THE EFFECTS OF REVISED LANGUAGE ON THE PERFORMANCE OF NINE TO FOURTEEN YEAR OLD DEAF STUDENTS ON THE STANFORD ACHIEVEMENT TEST

THESIS

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Abstract

The purpose of this study was to investigate the effects which language revisions had on the performance of 9 to 14 year old deaf students with regard to specific subtests of the Stanford Achievement Test. An experimental design was used for the study. The sample consisted of 31 severely or profoundly deaf students, ranging in age from 9 to 14 years, who were enrolled at a residential school for the deaf. The subjects varied in grade level, intelligence, socioeconomic background, cause of hearing loss, receptive and expressive language capability and age at which formal education began. For the purposes of this study the subjects were divided into two groups. One group of students was used to examine the effects of language revisions on the Arithmetic subtest of the Stanford Achievement Test. The other group was used to examine the effects of language revisions on the Science/Social Studies Concepts subtest of the Stanford Achievement Test.

For the first testing situation all students were given several subtests of the Stanford Achievement Test during the annual schoolwide testing program. In the second testing situation the students were given an alternate form of either the Arithmetic subtest of the Primary I Battery Stanford Achievement Test or the Science/Social Studies Concept subtest of the Primary II Battery Stanford Achievement Test. In the second testing situation the subtests used had language revisions which were made by the researcher.

The instrument used for the first test situation was the published version of the *Stanford Achievement Test*, Form X. For the second testing situation, the researcher revised the language on the Primary I Battery Arithmetic subtest and the Primary II Battery Science/Social Studies Concepts subtest of the *Stanford Achievement Test*, Form W.

In both testing situations the directions in the administration manual were to be followed. The questions on both the Arithmetic subtest and the Science/Social Studies Concepts subtest were to be read to the students. Some adaptations were made to meet the needs of deaf students. For example, time limits were extended on subtests which were presented orally to allow for use of the Rochester Method. Also tests presented using the Rochester Method were accompanied by a script which the students could refer to in addition to the oral presentation.

The directions were followed with the group using the Arithmetic subtest. In both testing situations the questions were read to the students using the Rochester Method. The group using the Science/Social Studies Concepts subtest used the same procedure in both testing situations, but directions from the administration manual were not followed. The questions were not read to the students. Students were only given a script from which to read the questions.

A correlated *t* test was used to analyze the data at the .05 level of significance. The results indicated that revising the language on the Science/Social Studies Concepts subtest did not significantly affect the mean raw score when compared with the mean raw score on the published version of that subtest. Students did not score significantly higher on the revised version as compared with the published version of the Science/Social Studies Concepts subtest.

However, the revisions made to the Arithmetic subtest did significantly affect the mean raw score when compared with the mean raw score on the published version of that subtest. Students scored significantly higher on the revised version than on the published version of the Arithmetic subtest.

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Chapter I

Statement of the Problem

Purpose

The purpose of this study was to investigate the effects language revisions had on deaf students' performance on selected sections of the Stanford Achievement Test.

Need for the Study

The problem of measuring what a student knows is a complex one which is further complicated by a student's deafness.

Achievement tests, designed to measure the academic accomplishments of students, are based on the public school curriculum and use the English language as a medium for questioning. Thus, the achievement tests currently on the market are ineffectual for measuring a deaf individual's academic attainment.

Curriculum in schools for the deaf differs markedly from the curriculum of public schools. Although deaf children are taught science, social studies and arithmetic concepts, they spend a great deal of time learning the basic language skills that most two or three year old hearing children acquire from listening to siblings and adults. Considerable emphasis, especially in the early years, is placed on language development. Since a deaf child does not hear English syntax and vocabulary, as do his hearing peers, these aspects of language must be taught early in his school experience and continue throughout his entire education. Despite the emphasis placed on language, few prelingually deaf individuals attain full competence in English (Charrow & Wilbur, 1975).

The teaching of developmental speech, speech reading and auditory training are important to the deaf child, but are not a part of curriculum for hearing students, and therefore are not tested by achievement tests (Furth, 1973). The deaf child is faced with the dilemma of having acquired considerable knowledge which generally is not tested by achievement tests.

It is difficult for the deaf child to demonstrate the knowledge he has acquired because he does not understand the standard English language used to question him. Prelingually deaf children with severe to profound hearing losses are seriously deficient in language skills. Studies prior to the mid 1960's were concerned with the quantity of language a deaf child possessed (Swisher, 1976). Researchers were interested in how many verbs a child knew or the length of his sentences. More recent research is concerned with how the deaf child develops language. Some researchers have found that deaf children learn language in the same order as hearing children, but at a slower rate (Green, 1974; Swisher, 1976). Other researchers support the argument that deaf children have a different framework, learn language in a different order, than do hearing students (Furth, 1973).

Whether language development deviates because it is learned in a different order or because it developed at a slower rate, the important factor is that the language of a deaf child is different from that of a hearing child. The deaf child has a smaller vocabulary and is unable to understand many complex syntactic constructions which a much younger hearing child understands with ease.

Despite these differences, the same tests are used to measure the academic accomplishments of deaf students and hearing students. Although the language on the Primary I and Primary II Batteries of the Stanford Achievement Tests is understood by second and third grade hearing students, it is well above the language levels of many older deaf students being tested by those batteries.

Many of the concepts being tested on the science, social studies and arithmetic subtests are in the realm of knowledge of the deaf students being tested, but because of inability to understand the questions, these students are unable to answer correctly. Science, social studies and arithmetic concepts are taught to the children using language structures they understand. It seems reasonable to test deaf students with these same structures.

If educators want a true measurement of what deaf students know, it is necessary to present testing material in a form which can be understood by them.

Definition of Terms

Several definitions of terms are important to this study. They are as follows:

Prelingually deaf individual is one who became deaf prior to development of natural language.

Speech reading is the ability to understand what is said by identifying words on the lips of the speaker.

Auditory training is teaching an individual to use his residual hearing to the greatest possible extent.

Severe to profound hearing loss is one in which the pure tone average in the better ear is 82 dB or greater.

Rochester Method is a communication method involving the use of speech, fingerspelling, speechreading and auditory training.

Revised version refers to the Stanford Achievement Test (Form W) Primary I Battery Arithmetic subtest and Primary II Battery Science/ Social Studies Concepts subtest with language revisions made by the researcher.

Limitations of the Study

An experimental design was used to compare the performance of deaf students in two different testing situations. Involved in the study were 31 severely to profoundly deaf students, ranging in age from 9 to 14 years. In the first testing situation, the standard, published version of the Stanford Achievement Test was administered to all subjects. The second testing situation, six weeks later, involved the use of a revised version of an alternate form of the Standard Achievement Test. The same procedure used in the first testing situation was used with the revised version of the test.

A correlated *t* test was used to compare the scores, on pre-selected subtests, at the .05 level of significance.

The sample consisted of 31 nine to fourteen year old students in one residential school for the deaf in New York State, who used the Rochester Method in their educational setting.

The revisions were made solely on the basis of the researcher's experience.

The Science/Social Studies Concepts subtest of the Primary II Battery was not administered using Rochester Method as instructed but was read from a script by the students.

The Primary I Battery and Primary II Battery of the Stanford Achievement Test were exclusively used as the basis of the study.

Summary

Evaluation is essential in any educational program. The tool which is used to evaluate students must be written within the realm of their understanding and must test materials taught in their curriculum. The achievement tests on the market do not adequately test the acquired skills and knowledges of the deaf students. These tests are inadequate because they do not use language which can be understood by the deaf students using them. Therefore, even if the student understands the concepts being tested, it may not be evident from the test results.

Chapter II

Review of the Literature

Purpose

The purpose of this study was to examine the results of language revisions, on the Stanford Achievement Test, on the performance of 9-14 year old deaf students. This investigation involved surveying the following three areas of research:

Language development of the deaf

The cognitive ability of the deaf

Achievement tests as measurement tools.

Language Development of the Deaf

The task of defining deafness often focuses on the level of an individual's hearing. Although numerical units provide specific, definitive limits, very important descriptive aspects of the handicap are overlooked in a strictly numerical definition. One of the most debilitating aspects of deafness is its effect on language development. A primary determinant of the extent that deafness affects language is the age of onset of deafness. Those individuals who become deaf after natural language develops have a considerable advantage over those who are born deaf (Brannon, 1966). Language development for congenitally and prelingually deaf individuals is completely a learned process. Whereas, for the normal hearing individual or the postlingually deaf individual, language is an imitative process. The language deficiency of congenitally and prelingually deaf individuals is of primary concern because of the global effect of language upon all aspects of life. (For the purposes of this paper the term deaf will be used to refer to those individuals who are congenitally or prelingually deaf.)

There is evidence in any number of research studies, supporting the fact that the language of deaf individuals is significantly different from the language of normally hearing individuals (Brannon, 1966; Goda, 1959; Quigley, 1977). However, the types of language differences which are identified vary among the researchers. In some cases the researcher's emphasis was on comparing the quantity of language produced by the two groups (Goda, 1959). Others examined the quality of the language being produced by each group and the types of errors being made (Brannon, 1966). Still others looked at the order of development of various structures of language (Brown, 1973; Quigley, Smith, & Wilbur, 1975). A closer examination of these differences will clarify the extent to which language is a handicap for the deaf individual.

Studies comparing the quantity of language output of deaf individuals and hearing individuals were common prior to 1960. Quantity of output was the most logical place to begin studying language differences since that is the most obvious difference between the language of deaf and hearing individuals. As might be expected, in the early studies deaf individuals were found to be significantly lower than hearing individuals in total output of words (Goda, 1959). Although Goda's findings regarding total output of words were elementary, they established a definitive difference between the language of deaf individuals and hearing individuals, and provided the basis for further study.

The next logical step, after examining total output, was to look at the quality of the output. Studying deaf students' facility with both content words and function words MacGinitie (1964) found that, unlike their hearing peers, deaf students were not able to complete sentences requiring content words with any higher rate of success than they were sentences requiring function words. The hearing students were able to use the language context to assist them in choosing correct content words. However, language context is of little help with function words. Thus, the hearing students performed poorly on sentences requiring function words. Since the deaf students did equally poorly with sentences requiring function and content words, it would seem that there was little use of language context clues by the deaf students, even when it was appropriate and helpful.

The quality of language used by the deaf was also studied in terms of structural coherence. Brannon's (1966) study focused on the effects of hearing loss, not only in relation to quantity but also quality of language. It is not only important that deaf students use language, but that they use it correctly and are understood by others. Brannon found a high correlation between hearing loss and structural accuracy. By comparing utterances of hearing students, hard of hearing students, and deaf students Brannon found that general language retardation was evident among all of the deaf and hard of hearing subjects, but the extent of language retardation was greater among the deaf than among the hard of hearing students.

Language differences among deaf and hearing individuals can be viewed from another perspective--development. The question has been raised as to whether deaf children acquire language in a different order than hearing children do, or in the same order but at a different rate. Recent studies (Power & Quigley, 1973; Quigley et al., 1975; Russell, Quigley, & Power, 1976) have produced evidence that deaf children acquire language structures in much the same order as hearing children do, but at a much slower rate. For example, most hearing students have mastered the basic aspects of the phrase structure rules governing their language by the time they have completed first or second grade (Menyuk, 1969). Whereas deaf students may not have mastered all aspects of phrase structure rules by the age of eighteen. Phrase structure rules define the grammar of language and include such complex structures as passive voice, relativization, and complementation.

The hearing child acquires these rules naturally by listening to peers and family communicate. The deaf child, who does not hear peers and family communicate, must acquire these rules through direct teaching and thus their mastery is at a much slower rate.

The ten year old deaf student has generally developed the most general phrase structure rules, but has great difficulty in learning their more subtle manifestations in surface structure. The very simplest phrase structure rule which states that a sentence consists of a noun phrase and a verb phrase is generally mastered by deaf children by the age of ten (Russell et al., 1976). In leading to the development of this rule the same type of omissions were evident in the development of hearing and deaf children (Gruber, 1967; Taylor, 1969). Both groups substituted similarly to form "sentences." For example, in attempting to develop a sentence consisting of a noun phrase and a verb phrase, both groups combined a noun phrase and a locative, a noun phrase and an adjective and two noun phrases as developmental stages leading to the final phrase structure rule. With the hearing child the development occurs at about age two. For deaf children this stage of development generally does not occur until age four or five (Russell et al., 1976).

Deaf students have a great deal of difficulty acquiring the standard rules of English usage for expanding noun phrases and verb phrases (Russell et al., 1976). However the deviations from standard English evident during the developmental stages do not seem to occur randomly. In fact the consistency of syntactic deviations indicates an alternate set of deviant rules, peculiar to the language of the deaf, co-existing with the standard rules of English (Quigley, Wilbur, & Montanelli, 1974).

Quigley, in cooperation with others, and in various studies, has found that regardless of the method of language acquisition, development of several fairly complex structures of language is similar for deaf and hearing students (Quigley et al., 1975; Quigley, Wilbur & Montanelli, 1974).

Question formation, a very difficult structure for the deaf to master, and one which is not completely mastered by some even by age eighteen, is a good example of the parallel of development between deaf and hearing students. By comparing the study by Quigley, Wilbur, and Montanelli (1974), with deaf subjects, with the studies by Brown and Hanlon (1971) and Klima and Bellugi-Klima (1966) with hearing subjects, it was found that the same stages of development were identified for both the deaf and hearing students. The comprehension of yes-no questions occurred before the comprehension of wh-questions and tag questions in both groups. Likewise recognition of grammaticality was easier for both groups with yes-no questions than it was with wh-questions. Thus, the major difference in acquisition of question formation between deaf and hearing students seems to be one of rate rather than sequence of acquisition (Russell et al., 1976).

Throughout the literature the same findings occurred repeatedly--the language of deaf individuals is different from that of hearing individuals. For the purposes of this study the details concerning how the language differs are of less importance than the fact that the differences exist.

The Cognitive Ability of the Deaf

In reviewing the literature in the area of language development of the deaf it was found that the researchers agreed on a fundamental fact: that language development of deaf individuals differs from language development of hearing individuals. A variety of hypotheses were presented regarding how the two language systems differ, and why they differ, but there was a consensus that a difference exists.

In the area of cognitive ability there does not seem to be a similar consensus among the researchers. There is research suggesting that the deaf are intellectually inferior to hearing individuals by several years (Pintner & Reamer, 1920; Zeckel & Van der Kolk, 1939). Other studies suggest that the deaf are not intellectually inferior in all areas, but are below their hearing peers in some cognitive skills (Oléron, 1950). Even when researchers agree that there is a difference between the cognitive ability of deaf and hearing individuals, they dispute the cause of the difference. Pintner and Reamer (1920) attributed the lower cognitive abilities of the deaf to the same factors which caused the deafness (illness or genetics) On the other hand, Oléron (1950) attributed the deaf individual's inferiority in abstract thinking skills to the close connection between language and abstract thinking.

Still others doing research in this area have found little or no difference between the cognitive ability of deaf and hearing individuals (Springer, 1938). Most recent studies report superior intelligence quotient scores for the deaf (Brill, 1969).

A wide variety of factors have been identified which affect the diversity of results found in the research. Of primary importance is the issue of standardization. Rudner (1978) cautioned against the use of measures which were standardized on the population at large, for use in measuring abilities of the deaf. The same concerns were expressed by Levine (1971). However, the availability of measurement instruments designed for, and standardized on a representative deaf sample, is limited. Levine conducted a search to identify tests which were specifically designed for the deaf. He found a total of eleven, nine of which were psychological tests. Since that time a few others have been standardized on a deaf sample, but resources remain limited in that area.

A second area of concern is the wide variety of tests used to measure the intellectual ability of the deaf. In the early studies, carried out by Pintner (1920) and various associates, the tests were generally group administered tests which yielded a single score. It was mainly in these early studies that results showed the deaf to be two to three years intellectually retarded as compared with hearing individuals.

More recently research has been conducted using individually administered tests which consist of several subtests. Those researchers who have indicated that deaf individuals are not inferior to hearing individuals in all aspects of cognitive ability, but are below their hearing peers in some areas, generally have been using instruments which include several subtests (Graham & Shapiro, 1953; Myklebust & Burchard, 1945; Sisca & Anderson, 1978; Templin, 1950).

Yet even within this group there is some disagreement as to which areas are the strongest and weakest among the deaf.

Beyond the question of the format of tests used to evaluate deaf individual's intellectual abilities is the question of the type of test to be used: verbal or performance. Considerable controversy surrounds this issue. On one side are those who believe that performance or non-verbal tests do not measure the same abilities as do verbal tests (Myklebust, 1964). Yet others state that performance tests are the only ones which accurately measure the cognitive ability of the deaf, because they eliminate language as a variable (Sisca & Anderson, 1978; Springer, 1938; Vernon, 1967). However, there is a lower correlation between intelligence test scores and academic achievement for the deaf students than for hearing students. This fact supports Myklebust's (1964) claim that tests requiring verbal facility correlate more closely to those abilities required for learning academic material.

Myklebust (1964) has raised another question regarding non-verbal or performance tests: Are all non-verbal tests equally non-verbal? If in fact they are not, understanding the discrepancies among non-verbal test results is made easier. However, this is a question requiring further research.

The final variable to be examined is research procedures used among the various studies. In the early studies, conducted mostly by Pintner (1920), samples were often small and from a single geographic area, sometimes from a single school. Due to changes which have occurred throughout the years in admission policies and in schools, the samples in the early studies could feasibly have been very different from those in later studies.

The communication method used at the school and the examiner's proficiency in using the method, as well as the examiner's knowledge of deafness, are all variables affecting test results.

Despite the dissimilarity among the various studies, some areas of consensus can be found in the more recent studies.

(1) Tests which consist of a variety of subtests measure the cognitive ability of deaf individuals better than the tests of a more general nature.

(2) Generally deaf individuals score better on performance type tests than they do on verbal type tests. This fact is related to the language handicap of the deaf.

(3) Object assembly is the strongest area of performance for deaf individuals.

(4) Deaf individuals are further behind hearing peers in skills requiring abstract thinking than in those skills requiring concrete thinking. It was suggested that this is due to the link between abstract thinking and verbal symbols.

Achievement Tests as Measurement Tools

Although standardized achievement tests are widely accepted as a means of measuring students' progress in school, questions arise as to their effectiveness. These questions are not limited to the area of deaf education, but are raised in schools which educate normally hearing students as well (Fleming, 1977). However, in this paper the topic will be limited to those concerns which specifically affect the use of standardized achievement with the deaf.

The lack of achievement tests specifically designed for and standardized on a deaf population has necessitated using tests which were developed for and standardized on hearing children. The information gained from these tests is of questionable worth as stated by Jensema (1978):

> Achievement tests currently used with hearing impaired students are gross estimates of achievement. They do not measure with the precision attributed to them in practice. (p. 497)

Rudner (1978) and Levine (1971) also cautioned against using measures which were standardized on the population at large for measuring abilities of the deaf. Rudner (1978) looked specifically at three areas which negatively affect the usefulness of standardized achievement tests with the deaf.

The first area of concern involves content validity. Rudner (1978) states that most commercially available tests do not measure the skills being taught by schools and programs for the deaf. Different schools, especially those with special education programs, use their own curriculums. The fact was further supported by Jenkins and Pany (1978):

> Data from present investigations strongly suggests that a basic assumption underlying standarized achievement measures--that they representatively sample different curricula--is largely without support; clear, significant biases appear to exist. (p. 450)

A second area of concern identified by Rudner (1978), with regard to standardization, was the reporting of scores produced by standardized achievement tests. The grade equivalent scores which are often reported do not necessarily represent a student's true ability. A sixteen year old deaf student who scores a grade equivalent of 3.5 is not necessarily performing as a third grader (Rudner, 1978). The use of stanine scores or percentile scores involves comparing the deaf student with a sample of students different from himself. Rudner (1978) states that, "Such scores are at best misleading and usually uninterpretable" (p. 33).

The third area to be dealt with here concerns the items included on standardized achievement tests developed for hearing students. Rudner (1978) addressed both the matter of item appropriateness, the degree to which an item measures what it is intended to measure, and item bias, the degree to which an item illicits differing responses from different culture groups. The fact that reliability scores are typically lower for deaf students than for hearing students probably is a result of item inappropriateness and item bias. In studies by Rudner (1978) and Tybus and Buchanan (1973), item bias was compared for deaf and hearing students for selected subtests of the 1964 version of the Stanford Achievement Test. The results of both studies indicated that there were many more items biased against the deaf students than against the hearing students. Also there were items biased against the deaf on every subtest used in the studies. In each study content analysis of those items which were identified as being biased against deaf students, provided similar information. The following linguistic structures were identified as causing exceptional problems for the deaf students:

1. Negation
2. Conditionals
3. Comparatives
4. Inferentials
5. Low information pronouns
6. Lengthy passages

The problems involved in using a standardized measurement tool to evaluate deaf students are amplified by the slow yearly academic growth rates of the deaf. Since the change from year to year is so slight, any gain made by the student may be concealed within the standard error of measurement (Jensema, 1978).

The need for specific tools designed for and standardized on a representative deaf sample is becoming more evident. The Office of Demographic Studies in Washington, D.C. has been working the past several years to standardize the 1964 version of the Stanford Achievement Test for deaf students (Tybus & Karchmer, 1977). Although this is a beginning, it is by no means the solution to the problem. Standardization of an existing test which was designed for hearing students does not address all of the issues identified by Rudner (1978). Although procedural changes were made in the directions for administration and level adjustments were made for various subtests, the Stanford Achievement Test for the Hearing Impaired is unchanged in content (Jenesma, 1978).

Summary

The literature describes various aspects of language differences between deaf and hearing individuals. First of all, the quantity of language output is much higher by hearing individuals than by deaf individuals. Second, hearing individuals produce language which is more similar to standard English than the language produced by the deaf. Finally, although hearing and deaf individuals develop language in much the same order, hearing individuals develop the various structures of language at a much faster rate.

There is a general lack of consensus among researchers regarding the cognitive ability of the deaf. Early studies reported deaf individuals to be several years behind their hearing peers in intellectual development. Later studies, using tests which contained several subtests, found deaf individuals to be inferior to hearing individuals in some aspects of cognitive ability, but not in all aspects. There was disagreement among these various studies as to which cognitive skills the deaf excelled in and which they were weak in. Most recent studies have reported superior intelligence quotient scores for the deaf. These inconsistencies in research findings result from a number of factors including types of tests used, testing procedure, and differences among samples.

Achievement tests designed for hearing students, but used to measure the abilities of deaf students, were found to be ineffective due to several factors. First of all, they do not measure the skills being taught in schools and programs for the deaf. Second, the scores reported on these tests compare the deaf student with a standard sample quite different from himself. Finally, the items used on the tests are biased against the deaf because of their language handicap. A need was expressed for achievement tests designed specifically for and standardized on a representative deaf sample.

Chapter III

The Research Design

The purpose of this study was to investigate the effects which language revisions had on the performance of 9 to 14 year old deaf students with regard to specific sections of the Stanford Achievement Test.

Hypotheses

The following hypotheses were investigated:

1. There is no significant difference between the mean raw scores of a group of 9 to 14 year old deaf students on the published version of Primary I Battery Stanford Achievement Test, Arithmetic subtest (Form X), and the mean raw scores of those same students on a revised version of the Primary I Battery Stanford Achievement Test, Arithmetic subtest (Form W).

2. There is no significant difference between the mean raw scores of a group of 9 to 14 year old deaf students on the published version of the Primary II Battery Stanford Achievement Test, Science/Social Studies Concepts subtest (Form X), and the mean raw scores of those same students on a revised version of the Primary II Battery Stanford Achievement Test, Science/Social Studies Concepts subtest (Form W).

Methodology

Subjects

The subjects consisted of 31 deaf students presently enrolled in the primary and intermediate departments of a school for the deaf in upper New York State.

There were 14 females and 17 males, ranging in age from 9 to 14 years, represented in the sample. Both day and residential students were included with 11 students living in the dormitories on campus and 20 students commuting daily. The students who live in the dormitories come from towns or cities which are 50 miles or more from the school.

The hearing losses for all subjects were in the severe to profound ranges. Table 1 provides information regarding the degree of hearing loss in the better ear for each individual.

The students in the sample varied in terms of intelligence, grade level of academic work, socioeconomic background, cause and level of hearing loss, age at which hearing loss occurred and age at which formal education began. Intelligence scores for each student are provided in Table 2. The scores given were taken from the latest evaluation available. A variety of intelligence tests are used at the school in an attempt to obtain the most reliable intelligence quotient for each student.

Table 1

Hearing Loss of Subjects

Pure Tone Average - Better Ear

Subjects taking Science/Social Studies Concept Test		Subjects taking Arithmetic Test	
Subjects	Loss	Subjects	Loss
A	110+ dB	R	103+ dB
B	98 dB	S	85 dB
C	105+ dB	T	103+ dB
D	108+ dB	U	70 dB
E	102+ dB	V	102+ dB
F	103+ dB	W	90+ dB
G	103+ dB	X	87+ dB
H	97 dB	Y	108+ dB
I	92 dB	Z	105+ dB
J	110+ dB	AA	105+ dB
K	87 dB	BB	105+ dB
L	98 dB	CC	110 dB
M	95 dB	DD	95 dB
N	108+ dB	EE	102+ dB
O	103 dB		
P	108 dB		
Q	98 dB		

Table 2

IQ Scores of Subjects

Subjects taking Science/Social Studies Concept test			Subjects taking Arithmetic test		
Subjects	IQ	Test	Subjects	IQ	Test
A	70	WISC-R	R	69	WISC-R
B	96	Leiter	S	95	WISC-R
C	117	WISC-R	T	95	WISC-R
D	115	WISC-R	U	115	WISC-R
E	93	WISC-R	V	96	WISC-R
F	101	WISC-R	W	72	WISC-R
G	105	WISC-R	X	106	WISC-R
H	99	WISC-R	Y	120	WISC-R
I	98	WISC-R	Z	104	WISC-R
J	115	WISC-R	AA	112	WISC-R
K	114	WISC-R	BB	91	WISC-R
L	78	WISC-R	CC	110	WISC-R
M	105	WISC-R	DD	114	WISC-R
N	93	WISC-R	EE	115	WISC-R
O	96	WISC-R			
P	82	WISC-R			
Q	102	WISC-R			

Note. Generally the entire Performance portion of the WISC-R is administered to students.

For the purpose of the study the subjects were divided into two groups according to their placement in school. There were 14 students involved from the primary department. This group will be referred to as the primary group. The remaining 17 students were from the intermediate department and will be referred to as the intermediate group. Each group performed the same types of tasks at different levels and in different subject areas, but were compared only with themselves.

Instruments

The first testing situation with each group involved the use of a regular published version of the Stanford Achievement Test, Form X, 1964 edition. The primary group was given the Primary I Battery, Arithmetic subtest. The intermediate group was tested using the Science/Social Studies Concepts subtest of the Primary II Battery.

In the second testing situation a revised version of the Stanford Achievement Test Form W, 1964 edition was used. As in the first situation, the primary group was given the Primary I Battery, Arithmetic subtest (revised) and the intermediate group was given Primary II Battery, Science/Social Studies Concepts subtest (revised).

The researcher revised the test using her experience as a teacher of the deaf and her knowledge of deaf children's receptive and expressive language. Revisions included changes in syntax and vocabulary, including deletion of language which was unnecessary to meaning. Considerable care was taken not to change the concepts being tested in each question. During the revision process, five additional experienced teachers of the deaf were involved in reviewing and critiquing the proposed revisions. The suggestions from that group were included in the final revised form which was used in the study. (See Appendix)

In addition, one practice test was developed for each group by the researcher. The purpose of the practice tests was to acquaint or reacquaint the students with the procedure for taking standardized tests. It was felt that the use of a practice test would also eliminate any possibility of practice effect between the first and second testing situations in the study.

The questions for the practice tests were taken from the Stanford Achievement Test, Form Y, 1964 edition. The Primary group practice test included 10 questions from the Primary I Battery, Arithmetic subtest. The intermediate group practice test consisted of 10 questions from the Primary II Battery, Science/Social Studies Concepts subtest.

Procedure

Prior to the first testing situation, all students were given a practice test by their classroom teacher. Teachers were instructed to use the test to teach students how to follow directions, eliminate wrong answers, and generally become familiar with the test format.

As part of the school testing program, the Stanford Achievement Test is administered annually. All students involved in the study were tested during the annual testing session with Form X.

In both the regular school testing program and the experimental testing program the directions given in the Stanford Achievement Test Administering Manual were to be followed. That is, certain subtests, including the Arithmetic subtest of the Primary I Battery and the Science/Social Studies Concepts subtest of the Primary II Battery, were to be given orally. Certain adaptations in testing procedure were made to better meet the needs of deaf students. Since some of the subtests were given orally, the time requirement was extended on those tests to allow for the use of the Rochester Method, a communication method in which the individuals use finger-spelling, speechreading, and auditory training to understand what is being said. Also, all oral tests were accompanied by a printed script which could be referred to by the students.

The students in the primary group were given selected subtests of the Primary I Battery and the intermediate students were given selected subtests of the Primary II Battery. For the purposes of this study only the results of the Primary I Battery, Arithmetic subtest and Primary II Battery, Science/Social Studies Concepts subtest were examined.

The actual testing procedure differed between the two groups. The two classes in the primary group were each tested by their own classroom teachers who followed the instructions in the instruction manual and presented questions orally. The adaptations mentioned above were used. The four classes in the intermediate group were tested together by one examiner. Although their test was designed to be given orally, it was not. Directions were given orally and students worked independently, reading from a script, from that point on. The decision to omit the oral presentation of questions for this group was an administrative one.

Despite the difference which occurred in the testing procedures between the primary and intermediate groups, the same procedures were used in the second experimental testing situation as were used in the first testing situation.

The second testing situation involved the use of the revised version of the test and was held six weeks following the first test. In the second testing situation only the specific subtests being used in the study were given. The testing procedures were identical to the first situation for each group.

Analysis of Data

A correlated t test was used to test the hypotheses at the .05 level of significance. In the primary group the mean raw score for the published version of the Arithmetic subtest was compared with the mean raw score of the group on the revised version of the test. In the intermediate group a comparison was made between the published version mean raw score and the revised version mean raw score using the Science/Social Studies Concepts subtest scores.

Summary

An experimental design was used in the study to investigate the results of revising language of a standardized test, on the performance of 9 to 14 year old deaf students. The sample consisted of 31 students enrolled at a residential school for the deaf. Students differed in socioeconomic background, intelligence, degree of hearing loss, cause of deafness, age deafness began and academic placement. The subjects were tested using a published form of the Stanford Achievement Test and a revised version of another form of the test. A correlated *t* test was used to compare the mean raw score of the published version and the revised version of the selected subtests for each group.

Chapter IV

Analysis of Data

The purpose of this investigation was to examine the results of language revisions on deaf students' performance on a standardized achievement test which was designed for hearing students.

Findings and Interpretations

The following hypotheses were investigated:

1. There is no significant difference between the mean raw scores of a group of 9 to 14 year old deaf students on the published version of the Primary I Battery Stanford Achievement Test, Arithmetic subtest (Form X), and the mean raw scores of those same students on a revised version of the Primary I Battery Stanford Achievement Test, Arithmetic subtest (Form W).

2. There is no significant difference between the mean raw scores of a group of 9 to 14 year old deaf students on the published version of the Primary II Battery Stanford Achievement Test, Science/Social Studies Concepts subtest (Form X), and the mean raw scores of those same students on a revised version of the Primary II Battery Stanford Achievement Test, Science/Social Studies Concepts subtest (Form W).

Each hypothesis dealt with one subtest of the Stanford Achievement Test. The first hypothesis was to determine if students' scores were significantly affected by language revisions on the Arithmetic subtest. The second hypothesis was to determine if significantly different scores resulted from language revisions on the Science/Social Studies Concepts subtest. A correlated t test was used to test these hypotheses at the .05 level of significance The data from this statistical analysis are provided in Table 3.

Table 3

Analysis of Test Scores

Test	n	Mean raw scores	S.D.	Correlated t test values
Science/Social Studies Concepts Subjects				
Published version	17	15.6	5.16	.78 (N.S.)
Revised version	17	14.9	5.57	
$t_{crit}(17) = 2.110$				
Arithmetic Subtest				
Published version	14	40.93	5.53	-2.95*
Revised version	14	44.26	9.35	
$t_{crit}(14) = 2.145$				

*p < .05

Since the calculated _t_ value was larger than the critical _t_ value for the Arithmetic subtest scores, the hypothesis of no difference is rejected. The mean raw score on the revised version of the Arithmetic subtest was significantly higher than the mean raw score on the published version of the Arithmetic subtest.

Since the calculated _t_ value on the Science/Social Studies Concepts subtest was not larger than the critical _t_ value, the hypothesis of no difference is accepted. The mean raw score on the revised version of the Science/Social Studies Concepts subtest was not significantly higher than the mean raw score on the published version of the Science/Social Studies Concepts subtest.

The findings of the study demonstrate that revising the language of the Science/Social Studies Concepts subtest did not significantly affect the mean raw score when compared with the mean raw score on the published version of that subtest. However, the revisions made to the Arithmetic subtest did significantly affect the mean raw score when compared with the mean raw score for the published version of that subtest. Students scored significantly higher on the revised version than on the published version of the Arithmetic subtest.

Summary

The purpose of the investigation was to assess the effects of language revisions on student's performance on portions of the _Stanford Achievement Test_. Analysis of the data demonstrates that the mean raw score was significantly higher on the revised Arithmetic subtest than on the published version of the Arithmetic subtest. The mean raw score on the revised version of the Science/Social Studies Concepts subtest was not significantly different from the mean raw score on the published version of that subtest. On the Arithmetic subtest only the language was altered while on the Science/Social Studies Concepts subtest the language and testing procedures were altered.

Chapter V

Conclusions and Implications

The intent of this investigation was to examine the effects of language revisions on deaf students' performance on selected subtests of the Stanford Achievement Test.

Conclusions

The results of the study demonstrated that the mean raw score on the revised version Arithmetic subtest was significantly higher than the mean raw score on the published version of the test. Students scored significantly higher on the Arithmetic subtest when language revisions were made to accommodate their language deficit.

The results of the Science/Social Studies Concepts subtest demonstrated that the mean raw score for the revised version of the test was not significantly higher than the mean raw score for the published version of that test.

Examination of the test procedure used by the Science/Social Studies Concept group revealed that although the testing situations for the published test and the revised test were identical, the testing directions were not followed. The test items were to be read to the students using the Rochester Method. Instead, only the directions were given using the Rochester Method. The test questions were read by the students from a printed script.

This difference might explain the lack of significant difference between the mean raw scores on the published and revised version of the test. In both testing situations students were being tested on reading ability as well as knowledge of the subject matter being tested. By changing the testing procedure, the focus was changed from examining effects of language revisions on conceptual ability to examining effects of language revisions on reading ability.

Deaf students, like hearing students at that age, have a larger "listening" vocabulary than reading vocabulary. Changing the language so that material can be understood by students via the Rochester Method does not necessarily mean that students will be able to read the material. Since the test questions were not presented using the Rochester Method it is not possible to determine if the lack of a significant difference truly was a result of the students' inability to read either the revised or published version, or if there really is no significant difference in the performance when the language is revised.

Implications for Further Research

This section is divided into two categories. The expansion and refinement of the study will be presented followed by the recommendations for further research.

Expansion and Refinement of the Present Study

The study was limited by a small sample of 31 students, all of whom use the Rochester Method in their academic setting. A larger sample including students from oral and total communication programs would be advantageous should this study be replicated.

Information could be gained regarding the effects of language revisions on the Science/Social Studies Concepts subtest by administering the test using the Rochester Method.

The use of phrase structure rules and transformational grammar to guide the language revisions might provide more specific information as to which types of language revisions are most beneficial.

The study should be replicated using other achievement tests or other subtests of the Stanford Achievement Test.

Recommendations for Further Research

Further investigations could be conducted in the following areas:

1. An investigation might be undertaken that would examine the effects of language revisions on students whose modes of communication differ (Rochester Method, American Sign Language, Total Communication, Oralism).

2. There is a need in the field of education of the deaf, to identify to what extent reading difficulties are influenced by structure or syntax and the extent vocabulary contributes to reading problems.

3. A study might be undertaken to identify specific structures of language which contribute most to reading problems in deaf students.

4. A study which would examine the effects of teaching specific language structures upon reading scores of deaf students would be beneficial to teachers and materials producers.

Classroom Implications

On the basis of the research results, language revisions appear, to this researcher, to be necessary on the Stanford Achievement Tests which were designed for hearing students, but which are used to test academic achievement of the deaf.

1. Language develops differently for hearing and deaf students. Therefore language which may be familiar to a hearing student may not necessarily be familiar to a deaf student.

2. Standardized achievement tests are designed to test students' level of attainment in various academic areas. Evaluation can be more accurate if the questions are presented in language which is familiar to the deaf student.

3. Cognitive development occurs regardless of the language system used. Deaf students do acquire knowledge in various academic areas, through a language system they understand. The problem occurs when a different language system is used to evaluate these students.

Summary

The study demonstrated that language revisions made on the Arithmetic subtest of the Stanford Achievement Test did positively affect the performance of deaf students on that subtest. However, there was no significant change in the performance of students using the revised version of the Stanford Achievement Test Science/ Social Studies Concepts subtest.

The study was limited by the small population and the variance of the test procedure on the Science/Social Studies Concepts subtest.

Further research could examine the following areas:

1. The effects of language revisions on students with varying modes of communication.

2. An investigation into the extent reading difficulties among the deaf are influenced by structure, syntax and vocabulary.

3. The effects of teaching specific language structures upon reading scores.

Language revisions appear to be necessary when tests designed for hearing students are used with deaf students, if accurate measurements of achievement are to be found.

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Appendix

Revised Arithmetic.

Form W

1. Make a cross on the puppy that is nearest to you.

2. Draw a line from the triangle to the square.

3. Which coin is the same as 10 nickels. Make a cross on that coin.

4. How many days are in most months? Make a cross on that number.

5. Make a cross on the box that has a dot in its lower left hand corner.

6. When do most children wake up in the morning?
Make a cross on the clock that shows the time when most children wake up.

7. Which candy cane costs the most money? Make a cross on that candy cane.

8. Which person has on the right clothes to go outside when it is 70°? Make a cross on that person.

9. Tom's birthday is Monday. What is the date of Tom's birthday?
Make a cross on that person.

10. Which thing is really about 3 inches high? Make a cross on it.

11. The box with the dots weighs 14 ounces.
The box with the stripes weighs a pound.
Make a cross on the heavier box.

12. Count the money. Make a cross on the number of cents you see.

13. How many cups are there in one quart? Make a cross on the cups you can fill if you pour the quart of milk into them.

14. George has 3 baseballs. He bought 3 more. How many baseballs did he have then? Make a cross on that number.

15. Jeff had 6 marbles. He lost 3 marbles. How many marbles did he have left? Make a cross on the number.

16. Bill had 1 box of crayons. Sally gave him another box for his birthday. How many boxes of crayons does Bill have in all. Make a cross on the number.

17. Mary wants to buy 6 dolls. Each doll costs one dollar. How many dollars does Mary need? Make a cross on that number.

18. Joe wants to save 5 baseball cards. He has 2 baseball cards now. How many more baseball cards does he need to save? Make a cross on the number.

19. Sharon had some money. She spent 3¢ for gum and 1¢ for candy. How much money did Sharon have at first? Make a cross on the number.

20. Ted bought some things downtown. He bought a pencil for 3¢, some gum for 1¢, and a toy for 2¢. How much money did Ted spend? Make a cross on the number.

21. Tom bought 3 tickets to a basketball game. Henry bought 1 ticket. How many tickets did both boys buy? Make a cross on that number.

22. Frank's truck can go 10 miles on 1 gallon of gas. How many miles can it go on 2 gallons of gas? Make a cross on the number.

23. Mary finished 4 math worksheets. She has 6 worksheets to do in all. How many more worksheets does Mary need to do? Make a cross on the number.

24. Pat has 3 candy bars. His brother has 2 more candy bars than Pat has. How many candy bars does his brother have? Make a cross on the number.

25. Gum costs 1¢ each. How many pieces of gum can you buy for 4¢? Make a cross on the number.

26. Donald is 5 years old. His sister is 4 years old. How many years older is Donald? Make a cross on the number.

27. Joe bought a model airplane. He gave the clerk 5 dollars. The clerk gave him 4 dollars change. How much did the airplane cost? Make a cross on the number.

28. Bubble gum costs 2¢ each. How many can you buy for 4¢? Make a cross on the number.

29. Peggy baby-sat for a half-hour. She earned 20¢. How much would she earn for baby-sitting one hour? Make a cross on the number.

30. Howard lost 6 nickels. He has found 2 of them. How many more must he find? Make a cross on the number.

31. Philip rode his bicycle 1 mile in 10 minutes. How many miles can he ride in 20 minutes? Make a cross of the number of miles.

32. Count the dots. Write the number on the line.

33. Draw a line from the number word to the number it means.

34. When we divide something into fourts, how many pieces are there? Make a cross on the number.

35. Make a cross on the number that means the greatest number of things.

36. How many make a pair? Make a cross on the number.

37. Look at the numbers. See how they go. Write the number that goes in the empty box.

38. Write the number 57 on the line.

39. How many ones in the number 63. Write the answer in the little box.

40. See how the numbers go. Write the number that comes between the numbers you see.

41. See how these numbers go. Write the number that comes between the numbers you see.

42. What number is 1 ten and 5 ones. Make a cross on that number.

43. How many tens in 20? Make a cross on the number.

Revised Science/Social Studies Concepts

Form W

1. What goes into our lungs when we breathe?

   minerals   oxygen   vitamins

2. What helps the brain control our bodies?

   capillaries   wires   nerves

3. A lot of ice is

   a planet   the pole   a glacier

4. Water evaporates quickly if it is

   salted   heated   frozen

5. A barometer and an anemometer are used by people who work in a

   weather bureau   train engine   hospital

6. Some animals' fur changes white like snow in the winter for

   hibernation   beautification   protection

7. The rod between two wheels is

   an axle   a propeller   a gear

8. Sound is heard when something

   vibrates   elevates   expands

9. A nutcracker is a

   plane   lever   pulley

10. The earth moves around the sun in one

    year   season   month

11. If a bird flies to warm land we say it

    migrates   hibernates   molts

12. Plants are covered with soil or dirt. The plants rot. This makes

limestone timber humus

13. Microscopic plants and animals are

dangerous warm-blooded very small

14. A windmill may be used for

power lumber mills crop dusting

15. A snake is one kind of

reptile worm rodent

16. A dry cell is a

plant's stem desert leaf battery

17. How can we make water safest to drink?

draining boiling filtering

18. How does a brake stop a bicycle?

lubrication friction slippage

19. A worker or a drone has a job in a

herd flock hive

20. A merchant sells things to his

clerk owners customers

21. A century is

a year 100 years 10 years

22. Who made most log cabins?

trappers Indians pioneers

23. Who needs a lumberyard?

carpenter plumber lawyer

24. A person needs proof. He needs

guesses facts rumors

25. People who work together on a special job are a

race	club	committee

26. Paper is made from

grain	trees	minerals

27. What helps things grow in the desert?

tractors	fertilizers	irrigation

28. A person looking for a new place is

a trader	an explorer	a settler

29. If you work, you get money. You are

secured	employed	conducted

30. The pilgrims came from

Europe	Africa	Asia

31. Changing slowly but steadily means changing

gradually	frequently	rapidly

32. The committee chairman's work is to

do the work	boss the job	organize

33. City government provides us with

automobiles	food	water

34. Who was a great inventor?

Edison	Columbus	Lincoln

35. The distance above sea level is called

air pressure	altitude	depth

36. What country is south of the equator?

Brazil	Italy	Japan

37. When are city buses likely to be full?

5 P.M.	2 P.M.	10 A.M.

38. If you owe money you have

an account	a debt	income

Practice Test: Arithmetic I

Teachers' Directions

Instructions:

Using language your class will best understand, convey the following thoughts about this practice test:

1. This is a practice for the tests they will be taking next week and in March.

2. On this test the teacher will be helping students to understand the questions, but on the real tests they will have to work alone.

3. If they have any questions they should be sure to ask during this practice test.

Read the following directions to the students except for the parts in parentheses, which are for your information.

I will give you a paper. Do not look at it until I tell you to do so. Today we are going to have some fun with numbers. Sometimes you will make a cross (X) on things I will tell you to mark. Sometimes you will write some of the answers. Listen and watch carefully to what you are told to do.

(At this time explain any part of the directions you think your children may not understand. Stress the importance of listening to what they are to do. Review some of the common directions used in the test such as:

Draw a line from ___________ to ________.

Put a cross on.

Write the number.

Draw a line under.)

(Pass out papers face down.)

Now look at your papers.

You must listen and watch carefully while I tell you what to do. Find the picture of the flag in the upper left hand box. There is a cross on one of the numbers. Which number is it?

(Again take time to explain these directions so that you are sure the students understand them. There is no explanation in the directions as to why number 2 is marked.

It may be important to explain to the class that two has a cross on it because it was the correct answer to that question.)

Now look at the second box. Make a cross on the tallest flower.

(Again discuss any vocabulary the students are not familiar with. Be sure the students understand that make a cross is important because it tells them what to do.)

(As you go through the questions explain vocabulary and stress the phrases which tells the students what to do. Use any procedures that you feel will help the students to do better on the actual test.)

(Read each question twice. Discuss questions as students work through the practice test.)

PART A: Measures

1. Now look at the paths. Make a cross on the widest path.
2. No look at the next row. It begins with a needle. See the numbers beside the needle. How many months are there in a year? Make a cross on the number of months in a year.
3. Find the picture of part of a calendar. Tom's birthday is on the second Wednesday shown. Find the date of his birthday on the calendar and then make a cross on the number at the right that is his birthday.
4. Look at the coins. How much money do you see? Make a cross on the correct answer.
5. Make a cross on the coin that is the same as 5 dimes.
6. What time do many people eat breakfast? Make a cross on the correct clock.

PART B: Problem Solving

7. Look at the cup and the numbers beside it. There were 6 glasses on the table. Baby sister bumped the table and 2 glasses were broken. How many glasses were left that did not break? Make a cross on that number.
8. Look at the numbers beside the giraffe. Bill gave away 2 pop bottles. He now has 3 left. How many pop bottles did he have at first? Make a cross on the number of pop bottles.

9. Find the numbers beside the toothbrush. Mary ironed 3 blouses yesterday and 3 blouses today. How many blouses did Mary iron both days? Make a cross on the number.

10. Jerry has 5 crayons. His sister has one more than Jerry. How many crayons does his sister have? Make a cross on the numbers.

11. Janet went to the park 4 times last week. This week she went to the park 2 more times. How many times did she go to the park in all? Make a cross on the number.

12. Jim has 4¢. Peaches cost 3¢ each. How many peaches can Jim buy? Make a cross on the number.

PART C: Number Concepts

13. Now look at the dots. Count them. Write on the line the number of dots you see.

14. See the next row and the numbers beside the scissors. Make a cross on the number that means the least number of the things.

15. See the next row. It begins with a knife. Look at the numbers in the boxes and see how they go. Write the number that belongs in the empty box.

16. Look at the number. How many tens are in the number. Write the answer in the little box.

17. Write the number 79 on the line.

18. Draw a line from the number word to the number it means.