is not deficient but different than the code used in spoken English because they regard reading as being similar to learning a second language. This difference in coding creates unfamiliarity for the hearing-impaired since comprehension of written words is highly correlated to the phonology of spoken words.

In a chronometric study of sentence processing in hearing-impaired children, Hung and Tzeng (1981) investigated the reading inability of deaf children. The first experiment observed the encoding and decoding of alphabetic letters between normal and deaf subjects. It was found that deaf subjects took longer than normal subjects in encoding and decoding of alphabetic letters. The second experiment employed identification of a sentence-picture pattern. The results revealed that deaf subjects adopted a visual-imagery coding strategy. During the third experiment of this study, the sentence was presented in manual signs to the deaf subjects. When sentence-picture identification occurred, the deaf subjects adopted a general linguistic code. Hung and Tzeng (1981) concluded that deaf subjects can develop a linguistic coding strategy but it is not applied to process printed English sentences.

Conrad (1964) suggests that sign language may be an effective means for thought because when sign language is learned as the first language, reading is synthetic and requires a different strategy for information processing.

Klima and Bellugi (1978, 1979) describe American Sign Language (ASL) as a separate language when compared to English. They further describe ASL as being independent in which the signs may or may not have exact single-word English equivalent as well as their own rule formation for production of correct signing sequences. Newport and Bellugi (1978) demonstrated that sign language has a hierarchial structure in which concrete objects are represented like English at various levels. Newport and Bellugi point out that ASL should be considered as an independent language in which deaf people who use ASL should be considered bilinguals, therefore learning to read English should also be considered as second language learning.

STATEMENT OF THE PROBLEM

Metalinguistic development of the hearing-impaired has not received enough attention. Further exploration is needed to analyze the language behaviors of the hearing-impaired through administration of metalinguistic tasks. Research that does exist when comparing the metalinguistic abilities of normal subjects and hearing-impaired subjects reveals that there are significant differences in the performance of comprehension and structuring of language as well as in knowing the rules for language (Woolfolk & Lynch, 1982; Presnell, 1973; Quigley, Smith & Wilbur, 1974; Furth, 1973; Deily & Love, 1974). Several other researchers such as Power and Quigley (1973), Quigley, Power and Steinkamp (1977), Hung and Tzeng (1981), agree that language develops in a delayed manner for hearing-impaired children when compared to normal children. These findings are primarily based on judgment tasks which require grammatical corrections of sentences.

The purpose of this investigation is to discover whether or not hearing-impaired subjects matched to normal subjects will perform differently on metalinguistic tasks as measured by scores on Metalinguistic Tasks for Adolescent Children (Griffin & Hedrick, 1986). Comparisons will be made between two experimental groups

which are the non-residential hearing-impaired (NRHI) and the residential hearing-impaired (RHI) matched to their controls (Control Group 1 and Control Group 2). Subjects will be matched according to his/her syntactic ability of the Short Form North-Western Syntax Screening Test (NSST), (Ratusnik, Klee & Ratusnik, 1980).

METHODOLOGY

Subjects

Two experimental groups, each consisting of six subjects aged 15-18 years, were selected from a population of hearing-impaired children. Subjects were selected from those students who (a) had average intelligence as determined by I.Q. tests administered by the school or as determined by the teacher's assessment of the student's classroom ability; (b) had linguistic ability that is considered average for the age of each subject as determined by the teacher's assessment and the degree of hearing impairment; (c) had adequate vision and no other apparent physical or psychological handicap; (d) had a current audiogram with configurations of a moderate to severe (aided) hearing impairment for the frequencies tested at 250-8000 Hz.

The first group of subjects (RHI) attended a residential school for deaf students in which a total communication (oral plus fingerspelling and sign) method of teaching was being utilized in the classroom. The second group of subjects (NRHI) were enrolled in a non-residential school and were mainstreamed into academic and non-academic classes with hearing children and were instructed by an oral method of teaching in the classroom. All the subjects had been fitted with individual hearing aids and wore them at the

time of testing. Each subject's hearing loss was either congenital or had an onset before two years of age.

Once this procedure was completed and all of the previously mentioned criteria were met, all 12 subjects were separately administered only expressive items of the Short Form NSST (Ratusnik, Klee & Ratusnik, 1980).

The Short Form NSST comprises 11 expressive items of grammatical forms that vary in level of complexity.

The six hearing-impaired subjects who communicated through a total approach were instructed by an assistant qualified in finger-spelling and signed English. The other oral hearing-impaired subjects were instructed orally.

Two control groups were established to match with the RHI group and the NRHI group. The control groups were also tested to aid in the interpretation of test results. Nine normal subjects were selected and were formed into matching groups of six and six to match the two experimental groups on the basis of a screening test of grammar. Three of the normal subjects with mid-low scores were used in both groups. Three of the highest scoring normal subjects were used to match with the NRHI subjects and the two lowest scoring normal subjects plus one higher scoring normal subject was used with the RHI subjects. Matching the control groups with the experimental groups (NRHI and RHI) was obtained by the closest overall mean of scores on the Short Form NSST (see Table 1).

TABLE 1

THE MEAN SCORES OF CONTROL GROUP 1 AND CONTROL GROUP 2 AS COMPARED TO THE NRHI GROUP AND THE RHI GROUP DERIVED FROM THE SHORT FORM NSST

Group	Mean Score	Percentile
Control Group 1	16.5	10 ↓
NRHI	16.33	10 ↓
Control Group 2	12.5	10 ↓
RHI	11.67	10 ↓

Age, race and sex were not the criterion variables for the subject selection since subject selection was achieved only by the closest overall mean of the Short Form NSST scores of the four subject groups.

Control Group 1, which was matched with the NRHI group consisted of four white females and two white males. The NRHI group was comprised of three white males, one white female and two black females. Control Group 2 which was matched with the RHI group consisted of two white males, two white females, one black male and one black female and the RHI group was comprised of four white males and two white females. All subjects ranged in ages 15 to 18 years. Data descriptive of the four subject groups are presented in Table 2.

TABLE 2

AGE, SEX AND RACE OF ALL FOUR GROUPS

CONTROL GROUP 1				NRHI				CONTROL GROUP 2				RHI			
Subject	Age	Sex	Race	Subject	Age	Sex	Race	Subject	Age	Sex	Race	Subject	Age	Sex	Race
1	16	F	W	1	17	F	W	1	15	M	W	1	17	M	W
2	15	F	W	2	17	M	W	2	15	F	B	2	18	M	W
3	18	M	W	3	15	M	W	3	16	F	W	3	17	M	W
4	18	F	W	4	18	F	B	4	15	F	W	4	16	F	W
5	16	M	W	5	17	F	B	5	18	M	W	5	16	F	W
6	16	F	W	6	17	M	W	6	17	M	B	6	17	M	W

Normal hearing levels of each normal subject were determined by administering a brief hearing screening test which consisted of required responses to air conduction pure tones at 25 db H.L. at 250 Hz and 500 Hz and 20 db H.L. at 1000 Hz and 2000 Hz (see Appendix A).

All subjects had to return a signed parental consent form giving permission to take part in this study as well as individual signed authorization of a "Right to Withdraw" any time from any of the activities (see Appendix B).

Materials

Subjects were administered Metalinguistic Tasks for Adolescent Children adapted from copyrighted material by Griffin and Hedrick, 1986 (see Appendix C). The tasks were designed to study how children reflect linguistically and how they commensurate with the nonverbal cognitive skills. The Metalinguistic task consisted of seven subtasks which included conflict sentence difference, classification, word referent, the listening game, sentence reformulation, categorical naming and sentence formulation.

Subtasks

Conflict Sentence Difference. This subtask is concerned with the ability to grammatically judge sentences on the basis of syntactic and semantic context. This task was constructed of 17 sentences in which each subject was required to put a checkmark under columns headed "okay" or "bad" by each sentence. If a checkmark was placed under "bad" by a sentence, then the subject was required to rewrite the grammatically correct sentence structure.

Each sentence in this task received a raw score as correct or incorrect. Additional scoring was obtained by determining if the error was semantic or syntactic in content and whether the error was within or outside of a clause.

Classification. This subtask is a word association task determined by semantic context. The subject is first given a

list of words to sort into two lists. The words in each list have to go together in some way. For example, motor, meadow, pie, ball, mother, pancake, map, marshmallow, apple, mop, plate, moon, balloon, mayonnaise, could be sorted into two groups: those that are round and those that are not.

After completion of this task, the subject is then instructed to take some of the other things from both of the lists and make one new list of things that go together.

Each subject was given a "+" (correct) or a "o" (incorrect) for the first formed list and a "+" or a "o" for the second list. The total number of correct or incorrect was then calculated for each group.

Word Referent. This subtask is designed to reflect the child's ability to differentiate between a word as a linguistic entity and the real word object. The subject is instructed to put a checkmark under the word "big" if he/she thinks the word is big or put a checkmark under the word "small" if he/she thinks the word is small. In addition, the subject is required to tell why the word is big or small.

Each response was assessed by description of words which could be divided according to size, function or number of letters contained in each word. A mean of each category was obtained.

The Listening Game. This subtask is concerned with formation of patterns through verbal feedback and symbolization as a function of cognition. Here, the subject and examiner are each given a

variety of colored chips. First, the examiner forms a straight line pattern with the chips and does not reveal it to the subject. The subject is then asked to guess what order the examiner's colored chips are by making his/her own straight line pattern. If the subject matches the pattern exactly--same color in the same position--then the task is complete.

If not, the subject's pattern is "scored." For each chip that is the right color and in the right position, a white chip is used. For every chip that is the wrong color in the wrong position, a black chip is used. Each subject had five trials in which to form the correct pattern. A 8"X12" game board on which the chips were placed was used.

The assessment of this task was twofold. Amount of trials needed to formulate the pattern was the first component combined with the amount of time needed for completion of the task.

Sentence Reformulation. This subtask involves rebuilding scrambled sentences through semantic and syntactic context. Subjects are given a string of words placed on 1"X2" stimuli cards to arrange into a sentence. Each subject is given five different sets of strings of words from which to form five sentences.

The score for this task was obtained by the amount of time needed to formulate each sentence. The amount of time was calculated in minutes and seconds.

Categorical Naming. This subtask measures the ability to classify and think categorically by controlling word association.

This task consisted of two separate words to classify within one minute each. Each subject was told when to start and stop naming words.

Assessment of this task was obtained by counting the number of items named in the category within one minute. Two separate scores were derived from each category.

Sentence Formulation. This subtask involves the grammatic knowledge required to structure sentences. Subjects are given a string of words placed on 1"X2" stimuli cards and are instructed to use the words to form a sentence. Words could be added to the sentence by having the examiner write down and insert the additional word in the requested arrangement. Each subject was required to create two sentences for this task.

Each response separately received a score as semantically "+" (correct) or a "-" (incorrect). Furthermore, each sentence was separately timed in minutes and seconds.

Procedure

The seven subtasks were administered separately to each subject in his/her school. Each subject was allowed as much time as needed for six of the seven subtasks. However, the tasks of the Listening Game, Sentence Reformulation and Sentence Formulation were timed for comparison of length of time required by each subject.

Only the Categorical Naming subtask was taped and had a time limit of one minute. Subjects were told that this was a test of their knowledge of English and it did not effect their school grade.

There was a difference in instructional mode for the hearing-impaired who communicated through the "total approach." This group was administered the tasks by an assistant qualified in fingerspelling and signed English. The other group of hearing-impaired who communicated orally and the control group of normal subjects were instructed orally by the same examiner. Before starting the task, subjects were given an example of the task and an opportunity to ask questions. The session did not begin until the examiner was certain each subject understood the instructions. All tasks were administered in the same order of presentation within one session which lasted approximately one hour. Subjects were required to give manual and graphic responses throughout the test.

RESULTS

Metalinguistic Tasks for Adolescent Children (Griffin & Hedrick, 1986) was given to both of the experimental groups and their matched control groups. The results were assessed as shown below. The significance level was set at .05 for all tasks.

Task 1: Conflict Sentence Difference

Looking at Figures 1 and 2, there was a tendency for both the NRHI group and the RHI group to score lower on the total mean number of correct responses on the semantic sentences and the syntax sentences than their matched control group. However, when applying the statistics to determine a significant difference, the Wilcoxon Rank Sum test was used and a significant difference was found only between the NRHI group and its control group with ($T_{cv\ .05=0}$).

The proportion test was used to determine whether the errors were semantic or syntax, inside or outside of clauses. A significant difference was found between Control group 1 and the NRHI group on semantic errors occurring inside of a clause with the resultant p=.001. A significant difference was also found between the RHI group and Control group 2 on semantic errors occurring inside a clause (p=.001) and semantic errors occurring outside of a clause (p=.001). Tables 3 and 4 summarize the significance levels

computed to compare the abilities of the experimental groups and control groups for errors on the specific tasks, semantic errors inside and outside of clauses and syntactic errors inside and outside of clauses.

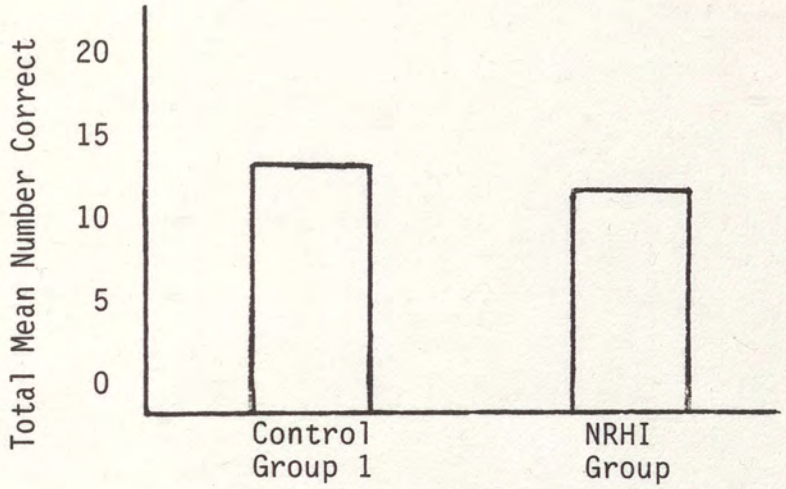

Figure 1. Mean Number of Correct Responses for Conflict Sentence Difference Task for Control Group 1 and the NRHI Group.

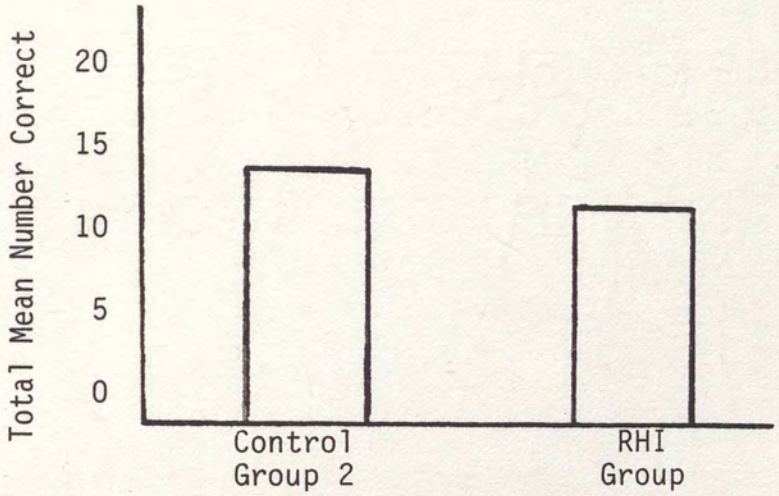

Figure 2. Mean Number of Correct Responses for Conflict Sentence Difference Task for Control Group 2 and the RHI Group.

TABLE 3

P- VALUES FOR THE NRHI GROUP VS. CONTROL GROUP 1
ON CONFLICT SENTENCE DIFFERENCE TASK

	Within	Without
Semantic	*.001	.480
Syntax	.233	.206

*$p \leq .05$

TABLE 4

P-VALUES FOR THE RHI GROUP VS. CONTROL GROUP 2
ON CONFLICT SENTENCE DIFFERENCE TASK

	Within	Without
Semantic	*.001	*.001
Syntax	.224	.203

*$p \leq .05$

Task 2: Classification

The classficiation task assessed the subject's ability to form different lists of words determined by semantic context. The first task is to sort a list of words into two lists according to likeness and differences. The second task was to take some of the items from both of the lists and make one new list of items that went together.

Figures 3 and 4 show the number of correct responses for the experimental groups matched to their control group. Looking at the figures, it can be seen that in Figure 3 there was no difference between Control group 1 and the NRHI group on construction of word lists but a marked difference can be observed between Control group 2 and the RHI group in Figure 4 for construction of the third word list. The Chi Square test was used for statistical comparison of this difference and no significant differences were found.

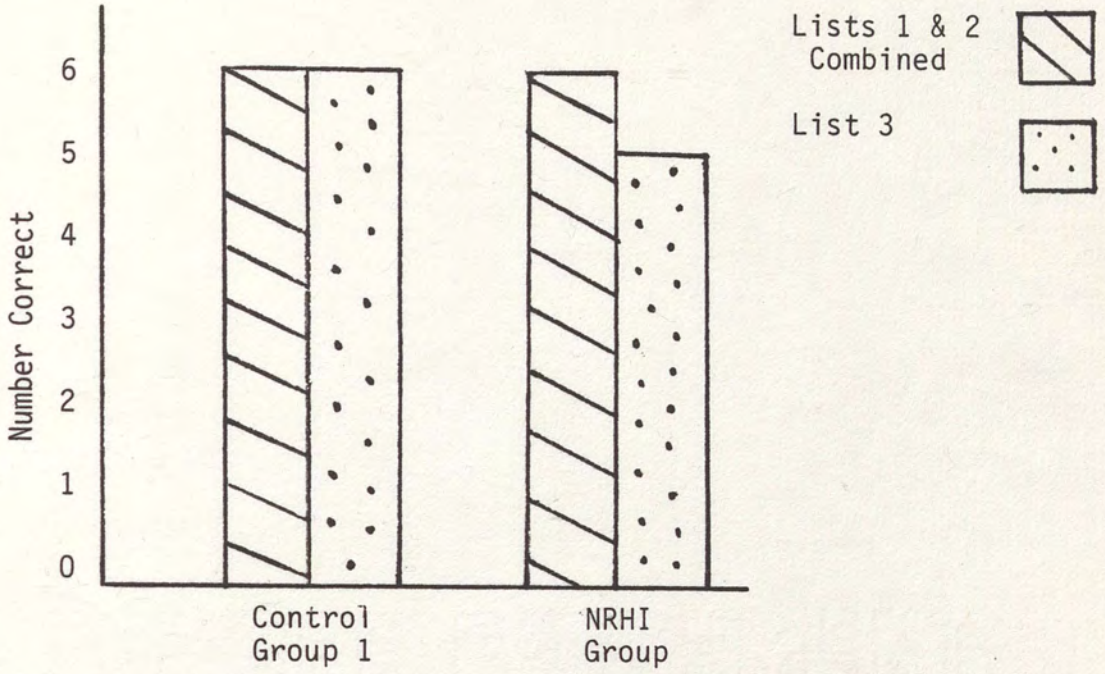

Figure 3. Number Correct for Control Group 1 and the NRHI Group on the Classification Task.

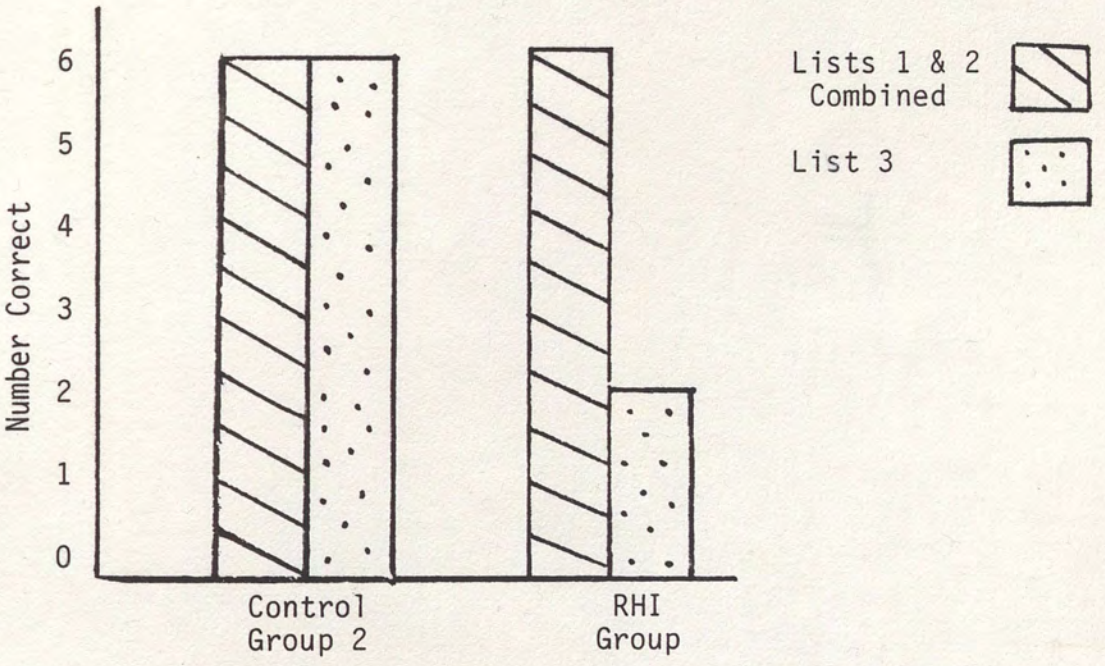

Figure 4. Number Correct for Control Group 2 and the RHI Group on the Classification Task.

Task 3: Word Referent

The word referent task was administered to assess the subject's ability to differentiate between a word as a linguistic entity and the real word object. The subjects were instructed to put a checkmark under "big" or "small" and to provide a written explanation of the given response.

Figures 5 and 6 give a mean percentage for both matched groups for description of words on the reference task. It can be seen that the NRHI group and Control group 1 tended to use the same responses except when describing words in terms of function. The NRHI group used function descriptors .22 of the time whereas none of the subjects in Control Group 1 attempted to base their description according to function.

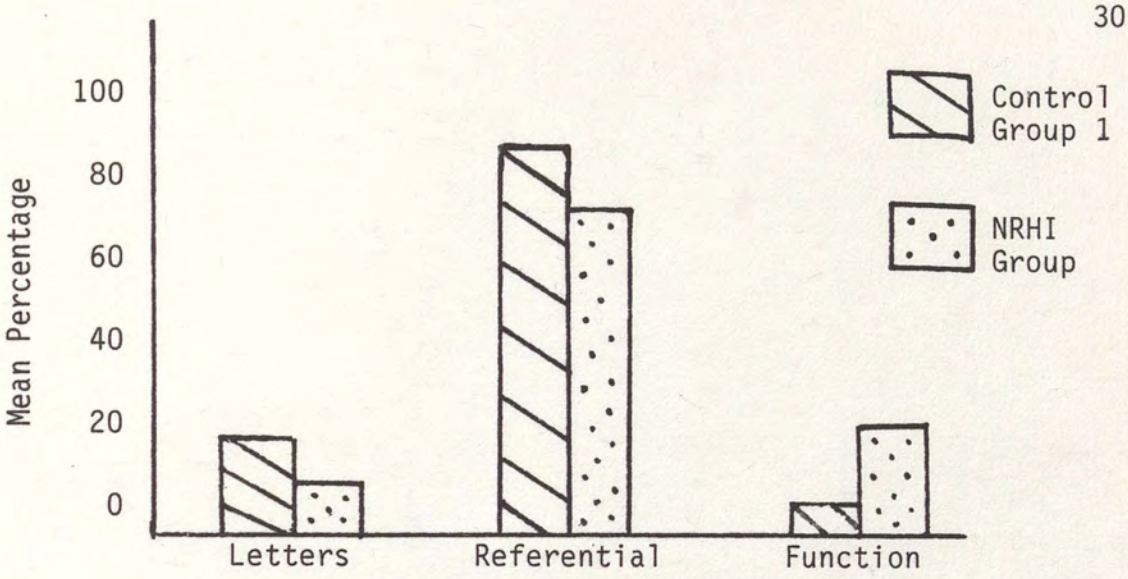

Figure 5. Mean Percentage for Control Group 1 and the NRHI Group for Description on the Word Referent Task.

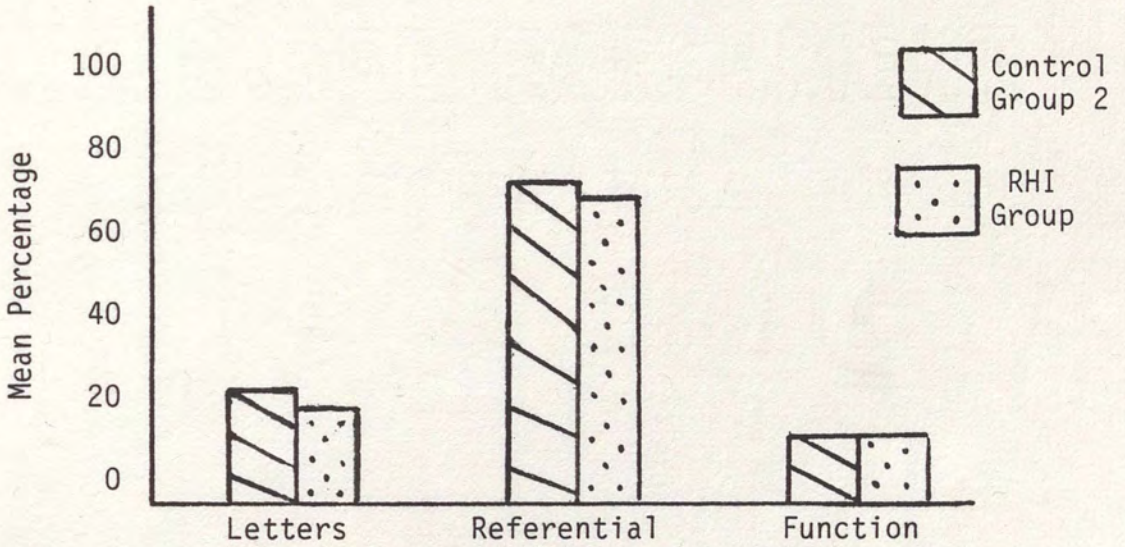

Figure 6. Mean Percentage for Control Group 2 and the RHI Group for Description on the Word Referent Task.

Task 4: The Listening Game

The Listening Game task was administered to assess the formation of patterns through verbal feedback and symbolization as a function of cognition. This task required the subjects to form a pattern with colored chips in the same sequence as the examiner's without exposure to the sequence of the examiner's chips. The subject's pattern was scored by placement of black chips for the wrong color and wrong position and placement of white chips for the right color and right position.

Figures 7 and 8 show the mean number of trials to complete the listening game task. The NRHI group completed the task in fewer trials for pattern completion when compared to its matched control group whereas the RHI group required a slightly higher number of trials to complete the correct pattern than their matched control group.

Figures 9 and 10 show the mean time in minutes to complete the Listening Game task. Looking at these figures, it can be seen that both experimental groups required a slight increase in time for pattern completion when compared to their matched control group.

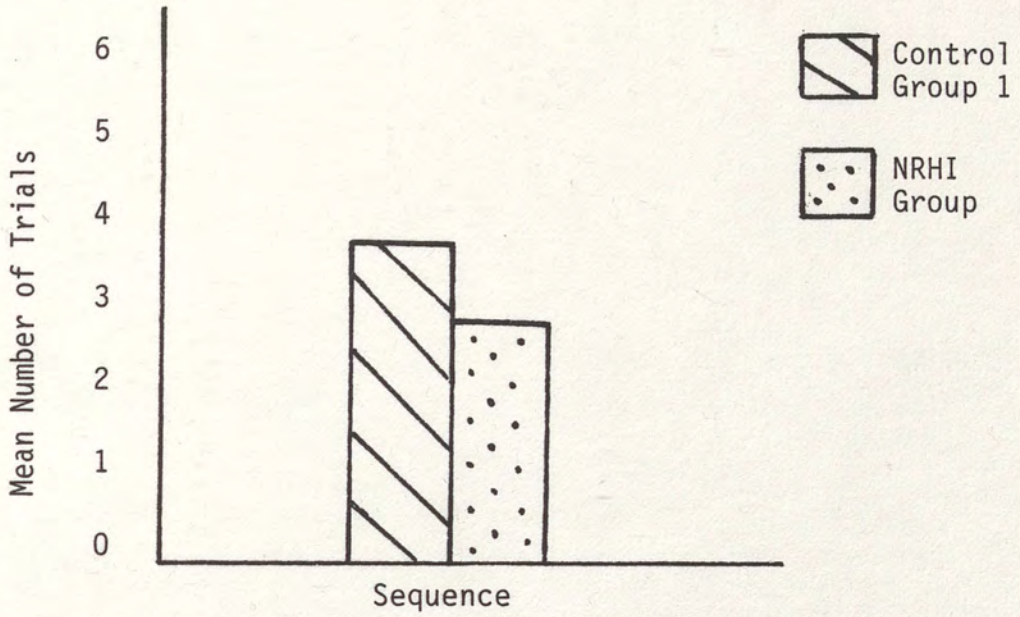

Figure 7. Mean Number of Trials for Control Group 1 and the NRHI Group for the Listening Game Task.

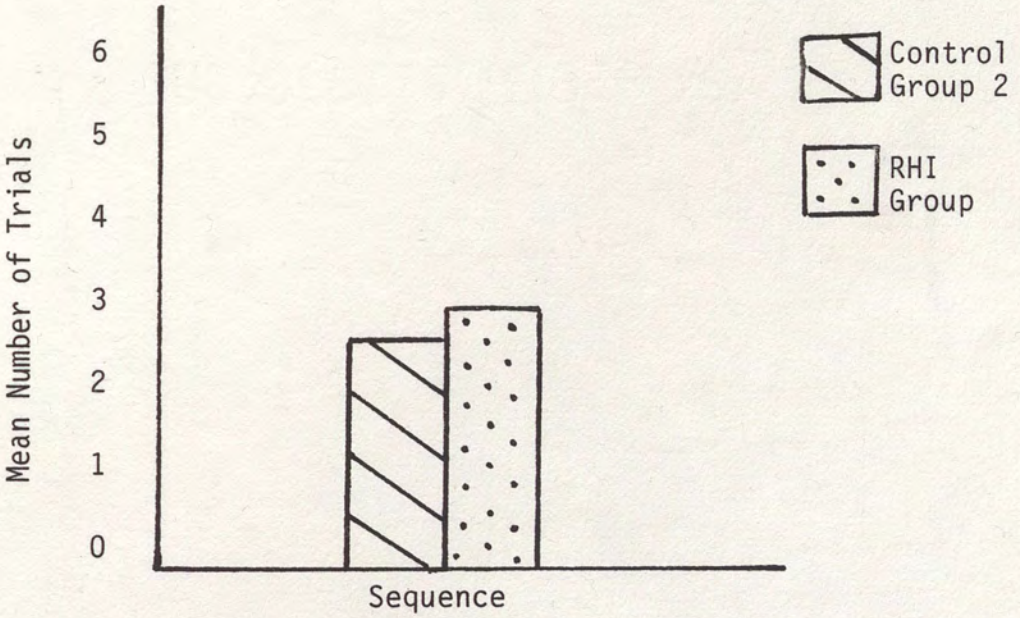

Figure 8. Mean Number of Trials for Control Group 2 and the RHI Group for the Listening Game Task.

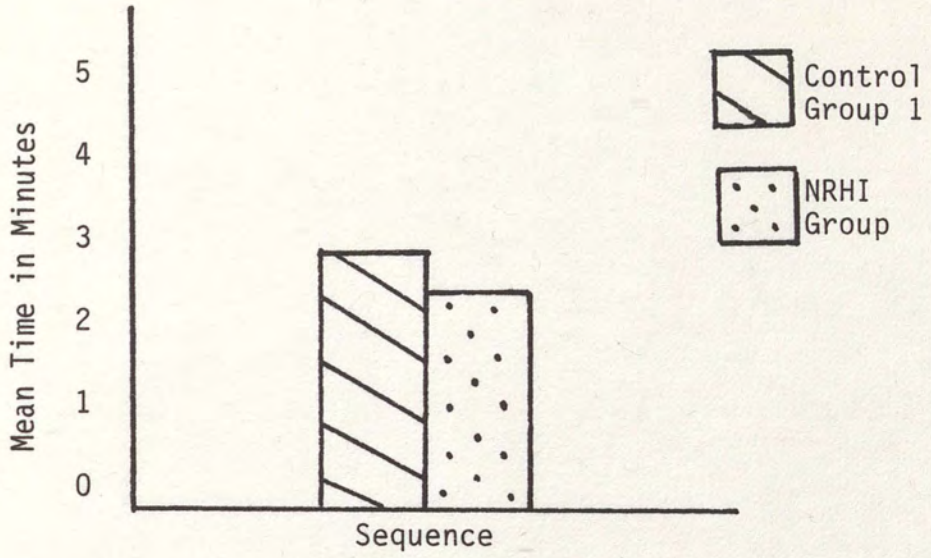

Figure 9. Mean Time (Minutes) for Control Group 1 and the NRHI Group to Complete Listening Game Task.

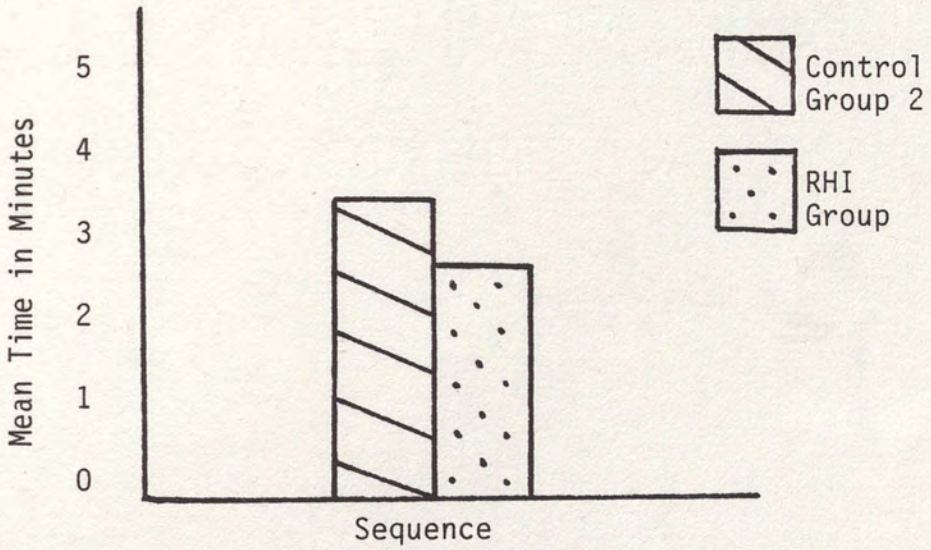

Figure 10. Mean Time (Minutes) for Control Group 2 and the RHI Group to Complete the Listening Game Task.

Task 5: Sentence Reformulation

The Sentence Reformulation task assessed the subject's ability to rebuild scrambled sentences through semantic and syntactic context. Performance was determined by the number of correctly reformulated sentences.

Looking at Figure 11, it can be seen that there is no difference between Control group 1 and the NRHI group on correct reformulation of the fourth sentence. However, a difference is shown between Control group 1 and the NRHI group on the reformulation of the second, third and fifth sentences. Figure 12 reveals differences between Control group 2 and the RHI group on all sentences, with no RHI subjects successfully reformulating the third sentence.

The Chi Square test was used for statistical comparison of the above differences. Significant differences were found between the NRHI group and Control group 1 on the second ($X^2=8$), third ($X^2=8$), and fifth ($X^2=30$) sentences with $X^2_{cv.05=1}$. Significant differences were also found between the RHI group and control group 2 on all sentences reformulated ($X^2_{S1}=7.2$, $X^2_{S2}=8$, $X^2_{S3}=4.2$, $X^2_{S4}=6.4$, $X^2_{S5}=6.4$) with $X^2_{cv.05=1}$.

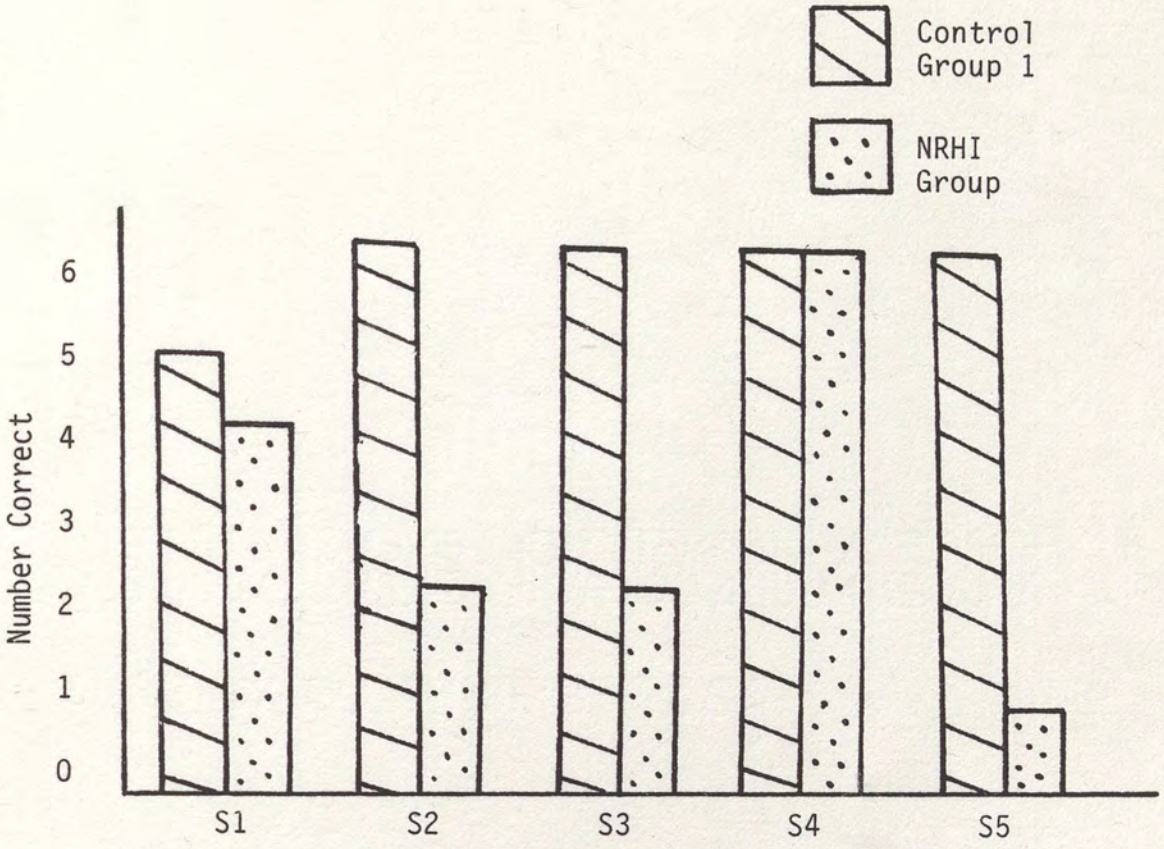

Figure 11. Number Correct for Control Group 1 and the NRHI Group and the Sentence Reformulation Task.

S1. He rowed in a boat which leaked.
S2. The movie was weird because all the actors wore masks,
S3. The story was told by a man who had a beautiful deep voice.
S4. She was shoved into the hall by the force of the wind.
S5. Where is the best beach which allows people to fish?

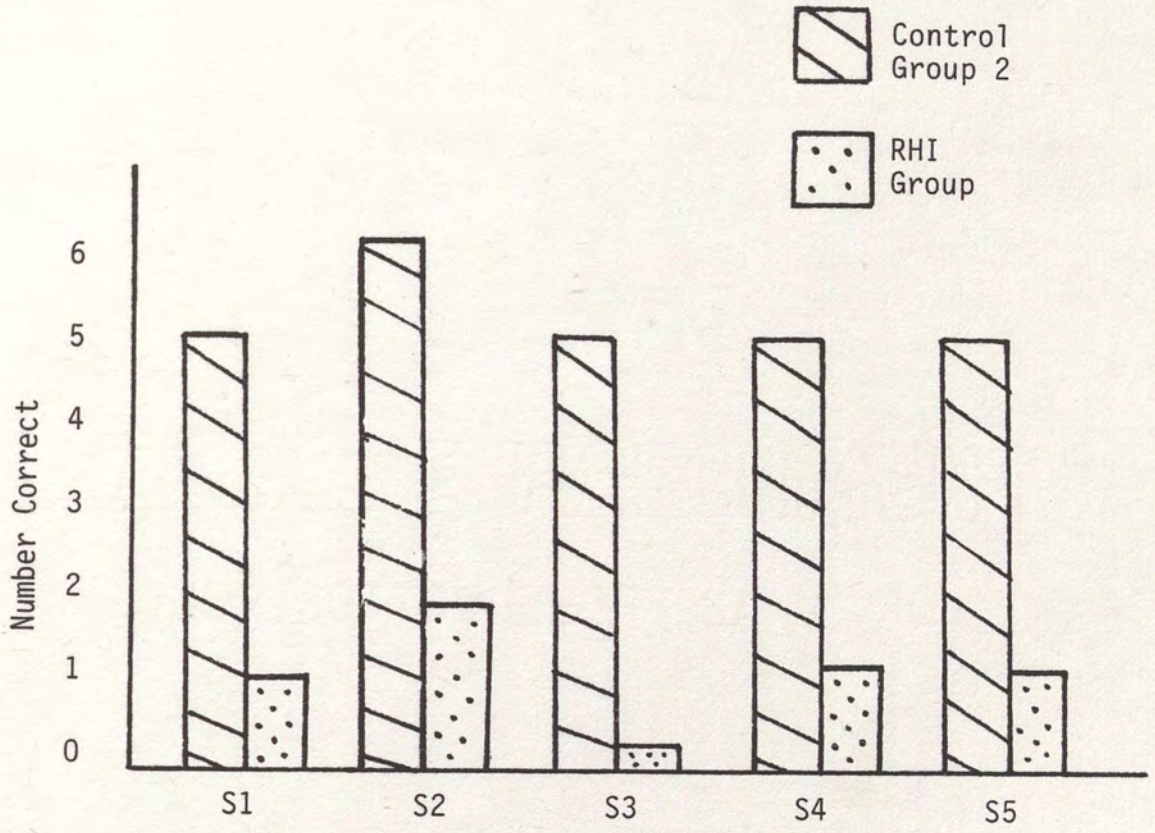

Figure 12. Number Correct for Control Group 2 and the RHI Group on the Sentence Reformulation Task.

S1. He rowed in a boat which leaked.
S2. The movie was weird because all the actors wore masks.
S3. The story was told by a man who had a beautiful deep voice.
S4. She was shoved into the hall by the force of the wind.
S5. Where is the best beach which allows people to fish?

Task 6: Categorical Naming

The Categorical Naming task was administered to assess the subject's ability to classify and think categorically by controlling word association. Each subject was to name as many foods as possible within one minute as well as forms of transportation within another minute. Figures 13 and 14 reveal the mean number of words named by the two matched groups.

It can be seen in Figure 13 that there was a slight tendency for the NRHI group to name a higher number of words for the category of transportation when compared to the performance of Control group 1. However, both the NRHI group and the RHI group had a slight tendency to name fewer words for the categorization of food when compared to the performances of Control group 1 and Control group 2.

For statistical analysis, the Wilcoxon Rank Sum test was utilized for comparison of each categorical naming for the two matched groups. No significant differences were found for the matched groups in either of the two categories.

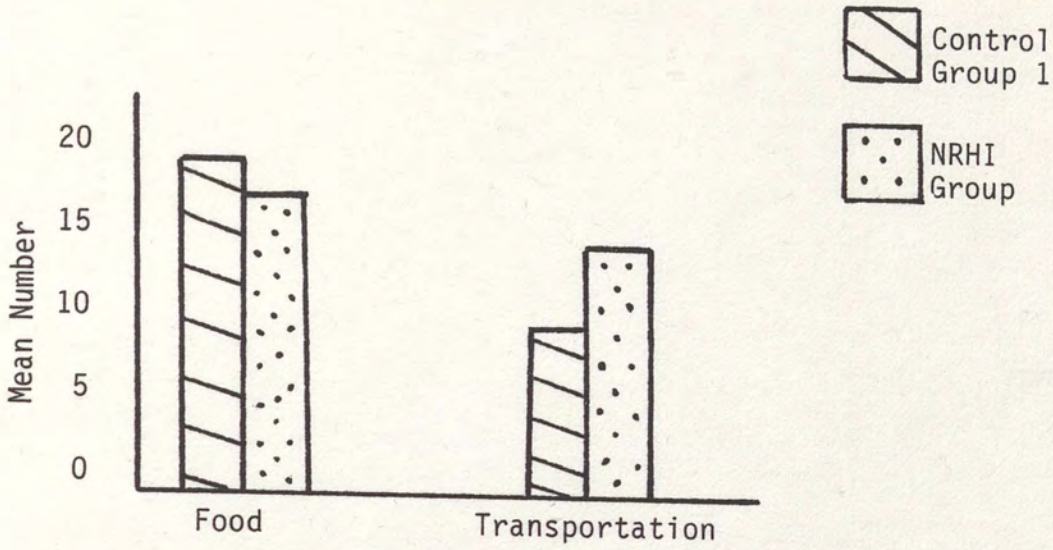

Figure 13. Mean Number of Words Named by Control Group 1 and the NRHI Group on the Categorical Naming Task.

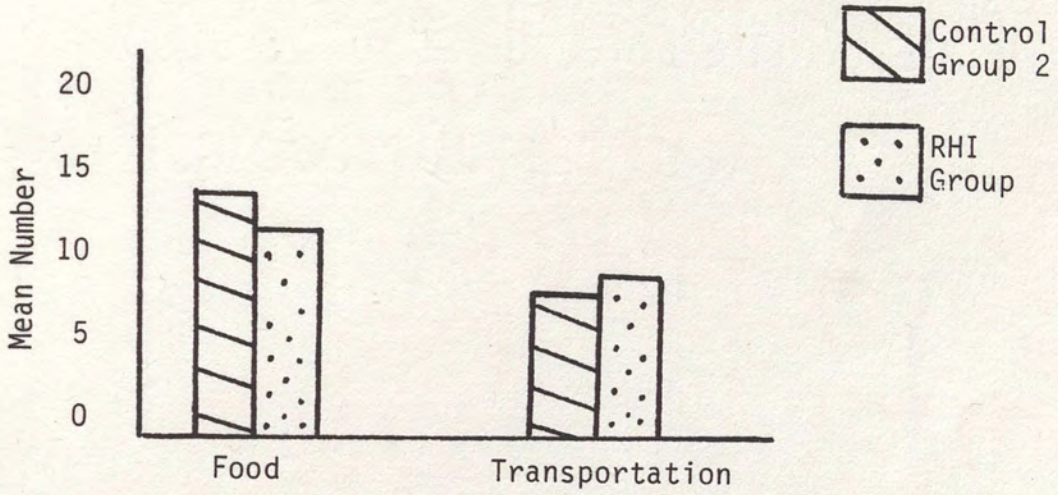

Figure 14. Mean Number of Words Named by Control Group 2 and the RHI Group on the Categorical Naming Task.

Task 7: Sentence Formulation

The Sentence Formulation task was used to assess the subject's grammatic ability to structure a sentence. Each subject was given a string of words to form a sentence in which each word could only be used once with insertion of additional words for a semantically and syntactically appropriate arrangement. Comparisons of semantic and syntactic performances were made by the number of correct responses to complete both of the sentences. Figures 15 and 16 reveal that Control group 1 and Control group 2 were able to produce a higher number of semantically and syntactically appropriate sentences. For statistical analysis, the Wilcoxon Rank Sum test was calculated for this data. The resultant T=0 for both matched groups reveals a significant difference for comparison of correct responses ($T_{cv}{}_{.05=0}$).

A test on proportions was used to determine whether the errors produced were semantic or syntactic for each sentence. Significant differences were found between Control group 1 and the NHRI group with the resultant p=.043 on semantic and syntactic errors for sentence 2. Significant differences were also found between Control group 2 and the RHI group with the resultant p=.002 on semantic and syntactic errors for sentence 1 and p=.008 on semantic and syntactic errors for sentence 2. Tables 5 and 6 summarize the significance levels computed to compare the abilities of the experimental groups and the control groups on semantic and syntax errors produced for each sentence.

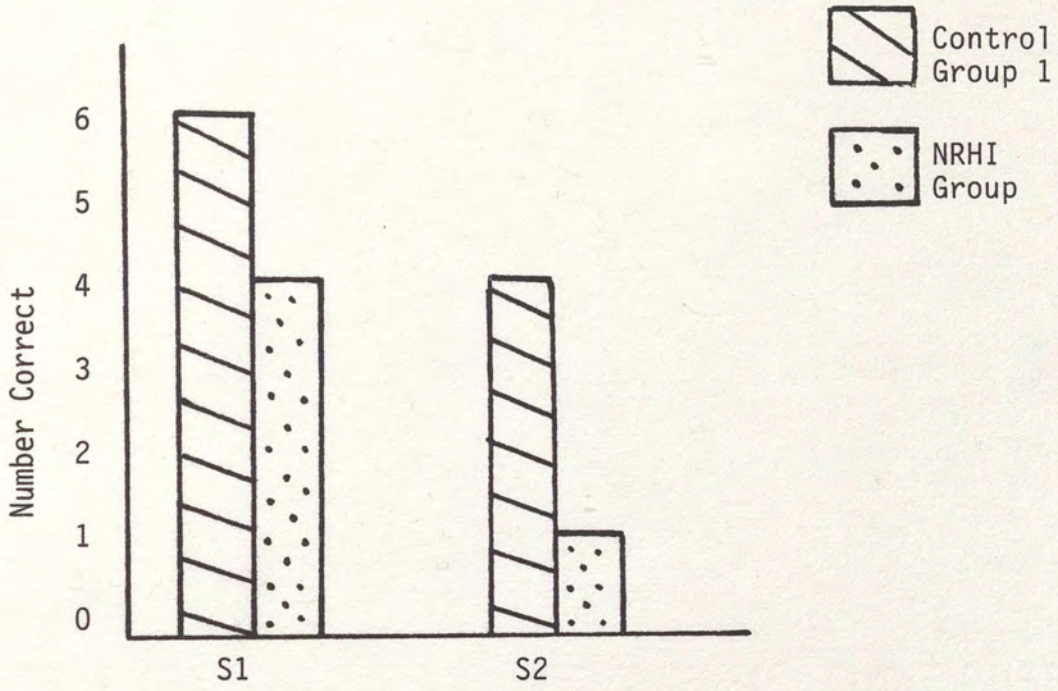

Figure 15. Number of Correct Responses for the Sentence Formulation Task for Control Group 1 and the NRHI Group.

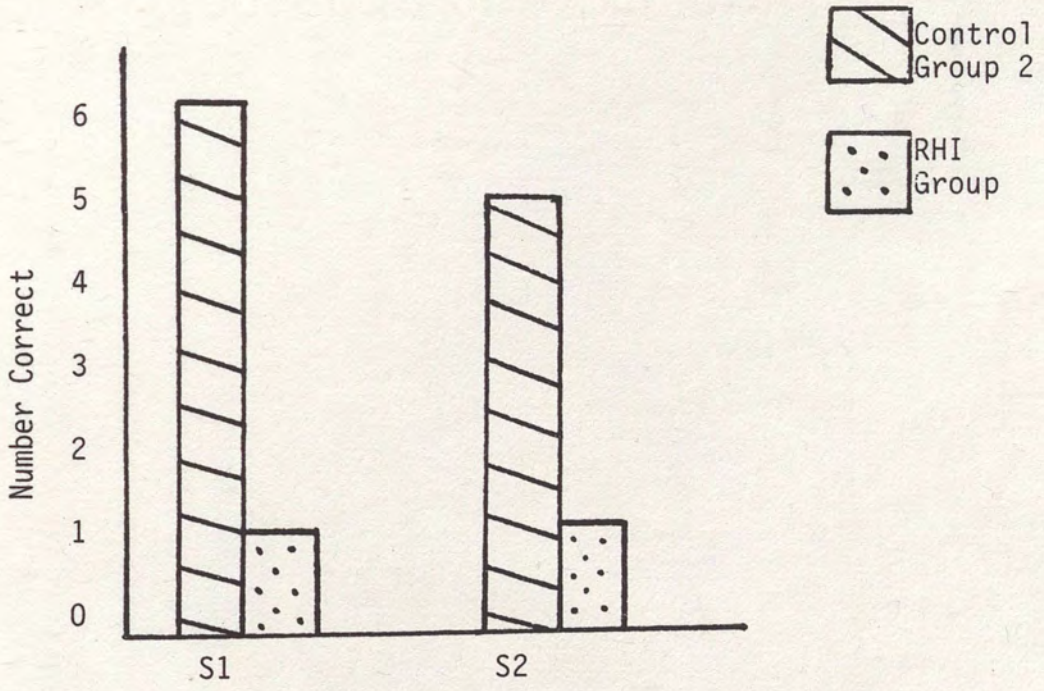

Figure 16. Number of Correct Responses for the Sentence Formulation Task for Control Group 2 and the RHI Group.

TABLE 5

P-VALUES FOR THE NRHI GROUP VS. CONTROL GROUP 1
ON THE SEMANTIC AND SYNTACTIC SENTENCE FORMULATION TASK

	Semantic	Syntax
Sentence 1	.268	.268
Sentence 2	*.043	*.043

*$p \leq .05$

TABLE 6

P-VALUES FOR THE RHI GROUP VS. CONTROL GROUP 2
ON THE SEMANTIC AND SYNTACTIC SENTENCE FORMULATION TASK

	Semantic	Syntax
Sentence 1	*.002	*.002
Sentence 2	*.008	*.008

*$p \leq .05$

DISCUSSION

The purpose of this investigation was to describe and compare metalinguistic abilities utilizing semantics and syntax of hearing-impaired adolescent children to normal adolescent children (Control group 1 and Control group 2). The results of this investigation indicated similarities as well as differences for these groups of subjects.

Similar strategies were employed by both matched groups for some tasks. The word referent task required description of words as "big" or small" accompanied by a written explanation of the response. Both matched groups had a tendency to describe words in terms of referent. These results differed from data gathered by Griffin (1986) for the same task administered to non-hearing-impaired students. Griffin indicated a greater percentage of words described in terms of numbers of letters for tenth grade students. A possible explanation for the discrepancy results from the control groups used in this study and the students in Griffin's study as well as a difference in task instruction. The normal subjects in this study were matched syntactically to hearing-impaired subjects whereas the subjects in Griffin's study were randomly chosen. Subjects in Griffin's study were administered the task orally and were required to

tell if the words read to them were "big" words or "small" words and to tell why they chose their response. The differences between the hearing-impaired subjects in this study and the non-hearing-impaired subjects in Griffin's study might be due to the "esoteric" or private communication of hearing-impaired children (Quigley, Smith, & Wilbur, 1974). For their esoteric language in communicating with each other, the students utilize the communication mode of sign language and fingerspelling with their "exoteric" language being taught to them in school. As age increases with this particular population, the early dominance of the esoteric language influences the development of the exoteric language and perhaps is the source of the differences found between these two studies for this particular word association task. This esoteric language of hearing-impaired demonstrates the ability to engage in reflective performance as differentiated from performances-in-context when engaging in word association tasks used to analyze semantic development.

Another interesting finding concerning task performances were the similarities in categorical naming, particularly the naming of foods rather than the forms of transportation when comparisons were made between the matched groups. In general, it was thought that the hearing-impaired subjects would use the strategy of grouping transportation instead of naming forms of transportation because of an experential deficit. However, the tendency to group transportation was demonstrated by Control group 1 and

Control group 2. An explanation for the tendency to group by form could possibly be attributed to the curriculum directed towards transportation in the language program of the hearing-impaired in which this exposure is lacking in the environment of normal individuals.

In this study, the small sample size makes it difficult to generalize the results or to obtain statistical significance on some tasks where differences appeared to exist between the groups. In addition, the lack of racial balance between the groups hampers generalization. However, it should be mentioned that even though one of the experimental groups (RHI group) was an unmixed racial group containing all white subjects while the remaining experimental group (NRHI group) and the two control groups contained a combination of white and black subjects, the differences did not favor the experimental group that was unmixed. In spite of the aforementioned limitations to this study, there were some significant differences between the experimental groups and their matched control group which would appear to be important findings in terms of metalinguistic behaviors of hearing-impaired adolescent children. Specifically, the task performances utilizing grammar for judgment of correctness of sentences and the reformulating and formulating of sentences proved to be of greater difficulty for the hearing-impaired subjects than their matched controls.

The inability of the hearing-impaired to assess the correctness of grammar might be attributed to their reliance on visual mediating

processes. It may be that acoustic mediators are needed for comprehension and production of appropriate sentence structuring when learning language. There is no research to support this thesis. However, research in reading suggests a strong language based component for reading (Schallert, Kleinman & Rubin, 1977). The semantic and syntactic level which was required to appropriately judge the correctness of each sentence proved to be more complex for the hearing-impaired. It was evident that the hearing-impaired subjects did not possess the semantic vocabulary required for appropriate judgmental sentence structuring or the knowledge of clause formation which may not be used when written by the hearing-impaired. This problem in grammatical complexity has been shown in research in which older hearing-impaired children have performed more like younger, non-hearing-impaired subjects (Power & Quigley, 1973). The students may have been able to do the tasks which are sentence formulation and reformulation if the changes had been made in sentences that did not contain dependent clause structures and which did not include passive transformations (i.e., She was shoved into the hall by the force of the wind).

The hearing-impaired tended to overuse the subject-verb-object pattern especially when constructing sentences in which reversibility makes a sentence more difficult to comprehend. This linguistic performance was evident particularly for the NRHI group when required to reformulate the fifth sentence of

the reformulation task. Furthermore, the RHI group demonstrated the greatest difficulty with the third sentence in which this construction required a different strategy for reformulating a passive sentence. The deep and surface structure may be much more similar in hearing-impaired adolescent children than the alternate models available for their matched controls. Quigley, Power and Steinkamp (1977) certainly support a different manner used of acquiring written language which may contribute to rigid underlying rules needed for syntactic structuring of sentences.

The major findings of this study suggest the following. First, this study provides support that hearing-impaired adolescent children, both residential and mainstreamed, have metalinguistic skills similar to the non-hearing-impaired controls. The area of strength for the hearing-impaired as shown in this study is metasemantics, specifically classification into two sets and providing examples of distinct categories. Second, this study reveals some differences between the hearing-impaired and their matched controls, specifically in metasyntax. The hearing-impaired do have difficulty building syntactical strings of a complex nature and recognizing the grammacallity of constructed strings. If the findings of this study are validated in other studies, it might service evidence to make suggestions to change the language curriculum of the hearing-impaired.

Although it is possible to speculate whether the metalinguistic differences between the normal subjects and the hearing-impaired subjects who communicate through manual signs (RHI group) resulted from interaction between the language of signs and English, the data did not provide information to permit examination of this possibility. Additional analysis is needed to clarify this issue. However, it is important to realize that this difficulty with language acquisition lies not in hearing-impaired children themselves, but in the impedance between the medium of transmission of information (acoustics) and the children's ability to receive it.

APPENDIX A

Hearing Screening

Name: _____ Date: _____

School: _____ Age: _____

Evaluator: _____ Grade: _____

	@ 25 dB H.L.		@ 20 dB H.L.	
	250HZ	500HZ	1000HZ	2000HZ
Right				
Left				

Comments:

Pass: _____ Fail: _____

Signature: _____

APPENDIX B

Consent Form

To Whom It May Concern:

I am a student at the University of Central Florida currently working on my master's thesis in Audiology. As part of my thesis, I am administering tasks to see how the participant performs various language skills. The information gathered here will be used to help other children.

Please be informed that if, at any time, the participant would not like to complete the tasks and stop the activities, he or she may do so as they wish.

Please sign below if you give permission for your teenager to participate in this study.

Thank you in advance for your time and cooperation.

_____ grants permission for
(Parent or guardian signature)

_____ to participate in this study.
(Participant's name)

I, _____, agree to participate in this
(Participant's name)
study. I am aware that I have the right to withdraw at any time from any of the activities if I wish to do so.

APPENDIX C

Test Protocol and Instructions

SUBTASK 1: CONFLICT SENTENCE DIFFERENCE Raw Score _____

Rewrite the sentences that are bad. Make them okay. Put a check under okay or bad by each sentence if you think it is okay or bad.

Example:

Okay	Bad
	✓

The plant, which are tall grew fast.

The plant, which is tall, grew fast.

Now you try

Okay	Bad		
		1.	The dog, which was in the house, was sleeping his dinner.
		2.	The horse, that found I, followed me home.
		3.	She ate the pizza, that her mother made.
		4.	She was singing so softly, it hurt my ears.
		5.	The cat, that was grey, had five kittens.
		6.	The little boy, who was sleeping, ran around the house.
		7.	The man, who was tall, sit on the bench.
		8.	He eats his dinner, who was cold.
		9.	The man, who was sick, went to the hospital.
		10.	The girl, who was crying, looked happy.
		11.	The boy, who run to class, was late.
		12.	The girl fixed the bike, which had a flat tire.
		13.	The chocolate bar, which was a Snickers, ate a girl.
		14.	She drink water, which was dirty.
		15.	He kicked the refrigerator, that was his favorite pet.
		16.	The family, which was big, went on a picnic.
		17.	He want some more soup, which was homemade.

SUBTASK 2: CLASSIFICATION Raw Score _____

These words are sorted into two lists. The words in each list have to go together in some way.

Example:

firetruck
grapes
apple
shoe

Red	Not Red
firetruck	grapes
apple	shoe

Now you try. Sort these words into two lists. The words in each list has to go together in some way.

Word list:

motor
meadow
pie
ball
mother
pancake
map
marshmallow
apple
mop
plate
moon
balloon
mayonnaise

Now take some of the things from both of the lists you have made and make one new list of things that go together.

Example:

Red	Not Red
firetruck	grapes
apple	shoe

Fruit
grapes
apple

Now you try to make one list from the two lists you made above.

SUBTASK 3: WORD REFERENT Raw Score _____

If you think the word is big, check big. If you think the word is small, put a check under small. Be sure to tell why you think the word is big or small.

Example:

Big	Small	Word List
✓		boat

Now you try.

Big	Small	Word List	Why?
		dictionary	
		bug	
		radio	
		encyclopedia	
		house	
		wall	
		lipstick	
		tree	
		cornacopia	
		telephone	
		pizza	
		lake	
		umbrella	
		earring	
		cigarette	

SUBTASK 4: THE LISTENING GAME Raw Score _____

I want yours to look like mine, but I'm going to make it hard. I'm going to hide mine. Okay. I've made mine. Now you try and make one like mine.

Pattern:	Correct	Incorrect
1.		
2.		
3.		
4.		
5.		

SUBTASK 5: SENTENCE REFORMULATION Raw Score _____

Use these words to make one sentence.

Example:

cat
of
girls
the
one
held
the One of the girls held the cat.

Now you try.

1. a
rowed
which
leaked
boat
in
he _____

2. all
masks
wore
the
was
movie
weird
the
because
actors _____

3. who
   a
   was
   told
   story
   the
   voice
   beautiful
   deep
   had
   a
   man
   by

   _____

4. she
   wind
   by
   the
   force
   into
   was
   hall
   shoved
   of
   the
   the

   _____

5. people
   fish
   to
   which
   is
   beach
   best
   allows
   where
   are
   the

   _____

SUBTASK 6: CATEGORICAL NAMING Raw Score _____

Example: Tell me all the words you can think of that go with circus.

clowns
juggler
ringmaster
trampoline
tent
lions
horses
monkeys
cages

Now I want you to tell me all the foods you can think of. I will tell you when to start. Keep naming foods until I say stop.

Tell me all the words you can think of that go with transportation. I will tell you when to start. Keep telling me words for transportation until I say stop.

SUBTASK 7: SENTENCE FORMULATION Raw Score _____

Use these words to make a sentence. You may use other words as many times as you want.

Example:

large
in
lake
beside
went
of
woods
group
a
the
camping
people
a

A large group of people went camping in the woods beside a lake.

Now you try. Use these words to make a sentence. You may use other words as many times as you want.

football
game
rainy
the
incredible
with
because
Seniors

_____

_____

Use these words to make a sentence. You may use other words as many times as you want.

and
he
but
winter
rain
off
Orlando
is
play
King Kong

_____

_____

REFERENCES

Allan, K. (1982). The development of young children's metalinguistic understanding of the word. Journal of Educational Research, 76, 89-92.

Baddeley, A. (1979). Working memory and reading. In P. A. Kolers, M. Wrolstad, and H. Bouma (Eds.), Processing of visible language (pp. 172-186). New York: Plenum.

Baron, J. (1976). Mechanisms for pronouncing printed words: Use and acquisition. In D. La Bierge and S. J. Samuels (Eds.), Basic processes in reading: Perception and comprehension (pp. 87-106). Hillsdale, NJ: Erlbaum.

Boehm, A. (1971). Boehm test of basic concepts: Manual. New York: The Psychological Corporation.

Bornstein, H., and Roy, H. (1973). Comment on "linguistic deficiency and thinking: Research with deaf subjects 1964-1969." Psycological Bulletin, 3, 211-214.

Bown, J., and Mecham, M. (1961). The assessment of verbal language development in deaf children. The Volta Review, 44, 228-230.

Brannon, J. (1968). Linguistic word classes in the spoken language of normal, hard-of-hearing, and deaf children. Journal of Speech and Hearing Research, 11, 279-287.

Brenza, B., Kricos, P., and Lasky, E. (1981). Comprehension and production of basic semantic concepts by older hearing-impaired children. Journal of Speech and Hearing Research, 24, 414-419.

Carroll, J. (1966). Some neglected relationships in reading and language learning. Elementary English, 43, 557-582.

Carrow-Woolfolk, E., and Lynch, J. (1982). An integrative approach to language disorders in children. New York: Grune and Stratton.

Cazden, C. (1975). Play with language and metalinguistic awareness: One dimension of language experience. In C. B. Winsor (Eds.), Dimensions of language experience (pp. 87-101). New York: Agathon Press.

Charrow, V., and Fletcher, J. (1974). English as the second language of deaf children. Developmental Psychology, 4, 463-470.

Chomsky, C. (1969). The acquisition of syntax in children from five to ten. Cambridge, MA: MIT Press.

Conrad, R. (1964). Acoustic confusions in immediate memory. British Journal of Psychology, 55, 75-84.

Curtiss, S., Fromkin, V., Krashen, S., Rigler, D., and Rigler, M. (1974). The linguistic development of Genie. Language, 50, 528-554.

Dale, P. (1976). Language development: Structure and function (2nd Ed.), New York: Holt Reinhart and Winston.

Deily-Sarachan, A., and Love, R. (1974). Underlying grammatical rule structure in the deaf. Journal of Speech and Hearing Research, 17, 689-698.

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

de Villiers, P., and de Villiers, J. (1972). Early judgments of semantic and syntactic acceptability by children. Journal of Psychological Research, 4, 299-309.

Di Simoni, F. (1978). The token test for children. Boston: Teaching Resources.

Di Simoni, F., and Borino, B. (1982). Response of severely and profoundly hearing impaired children on a semantic language task (Token Test). The Journal of Auditory Research, 22, 23-28.

Forde, J. (1977). Data on the PPVT. American Annals of the Deaf, 122, 38-43.

Franklin, M. (1979). Metalinguistic functioning in development. In N. R. Smith and M. B. Franklin (Eds.), Symbolic functioning in childhood (pp. 199-215). Hillsdale, NJ: Erlbaum.

Furth, H. (1966). Thinking without language. New York: Free Press.

Furth, H. (1971). Linguistic deficiency and thinking: Research with deaf subjects 1964. Psychological Bulletin, 76, 58-72.

Furth, H. (1973a). Words and concepts in deafness. Deafness and Learning (pp. 7-19). Belmont, California: Wadsworth Publishing Company, Inc.

Furth, H. (1973b). Further thoughts on thinking and language. Psychological Bulletin, 79, 215-216.

Gleitman, L., Gleitman, H., and Shipley, E. (1972). The emergence of the child as grammarian. Cognition, 1, 137-164.

Griffin, M. (1986). Metalinguistic tasks for adolescent children. Unpublished master's thesis, University of Central Florida, Orlando, Florida.

Griffin, M., and Hedrick, D. (1986). A screening test of metalinguistic abilities of older school-aged children. Unpublished manuscript.

Hart, B., and Rosenstein, J. (1964). Examining the language behavior of deaf children. The Volta Review, 53, 679-682.

Hubbell, R. (1981). Language sampling and the sequence of training. Children's language disorders (pp. 160-195). Englewood-Cliffs, NJ: Prentice-Hall, Inc.

Huey, E. (1908). The psychology and pedagogy of reading. New York: Macmillan Co.

Hung, D., and Tzeng, O. (1981). A chronometric study of sentence processing in deaf children. Cognitive Psychology, 13, 583-610.

Kintsch, W., and Buschke, H. (1969). Homophones and synonyms in short-term memory. Journal of Experimental Psychology, 80, 403-407.

Kleiman, G. (1975). Speech recoding in reading. Journal of Verbal Behavior, 14, 323-339.

Klima, E., and Bellugi, V. (1978). Poetry without sound. Human Nature, 74-83.

Klima, E., and Bellugi, V. (1979). The signs of language. Cambridge, MA: Harvard University Press.

Lennenberg, E. (1968). The biological foundation of language. New York: Wiley.

Liberman, A., Mattingly, I., and Turvey, M. (1972). Language codes and memory codes. In A. W. Melton and E. Martin (Eds.), Coding processes in human memory (pp. 33-71). New York: Wiley.

Liberman, I., Shankweiler, D., Liberman, A., Fowler, C., and Fischer, F. (1977). Phonetic segmentation and recoding in the beginning reader. In A. S. Reber and D. Scarborough (Eds.), Toward a psychology of reading (pp. 109-123). Hillsdale, NJ: Erlbaum.

McClave, J., and Dietrich, F., II (1980). Statistics (3rd Ed.). San Francisco, CA: Dellen Publishing Company.

Newport, E., and Bellugi, V. (1978). Linguistic expression of category levels in visual-gestural language: A flower is a flower is a flower. In E. Rosch and B. Lloyds (Eds.), Cognition and categorization, (pp. 56-73). Hillsdale, NJ: Erlbaum.

Odom, P., Blanton, R., and Nunnally, J. (1967). Some "cloze" technique studies of language capability in the deaf. Journal of Speech and Hearing Research, 10, 816-827.

Olson, D. (1977) Oral and written language and the cognitive process of children. Journal of Communicative Disorders, 27, 10-26.

Osgood, C., Suci, G., and Tennenbaum, P. (1957). The measurement of meaning. Urbana, IL: University of Illinois Press.

Power, D., and Quigley, S. (1973). Deaf children's acquisition of the passive voice. Journal of Speech and Hearing Research, 16, 5-11.

Presnell, L. (1973) Hearing impaired children's comprehension and production of syntax in oral language. Journal of Speech and Hearing Research, 16, 12-21.

Quigley, S., and Kretchmer, R. (1982). The education of deaf children. Baltimore, MD: University Park Press.

Quigley, S., Power, D., and Steinkamp, M. (1977). The language structure of deaf children. The Volta Review, 68, 73-84.

Quigley, S., Smith, N., and Wilbur, R. (1974). Comprehension of relativized sentences by deaf students. Journal of Speech and Hearing Research, 17, 325-341.

Quigley, S., and Steinkamp, M., Power, D., and Jones, B. (1978). Test of syntactic abilities. Beaverton, Oregon: Dormac, Inc.

Ratusnik, D., Klee, T., and Ratusnik, C. (1980). Northwestern syntax screening test: A short form. Journal of Speech and Hearing Disorders, 45, 200-206.

Reynolds, L. (1955). The school adjustment of children with minimal hearing loss. Journal of Speech and Hearing Disorders, 20, 380-384.

Richgels, D. (1982). The language experience approach: A transition from oral to written language. Reading Horizons, 23, 47-53.

Russell, W., Quigley, S., and Power, D. (1976). Linguistics and deaf children. Washington, D.C.: A. G. Bell Associates.

Schallert, D., Kleinman, G., and Rubin, A. (1977). Analysis of differences between written and oral language. Urbana, IL: Central Ridge Study.

Siegel, S. (1956). Nonparametric statistics for the behavioral sciences. New York: McGraw-Hill Book Company.

Skarkis, E., and Prutting, C. (1977). Early communication: Semantic functions and communication intentions in the communication of the preschool child with impaired hearing. American Annals of the Deaf, 122, 382-392.

Smith, C., and Tager-Flusberg, H. (1980). The relationship between language comprehension and the development of metalinguistic awareness. Presented at the Fifth Annual Boston University Conference on Language Development.

Smith, C., and Tager-Flusberg, H. (1982). Metalinguistic awareness and language development. Journal of Experimental Child Psychology, 34, 449-468.

Tweney, R., Hoemann, H. and Andrews, C. (1975). Semantic organization in deaf and hearing subjects. Journal of Psycholinguistic Research, 4, 61-73.

Van Kleeck, A. (1982). The emergence of linguistic awareness: A cognitive framework. Merrill-Palmer Quarterly, 28, 237-265.

Van Kleeck, A. (1984a). Metalinguistic skills: Cutting across spoken and written language and problem-solving abilities. In G. P. Wallach and K. G. Butler (Eds.), Language learning disabilities in school-age children (pp. 128-153). Baltimore, MD: Williams & Wilkins.

Van Kleeck, A. (1984b). Assessment and intervention: Does "meta" matter? In G. P. Wallach & K. G. Butler (Eds.), Language learning disabilities in school-aged children, (pp. 179-198). Baltimore, MD: Williams & Wilkins.