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A Comparison of the Verbalization Attempts and Word Approximations Produced by Mentally Retarded Students Who Receive Training on Selected Words Using Simultaneous Sign and Speech and Training on Selected Words Using Speech Only

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A Comparison of the Verbalization Attempts and Word Approximations Produced by Mentally Retarded Students Who Receive Training on Selected Words Using Simultaneous Sign and Speech and Training on Selected Words Using Speech Only

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by

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THESIS ACCEPTANCE

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Committee

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CHAPTER ONE

Introduction

Developing communication and speech skills in nonverbal and speech limited moderately and severely mentally retarded children and adults has been a concern of speech pathologists and special educators for many years. When traditional methods of verbal language training have met with limited or no success, teachers and speech pathologists have had to seek alternative methods of communication for their nonverbal and speech limited mentally retarded students. The use of sign language has been one of the methods explored.

In a national survey by Fristoe and Lloyd (1978), it was found that special educators and speech pathologists were using manual sign with many of their nonverbal and language limited students. Thus far in the 1980's, 29 articles including research studies, reviews, and clinical reports have been published concerning the use of sign language with the mentally retarded and its effect on verbal language development. This indicates a continued interest and acceptance of the use of sign language as an alternative and augmentative method of communication for the mentally retarded. Despite its apparent popularity, the use of

sign language with the mentally retarded was criticized by some because of the lack of empirical evidence to support its use (Poulton and Algozzine,1980; Reichle, Williams, and Ryan, 1981; Hopper and Helmick, 1977; and Sisson and Barrett, 1983). In a review of research concerning manual communication and the mentally retarded, Poulton and Algozzine (1980) found that only one of ten clinical studies provided data to support the conclusions of the study. In a review by Sisson and Barrett (1983), the authors noted that the most frequent behavior reported was an increase in spontaneous verbalizations but "unfortunately, in the majority of cases, the collection of data was not sufficiently systematic to support what are merely anecdotal observations"(p. 112). Researchers are now attempting to delve deeper into how, why, and in what ways sign language affects the communication and speech skills of the mentally retarded. Aspects of sign language that have been examined in recent years have included factors affecting sign learnability, the selection of sign lexicons, and the effects of using simultaneous speech and sign on receptive and expressive language development skills. It is the last aspect of which this study is concerned.

The use of simultaneous speech and sign and its

effect on the oral language development of the moderately and severely mentally retarded has been of considerable concern to some teachers, speech pathologists, and parents. Von Tetzchner (1984) states that the most important obstacle to more extensive use of non-vocal language training to facilitate speech development is the belief held by many professionals and parents that signs may interfere with the development of speech (p.267). This belief may have developed from the view of professionals involved in the education of the deaf who argue that deaf children may prefer sign language over exerting the extra effort to learn speech. There was no available research that substantiated this belief, but there was also a limited number of studies that provided empirical evidence supporting sign language as a way to develop and increase oral language skills. Of the research examined which compared the use of verbal training with simultaneous sign and verbal training, a number of authors found that the use of sign did not inhibit or adversely effect the verbal behavior of their mentally retarded subjects, and, in general, the addition of sign language to speech was found to promote an increase in verbalizations and spoken words in their subjects(Kahn, 1981; Weller and Mahoney, 1983; Romski

and Ruder, 1984; Penner and Williams, 1982; Kotkin, Simpson, and Desanto, 1977; Reich, 1978; Van Biervliet, 1977; Konstantareas, 1984; Karlan, et.al., 1982; Ferrarese, Norton, and Whitmont, 1982; Casey, 1978; and Von Tetzchner, 1984). Statistically significant analysis of results was provided in only six of the studies. Of these six, only one study specifically addressed the effect of simultaneous speech and sign training on the articulation of targeted words by a borderline retarded and autistic boy (Ferrarese, Norton, and Whitmont, 1982). Improved articulation of targeted words was demonstrated with the use of sign language and accompanying vocalization. The authors of this study suggested further investigations of the signing effect on articulation should be considered to determine whether children of lower IQ could also benefit from this method.

Because of the limited research evidence supporting the use of sign language to develop oral language in the moderately and severely mentally retarded, it is important that further research be conducted in this area. The purpose of this study is to determine if there is a significant relationship between the use of sign language and the development of verbalization skills in speech limited moderately and

severely mentally retarded students.

Statement of the Problem

The purpose of this study is to attempt to answer the question:

Is there a significant difference in the verbalization attempts and word approximations of speech limited moderately and severely mentally retarded students when given training on selected words using simultaneous sign and speech as compared to training on selected words using speech only?

Hypothesis to be Tested

There is no significant difference in the verbalization attempts and word approximations of speech limited moderately and severely mentally retarded students when given training on selected words using simultaneous sign and speech as compared to training on selected words using speech only.

Significance of the Problem

Some teachers, speech pathologists, and parents have avoided the use of sign language with moderately and severely mentally retarded children having limited or no verbal speech ability because they believed that sign language would inhibit the development of oral language. Only a few pertinent studies have presented significant evidence to support the use of sign

language as a facilitator of speech development in the mentally retarded. There is a need for additional research data in this area so that the most effective methods for increasing communication and oral language development in speech limited moderately and severely mentally retarded students can be found and substantiated.

Assumptions and Limitations

There are two assumptions related to this study.

Assumption 1. The socio-economic background, race, and sex of the subjects would have no effect on the outcome of the study.

Assumption 2. The classroom teachers involved in the study were competent and followed the training procedures described.

There are two limitations related to this study.

Limitation 1. All the subjects of the study were from one metropolitan area.

Limitation 2. The small number of moderately and severely mentally retarded subjects used in the study may not be a representative sample of the population.

Definition of Terms

Moderately mentally retarded are those individuals with an intelligence quotient between 40 and 54 as measured by the Wechsler Intelligence Scale for

Children.

Severely mentally retarded are those individuals with an intelligence quotient between 25 and 39 as measured by the Wechsler Intelligence Scale for Children.

Verbalization attempt means that a sound/sounds is produced but the sound/sounds is not contained in the selected word that is cued.

Word Approximation means that the sound produced contains at least one or more recognizable sounds in the selected word that is cued.

Simultaneous sign and speech means that the sign for the selected word and the verbal production of the selected word are performed at the same time.

CHAPTER TWO

Review of Related Research

Research into the use of sign language as an alternative and augmentative system of communication and language development with the mentally retarded gained impetus in the 1970's and continues to be a topic of considerable interest in the 1980's. The effects of using sign language on the oral language development skills of the mentally retarded have been examined by a number of authors in the past ten years. Clinical and experimental studies, program reports, and literature reviews were examined for this study which directly pertained to the effect of sign language on the oral language development of the mentally retarded or which made implications to the effect.

Nine studies utilizing experimental designs were examined which compared the effect of using speech only with the use of simultaneous speech and sign. Statistically significant data was provided in six of the nine studies (Ferrarese, Norton, and Whitmont, 1982; Kahn, 1981; Reich, 1978; Romski, 1984; Konstantareas, 1984; and Weller and Mahoney, 1983). Results in the other three studies provided comparison of responses between conditions but did not perform any

analysis of significance(Van Biervliet, 1977; Kotkin, Simpson, and Desanto, 1977; and Penner and Williams, 1982).

In the study by Kahn(1981), an attempt was made to determine if sign language training was a more effective teaching method than oral language training. The relationship between cognitive function and the learning of speech and/or sign was also examined. Cognitive function of the subjects was based on the scores of the Uzgiris-Hunt scales of sensorimotor development. Twelve nonverbal, hearing retarded children were randomly assigned to one of three experimental groups. One group received speech training, another group received sign training paired with verbalization, and a placebo group received instruction in other areas of the curriculum. An analysis of the data revealed no significant difference between the speech group and the sign-verbal group but both of these groups learned significantly more language than the placebo group. The scores on some sections of the Uzgiris-Hunt scales were found to be highly and significantly correlated with success in learning speech and sign but need to be studied further with a larger number of subjects before the author feels any implications can be made. Kahn also

indicated that although the data was not significant between the speech group and the sign-verbal group, sign learning seems to be an effective means of learning language and facilitation of speech can occur if verbalizations are paired with sign during training.

Nine low functioning preschoolers with little or no expressive language skills were the subjects of a study done by Reich(1978) in which she investigated the effect of the use of gesture paired with speech with the use of spoken words only on the spontaneous and imitative use of targeted words. A list of 24 targeted words thought to be essential to daily communication were selected and randomly assigned to an experimental or a control list. The experimental words were presented using speech with accompanying gestures and the control words were presented using speech only. The targeted words were used often throughout the school day and the subjects were reinforced for any imitative or spontaneous attempt of the words. The study was conducted for a period of four weeks with data taken on each subject's spontaneous or imitative use of the targeted words during the fourth week only. Results indicated a significant mean difference between the experimental and control target words used both imitatively and/or spontaneously. These results

indicate that the use of gestures paired with spoken words facilitated the development of spontaneous language in the preschool retarded subjects of this study.

A study by Weller and Mahoney (1983) compared the use of oral and total communication modalities with 15 young Down's syndrome children in a home-based language intervention program over a five month period. Mothers of the children received weekly instruction on the implementation of the Environmental Language Intervention Program. Children and mothers were randomly assigned to either the experimental group using an oral presentation or the experimental group using a total communication presentation. Daily lessons were identical for both groups except that mothers in the Total Communication group presented the lessons by simultaneously speaking and signing. Assessment measures used were the Bayley Mental Development Scale, the Receptive Expressive Emergent Language Scale, the Ordinal Scales of Psychological Development, the Environmental Prelanguage Battery, and reports from the mothers of the number of words and/or signs that their children had used at least 3 times spontaneously and appropriately. Results indicated that the Total Communication group learned a greater

total vocabulary than the Oral Language group but posttest measures of cognitive ability indicated there were no significant differences between the groups in their levels of cognitive and language functioning. The authors concluded that the addition of manual signs to language training of young Down's syndrome children did not increase their rate of oral language acquisition, but also did not seem to adversely affect oral language development either. The results of this study thus provided no support of the fear that the use of manual sign training impedes the development of oral language.

Romski and Ruder (1984) did a study with 10 verbal Down's syndrome children who were functioning on Brown's early Stage 1 level. Their study was concerned with the treatment conditions of speech and speech paired with sign and their effects on oral language learning and generalization of action+object combinations. Pretest assessments indicated that none of the subjects possessed the skill of combining action+object. Also, none of the subjects had any previous exposure or instruction in manual sign. Subjects received concurrent instruction in both treatment conditions -- one using speech only instruction and one using simultaneous speech and sign.

Instruction consisted of daily 30 minute sessions for each subject. Vocabulary was individualized for each subject and 12 nouns and 12 verbs were selected for each subject. A miniature linguistic system was used to teach comprehension of the action+object combinations in both treatment conditions. Seven action+object combinations were taught. After criterion was met for both the speech treatment and speech-sign treatment, comprehension and production generalization were assessed in the treatment room and the subject's classroom. The results of the study revealed no significant difference between the two treatment conditions -- both facilitated the learning of action+object combinations equally well. Generalization differences were also found not to be significant between the treatment conditions -- limited generalization occurred across both conditions. The authors conclude that, although manual sign did not impede the generalization of the combinations taught, neither was it more effective than speech alone. It was observed in individual subjects that manual sign was either greatly beneficial or, in some cases, detrimental for particular children. Because of these individual differences observed, the authors suggest that speech-language clinicians should beware of the

general adoption or rejection of manual sign with verbal developmentally-delayed children.

The hypothesis that the simultaneous use of spoken and signed functors would be superior to spoken functors alone in facilitating acquisition and recall of 6 pronouns and 6 prepositions chosen as functors was tested in a study by Konstantareas (1984). The subjects of the study were 14 language-impaired children with varying degrees of communication and cognitive impairments. Criterion for selection as a subject was that the child have speech but that it be telegraphic. From the six pronouns and six prepositions chosen as functors, two lists, A and B, were selected along with sentences in which they were to be embedded during training. Half the subjects were randomly assigned to receive training on functors in list A or list B. The functors in list A were taught using simultaneous sign and speech while those in list B were taught through speech alone. The other half of the subjects received training on the lists in reverse. A pretest was given on all 12 sentences to assess any previous knowledge of the functors. Training was given over three sessions on three consecutive days with two sentences from the sign-word list and two from the word only list. Every sentence was trained for eight trials

per session with each trial consisting of three steps. A recall test was given on the fourth day. Answers were scored on the basis of whether they were spontaneous or cued. A reliability observer was also used to record the subject's verbal productions and 99% agreement was attained between the two raters. The findings of the study supported the hypothesis tested and provided statistical evidence of significance. The use of sign and speech training together resulted in superior spoken production of the functors for both acquisition and recall. The author concludes that as a result of these findings, the use of signs can be considered as aids to more complex speech production for those who have useful but limited speech. One explanation given for this superiority may be that signs provide extra information compared to verbal words only.

In a case study of an autistic child with borderline retardation, improved articulation was demonstrated with the use of sign language (Ferrarese, Norton, and Whitmont, 1982). The study took place over a six month period and consisted of three stages. In stage 1, a target list of words was chosen and probe 1 was taken which assessed the vocalization of the target words. In stage 2, signs for target words were taught

in one hour weekly sessions. Probe 2 data was taken of the vocalization of target words with vocalization alone and vocalization with accompanying sign. Stage 3 consisted of reinforcement of signs and vocalizations for the target words during the last three months of the study. Probe 3 was taken at the end of the final month of the study and consisted of the same assessments as in probe 2. All three probes were tape recorded and vocalizations rated according to a four point scale: 1) unintelligible, 2) poor, 3) adequate, and 4) very good. Results showed that the subject's best articulation performance improved significantly only in probe 3. At the end of training, vocalizations with accompanying signs were significantly better articulated than vocalizations alone. The results of this study indicate that articulation improvement when using sign language was both clinically and statistically significant. Since the single subject of this study was of near normal intelligence, the authors suggest that further investigations of the signing effect on articulation be undertaken with lower functioning retarded students to determine if this method can also benefit this population.

A 1977 study by Kotkin, Simpson, and Desanto

presented a multiple baseline design comparing training on the verbal labels of pictures using verbal training and simultaneous sign and verbal training. Two moderately retarded Down's syndrome girls were used as the subjects. Three daily training sessions were completed each day with one experimental picture presented in each session. The subjects were trained using the verbal only method in intervention 1 and presented with simultaneous verbal and sign cues of experimental pictures in intervention 2. A probe was also taken one week after the last data was recorded to test retention. The results showed that acquisition of the verbal labels was demonstrated more effectively with the sign-verbal presentation. The authors suggest that this could be a useful technique for learning new vocabulary. The authors also present three variables which appear pertinent to the use of simultaneous sign and verbal cues and their positive relationship to the facilitation of oral language in moderately retarded children with minimal oral language. These are: "1) signs are a static presentation which allow a child to take as long as necessary to process a single presentation, 2) signs tend to have a gesture-concept associative relationship rather than a gesture-word relationship, thus providing the child with an

additional cue, and 3) signs simultaneously paired with a verbal label provide a child with a multi-modal presentation."

In another study, Penner and Williams (1982), compared the use of signs only, verbal cues only, and simultaneous signs and verbal cues on the color naming ability of 10 severely retarded adults. The subjects were randomly assigned to one of the three training groups. Each subject received four 30 minute training sessions a week for three weeks. The training program consisted of four progressive phases (matching, imitation, receptive identification, and expressive identification) with criteria for advancement to the next phase set at 100% accuracy. Each color was introduced singly and in all four phases before another color was presented. At the end of the training period, each subject was tested on his expressive and receptive ability to identify color names. The subjects were also retested four weeks later to assess retention of the color names learned. Because of the small number of subjects in each group, tests of differences were not considered as a meaningful analysis for this study. Results indicated that the Sign Only and Verbal Only groups learned the same number of colors while the Sign-Verbal group learned

more than twice as many verbal color names than did the Verbal Only group. Retention after four weeks was found to be higher in the Sign-Verbal group than either of the other two groups. When verbal performance of the Sign-Verbal group is compared to Verbal Only subjects, it appears that sign paired with verbalization facilitates verbal learning.

The purpose of a study by Van Biervliet (1977) was to determine whether sign-object and sign-word training would result in the acquisition of word-object associations. Six male retarded residents of a hospital training center were used as the subjects. Five nonsense consonant-vowel-consonant words were used as the stimuli for the subject along with five junk objects unidentifiable by any common name and five nonsense manual signs not representing any common words in American Sign Language. The six subjects were randomly assigned into three pairs and each pair was trained to associate the nonsense stimuli differently. There were nine experimental tasks on which training occurred. These were object matching, sign imitation, object-sign production, sign-object reception, word imitation, word-sign production, sign-word production, word-object reception probe, and object-word production probe. Training was administered daily with each

subject for 15 minute sessions. All of the subjects successfully completed all nine training tasks but the number of sessions each subject required to reach criterion on each task varied greatly. Despite this difference in acquisition rates, the author concludes that the results of the final probe indicated that all of the subjects were able to associate the words and the objects correctly following the sign-object and sign-word training. He suggests that the combined use of sign and speech may be an effective means of training spoken language to some individuals.

A case study of a three year old dysphatic boy was reported by Von Tetzchner (1984). The subject's speech was essentially unintelligible. He scored around the one year level on the Reynell Developmental Language Scales and communicated predominately by pointing. The subject often had temper tantrums, especially when he could not make himself understood. The study took place over a six month period where the subject was given daily training sessions of 10-15 minute periods. The subject's parents and teachers were also taught the signs. After six months of training, the subject had gained one year on the Receptive and Expressive Scales of the Reynell. The subject's speech was easier to understand and his temper tantrums became less

frequent. The author concludes that the significant gains made in the subject's vocal language production demonstrates that signs do not interfere with speech acquisition and suggests that signs may be used in language intervention to facilitate early speech development.

There have been a number of programs reported in the literature which have employed sign language as a means of developing alternative and augmentative communication skills in the mentally retarded. Grinnell, Detamore, and Lippke (1976) describe a program of total communication with mentally handicapped students. They reported that some students who had been virtually nonverbal before the instigation of their program learned to use signs as a limited means of communication and also began pairing sounds with signs. Those students who had begun the program with some vocalization ability increased the number of sounds they were able to produce and some progressed to verbalizing whole words. Students who had begun the program with a limited verbal vocabulary showed improvement in intelligibility and began using verbal combinations of phrases and sentences. The authors feel that the use of manual sign was a key to the development of language skills in these students. In

their program with trainable and educable mentally retarded students, signing was used successfully to increase communication and language skills. Articulation of sounds was also reported to have increased noticeably.

A program involving 21 severely and profoundly retarded children was reported by Daniloff and Shafer (1981). The participants in the program had failed to make progress in communication despite previous efforts from speech-language clinicians using traditional methods. A therapy program was initiated using Amer-Ind gestures for actions and objects functional to daily needs and desires of the children. Therapy training continued throughout the school year in individual speech therapy sessions with follow-through in the classroom. The results were reported over a 12 month period. All students had made some progress in using gestures to communicate. Results indicated that 1-33 gestures were acquired in the one year period. It was also reported that more than half of the participants in the program showed an increase in vocalizations and/or verbalizations along with the use of gestures.

An article by Harris and Vanderheiden (1977) explored some basic considerations and initial steps

involved in developing augmentative non-vocal communication programs for nonverbal handicapped children. The authors discussed the use of non-vocal techniques to augment or supplement communication rather than as an alternative to speech. They also suggested that the role of non-vocal techniques, such as sign language, be to develop communication skills and facilitate the language and speech development process of a child who is currently unable to communicate effectively through speech.

The use of manual signing as a language system and speech initiator for nonverbal severely handicapped children was also reported in 1977 by Stremel-Campbell, Cantrell, and Halle. They initiated a sign program with nine residents of a state hospital and training center. After the initiation of the sign program, students began using many of their signs within the classroom and six of the nine began using some verbal approximations along with their signs. The authors found that the use of sign language seemed to facilitate the initiation of speech. They proposed a possible explanation for this effect through the generalization of the motor imitation response from sign training transferring to imitation of the vocal response when a sign is paired with the spoken word.

The Makaton Vocabulary was described in an article by Walker and Armfield (1981). This program is widely used in the United Kingdom and its use has spread to other countries as well. The Makaton approach utilizes sign language and the acquisition of a core vocabulary through a series of developmental stages. The vocabulary has been used successfully with a variety of mentally handicapped children and adults, the autistic, normal young deaf children, children with severe articulation or speech problems, and normal adults with acquired communication problems. The authors report that in addition to the development of concepts and language, there has also been other positive results reported. These have included increases in eye contact, attending, sociability, vocalizations, and expressive speech.

Kriegsman, Gallaher, and Meyers (1982) present a basic structure for selecting appropriate candidates for sign programs and describe intervention strategies. They believe that, unless a child has a major structural defect in the actual speech mechanism, sign should be considered as a possible means to facilitate speech. On the basis of their own clinical experiences, they feel that sign production should be considered along with direct training on verbal

production.

Reichle and Karlan (1985) present support for the use of nonvocal augmentative communication systems. They cite that one interesting result of the use of sign language and communication board programs has been the apparent facilitating effect on the vocal modality. The authors noted their review of numerous investigations reporting a positive effect of signing upon the frequency and quality of verbal language production but found that most of these reported effects were anecdotal. In general, the authors found that the conclusions of many investigators has been that the use of sign language has facilitated the production of speech in many instances and that there have been no adverse effects shown on the acquisition of verbal communication from the learners' exposure to and training in the use of sign.

In a review of research in 1976, Kotkin and Simpson examined studies using sign language with speech to facilitate the development of receptive and expressive language skills in nonverbal children. On the basis of their examination, they conclude that the purpose of using sign language with nonverbal children is to give then a functional communication system as a foundation for language development. They see the

simultaneous pairing of speech and sign as a multisensory approach that appears to aid oral language development in many nonverbal children.

Hopper and Helmick (1977) discuss the use of training severely handicapped in nonspeech communication. They found that sign language use with this verbally deficient population seems to be accepted to a greater degree than it has been validated by empirical research. Limited research indicates that sign language can facilitate rather than inhibit verbalization. The authors note a study by Oxman and his colleagues which employed a pretest and posttest measure of articulation. Results showed improvement in articulation and increases in verbalizations after students had learned sign language. The authors found that these researchers and the research of others gives support for the use of sign and speech instruction because results of the studies showed that subjects became more proficient in articulation, comprehension of speech, and vocalizations when this method was employed. The authors caution, however, that research efforts, in most cases, lack experimental rigor and control and should be interpreted carefully.

A review of 19 articles was published in 1980 by Poulton and Algozzine which evaluated the use of manual

sign systems with the mentally retarded. They found much the same results as the previous authors -- that the use of manual communication systems with the mentally retarded is guided by little scientific data. From the studies reviewed, the authors conclude that retarded subjects are capable of attaining comprehension and production of a limited number of signs, that simultaneous sign and verbalization appear to facilitate comprehension of new vocabulary words, and that the literature specifically gives support to the notion that the use of manual sign can facilitate word-object associations.

A paper by Benson Schaeffer (1980) considers data available on the use of signed speech by nonverbal retarded and autistic children and on the unsigned speech that grows out of it. He also discusses possible explanations for the success of signed speech and outlines suggestions for intervention and research. He concludes that nonverbal mentally handicapped children are capable of mastering communication using signed speech and some are capable of progressing to verbal speech. He feels the signed speech approach allows new language opportunities for nonverbal children, namely the use of spontaneous signed speech and the development of spontaneous vocal language.

Clinical implications are derived from existing data as applied to autistic children and generalized to other severely handicapped nonverbal populations in an article by Nancy Creekmore (1982). The author found that the studies reviewed lead to the conclusion that total communication is effective as a language training strategy because the use of sign language provides multisensory input which, in turn, provides a broad base for success and learning in these handicapped populations.

The use of sign language and its effect on oral language development of the mentally retarded has been explored by a number of investigators. Specific research into the effects of the use of sign language on articulation development has been limited though many authors have made anecdotal observations of this effect. In order to substantiate the use of sign language with the mentally retarded as a successful learning strategy for communication and language development, more research is needed which specifically addresses the development of verbalization and articulation skills using this method.

CHAPTER THREE

Design of the Study

A single subject design was selected for this study which compared the effects of two treatment conditions on the verbalization attempts and word approximations of severely and moderately retarded subjects. Six speech limited mentally retarded students were the subjects of the study. All subjects were enrolled in classes for the mentally retarded in a large metropolitan school district. Three of the subjects attended a class for trainable mentally retarded and physically handicapped primary students, two subjects were in a classroom for primary level severely retarded students, and one subject was in a class for severely retarded intermediate level students. Subjects were selected according to the following criteria: 1) functioning in the severe or moderate range of mental retardation, 2) presently limited in speech to a few sounds or words, and 3) having a minimum language age of 18 months according to test results provided by the speech pathologist. See Table 1 for chronological age, receptive language age, and expressive language age listings for each subject. The primary handicapping conditions of each subject are presented in Table 2.

Table 1

Ages of Subjects at Beginning of Training

		Language Age*	
Subject	Chronological Age	Receptive	Expressive
1	8 yrs 1 mo	2 yrs 10 mos	1 yr 10 mos
2	7 yrs 11 mos	2 yrs 1 mo	1 yr 10 mos
3	6 yrs 6 mos	1 yr 7 mos	1 yr 6 mos
4	6 yrs 3 mos	2 yrs 8 mos	2 yrs
5	8 yrs 4 mos	3 yrs 4 mos	3 yrs 4 mos**
6	10 yrs 10 mos	2 yrs 11 mos	1 yr 11 mos

*According to the Reynell Language Development Scale

**Subject achieved this score using Rebus symbols

Table 2

Primary Handicapping Conditions of Subjects

Subject	Handicapping Conditions
1	Cerebral Palsy, Moderate Retardation*
2	Cerebral Palsy, Moderate Retardation
3	Severe Retardation
4	Down's Syndrome, Severe Retardation
5	Cerebral Palsy, Moderate Retardation
6	Severe Retardation

*Subject 1 also has a mild to moderate hearing loss with bilateral hearing aids.

Three teachers were involved in the study -- the author of this paper and two others. A speech pathologist for the school district's mental retardation programs also participated by providing the language age data for each subject and by administering the articulation pretest and posttest measure to each subject.

Following the selection of the subjects by each teacher, an articulation pretest was given to each subject by the speech pathologist. The articulation test was modified from the Fisher-Logemann Test of Articulation Competence (1971). Only single consonant sounds were chosen as test items and the corresponding pictures from the Fisher-Logemann Picture Test were used as the stimuli for the sound productions. The tested sounds were also ranked according to the Sanders Developmental Norms so that the earliest appearing deficit sounds could be selected for treatment in the study. A copy of the articulation test form used in the study is included in Appendix A.

From the pretest results, each teacher, along with the speech pathologist, selected the deficit sounds to be targeted for each subject in their classroom. Sounds were selected for each subject according to the earliest appearing deficit sounds as determined by the

developmental ranking of the Sanders Norms. After the selection of the deficit sounds was made, teachers were instructed to choose two words for each initial, middle, and ending sound they had targeted for their subject/subjects for treatment. The words were selected from the Makaton Vocabulary stage/stages with which the subject was familiar and according to the functionality of the selected words to the subject. The Makaton Vocabulary was the chosen lexicon for word selection because of its widespread use in the school district's mental retardation programs. It is a developmentall core vocabulary taught with signs and speech. Pictures depicting the selected words for each subject were compiled to use during the formal training sessions. Targeted sounds and accompanying words were randomly assigned to one of the two training treatments. In Treatment 1, words were to be presented using simultaneous speech and sign. Signs used were those illustrated in the U.S. Makaton Vocabulary Development Project Sign Dictionary and Signing Exact English. Training of words in Treatment 2 were to be presented using speech only. Teachers were asked to be consistent with their treatment of selected words as the words occurred throughout the day. Therefore, if a selected word such as "milk" was assigned to Treatment

1, both sign and speech would be presented for the word "milk" as it occurred at lunch time.

Subjects received training from their respective teachers on the selected words in Treatment 1 and Treatment 2 daily for a period of eight weeks. Each training session was approximately 15 minutes in duration. Treatment 1 training for each selected word consisted of four steps: 1) The attention of the subject was gained by saying "Look"; 2) A picture for the word was presented; 3) The name of the pictured object/action was simultaneously signed and spoken; and 4) The subject was cued "Now you say it". Training of Treatment 2 words were presented following the same four steps except that no sign accompanied the spoken word in step 3.

Five trials were recorded for each targeted word in Treatment 1 and each targeted word in Treatment 2 according to the subject's verbalization attempts and word approximations. A (+) in the Verbalization Attempts column on the data collection form indicated that some sound was produced but no sound/sounds were made from the targeted word. A (-) in the Verbalization Attempts column meant that no sound had been produced after the presentation of the targeted word. A (+) in the Word Approximation column indicated

that one or more recognizable sounds from the targeted word were produced. There was no need for a (-) in the Word Approximation column because, if the sound produced contained no sound or sounds from the targeted word, it was recorded as a (+) in the Verbalization Attempts column. See Appendix B for the data collection sheet used.

Upon completion of the eight weeks of training, the speech pathologist administered the articulation test as a posttest measure. Completed data sheets were collected for each subject and the results tallied for the targeted words in both treatment conditions according to responses in the Verbalization Attempts and Word Approximation columns. The difference in the responses to the targeted words in Treatment 1 and Treatment 2 for all subjects was then analyzed using a Median Test.

CHAPTER FOUR

Results of the Study

The results of the tabulated responses for each subject are presented in Figures 1-3 for word approximations, correct verbalization attempts, and incorrect verbalization attempts produced during training on selected words presented using simultaneous sign and speech and on selected words presented using speech only. The data is presented in percents because each of the subjects did not receive training on the same number of selected words and also varied on the number of training days due to absences.

As seen in Figure 1, subjects 1 and 2 elicited more word approximations of the selected words in Treatment 1 using simultaneous sign and speech than of selected words in Treatment 2 using speech only. Subject 6 elicited word approximations of all words in both treatments. A greater percentage of selected words were approximated in the Treatment 2 presentation of speech only for subjects 3, 4, and 5.

Figure 2 shows the percentage of correct verbalization attempts made. Subjects 1, 2, and 4 produced more verbalization attempts of selected words in the speech only presentation. A greater percent of verbalization attempts was made on the selected words

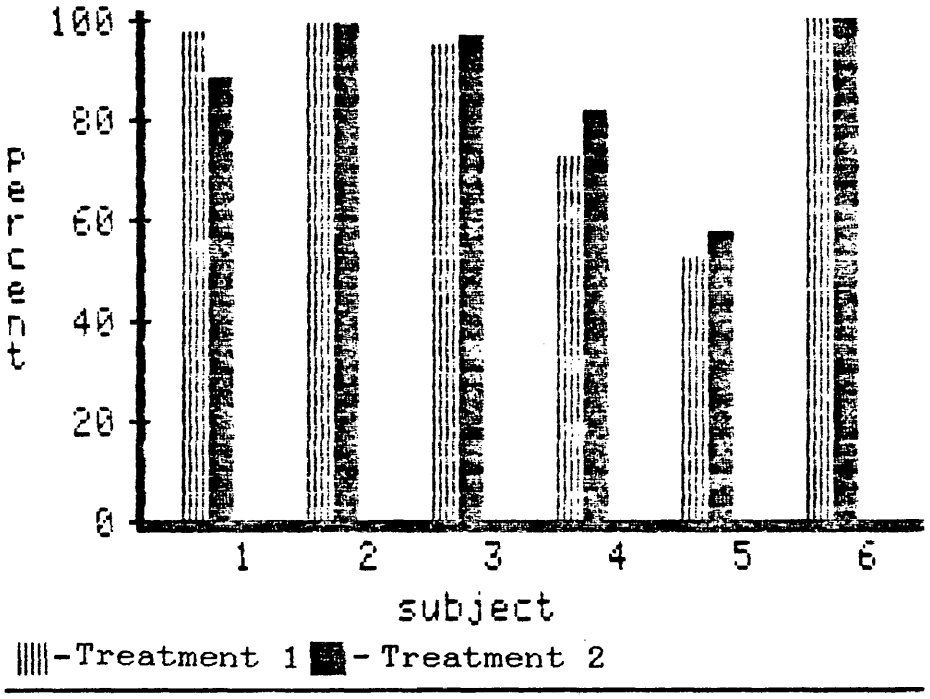

Figure 1. Bar graph showing percent scores for each subject's word approximations of selected words in Treatment 1 and of selected words in Treatment 2.

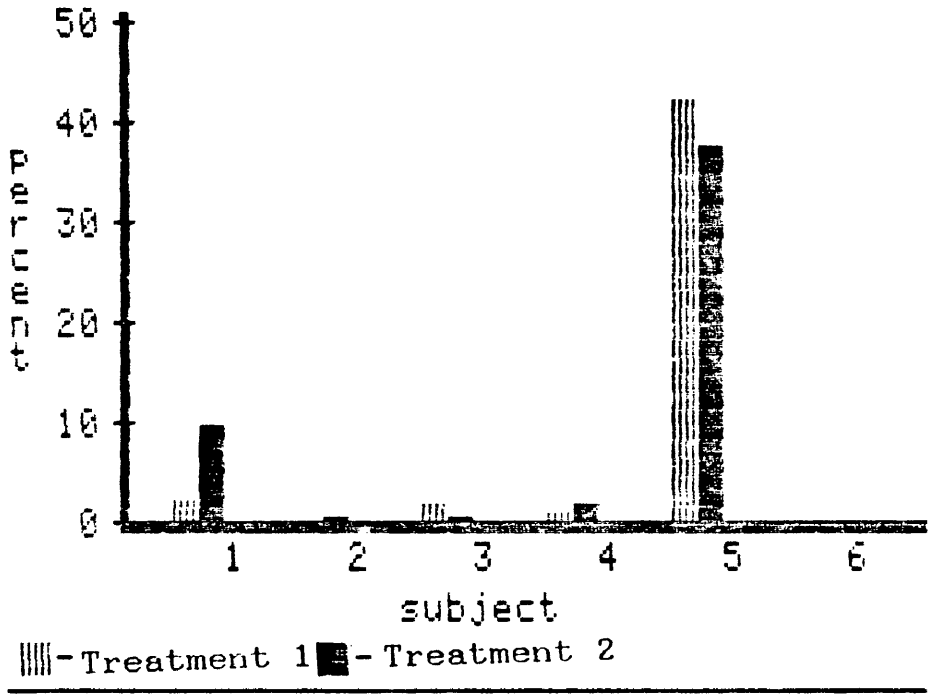

Figure 2. Bar graph showing percent scores for each subject's correct verbalization attempt of selected words in Treatment 1 and of selected words in Treatment 2.

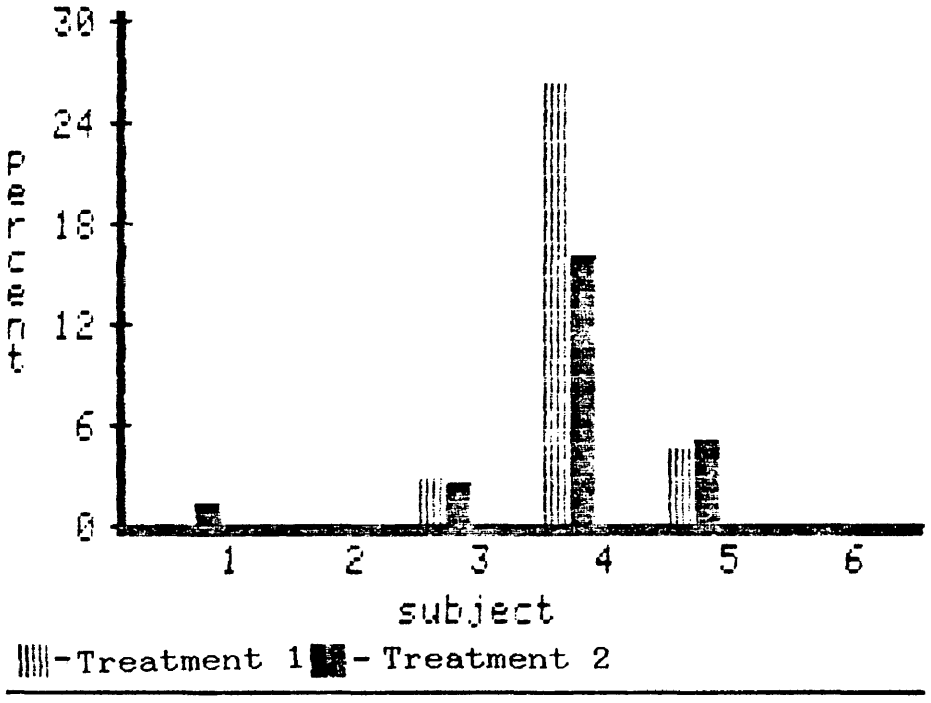

Figure 3. Bar graph showing the percent scores for each subject's incorrect verbalization attempts of selected words in Treatment 1 and of selected words in Treatment 2.

using simultaneous sign and speech by subjects 3 and 5.

The percentage of incorrect verbalization attempts are presented in Figure 3. A greater percent of incorrect verbalization attempts was seen in subjects 1, 2, and 5 for the selected words presented with speech only. Subjects 3 and 4 showed a greater percentage of incorrect verbalization attempts on the selected words in Treatment 1 presented with simultaneous sign and speech.

To test the hypothesis that there is no significant difference in the word approximations and verbalization attempts of speech limited moderately and severely retarded students when given training on selected words using simultaneous sign and speech as compared to training on selected words using speech only, the tallied scores in percents were combined for word approximations and verbalization attempts of each subject for both training treatments. The Median test was used to analyze the difference in Treatment 1 word responses and Treatment 2 word responses for significance. The nonparametric median test was the chosen statistical measure applied because of the nonequivalence of the selected words in the two treatments. Table 3 shows the percent scores and rank of the word approximations and verbalization attempts

Table 3

Word Approximation and Verbalization Attempt Scores*

Treatment 1			Treatment 2		
Subject	Score	Rank	Subject	Score	Rank
1	99.9	9	1	98.7	7
2	100	10	2	99.8	8
3	97.2	5	3	97.4	6
4	73.6	1	4	83.8	2
5	95.5	4	5	95	3
6	100	11	6	100	12

Median = 97.3

*Scores presented in percents

for both treatments and the resulting combined median. The number of scores above and below the median are shown in Table 4. The resulting chi square value of the 2x2 table was .3429. With one degree of freedom, a chi square value must equal or exceed the critical chi square value of 3.841 to be significant at the .05 level. Since the value achieved of .3429 is below the critical value, the null hypothesis is retained. No significant difference was shown between word approximations and verbalization attempts of selected words presented using simultaneous sign and speech as compared to word approximations and verbalization attempts of selected words presented using speech only.

Additional Results

Articulation posttest results showed improvement in three of the six subjects for deficit sounds trained through selected words in Treatment 1 and selected words trained in Treatment 2. These results, though not part of the hypothesis tested, are presented for additional information. Table 5 shows the number of deficit sounds targeted for training and the number of correctly articulated targeted deficit sounds in the posttest for the two training treatments. As seen in Table 5, no improvement was shown in the articulation of targeted deficit sounds trained in either treatment

Table 4

Median Test 2x2 Contingency Table

	Treatment 1	Treatment 2
Scores above median	3	4
Scores below median	3	2

Chi square = .3429

Table 5

Articulation Posttest Results

Subjects	# of sounds targeted	# of sounds improved	
		Treatment 1	Treatment 2
1	12	5	2
2	6	1	2
3	8	2	1
4	4	0	0
5	4	0	0
6	6	0	0

for subjects 4, 5, and 6. Subject 1 showed the greatest number of targeted sounds correctly articulated on the posttest -- five sounds trained in Treatment 1 selected words and two sounds trained in the selected words of treatment 2. Subject 2 correctly articulated one targeted sound trained in Treatment 1 words and two targeted sounds trained in Treatment 2 selected words. Two targeted sounds trained in Treatment 1 selected words were correctly articulated by subject 3 and one sound trained in Treatment 2 selected words was correctly articulated on the posttest. These results show that three of the mentally retarded subjects improved articulation of sounds after receiving training on the selected words of both treatment conditions.

CHAPTER FIVE

Summary and Conclusions

Statement of the Problem

The purpose of this study was to attempt to answer the question: Is there a significant difference in the verbalization attempts and word approximations of speech limited moderately and severely mentally retarded students when given training on selected words using simultaneous sign and speech as compared to training on selected words using speech only?

Description of Procedures Used

A single subject design was selected for this study. Six speech limited mentally retarded students were the subjects. Three of the subjects were classified as moderately retarded and three were severely retarded. Subjects attended classes for the mentally retarded in a large metropolitan school district. Criteria for subject selection stated that subjects: 1) be functioning in the severe or moderate range of mental retardation, 2) be presently limited in speech to a few sounds or words, and 3) have a minimum language age of 18 months according to test results provided by the speech pathologist.

Three teachers carried out training treatments with subjects in their respective classrooms. A speech

pathologist for the school district's mental retardation programs also participated by providing the language age information and by administering the articulation pretest and posttest to each subject.

From the results of the articulation pretest, targeted deficit sounds were selected by the teacher and speech pathologist according to the earliest appearing deficit sounds as determined by the developmental ranking of the Sanders Norms. Teachers then chose two words for each sound targeted for treatment. The selected words were randomly assigned to one of the two training treatments. Treatment 1 words were presented using simultaneous sign and speech. Treatment 2 selected words were presented using speech only.

Subjects received training daily on the selected words in both treatments for a period of eight weeks with the exception of subject 5 who moved from the school district after four weeks of training. Training of selected words in both treatments consisted of four steps for the presentation of each selected word. Five trials were recorded for each word in Treatment 1 and each word in Treatment 2 according to the subject's verbalization attempts and word approximations.

Upon completion of the eight weeks of training,

the articulation posttest was administered by the speech pathologist. The data sheets for each subject were collected and the results tallied for the selected words in both treatment conditions. The difference in the word approximation and verbalization attempt responses of selected words in Treatment 1 and Treatment 2 for all subjects was then analyzed using the median test. The resulting chi square value using a 2x2 table was .3429. This value was not significant at the .05 level. Articulation posttest results were also reported and increases in the articulation of deficit sounds noted for three of the subjects.

Principal Findings and Conclusions

The difference in Treatment 1 word responses and Treatment 2 word responses was not found to be statistically significant. Thus, the null hypothesis is retained. The combined responses of the six subjects of the study showed no significant difference in the number of word approximations and verbalization attempts produced after the presentation of the selected words using simultaneous sign and speech and the presentation of selected words using speech only. It should be noted that, though the difference was not found to be statistically significant using the combined scores of the subjects, individual subject

differences in responses under both treatments should be examined. Comparing the percent scores of each subject's total word approximations and verbalization attempts, a difference of 10 percentage points was noted in only one subject. Subject 4 produced 10.2 percent more word approximations and verbalization attempts of selected words in the speech only treatment. This difference could be the result of the selected words chosen. In Treatment 1 using simultaneous sign and speech, subject 4 almost consistently gave a sign response to one word with no verbalization attempt. The word "ice cream" comprised 90% of the total number of incorrect verbalization attempts recorded for subject 4's responses to Treatment 1 selected words. All other subjects showed a difference of less than 1.5 percentage points between responses to selected words in the two treatment conditions. Subjects 1, 2, and 5 showed slightly higher percentages of verbalization attempts and word approximations of selected words in Treatment 1 using simultaneous sign and speech. Subject 3 was slightly higher (.2%) in the word approximation and verbalization responses of Treatment 2 words. Subject 6 produced word approximations of 100% of the selected words in both treatments. These individual comparisons

show that, for the majority of the subjects, both training treatments were successful in promoting verbalizations and approximations of selected words with a slightly greater number of word approximations and verbalization attempts produced on words presented using simultaneous sign and speech by three of the six subjects who participated in the study.

When examining these results, the nonequivalence of the targeted sounds and words between treatments should be considered. The sounds and selected words trained in either treatment could have been phonologically easier or more difficult to produce. A method for evaluating the phonological equivalence of sounds and words needs to be determined so that further research can be conducted which compares the presentation of simultaneous sign and speech and the presentation of speech only on equivalent matched pairs of words.

The posttest articulation results indicate that daily training of selected words may produce enough phonological input to be generalized to sound production in other words such as those on the posttest. This implies that daily articulation training on selected words may be an effective technique in developing the articulation skills of

speech limited moderately and severely retarded students. Further research is warranted to determine the effectiveness of this technique.

The overall findings of this study provides evidence that the verbalization attempts and word approximation responses of the speech limited moderately and severely retarded subjects of this study were not hindered by the simultaneous presentation of sign with speech. The suggestion that the use of sign inhibits speech production is not supported by the results of this study. It is recommended that the use of simultaneous sign and speech continue to be explored as a method of verbal language development with the moderately and severely mentally retarded and further research be conducted in this area.

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Appendix A

ARTICULATION TEST

Subject's First Name: _____

Birthdate: _____ Language Age: _____

		Pretest Date:			Posttest Date:		
Card #	Sound	Initial	Middle	Ending	Initial	Middle	Ending
1	p (3)						
2	b (3)						
4	w (3)						
5	m (3)						
6	f (4)						
7	v (8)						
10	t (6)						
11	d (4)						
12	l (6)						
13	n (3)						
14	s (8)						
15	z (8)						
19	j (7)						
20	y (4)						
21	r (6)						
22	k (4)						
23	g (4)						
25	h (3)						

* Number encircled indicates the developmental age at which 90% of all children customarily produce the sound according to the Sanders Developmental Norms.

This articulation test and materials were adapted from the Fisher-Logemann Test of Articulation Competence.

Appendix B

NAME_____

Research Committe: Makaton Communication design Project
P.O. Box 3121, Omaha, NE 68131 VERBALIZATION

RECORD SHEET

Targeted Sounds:_____

Date	Targeted sound	Targeted word	Verbalization attempted	Word approximated	