The Assessment and Development of Language in Hearing Impairment Individuals

STEPHEN P. QUIGLEY
MARJORIE W. STEINKAMP
BARRY W. JONES

INTRODUCTION

For the past several years a group in the Institute for Child Behavior and Development at the University of Illinois at Urbana-Champaign has been conducting research on the development of syntactic structures in the language of deaf children and youth. The information from this research is currently being used to prepare diagnostic instruments for the assessment of syntactic problems in the language of deaf students and to prepare materials to assist in language and reading instructions for this population. The research and its implications for diagnosis and materials development will be considered in this paper.

LONG TERM PLANS

The long term program of research and development in language with hearing-impaired individuals is outlined in Table 1. The dates on this table show that the program was begun in 1968 and is expected to be completed in 1983. In can also be seen from this table that there are five major divisions which, together, form a comprehensive and interrelated program in language development for hearing-impaired children. These divisions are labeled: (1) Research, (2) Diagnostic Instruments, (3) Materials for Language Instruction, (4) Reading Materials, and (5) Language Textbooks.

The first division, Research, lists the major productions resulting from a six-year program of research into the syntactic structures of language in deaf children and youth. This research was funded by the Bureau of Education for the Handicapped and the National Institute of Education.

Table 1

Plan for Language Development Program
1968-1983

	RESEARCH
COMPLETED	1. Convention papers 2. Journal articles 3. Final Report 4. Linguistics book
	DIAGNOSTIC INSTRUMENTS
IN PROGRESS	1. Original Test of Syntactic Abilities (TSA) 2. Revised TSA & Test Manual 3. Screening TSA & Test Manual
	MATERIALS FOR LANGUAGE INSTRUCTION
IN PROGRESS	1. Instructional packages for teaching syntactic structures. 2. Teachers' manual describing linguistic derivation of each structure, research on it, its relations to other structures.
	READING MATERIALS
IN PLANNING	1. Reading series--primer to 6th grade a. controlled for syntax, vocabulary, and experience b. graduated by difficulty on syntax, vocabulary and experience 2. Teachers' manual describing series, some background on construction of series (research, linguistics, etc.), suggestions for best use of books.
	LANGUAGE TEXTBOOKS
IN PLANNING	1. Language & Hearing--general theoretical textbook on development of language and hearing skills, their interrelations and the influence of hearing and language problems on other disabilities, mental retardation, learning disabilities, etc. 2. Teaching Language to Hearing Impaired Children, text for teachers--related to theory book and to other materials. 3. Language Curriculum for Hearing Impaired Children--a detailed curriculum.
	All of these items are interrelated. They form a comprehensive program in language development for hearing impaired children and their teachers and clinicians.

This research will be considered in more detail later in this paper. The results have been extensively reported in more than 20 papers at conventions of the Alexander Graham Bell Association for the Deaf, the American Instructors of the Deaf, the American Speech and Hearing Association, the Illinois Speech and Hearing Association, and the Linguistic Society of America, and in a series of seven articles published in the

Journal of Speech and Hearing Research. Those articles form the major professional reporting on the project, although summary articles have appeared in the *Volta Review* and are planned for other publications. A final report is available which contains the theoretical formulations, procedures, major findings, and conclusions of the research. Finally, a book on transformational generative grammar stressing applications to the language problems of deaf children has been published by the Alexander Graham Bell Association. The notation to the left of the research part of the plan indicates that this phase has been completed.

Part two of the plan, Diagnostic Instruments, was a logical outgrowth of the language research. In examining syntactic structures in the language of deaf children and youth, it became necessary to construct instruments which would permit controlled manipulation of specific structures. The instrument devised for that purpose was the Test of Syntactic Abilities. The original instrument functioned well for research purposes; however, it chad certain limitations for other uses. Administration of the total battery of 22 tests, while relatively easy, required about six hours; complete scoring took about 12 hours; and some of the scoring required considerable linguistic sophistication.

Because of the potential value of the TSA for assessing the syntactic abilities of deaf children, it was decided to transform the original research instrument into a multiple-choice diagnostic test for clinical and classroom use. This is the second item listed in part two of the 15-year Plan. The third item refers to a screening version of the TSA. This will include items of highest psychometric quality from the 19 diagnostic tests. It will be constructed so that it can be easily administered in about an hour and will provide an overall indication of the abilities of deaf children on a range of syntactic structures. The project for the development of diagnostic instruments is being funded by the Bureau of Education for the Handicapped. As indicated to the left of the diagram, it is in progress. This section on diagnostics will be considered in more detail later.

The availability of a body of research knowledge and instruments to assess the syntactic structures inthe language of deaf children led naturally to the development of diagnostic instruments for use in the classroom and this in turn leads just as naturally to the development of materials for teaching those structures which the tests are designed to diagnose. There is little value in being able to indicate specific syntactic problems unless we have some way of treating them. That is what the third part of the plan is designed to do—develop Materials for Language Instruction. Here we will be concerned with developing instructional packages dealing with specific structures. Along with the instructional packages for teaching specific structures, a manual for teachers and clinicians describing the linguistic derivation of each structure, research with hearing and deaf

children, and its relationship to other structures will be provided. We have not yet decided, however, whether to limit the materials to paper and pencil, chalkboard, and overhead projector or to plan for more sophisticated instrumentation.

The notation to the left again denotes that the work is in progress. Work on this phase of the project has been underway in Australia for more than a year under the direction of Dr. Desmond Power, Director of Research in the Institute of Special Education in Burwood State College in Melbourne. Dr. Power worked for several years as a doctoral student at the University of Illinois on the early stages of the research phase of the plan. He presently has a grant from the Australian government for the development of instructional packages on syntax. So far, he has developed a package for teaching the passive voice which is being field tested in Australia. He is now working on packages for negation and pronominalization. In this country, staff in the Institute for Child Behavior and Development have begun work on materials for teaching relativization and plan to proceed from that to complementation and conjunction. We are also working closely with personnel in the Curriculum and Instructional Design Division of the Model Secondary School for the Deaf in Washington, D.C. in the preparation of these materials. The three groups, ISE staff in Australia, ICBD staff at the University of Illinois, and staff of the CIDD of the Model Secondary School for the Deaf, will be equal partners for the next several years in the development of the language and reading materials.

The fourth part of the plan, Reading Materials, is obviously related to the third (which was, of course, related to the other two). This phase calls for development of a series of reading books controlled for vacabulary, syntax, and subject matter and graduated by difficulty on those factors. These will be used along with the instructional packages for teaching specific syntactic structures. We are fully aware that the vocabulary, the syntax, the cognitive experiences of the child, and the various aspects of the reading process itself must be considered. We are emphasizing syntax here, because it it our major concern and interest and, because, as even a cursory knowledge of the written language of deaf children reveals, it is a major problem for deaf children.

And so to the fifth part of the plan—the development of Language Textbooks. Three major items are planned here. The first listed (although not necessarily the first that will be completed) is a general theoretical text on the development of language and hearing skills, their interrelations, and the influence of hearing and language problems on other disabilities such as mental retardation, and learning disabilities. The second item is a text for teachers on the teaching of language to hearing impaired children. And, finally, we plan the writing of a language cur-

riculum. In most plans the curriculum would come first and the other parts would follow in some deductive order. We prefer to develop the basic elements first, the research, the diagnostics, the language materials, and the reading materials, and then let the curriculum develop inductively from those.

THE LANGUAGE RESEARCH PROJECT

The findings of the initial research from which this comprehensive program of language development evolved have been reported in a series of articles in the *Journal of Speech and Hearing Research* and the *Volta Review*. Five major questions motivated these studies:

1. What is the order of difficulty of various syntactic structures for deaf children; is it similar to the order of difficulty for hearing children; and is it predictable from theories of transformational generative grammar?
2. How well established are the syntactic rules of standard English in the language of deaf children at age levels from 10 through 18 years?
3. Are there developmental stages for these rules in deaf children, and, if so, how similar are they to developmental stages for hearing children?
4. Do deaf persons acquire the same syntactic rules as hearing persons, but at a slower rate, or do they acquire some rules that never operate in the grammar of hearing persons?
5. How does deaf children's understanding of various syntactic structures compare to the occurrence of those structures in reading materials children typically use?

METHODS

Instruments

Even though previous investigators have depended heavily on analyses of written language samples collected from deaf subjects, there are obvious limitations to this procedure. Two principal limitations are that the investigator cannot (1) control the presence or absence of particular structures, or (2) manipulate the linguistic environments in which specific syntactic structures would be expected to appear. In order to overcome these limitations the Test of Syntactic Abilities (TSA) was developed during the early stages of the research to assess the comprehension and production of the major syntactic structures of English. These include: negation, question formation, conjunction, pronominalization, relativization, complementation, and the verb system. This battery of 22 subtests consisted of 652 items which took approximately six hours to administer. Scoring took approximately 12 hours per individual and required person-

nel trained in linguistics and psychometrics.

Sample

The subjects for the research consisted of groups of deaf and hearing students. One group was composed of 450 prelingually deaf students between the ages of 10 and 18 years. Twenty-five boys and 25 girls at each age level were randomly selected from 16 educational programs with 100 or more students which had also been randomly selected after programs had been stratified on the basis of geographical region of the United States and type of program (day or residential). This group of subjects met the following criteria:

1. Sensori-neural hearing impairment of not less than an average of 90 dB (ISO) in the better ear at 500, 1000 and 2000 Hz,
2. Born deaf or deafened before the age of two years,
3. An IQ of at least 80 on the performance scale of the WISC or WAIS or some comparable test, and
4. In the judgment of school personnel, no apparent disability other than hearing impairment (except for corrected visual defects).

The second group of subjects consisted of hearing students—10 males and 10 females at the ages of 8, 9, and 10 years who attended the third, fourth, and fifth grades of a midwestern public school.

SUMMARY OF RESULTS OF LANGUAGE PROJECT

Order of Difficulty of Syntactic Structures

Table 2 presents data on question 1 stated previously. The structures are listed in the table by their order of difficulty for the deaf subjects from the easiest to the most difficult. Even though the orders of difficulty were not identical between the deaf and hearing subjects, it is of interest to note that the three easiest structures for the deaf students (negation, conjunction, and question formation) were also the easiest for the hearing sample. In like manner, pronominalization, the verb system, complementation, and relativization were most difficult for both groups. The only major difference in order of difficulty appeared with the disjunction and alternation subtest. This could be explained by the deaf children's failure to understand the complex semantic nature of sentences containing these structures.

In addition to providing mean scores for each syntactic structure for

Table 2

Summary of Performance on Syntactic Structures and Their Frequency of Occurrence Per 100 Sentences in the Reading for Meaning Series

Structure	Deaf Students: Average across ages	Deaf Students: Age 10	Deaf Students: Age 18	Deaf Students: Increase	Hearing Students: Average across ages	Frequency of Occurrence: Level at which structure first appeared	Frequency of Occurrence: 6th grade
Negation							
be	79%	60%	86%	26%	92%	1st Primer-13	9
do	71	53	82	29	93		
have	74	57	78	21	86		
Modals	78	58	87	29	90		
Means	76	57	83	26	90		
Conjunction							
Conjunction	72%	56%	86%	30%	92%	1st Primer-11	36
Deletion	74	59	86	27	94		
Means	73	57	86	29	92		
Question Formation							
WH-questions: Comprehension	66%	44%	80%	36%	98%	2nd Primer-5	6
Yes/no questions: Comprehension	74	48	90	42	99	1st Primer-5	3
Tag questions	57	46	63	17	98		
Means	66	46	78	32	98		
Pronominalization							
Personal Pronouns	67%	51%	88%	37%	78%		
Backward Pronominalization	70	49	85	36	94	4th grade-1	0 (4 per 1000)
Possessive Adjectives	65	42	82	40	98	1st grade-4	27
Possessive Pronouns	48	34	64	30	99	3rd Primer-1	0 (3 per 1000)
Reflexivization	50	21	73	52	80	2nd grade-1	2
Means	60	39	78	39	90		

Table 2 (continued)

Structure	Deaf Students: Average across ages	Deaf Students: Age 10	Deaf Students: Age 18	Deaf Students: Increase	Hearing Students: Average across ages	Frequency of Occurrence: Level at which structure first appeared	Frequency of Occurrence: 6th grade
Verbs							
Verb Auxiliaries	54%	52%	71%	19%	81%	1st grade-1	18
Tense Sequencing	63	54	72	18	78		
Means	58	53	71	18	79		
Complementation							
Infinitives and gerunds	55%	50%	63%	13%	88%	2nd Primer-4	32
Relativization							
Processing	68%	59%	76%	17%	78%	3rd Primer-2	12
Embedding	53	51	59	8	84		
Relative Pronoun							
Referents	42	27	56	29	82		
Means	54	46	63	18	82		
Disjunction & Alternation	36%	22%	59%	37%	84%	1st grade-1	7

Source: Cited in Jones (1976), as adapted from Quigley, et al., 1976.

the deaf and the hearing students, Table 2 provides mean scores for each specific test for the youngest and oldest age groups of deaf students and the percentage increase in those scores. These should enable the teacher and clinician to determine what specific aspects of the larger structures present most difficulty for deaf children. For example, mean scores for deaf students on the embedding test in the relativization structure increased from 51% at age 10 to only 59% at age 18, only 8% improvement in approximately 8 years. This was obviously a very difficult test for the deaf students and also provided an interesting example of the deaf students' tendency to force a subject-verb-object pattern on sentences, even where it is inappropriate. Given a sentence such as *The boy who hit the girl ran away*, a deaf student is quite likely to believe that it was the girl who ran away. A similar strong tendency for surface reading of passive sentences was reported by Power and Quigley (1973) where deaf children were shown to interpret sentences such as *The girl was pushed by the boy*, as *The girl pushed the boy*, changing passive to active and in the process, of course, completely changing the meaning of the original sentence.

Establishment of Syntactic Rules

Table 2 also illustrates the extent to which the syntactic rules of English are established in the language of deaf children (Question 2). Most of the structures were not well established even among the 18-year-old deaf students, whereas virtually all of the structures had been mastered by the 10-year-old hearing subjects. It should be stressed, however, that the value of these data lies not in showing that there is a large gap between deaf and hearing children, but in showing precisely where the problems are for deaf children as evidenced by their performances on the specific tests and by the particular deviant (from standard English) structures they use.

Syntactic Structures in a Typical Reading Series

The disparity between the deaf subjects' knowledge of specific syntactic structures and their appearance in the *Reading for Meaning* series (McKee, et al., 1966) is also shown in Table 2. This series is used in schools and classes for deaf children and could be considered representative of other reading series in current use. As an example, deaf students at the age of 18 years had a mean score of 63% correct on the Complementation subtest. This structure first appeared in the second primer 4 times per 100 sentences and increased to 32 times per 100 sentences at the sixth grade level. It would appear, therefore, that deaf students at the age of 18 years would experience some difficulty in comprehending approximately one-third of the sentences in the sixth grade level text merely on the basis

of this one structure. Similar findings were made for the other structures studied.

Developmental Stages of Syntactic Rules

Studies of language acquisition among hearing children have indicated that children acquire specific syntactic structures through developmental stages. This has been shown by Klima and Bellugi (1966) and Bellugi (1971) for question formation and by Bellugi (1967) for negation. Question three asked if deaf children go through identical stages. The data from the TSA could not provide an adequate answer to this question since it measures degrees of syntactic difficulty rather than the acquisition process for specific structures in the language of children. Also, since the subjects for the study had age ranges of 10-18 years one could not reasonably expect the data to answer definitive questions concerning the language acquisition process. The authors did, however, offer a tentative conclusion that deaf children's use of syntactic structures develops in a manner similar to that of hearing children, but at a slower rate. They were able to reach this conclusion on the basis of comparisons from psycholinguistic literature on hearing children and data from the TSA. They did find exceptions and this was the concern of question four.

Acquisition of Distinct Syntactic Structures

The tendency of deaf subjects to impose a subject-verb-object pattern on sentences (and thus misinterpret the sentences) has been reported by Power (1971) and Power and Quigley (1973) for the passive voice and by Quigley, et al. (1974) for some aspects of relativization. The tendency to connect the nearest noun phrase and verb phrase also lead to the misinterpretation of many sentences. These two factors suggest that deaf subjects perceive English as a linear rather than a hierarchical structure and probably account for many of the language difficulties experienced by deaf students. Table 3 presents additional syntactic processes which seem to be common among deaf subjects. These structures appeared consistently in the productions of many of the deaf subjects, whereas they did not appear among the hearing sample. One might reasonably assume, therefore, that these structures are rule ordered. As one would expect, the extent to which deaf students acquire deviant syntactic structures affects their abilities to comprehend written English.

THE TEST OF SYNTACTIC ABILITIES

In discussing results from the administration of the research version of

Table 3

Some Distinct Syntactic Structures in the Language of Deaf Students

Structural environment in which structure occurs	Description of structure	Example sentences
Verb system	Verb deletion	The cat under the table.
	Be or Have deletion	John sick. The girl a ball.
	Be-have confusion	Jim have sick
	Incorrect pairing of auxiliary with verb markers	Tom has pushing the wagon.
	By deletion (passive voice)	The boy was pushed the girl.
Negation	Negative outside the sentence	Beth made candy no.
Conjunction	Marking only first verb	Beth threw the ball and Jean catch it.
	Conjunction deletion	Joe bought ate the apple.
Complementation	Extra for	For to play baseball is fun.
	Extra to in POSS-ing complement	John goes to fishing.
	Infinitive in place of gerund	John goes to fish.
	Incorrectly inflected infinitive	Bill liked to played baseball.
	Unmarked infinitive without to	Jim wanted go.
Relativization	NP's where whose is required	I helped the boy's mother was sick.
	Copying of referent	John saw the boy who the boy kicked the ball.
Question formation	Copying	Who a boy gave you a ball?
	Failure to apply subject-auxiliary inversion	Who the baby did love?
	Incorrect inversion	Who TV watched?
Question formation, Negation	Overgeneralization of contraction rule	I amn't tired. Bill willn't go.
Relativization, Conjunction	Object-object deletion	John chased the girl and he scared. (John chased the girl. He scared the girl.)
	Object-subject deletion	The dog chased the girl had on a red dress. (The dog chased the girl. The girl had on a red dress.)
All types of sentences	Forced subject-verb-object pattern	The boy pushed the girl. (The boy was pushed by the girl.)

Source: Quigley et al. (1976).

the TSA in the previous section of this paper, little attention has been given to the test itself. In this section of the paper the rationale for the development of the TSA, the formats used in the research version, and information on our present project to convert the original TSA into a multiple choice diagnostic test for clinical and classroom use will be considered.

Rationale for the Research Version of the TSA

Prior to the development of the research version of the TSA, an extensive linguistic analysis of a large corpus of written language samples was completed. This analysis resulted in the identification of rules used by

deaf children to produce sentences and demonstrated the consistency of many of these rules across a number of schools and age levels. As mentioned previously, however, written language samples have several limitations—some structures do not appear at all and some occur too infrequently for one to be able to draw valid conclusions. The research version of the TSA was developed to overcome these limitations. By use of the TSA one could elicit responses for as wide a range of structures as desired so that greater insight could be gained into the rules underlying the comprehension and production of deaf children's sentences and their gradual approximation to standard English usage.

Formats Developed for the Research Version of the TSA

Two basic types of test format were used in the research version of the TSA: Sentence Completion Tasks and Sentence Correction Tasks. The Sentence Completion Tasks appeared in two forms: (a) as "fill-the-gap" exercises in which the child was asked to complete a sentence correctly by inserting a word or words into a blank in a sentence, but where he was free to write any word at all (Figure 1), and (b) as "multiple choice" exercises where the child was again asked to insert a word or words into a sentence, but where he was constrained in the range of choices he could make by being provided with a number of possibilities, from among which he had to choose one response as the correct answer (Figure 2). This format was particularly useful where the range of possible answers was relatively small and could be specified accurately. This technique allowed for particularly close focusing on exactly what the child knew of a particular structure without interference from competing responses from similar structures.

The woman gave me some milk. The woman gave me some cookies.

Make ONE sentence:

The woman gave me some milk _____

Figure 1. Example of "Unconstrained Fill-the-Gap" Format

Sentence-Correction Tasks used in the research version of the TSA were based on reduction to written form of an oral technique often used by linguists using adult informants to investigate the grammar of an exotic language. Menyuk (1969) has demonstrated the validity of these techniques in studying the oral language of very young hearing children. The

Write ONE word to make a good sentence.

John hurt the girl_____ he hit.

Write ONE of

a. who
b. which
c. what
d. that
e. when
f. where
g. whose

Figure 2. Example of "Constrained Fill-the-Gap" Format

format used in this battery was based on the adaptation of this technique to written form and to the lowered comprehension of deaf children. In this format the child was presented with either correct or incorrect versions of the structure under consideration. Most of the "incorrect" (as compared with standard English) forms represented distinct syntactic constructions consistently found in the written language samples from deaf children. If the structure had not appeared at all in the written samples, incorrect forms were constructed by systematically varying relevant aspects of the correct form. A sample of the right-wrong-rewrite format in which the child was presented an "incorrect item" is illustrated in Figure 3.

John chased the girl who he scared the girl.

Check ☐ ONE box. The sentence is:

RIGHT: ☐ Go to page 2.

WRONG: ☐ Change the sentence to make it RIGHT.

Write the RIGHT sentence here:_____

Figure 3. Example of the Format for the "Sentence Correction" Task (Right-Wrong-Rewrite Format).

Pilot-testing of this right-wrong-rewrite format indicated a tendency for children who were unsure of their responses to check "right" to save

themselves work. Therefore, half the number of times the child was presented with the structure, he was not asked to rewrite the sentence in its correct form, but only to indicate whether the sentence was "right" or "wrong."

The right-wrong-rewrite technique seemed useful where it was not desirable to constrain the types of responses allowed the student, or where it seemed impossible to specify just what type of response would be "correct." It was particularly useful for the investigation of structures which involved the whole sentence as, for example, some aspects of the use of relative clauses. A variant of this type of task was found in such tests as Relativization in which the child was presented with a number of sentences and asked to determine whether they "meant the same" as the two sentences underlying each of the embedded sentences presented to him.

Pilot-Testing the Research Version of the TSA

Extensive pilot-testing of the initial version of the tests was conducted both with individuals and with groups of children. Results of the pilot tests provided information upon which the revised formats in the final version of the tests were based. It was found, in the pilot testing, that very few of even the oldest children tested were able to successfully cope with the nominalization test and aspects of complementation, so those tests were either dropped completely from the final battery or drastically reduced in size or scope before being included in it.

The Standardized TSA

The research version of the TSA was too unwieldy for classroom use. Not only did it take 12 hours to score for one individual, but its many and varied formats—each tailor-made to the specific structure being studied —also made it impractical. Therefore, since no objective tests for diagnosing and assessing deaf children's syntax exist, a revision of the TSA was the next logical step. This revision is the current project at the Institute for Child Behavior and Development.

Potential Uses for the Standardized TSA

The purpose of the project is to develop a standardized version of the TSA for use with deaf students ages 10 through 18 years. The standardized test will serve three important educational functions: (1) assessment of individual and group status and growth on major syntactic structures of English; (2) diagnosis of individual strengths and weaknesses in

syntactic skills; and (3) evaluation of the effects of language curricula.

Assessment of Status and Growth on Syntactic Structures of English. An essential purpose of the standardized TSA is to measure the extent to which deaf students have acquired the basic skills in syntax necessary for progress in academic endeavors. The test will enable teachers and administrators to ascertain the level of language accomplishment in syntax of each pupil in order that instruction may be more precisely adapted to the students' individual needs.

Measures of growth as well as status are highly desirable. Because of the high reliabilities expected to be obtained for the subtests of the revised TSA, profiles of battery scores, syntactic structure scores, and subtest scores could be interpreted precisely for groups, and when used with discretion and proper reservations, could make possible the location of plateaus and peaks in the individual pupil's development. A parallel form, constructed so that the student need not take the same test each year, will enhance the precision of the growth charts and increase their value for making more dependable decisions concerning groups and individual pupils.

Diagnosis of Each Pupil's Strengths and Weaknesses. If a classroom teacher does not have a standardized instrument for diagnosis and assessment, he/she is forced to perform these tasks by direct observation of the child's behavior. Oriented toward supplementing the teacher's personal impressions, the TSA will be constructed in such a way that the analysis of subtest results will identify grammatical constituents not understood by an individual student. In addition to this, an analysis of wrong answers the student chooses will enable the teacher to understand the specific confusions which characterize the student's language. With this information, the teacher could plan for remedial and individualized instruction as well as improve the quality of educational decisions made concerning each pupil.

Evaluation of Language Curricula. Because improvements in curriculum can be maintained and generalized only if they are confirmed in an objective manner, resolution of assessment problems would also permit research necessary to bring about improvements in language instruction and materials. A generally applicable instrument for determining specific rules and concepts of grammar which a deaf child had and had not mastered would be of great value in this respect, and the value of such an instrument would be enhanced if it could help determine not only whether a deaf person had or had not mastered a particular grammatical structure, such as relativization, but also the degree of development between no knowledge of a structure and complete mastery of it. Although the research version of the TSA was too unwieldy for general use,

we believe the standardized version will provide teachers and administrators with objective and dependable data for the identification of those areas of the instructional program most in need of greater emphasis, and provide reliable evidence of change in response to curriculum variations.

Formats Used in the Standardized TSA

One problem involved in converting the research version of the TSA to a standardized battery was related to item format. The formats used in the original TSA, written specially to examine specific deviancies, were highly successful for uncovering language characteristics of deaf students, but as mentioned previously, they were time-consuming to administer and required special training to score. In order to eliminate some of the scoring and interpretation problems associated with existing formats, alternations were made so that the tests would have two characteristics:

1. Teachers should be able to score and interpret the tests without special training, and
2. Chosen formats should require limited reading and little writing on the part of the student, since measuring the influence of enabling factors is not a purpose of the test.

The multiple choice format was selected in order to incorporate these attributes. In some cases an item stem was provided, but in most cases four sentences were presented, with the student to select the one sentence which was correct. An example is given in Figure 4. In the pronoun test, stimulus items with a blank space substituted for the pronoun were presented and the children were instructed to select the correct pronoun for the blank as seen in Figure 5. Three incorrect alternatives were associated with each item; care was taken to randomize the order of the presentation of distractors to minimize the possibility of a subject developing any kind of set for the position of right answers.

A. Was the kitten was on the table?

B. Was the kitten on the table?

C. The kitten on the table?

D. Did the kitten was on the table?

Figure 4. Example of Multiple Choice Format Used in the TSA

I made candy for the teachers.

They liked_____candy.

A. her
B. my
C. mine
D. our

Figure 5. Constrained Multiple Choice Format Used in Pronoun Subtests of the TSA

Pilot-Testing the Standardized TSA

Pilot-testing was used in the writing of the original TSA, and the research version of the TSA was "tried out" during the research on the 450 deaf children from across the country. But in revising the research instrument into a practical standardized test, much of the test was rewritten. Distractors from the research version which were seldom chosen or which did not incorporate potentially diagnostic information were replaced and extensive changes in format were made. Since no information was available on how this new set of items would act together, and since the revisions of the TSA represented departures from the formats used during the original administration of the tests, it was necessary to pilot-test the revisions to assess how well deaf students were able to use the new formats and to assess the effects of the changed formats on the reliability and difficulty of the items. The pilot sample provided sufficient information on possible floor and ceiling effects and on other consequences of the revisions to determine what other changes were desirable or necessary before the full scale testing of a national sample began. When pilot-testing indicated that certain items were inadequate for their special purposes in the test, new items were written and pilot-testing was repeated.

The revised version of the TSA is currently being standardized on a nationally selected random sample of prelingually, profoundly deaf students. Sampling was performed following basically the same procedures used in the previous six-year language research project. A stratified, random sample of 450 deaf students, 25 males and 25 females at each level from 10 through 18 years, were chosen from the schools which participated in our previous study. The students met the same criteria as those who were tested with the research version of the TSA.

SUMMARY

In about one year a battery of tests—valid, reliable, and standardized on a large population of deaf students from all parts of the country—will be ready for assessment and diagnostic use in the classroom. One parallel form and a complete manual will accompany the test. In addition, we plan to have, by 1983, language and reading materials available that have proved to be effective through extensive pilot and field testing. It is hoped that these tests and the materials will provide teachers with the types of information they need to help teach their students the English language, which continues to be the primary problem in the education of deaf children.

BIBLIOGRAPHY

BELLUGI, U. The acquisition of negation. Unpublished doctoral dissertation, Harvard University, 1967.

BELLUGI, U. Simplification in children's language. In R. Huxley and E. Ingram (Eds.), *Language acquisition: Models and methods.* New York: Academic Press, 1971.

JONES, B. W. The abilities of deaf students to comprehend and produce written English: A review of the literature. Urbana, Illinois: University of Illinois, 1976 (mimeo).

KLIMA, E. & BELLUGI-KLIMA, U. Syntactic regularities in the speech of children. In J. Lyons & R. J. Wales (Eds.), *Psycholinguistic papers.* Chicago, Illinois: Aldine, 1966.

McKEE, P., HARRISON, M. L., McCOWEN, A., LEHR, E. & DURR, W. K. *Reading for meaning* (4th ed.). Boston: Houghton-Mifflin, 1966.

MENYUK, P. *Sentences children use.* Cambridge, Mass.: M.I.T. Press, 1969.

POWER, D. J. Deaf children's acquisition of the passive voice. Unpublished doctoral dissertation, University of Illinois, 1971.

POWER, D. J. & QUIGLEY, S. P. Deaf children's acquisition of the passive voice. *Journal of Speech and Hearing Research*, 1973, *16* (1), 5-11.

QUIGLEY, S. P., SMITH, N. L. & WILBUR, R. B. Comprehension of relativized sentences by deaf students. *Journal of Speech and Hearing Research*, 1974, *16* (3), 325-341.

QUIGLEY, S. P., WILBUR, R. B., POWER, D. J., MONTANELLI, D. S. & STEINKAMP, M. W. *Syntactic structures in the language of deaf children.* Urbana, Illinois: Institute for Child Behavior and Development, 1976.