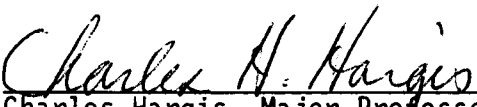
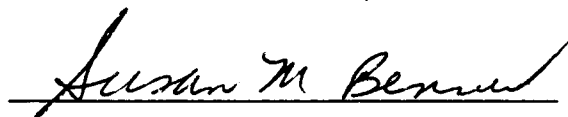
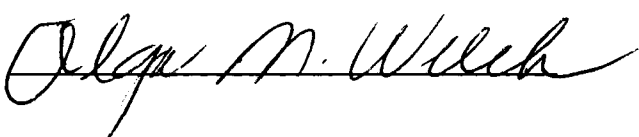


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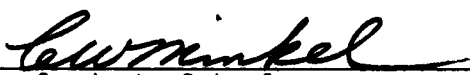
I am submitting herewith a thesis written by Teresa Nelson McMahan entitled "Study of the Comprehension of Cause and Effect Structures by Hearing Impaired Students." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Special Education.


Charles Hargis, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:


The Graduate School

STUDY OF THE COMPREHENSION OF CAUSE AND EFFECT
STRUCTURES BY HEARING IMPAIRED STUDENTS

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Teresa Nelson McMahan

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Finally, thanks to my family who were willing to put their desires aside to see this study completed.

ABSTRACT

The purpose of this study was to test the comprehension of the various cause and effect structures encountered by hearing impaired students. A test was developed by the researcher to evaluate the comprehension of these structures. By using the scores from this test, the structures were ranked so that they may be placed on the Receptive Language Scope and Sequence Chart used at the Tennessee School for the Deaf in Knoxville, Tennessee. By determining the correct order of difficulty of these structures, a skills hierarchy for teaching receptive language could be established.

The subjects participating in the study were eighty hearing impaired students at the Tennessee School for the Deaf. The students ranged in age from 8 to 16. A pencil and paper format allowed for group administration of the test. The student's test score, age, and reading level were compiled for statistical analysis by computer using a Pearson product-moment correlation and an analysis of variance with repeated measures. Tukey's (HSD) Multiple Comparison Test was used to determine the location of significance of difference between group means.

The results showed that a significant difference in difficulty exists among the various cause and effect structures. There was a positive correlation of .42 between reading ability and comprehension of the cause and effect structures. No significant relationship was found between chronological age and comprehension of the eleven cause

and effect structures. It was recommended that the test of the comprehension of cause and effect structures be used with larger groups of deaf children in a variety of settings.

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INTRODUCTION

Language has been defined as "a code whereby ideas about the world are represented through a conventional system of signals for communication" (Bloom & Lahey, 1978, p. 23). If a combination of factors is present a child will almost effortlessly acquire a language system. These factors include a stimulating environment, a sensory system without deficits, normal cognitive and intellectual functioning, and an interested person with whom to communicate.

Because many language systems are auditorially based, they pose unique problems for the deaf child. Deaf children do not seem to learn language as naturally as do their hearing counterparts. Hearing children learn the bulk of their language by the age of six. Perhaps deaf children are delayed because they must actively seek information rather than being able to passively receive it as a hearing child would.

Educators can best contribute to the process of language acquisition in deaf children by having a complete understanding of language as one of the systems of normal developmental processes (Streng & Kretschmer, 1978). One facet of this knowledge includes the presentation of the various language structures encountered by children. Until recently, many areas concerning the language development of deaf children have been uninvestigated. Little research has been done regarding the comprehension and acquisition of syntactic structures which deal with cause and effect relationships.

CHAPTER I

STATEMENT OF THE PROBLEM

Purpose of the Study

The purpose of the study was to test the comprehension of the various cause and effect structures encountered by hearing impaired students. A test was developed by the researcher to evaluate the comprehension of the structures by the students. By using the scores from this test the structures were ranked by level of difficulty. The structures were ranked so that they may be placed in appropriate order on the Receptive Language Scope and Sequence Chart used at the Tennessee School for the Deaf in Knoxville, Tennessee. By determining the correct order of difficulty of these structures, a skills hierarchy for teaching receptive language could be established.

Need for the Study

Repeatedly, researchers have shown that the language and reading abilities of many hearing impaired children are often delayed (Quigley, 1982; Wrightstone, Aranow, & Muskowitz, 1962, 1963; and Trybus and Karchmer, 1977). Quigley has shown that the average 18-year-old hearing impaired student cannot understand or use as many of the syntactic structures that the average 10-year-old child with hearing understands and uses with ease.

National surveys continue to report serious educational retardation, especially in reading (Wrightstone, Aranow, & Muskowitz, 1962, 1963). Only 10% of hearing impaired 18-year-olds nationally can read at or above the 8th grade level (Trybus & Karchmer, 1977).

Language delay in hearing impaired children can be attributed to several factors: (1) "Language is learned and in the beginning is learned auditorially" (Harris, 1971, p. 5). Without use of the auditory channel, language development is effected. Woolfolk (1982) states that linguistic input from the environment is seriously modified for most deaf children. (2) Liben (1978) points out that the deaf probably have experiential deficiencies. This opinion paralleled that of Furth (1966) who emphasized the importance of experience for development of the mind. Furth believed that less emphasis should be placed on language instruction and that deaf children should be encouraged to have the same life experiences as hearing students.

As stated earlier, the language and reading abilities of many hearing impaired children are quite delayed. It is obvious that different approaches in teaching language and reading are necessary in the field of deaf education. Concern in this area has resulted in new studies in the development of curriculum for teaching language and reading. The Test of Syntactic Abilities was introduced in 1980 by Quigley and Power. This instrument tests the comprehension of common syntactic structures encountered by children in reading materials. The standardization of this test has led to the development of a new reading program designed specifically for children who have

language delays. Reading Milestones is a syntactically controlled reading program for hearing impaired students (Quigley & King, 1981).

Until recently the acquisition of many syntactic structures by deaf children had not been studied. Wilbur (1983) researched nine previously uninvestigated syntactic structures. The difficulty of these structures was studied for more accurate use in controlled-syntax reading materials. The following structures were studied:

Why questions--Why is Mary crying?

Conditionals--If it rains, then we will go to the library.

Nonlocative prepositions--The present is for Mary.

Indefinite pronouns--John saw something behind the tree.

Quantifiers--each, every, some, any, all, and no.

Modal verbs--can, should, may, might, could, would, will and won't.

Elliptical constructions--The school is a long way from here.
Yes it is.

Reciprocal pronouns--John and Mary like each other.

Comparative constructions--John is taller than Bill.

Hearing impaired students were given a paper and pencil test to determine their comprehension of the nine syntactic structures. As a result of testing, Wilbur ranked the nine syntactic structures by level of difficulty. Wilbur cited the why-question form as being the easiest of the nine syntactic structures. In all the why-questions tested, the four multiple choice foils began with the word because. It is the contention of this researcher that why-questions which can

be answered with because are only one facet of the many syntactic structures which may have a cause and effect relationship.

For example, why questions can be directed to real situations. If a child is punished for writing on a wall with a crayon, it is easy for the child to answer the question--Why were you (the child) spanked? The child has a clear picture of the cause and effect relationship. On the other hand, a why-question can also be directed to an abstract, verbal situation. In a basal reader the child may encounter the sentence: The boy walked in the street so that he could get the ball. If no picture is provided, the student must rely solely on the verbal information provided in the text. In basal readers a student will be exposed to cause and effect relationships in a variety of syntactic structures. In his book, English Syntax, Charles Hargis (1977) devotes a chapter to all the syntactic structures which may indicate a cause and effect relationship (for further information refer to page 8).

Ignoring these differences, Wilbur ranked the why-question as the easiest structure seen by deaf students. In so doing, she has made a wide generalization about all cause and effect structures.

This researcher has found a lack of research concerned with the comprehension of the other cause and effect structures. The present study is designed to investigate this neglected area of research, i.e., the comprehension of cause and effect structures by hearing impaired students.

Research Questions

1. Are there significant differences in difficulty among the eleven cause and effect structures by hearing impaired students as a group?
2. Is there a significant relationship between reading ability and comprehension of each of the eleven cause and effect structures by hearing impaired students?
3. Is there a significant relationship between chronological age and comprehension of each of the eleven cause and effect structures by hearing impaired students?
4. Is there a significant relationship between the level of reading ability and comprehension of cause and effect structures by hearing impaired students?
5. Is there a significant relationship between chronological age and comprehension of cause and effect structures by hearing impaired students?

Definition of Terms

For the purposes of this study, it is necessary to define certain terms. These definitions are provided below.

Syntactic structures. A syntactic structure is defined as the various ways in which words of the language may be put together to form sentences.

Reading comprehension. Reading comprehension will be defined as obtaining meaning from the printed page. In the Wilbur study and for testing done by this researcher, students' scores from the reading comprehension section of the Stanford Achievement Test were used to determine reading comprehension.

Receptive language. Receptive language will be defined as the written, spoken, or manual language which the child understands. The students' receptive language will be measured by performance on the test of cause and effect structures.

Sensorineural hearing loss. Sensorineural hearing loss will be defined as a hearing loss caused by damage to the auditory nerve or inner ear.

Profound hearing loss. Profound hearing loss will be defined as a hearing loss greater than 90 dB in the better ear.

Deaf. A person is deaf when he or she is not able to use hearing to understand speech through the use of ears alone.

Hard of hearing. A person is hard of hearing if he or she has a significant hearing loss that makes some special adaptations necessary. He or she is, however, able to use hearing to understand speech, generally with the use of a hearing aid.

Hearing impaired. Both deaf and hard of hearing people fall under this category. The subjects participating in this study had a sensorineural hearing loss of not less than 90 dB at 500, 1000, and 2000 Hz. The subjects were all prelingually hearing impaired.

Causality. Causality is defined as the relation between cause and effect.

Cause and effect structures. These are defined as structures at a sentence level that contain a cause and effect relationship. Examples of cause and effect structures are listed following the definition of why questions.

Why questions. This question form is used to interrogate cause and effect relationships. This is explained in further detail on page 4. Below is a list of cause and effect structures that may be interrogated by why questions:

SUCH . . . THAT

This structure links sentences on the basis of noun phrases.

1. He was such a good student that he got all A's.

Why did he get all A's?

Because he was such a good student.

SO . . . THAT

In this class the words so . . . that link two sentences in the cause and effect relationship. The basis, or linking point for this relationship is an adjective, an adverb, or a noun phrase. The so precedes the adjective, adverb, or noun phrase and the that introduces the effect sentence.

1. Fred was so sleepy that he went to bed.

Why did Fred go to bed?

Because he was so sleepy.

SO THAT

So that introduces a causal adverbial clause in sentences such as:

1. Mary saved her money so that she could buy a bike.

Why did Mary save her money?

So that she could buy a bike.

THAT

In this class of cause and effect structures, that introduces the causal clause.

1. Jill was happy that she got a puppy.

Why was Jill happy?

That she got a puppy.

SO

Here, so introduces the clause which expresses effect of consequence.

1. The sun went down so the birds stopped singing.

Why did the birds stop singing?

Because the sun went down.

BECAUSE

Because introduces causal clauses.

1. Fred went home because he was sick.

Why did Fred go home?

Because he was sick.

BECAUSE OF

Because of introduces a nominalized causal sentence.

1. Fred got an A because of his hard work.

Why did Fred get an A?

Because of his hard work.

FROM

The prepositional phrase introduced by from can indicate causality.

1. Joe's hands turned blue from the cold.

Why did Joe's hands turn blue?

From the cold.

FOR/POSSESSING

The prepositional phrase introduced by the preposition for may indicate causality.

1. Joe got an electric car for driving to work.

Why did Joe get an electric car?

For driving to work.

FOR . . . TO

Sentences which have undergone the for . . . to transformation are frequently used to indicate causality.

1. We bought a bike for the children to ride.

Why did we buy a bike?

For the children to ride.

TOO . . . FOR . . . TO

In this class of sentences, a negative causal relationship is produced. Too operates in an intensifier position within the causal clause which is followed by a sentence nominalized by the for . . . to

transformation. The for . . . to structure indicates the effect structure in this sentence class.

1. The shelf was too high for him to reach.

Why could he not reach the shelf?

Because the shelf was too high.

CHAPTER II

RELATED LITERATURE

The review of related literature is divided into four major sections, early research on language and reading delays in hearing impaired students, recent research on language and reading delays in hearing impaired students, reasons for the language and reading delays in hearing impaired students, and current curriculum developments in addressing the language and reading problems in hearing impaired students.

Early Research on Language and Reading Delays in Hearing Impaired Students

Much of the early research conducted with hearing impaired children indicates that their language and reading abilities are quite delayed (Reamer, 1921; Heider & Heider, 1941; Pugh, 1946; and Goda, 1959).

Reamer (1921) studied 2500 deaf children. The students came from fifteen state institutions and eleven public day schools in nine different states. They ranged in age from 8 to 18 years of age. The students were given two separate tests. One was the Non-Language Mental Test, comprised of six different tests. The second test given was the Educational Survey Test, comprised of eight separate tests, which covered the principle subjects in the ordinary school curriculum. A standardization of the two tests was based on 2172 cases out of the 2500 tested.

As a result of testing Reamer concluded that the average difference in mental ability between deaf and hearing children is about two years. The average difference in educational ability between deaf and hearing can be expressed by saying that the deaf child is retarded five years when compared with the hearing child. The deaf child on the average is three and one-half years behind the hearing child in grade placement.

"The discrepancy between the two years retardation mentally and five years retardation educationally is due to the language handicap, and this is a good measure of the power of this handicap in the education of the deaf" (Reamer, 1921, p. 130).

Heider and Heider (1941) studied a group of young deaf children who had not yet acquired conventional language systems. Observations were made of a group of deaf children and a separate group of hearing children. Both groups ranged in age from 3 to 5 years. The researchers noted that communication in the deaf children was carried on by pointing and expressive movements. They also stated that the deaf children depended greatly on the context of the situation to obtain meaning. This was not necessary for the hearing children who used spoken language.

The deaf children were found to be greatly handicapped in dealing with abstract situations. It was determined that the deaf children had attained a stage of language development which is characteristic of two or two and one-half years.

In 1959, Goda conducted a study to investigate the chief language skills of adolescent pupils at a residential school for the deaf. The study was done at the Michigan School for the Deaf. There were 56 students involved in the study, 32 males and 24 females. The researchers chose to investigate (a) the relationship between chronological age and language skills, (b) the relationship between intelligence and language skills, (c) the difference between sexes in the development of language skills. In addition to a language deficit, the study showed a patterning of language skills existed among the subjects of chronological age and sex.

Similar findings were made by Lyon (1933). The Stanford Reading Achievement Test was given to students at the Illinois School for the Deaf. The subjects included 253 children, ranging in age from 8-23. Lyon makes the following conclusions after reviewing the test data:

1. The ability of the children to read and understand words was in general superior to their ability to read and comprehend directions.
2. There seems to be more rapid improvement in all subjects above grade nine than in earlier grades.
3. The achievement in the first six grades is very slow.
4. There is a considerable amount of unevenness in each grade in regard to achievement.

There is additional data that supports the deficit in the development of reading skills among the hearing impaired. In 1946 Pugh conducted a survey of 46 schools for the deaf. This included both residential and day schools. The children were grouped by the number of years they had attended school. The subjects were given the Iowa

Silent Reading Test which measures ability in Rate and Comprehension, Directed Reading, Word Meaning, Sentence Meaning, and Location of Information. Pugh reported the following results:

1. On all parts of the test, the medians for deaf pupils were lower than the medians for hearing children who had attended school an equivalent number of years.
2. The hearing impaired children showed the greatest retardation in Sentence Meaning and in Word Meaning.
3. Gradual progress was revealed by the Iowa Silent Reading Test, for deaf children who had attended school from seven to thirteen years, but this progress in some instances was very slight.

As a part of the National Study of the Psychology of Deafness, Myklebust (1960) reported significant retardation in reading achievement by deaf children. Myklebust administered the Columbia Vocabulary Test to 564 students in residential and day schools and to 201 school age hearing children. The children ranged in age from 9 to 15. "The comparison of scores for the deaf and normal children revealed that those with sensory deprivation were severely retarded" (Myklebust, 1960, p. 276). He found that the degree of retardation increased with age, a trend which was opposite of that found for the hearing children. The researcher also reports that as the profoundly deaf child reaches the age at which the hearing child completes high school his/her ability to read is below the third grade level. "These results indicate that when he completes his regular schooling, the deaf child is retarded seven to eight years in reading vocabulary" (Myklebust, 1966, p. 278). It is important to note that the general educational achievement is not delayed to this extent, but that this deficit in reading will greatly influence academic progress.

Another significant study (Wrightstone, Aranow, & Muskowitz, 1963, 1963) included 5307 deaf children in 73 residential schools and private and denominational schools in the United States and Canada. The children were given the Metropolitan Achievement Test. The results showed serious educational retardation, especially in reading. The average gain in reading for children age 10 to 16 was less than a year in grade level with an average reading achievement grade of 3.5 for the students who were 16 years old.

The area in which the deaf child is weakest, and which is at the root of deficiencies in other areas, is language ability. The highest grade level reached by any group of hearing impaired 16 year olds in regard to reading achievement is 6.0 (Pugh, 1946 and Miller, 1958). It has been demonstrated that even these estimates are inflated because the nature of multiple choice tests standardized on the hearing is such to assume basic linguistic proficiency which most deaf children do not possess (Moores, 1967). A child's comprehension of syntactic structures should not be assumed on the basis of a test score. It is important to take this fact into consideration when planning a realistic language remediation program.

Recent Research on Language and Reading Delays in Hearing Impaired Students

The Office of Demographic Studies (ODS) located at Gallaudet College has provided the most recent data concerning the reading achievement of the hearing impaired student. Since 1968, the ODS

has studied the educational achievement of hearing impaired children, and the special education programs which serve those students

(Karchmer, 1977).

The ODS through its Annual Survey of Hearing Impaired Children and Youth collected achievement test information on a national scale in the spring of 1969, and the spring of 1971. Results of this testing showed that reading scores of fifth grade or better were achieved by only 12% of the deaf school population including students at the secondary levels. Further details of the results of these studies have been reported in detail (Trybus, Buchanan, & DeFrancessca, 1973).

These earlier projects may be viewed as the necessary preliminaries to the most detailed project, The National Achievement Test Standardization Program. This project, conducted by the ODS in the spring of 1974, developed a special edition for hearing impaired students of the 1973 Stanford Achievement Test. As a result of this national project, an achievement test is now available for use with hearing impaired children (Trybus & Karchmer, 1973).

National norms for hearing impaired students, according to age, have been developed and are also available. Since the beginning of the program, test materials for more than 40,000 students have been distributed to approximately 400 school programs. Included is a full range of special education settings, from large residential schools to small integrated classrooms.

In the 1977 paper, Trybus and Karchmer describe the current status of hearing impaired students' performance in two subject areas:

math computation and reading comprehension. Normative score distributions by age were presented, showing the quartile points for each group. After interpreting test results, Trybus and Karchmer made the following observations:

Half the hearing impaired students at age 20 (or at any younger age) read at less than a mid-fourth grade level, that is, below or barely at a newspaper literacy level. Also, only 10% of hearing impaired 18 year olds nationally can read at or above an 8th grade level (1977, p. 64).

Through analysis of the various research done concerning reading achievement, it is very clear that the overwhelming majority of hearing impaired children leave school in the late teens at a very substantial educational disadvantage compared to their hearing counterparts.

Reasons for Language and Reading Delays in Hearing Impaired Students

Researchers have done much investigation into the reasons for language and subsequent reading delays in hearing impaired children.

Harris states that "Language is learned and in the beginning is learned auditorally. . . . It is understandable therefore that the infant or young child with a hearing loss will not develop language skills without special attention" (1974, p. 5).

Quigley (1982) feels that the problem seems to be interference with the establishment of easy and fluent communication between the child and the immediate figures in the environment. Because this easy and fluent communication in humans depends upon a reasonably

intact auditory system, deafness will certainly produce a massive disruption of the normal development of language and communication.

"The communication environment of the deaf child differs from the earliest months. Parents try to communicate through the auditory channel primarily and this leads to failed communication" (Woolfolk, 1982, p. 381). This is confirmed by Liben (1978) who contends that 90% of the deaf children of hearing parents lack an effective system of communication. Also Schlesinger and Meadow (1972) found that when mothers of deaf children were asked about child-rearing problems over half mentioned difficulties in communication.

Gregory (1976) obtained information from interviews with 122 mothers of young deaf children. Mothers were asked to identify their greatest problem when coping with their deaf child. Seventy-six percent of the women cited communication problems. When asked what the worst problem was from the child's point of view, 89% answered--communication. Overall, when the mothers were asked how they usually communicated with their children, 28% indicated that they used only speech. Thirty percent of the mothers said that they used only gestures and pointing. The remaining mothers used a combination of speech and gestures.

Characteristically, mothers, upon finding that their children are deaf, are less involved than mothers of hearing children. Woolfolk discusses a parent's reaction to their child's deafness. "For the hearing child of hearing parents, the child's first words are greeted by joy and the mutual sharing of this important milestone"

(1982, p. 381). Hearing parents of a deaf child spend months in a state of uncertainty over the status of the child's hearing. Once the diagnosis is made, the family undergoes shock and a period of mourning. "All of this modifies the parent's joy of interacting with the child" (Woolfolk, 1982, p. 381).

Even after the deafness is accepted, Wulburt (1975) says that mothers are less likely to allow their children to engage in joint activities, tend to avoid disciplining a child for misbehavior, and show less response to the child's communication attempts.

Wulburt contends that

. . . communication handicapped children and parents are in a double bind. The children themselves are impaired in language expression and understanding and by the presence of this impairment inhibit communication with the very adults likely to have the largest role in early language growth (1975, p. 63).

Despite all barriers to communication, Woolfolk says that "the needs and desires of deaf children to communicate appear just as important as those of hearing children" (1982, p. 382). This is supported by a study of the development of natural gesture in deaf children who lack any other means of communication. Godin-Meadow and Feldman (1975) found that deaf children invented "names" for actions and objects and syntactically coded semantic relations between actions and objects using a gestural system.

Finally on the subject of communication problems, Kretschmer (1978) feels that the language performance of hearing impaired children can parallel that of hearing children if the following factors are present:

1. The hearing impairment must be diagnosed early.
2. The quality and quantity of the linguistic experience is normalized.
3. The child is capable of profiting from auditory input.

Experiential deficiency is believed to be another factor which contributes to the language delay in deaf children. Three researchers have been mainly credited with promoting this idea. They include Furth (1966), Liben (1978), and Moores (1978).

A book written by Furth entitled Thinking Without Language (1966) has been influential in modifying educators' opinions about the thought and the language of the deaf. Furth, whose experiments were modeled upon the work of Piaget, emphasized the importance of experience for developing the mind. Furth proposed two ways to prove the hypothesis of a restrictive environment as main contributor to the deaf person's language deficiencies. First, the environment would be enriched and comparisons would be made between deaf children with enriched and deprived environments. In his book, Furth includes enrichment activities for the language delayed child.

The second method was to obtain a sample of persons who could be assumed to be culturally deprived and compare the performance of these persons with that of the deaf on some critical tasks. For his study the researcher tested children in ten schools for the deaf. The students were tested on Piaget's task of conservation of amount of liquid, and the task using logical symbols. Furth gave the same tests to hearing students who attended a school in a rural area and

were considered culturally deprived. The test was also administered to a control hearing group. Concerning the test on amount of liquid, the rural pupils fell midway between the deaf and control hearing group. That is, the rural group required an age level of about 13-14 years before establishing general success. This was an age level two years behind the control group and three years ahead of the deaf pupils (Furth, 1966). On the test regarding symbol discovery, the rural group performed as badly as the deaf group did. Furth suggests that these results indicate that socio-environmental deficiencies play just as large a part on the ability to accomplish reasoning tasks as does that of linguistic competence.

Furth's conclusion of his book summarizes the research findings on hearing impaired children in regard to language development and experiential deficiency.

The deaf illustrate some of the effects of linguistic deficiency. Apart from these effects, the basic development and structures of intelligence of the deaf in comparison with the hearing is remarkably unaffected by the absence of verbal language. . . . If substantial differences are found, they will likely be due to experiential and social factors of home, school, and the deaf community (1966, p. 227).

Liben (1978) agreed that the deaf do have experiential deficiencies which relate to language delay. Hearing impairment, unlike some other disabilities, is usually diagnosed only after months or years of anxious doubt and unrealistic hopes. Financial burdens and untold inconveniences serve as further complications. This cannot help but affect the young child to whose already great handicap

must be added the burden of doubts about self worth, as the child witnesses parental distress, and feels the isolation from other family members. This isolation prohibits the child from having the same experiences that hearing children do.

A criticism of the work of Furth has been made by Moores (1978). Moores charges Furth with judging the language of his subjects in terms of the oral language standard of the hearing community. Moores concludes that Furth studied thought, not language, in the deaf. Despite being very critical of Furth, Moores does agree with the fact that deaf children suffer from experiential deficiencies and that this in turn may affect language development.

Current Developments in Addressing the Language and Reading Problems in Hearing Impaired Students

In this chapter research concerning the language and reading delays in hearing impaired students has been discussed. Some reasons for these delays have also been mentioned. The retardation in language and reading by the deaf population has spawned new investigation into the development of language.

The Test of Syntactic Abilities is a culmination of a 10-year research program on the syntactic structure of the language of deaf children. This program was developed to provide teachers with a means of ascertaining what aspects of standard English structure a child has mastered. The child's performance on the test is compared

with other children of similar age. Finally, recommendations are made for language remediation (Quigley, 1978).

The TSA consists of: (1) a battery of 20 individual diagnostic tests each containing 70 multiple choice items; and (2) a screening test containing 120 items selected from the diagnostic battery. The TSA was standardized initially on profoundly deaf students. The test could also prove useful with children having language problems resulting from dyslexia, various types of learning disabilities, educable levels of mental retardation, and degrees of hearing impairment less than profound deafness.

The TSA was standardized on approximately 450 students in 18 educational programs for deaf children in the United States. All subjects met the following criteria:

1. Chronological age--10-00 through 18-11 (nine age levels).
2. Sensorineural hearing impairment of not less than 90 dB in the better ear at 500, 1000, and 2000 Hz.
3. Age of onset of hearing impairment of 24 months or younger.
4. IQ of at least 80 on the performance scale of the WISC or WAIS or some comparable test.
5. In the judgement of school personnel, no apparent disability other than hearing impairment.

Comprehension of the following syntactic structures was tested and ranked in descending order according to level of difficulty:

Negation

Conjunction

Conjunction

Disjunction and Alternation

Determiners

Question Formations

Wh-words

Answer Environments

Yes/No Questions

Verb Processes

Verb Sequence in Conjoined Structures

Main Verbs, Linking Verbs, and Auxiliaries

Passive Voice

Pronominalization

Possessive Adjectives

Reflexives

Possessive Pronouns

Forward and Backward Pronominalization

Relativization

Comprehension

Relative Pronouns and Adverbs

Embedding

Complementation

Infinitives and Gerunds

Nominalization

As noted earlier, the Test of Syntactic Abilities has provided educators of the deaf with valuable information regarding the comprehension of standard English syntactic structures. This test has also attempted to rank the structures by level of difficulty. In using this information, Quigley and King (1981) have developed a reading program for deaf children.

Reading Milestones is a set of linguistically controlled reading books and workbooks designed for deaf children (Quigley & King, 1981). There are eight levels in Reading Milestones. Each level has 10 readers, 10 workbooks, and a Teacher's Guide. The levels do not correspond to grade levels. The syntactic structures, vocabulary, and content become gradually more complex at each successive level. The goal of the authors and editors of Reading Milestones is to establish that written language represents meaning, and that word identification does not guarantee reading comprehension. A final goal is to make reading an enjoyable experience for language handicapped children (Quigley & King, 1981).

There is a great need for materials which provide systematic exposure to new language structures and to vocabulary. Many reading texts include a statement that materials and procedures must be modified for deaf children (Hall & Ramig, 1978; Carnine & Silbert, 1979). The need for special materials was also shown in a survey of programs for hearing impaired students which indicated that 46% of the people determining the programs for the hearing impaired believed top priority should be given to developing linguistically

controlled materials (La Sasso, 1978). Reading Milestones was designed to meet this need.

Another researcher interested in investigating the acquisition of syntactic structures by deaf individuals is Wilbur (1983). Wilbur presented nine syntactic structures to hearing impaired students. The study was undertaken as part of a larger investigation into many aspects of captioning. Wilbur also wished to order the structures in terms of difficulty.

The study presented each of nine syntactic structures in a comic book format. A total of 125 items were constructed. There were up to nine pictures per page. All vocabulary was at the first grade level. All items were multiple choice with four possible responses, only one of which was correct. A pencil and paper format allowed for group administration of the test. Each test began with sample items so that the teacher could make sure the student understood the nature of the task.

One hundred eighty seven subjects participated in the study. Each student had to meet the following criteria:

1. sensorineural hearing loss of not less than 90 dB at 500, 1000, and 2000 Hz.
2. suffered hearing impairment before age two.
3. IQ of at least 80 on the performance scale of the WISC or WAIS or other comparable test.
4. no other apparent disability with the exception of corrected vision.

The students ranged in age from 7 to 23 years. The students were also classified by reading levels. Reading levels were determined by either the Stanford or Metropolitan Reading Achievement Tests. Subjects were selected from five schools which included both day and residential students. In interpreting the results, Wilbur makes the following observations:

1. Performance improves as reading level increases.
2. Performance improves as age level increases.

In the results of the study, Wilbur also attempts to provide guidelines to the relative difficulty of the various structures. Following is the way the structures were ranked in the Wilbur study with the easiest items listed first.

Why questions
Conditionals
Nonlocative Prepositions
Indefinite Pronouns
Quantifiers
Modals
Ellipsis
Reciprocal Pronouns
Comparatives

Wilbur rates the why questions as the easiest of all the structures studied. It is important to point out that all why questions tested by Wilbur could be answered with phrases beginning with because. Wilbur makes the generalization that the students tested

could handle the syntax of why questions. It is the contention of this researcher that why questions are more complex and harder to comprehend than the Wilbur study has shown.

Very little research has been done concerning the acquisition of question formations by deaf individuals. Russel and Quigley (1976) and Quigley, Wilbur, and Montanelli (1974) are credited with researching the following question forms and their acquisition by deaf children:

Yes-No Questions--Any question form that may be answered with a yes or no, e.g., Can a fish swim?

Tag Questions--e.g., Brigett bought balloons, didn't she?

WH-Questions--Questions beginning with the words who, what, when, which, where. (Why and how are also included in this category, but were not studied by the researchers mentioned.)

In 1976, Russell and Quigley wrote a book to introduce to teachers of the deaf ways in which the syntax of deaf childrens' written language differs from the syntax of Standard English. It is important for teachers to have this information in order to develop or modify reading materials for deaf students. The researchers devote a chapter in the book to the acquisition of question formations in deaf and hearing children.

Quigley, Montanelli, and Wilbur (1974) indicate that there are developmental stages in the acquisition of question formations by deaf students similar to those found for hearing children. They found that the comprehension of Yes-No questions was easier for their

deaf subjects than was the comprehension of WH questions, which in turn was easier than the comprehension of Tag questions. Klima and Bellugi (1966) and Brown and Hanlon (1970) report the same order of acquisition in studies with hearing children. Although the WH-questions including who, what, where, and when have been studied, very little attention has been directed toward the Why question form.

Why Questions

Brown (1968) analyzed the spontaneous speech of three pre-school hearing children. The conversation between mother and child was recorded at home. At least two hours of conversation was recorded per month. The children were observed for two years. The progress of the childrens' spontaneous speech was measured by the number of morphemes that were used. A morpheme is defined as the smallest meaningful unit of speech. If the child used an average of 1.75 morphemes, they were placed in Level I. If the child used an average of 2.70 morphemes, they were placed in Level III. Finally, if a child used an average of 4.0 morphemes, they were placed in Level V.

It was found that these children did not appropriately answer why questions until they completed Level III. In explanation of this late acquisition, Brown makes the following comments:

It is not surprising that why questions were not answered in a semantically sensible way in the early period of I and II. Why questions may be said to contain a presupposition. The presupposition often has a surprise value. What the why question asks for roughly speaking is some salient premise

out of a set of premises from which the presupposition can be deduced. In other words, the why question asks the respondent to say something that will help to render logical, to account for or to explain a rather surprising proposition. Comprehending a why question means learning what explanation is (1968, p. 286).

The only research conducted concerning why questions in relation to hearing impaired children was done by Wilbur (1983) and Hargis (1977).

As mentioned earlier, the Wilbur study ranked the why question as the most easily understood structure studied. The why question form tested by Wilbur could be answered with a statement beginning with because. These questions are only one facet of the many syntactic structures which may have a cause and effect relationship. The area of causality may indeed be more difficult than Wilbur indicates. According to Hargis,

Cause and effect reasoning itself is as varied as the syntactic structures which represent it in our language. Some structures are used for representation of direct cause and effect relationships. Others represent only sufficiency for causal relationships. Also, some structures move from causality into the area of purpose. Still others indicate negative relationships. In some structures the causal component is emphasized while in others the effect of consequence receives emphasis (1977, p. 174).

Hargis discusses three question forms used to interrogate cause and effect structures. They are why, what . . . for, and how come questions. Given the sentence--Joe went to bed because he was sleepy, three questions may be asked:

1. Why did Joe go to bed?
2. What did Joe go to bed for?
3. How come Joe went to bed?

"The three question forms seem essentially synonymous even if structurally different" (Hargis, 1977, p. 175). The three question forms are also discussed in detail by Zwickey (1972).

Because Wilbur's study concentrates on cause and effect structures that can be interrogated by why questions, this researcher will focus on the same structures. The additional structures discussed by Hargis (1977) will also be studied. (These structures are explained on pages 8 and 9).

Summary

It has been repeatedly shown by researchers that language and reading abilities of many hearing impaired children are quite delayed. Quigley (1982) has shown that the average 18-year-old hearing impaired student cannot understand or use as many of the syntactic structures as the average 10-year-old child with hearing understands and uses with ease. National surveys continue to report serious educational retardation, especially in reading (Wrightstone, Aranow, & Muskowitz, 1962, 1963). Only 10% of hearing impaired 18-year-olds nationally can read at or above the 8th grade level (Trybus & Karchmer, 1977). There are several factors attributed to the language delay in hearing impaired children. (1) "Language is learned and in the beginning is learned auditorially" (Harris, 1971, p. 5). Liben pointed out that the deaf probably have experiential deficiencies.

It is obvious that new approaches in teaching language and reading are necessary in the field of education of the deaf. Concern in this area has brought forth new studies in the development of curriculum for teaching language and reading. The Test of Syntactic Abilities was developed to test the comprehension of common syntactic structures encountered by children in reading materials. The standardization of this test has led to the development of a new reading program. Reading Milestones is a syntactically controlled reading program for hearing impaired students (Quigley & Power, 1980; and Quigley & King, 1981).

The acquisition by deaf students of many syntactic structures has not been studied. Russell and Quigley (1976) have reported on the acquisition of question formations in deaf and hearing children. Quigley, Wilbur, and Montanelli (1974) indicated that there are developmental stages in the acquisition of question formations by deaf children. Brown (1968) analyzed the spontaneous speech of three preschool hearing children. The children showed late acquisition of an understanding of why questions.

Wilbur (1983) tested hearing individuals' comprehension of nine previously uninvestigated syntactic structures. Wilbur ranked these structures by level of difficulty, listing why questions as the easiest structure studied. Work by Hargis (1977) discusses cause and effect structures in relation to why questions in great detail.

This researcher has found a lack of research concerned with the comprehension of cause and effect structures. A test was developed

by this researcher to evaluate the comprehension of hearing impaired students in this area. The structures were ranked so that they may be placed in appropriate order on the Receptive Language Curriculum at the Tennessee School for the Deaf. By determining the correct order of difficulty of these structures, a skills hierarchy for teaching receptive language was established.

CHAPTER III

METHODS AND PROCEDURES

Nature and Purpose

The purpose of this study was to test the comprehension of various cause and effect structures encountered by hearing impaired students. By using scores obtained from a comprehension test developed by this researcher, the structures were ranked by level of difficulty. In determining the correct level of difficulty of these structures, a skills hierarchy for teaching receptive language was established. The structures were ranked so that they may be placed on the Receptive Language Scope and Sequence Chart used at the Tennessee School for the Deaf in Knoxville, Tennessee. The null hypotheses developed from the research questions are presented below:

1. There are no significant differences in difficulty among the eleven cause and effect structures by hearing impaired students as a group.
2. There is no significant relationship between reading ability and comprehension of each of the eleven cause and effect structures by hearing impaired students.
3. There is no significant relationship between chronological age and comprehension of each of the eleven cause and effect structures by hearing impaired students.

4. There is no significant relationship between the level of reading ability and comprehension of cause and effect structures by hearing impaired students.

5. There is no significant relationship between chronological age and comprehension of cause and effect structures by hearing impaired students.

The Population

Eighty subjects participated in this study. The students all attended the Tennessee School for the Deaf (TSD) in Knoxville, Tennessee. TSD is a residential school for the deaf which also includes a day program. The students who participated in the study ranged in age from 8 to 16 and were in grades 2 through 7. All students who met the following criteria (used by Wilbur, 1983), were included in the study:

1. sensorineural hearing loss of not less than 90 dB at 500, 1000, and 2000 Hz;
2. suffered hearing impairment before age 2;
3. measured IQ of at least 80 on the performance scale of the WISC, WAIS, or other comparable test;
4. no apparent disability (in judgement of school personnel) with the exception of corrected vision.

Pre-Testing Procedures

1. A blanket permission for testing was obtained from the Tennessee School for the Deaf.
2. Information concerning chronological age was obtained from the school records.
3. Information concerning hearing impairment and age of onset were obtained from the school audiologist.
4. Information concerning IQ was obtained from the school psychologist.
5. Reading levels were determined by scores on the Stanford Achievement Test given in the spring of 1983. The reading levels of the students ranged from 1.7 to 7.3.

Test Materials

The students were given a test developed by this researcher to determine their comprehension of the following cause and effect structures (for further explanation refer to page 8):

1. BECAUSE
2. BECAUSE OF
3. FOR/TO
4. THAT
5. SO THAT
6. FROM
7. FOR-POS-ING

8. SUCH THAT
9. TOO-FOR-TO
10. SO . . . THAT
11. SO

The test consisted of 56 test items. All items were multiple choice with four possible responses, only one of which was correct. There were two pictures per page. Included in the total number were two sample items, so that the examiner could make certain that all the subjects understood the procedure for marking the test booklet. Also included were 28 items constructed to test seven of the cause and effect structures. Those items all contained pictures to provide contextual information. An additional sixteen items tested the remaining four cause and effect structures using only sentences to provide syntactical information. These structures, too . . . for . . . to, so . . . that, such . . . that, and so can only be tested using verbal information. Additional syntactic structures tested:

a. The modal could was tested with four items using the picture format. The student must show an understanding of could to accurately test the so . . . that structure, e.g.,

Why did the boy climb the tree?

So that he could get the apple.

b. The verb get was tested with four items using the picture format. This word is also used to test the structure so . . . that.

c. It is possible that the contracted form of two words may post some additional problems for deaf children. For this reason,

the contractions couldn't and can't were tested using one item per contraction. The above items were included in order to verify the student's comprehension of these items since they were used throughout the test.

The vocabulary used on the test was carefully controlled. It was at a second grade level as were the ideas expressed. The vocabulary was chosen from lists used in kindergarten through second grade at the Tennessee School for the Deaf.

A pilot test was given to 15 hearing children between the ages of 6 and 8. The test was given to determine if the children had problems on the test and if so to identify any pattern of mistakes. In this way weaknesses in the instrument could be discovered. Because deaf children tend to have more problems with language and reading, it is assumed that a poor showing by hearing students would indicate that the deaf students would have even more difficulty on the test.

Of the 15 hearing subjects, 12 received 100% correct in answering the test. One student made two mistakes. Another student made three errors. There was no pattern of errors by these students. The final student made five errors. One item which tested the so . . . that structure was missed. All four items testing the for/ to structure were missed (e.g., Why did the boy walk to the store?).

To achieve face validity the test was next shown to a panel of seven instructors at the Tennessee School for the Deaf. The teachers were asked to examine the instrument and give suggestions

for improving the test. The following recommendations were made:

Vocabulary

The word present was changed to the word gift.

The word awful was changed to the word bad.

The teachers felt that these words were more recognizable to the students.

Pictures

Three pictures were changed to more closely match the vocabulary (e.g., a picture of a couch was shown but the word chair was used).

Finally the split-halves test of reliability was used. In this procedure, the test of comprehension was divided into two separate tests. All the odd numbered items were placed on one test while the even numbered items made up the second test. The student's score on one test was correlated with the scores from the second test using a Pearson product-moment correlation procedure. The test of comprehension of cause and effect structures received a high positive correlation coefficient of $+0.96$, suggesting a high level of reliability for the overall test.

Independent Variables

Two of the variables which could affect the testing of the comprehension of cause and effect structures are listed below:

1. Chronological age--the children ranged in age from 8 to 16.

2. Reading ability--the students ranged in reading ability from 1.7 to 7.3. Scores were obtained from the Stanford Achievement Test.

Test Procedure

The pencil and paper format allowed for group administration of the test. Whole classes with an average population of seven students were tested, after which ineligible students were removed from the sample (for criteria see page 36). The test was not timed but took approximately 30 minutes to complete. This researcher administered all tests. Two sample items were placed in transparency form on an overhead projector. The sentences were signed together and the best possible answer was discussed. Also, the appropriate procedure for marking the test booklet was explained. Below is a sample item from the test.

(The child was given a picture of a girl holding a hammer.
A broken piggy bank and some money are on the floor.)

Why did the girl break the bank?

() so that she could have a bank.

(✓) so that she could have some money.

() so that she could break the bank.

() so that she was happy.

The complete test of the comprehension of cause and effect structures is included in the Appendix.

Treatment of Data

The following statistical procedures were applied to the research questions:

1. Are there significant differences in difficulty among the eleven cause and effect structures by hearing impaired students as a group. (An analysis of variance with repeated measures was applied. Tukey's (HSD) Multiple Comparison Test was used.)
2. Is there a significant relationship between reading ability and comprehension of each of the eleven cause and effect structures by hearing impaired students? (A Pearson product-moment correlation was applied.)
3. Is there a significant relationship between chronological age and comprehension of each of the eleven cause and effect structures by hearing impaired students? (A Pearson product-moment correlation was applied.)
4. Is there a significant relationship between the level of reading ability and comprehension of cause and effect structures by hearing impaired students? (A Pearson product-moment correlation was applied.)
5. Is there a significant relationship between chronological age and comprehension of cause and effect structures by hearing impaired students? (A Pearson product-moment correlation was applied.)

CHAPTER IV

RESULTS OF THE STUDY

The purpose of this study was to test the comprehension of the various cause and effect structures encountered by hearing impaired students. A test was developed by the researcher to evaluate the comprehension of the structures by deaf students. By using the scores from this test the eleven cause and effect structures were ranked so that they may be placed in appropriate order on the Receptive Language Scope and Sequence Chart used at the Tennessee School for the Deaf in Knoxville, Tennessee. By determining the correct order of difficulty of these structures, a skills hierarchy for teaching receptive language could be established. The findings from the test of cause and effect structures were statistically analyzed by computer. The mean score on the total test of cause and effect structures was 38.25 with a standard deviation of 7.50. The scores ranged from 18 to 44. The results pertaining to each hypothesis of the study are presented in this chapter.

H_1 : There is no significant difference in difficulty among the eleven cause and effect structures by hearing impaired students.

An analysis of variance with repeated measures of the data was computed. Table I states the results of this analysis which demonstrate that the hypothesis was rejected. Table I reports a significant F value indicating a significant difference in difficulty exists among the eleven cause and effect structures ($p < .0001$).

TABLE I
ANOVA WITH REPEATED MEASURES FOR TOTAL GROUP
SCORE AMONG CAUSE AND EFFECT STRUCTURES

Source	DF	SS	MS	F
Model	89	425.37272727	4.77946885	11.17*
Error	790	338.07727273	0.4279451	
Corrected Total	879	736.45000000		

*p<.0001

In order to determine what extent the eleven cause and effect structures differ in difficulty, Tukey's HSD Multiple Comparison Test was used. This test is used to determine which of the differences between group means are significant and which are not. The results of Tukey's HSD Test are summarized in Table II. An examination of the means in Table II indicates a significant difference in difficulty between various cause and effect structures.

H_2 : There is no significant relationship between reading ability and comprehension of each of the eleven cause and effect structures by hearing impaired students.

A Pearson product-moment correlation was computed between reading ability and scores on each of the eleven cause and effect structures. These correlation coefficients failed to support the hypothesis, therefore it was rejected. Results are presented in Table III. The range of correlation coefficients was between .27 and .37. Structure 11 (SO) had the highest correlation coefficient (.37). Structure 10 (SO . . . THAT) had the lowest correlation coefficient (.27). Significant positive correlation coefficients were found between the variables for all the cause and effect structures.

H_3 : There is no significant relationship between chronological age and comprehension of each of the eleven cause and effect structures by hearing impaired students.

A Pearson product-moment correlation was computed between chronological age and scores on each of the cause and effect structures. No significant positive correlation coefficients were found.

TABLE II

TUKEY'S (HSD) MULTIPLE COMPARISON TEST FOR SIGNIFICANT
DIFFERENCES IN DIFFICULTY ACROSS CAUSE AND
EFFECT STRUCTURES

Structure	Mean
(2) Because of	3.6875
(6) From	3.6250
(7) For - pos - ing	3.6125
(1) Because	3.5875
(4) That	3.5250
(9) Too - for - too	3.4625
(5) So that	3.4375
(8) Such that	3.4375
(10) So....that	3.3875
(11) So	3.2625
(3) For/to	3.2000

Structures not included by the same line are significantly
different from each other.

2 to 3	6 to 3	7 to 3	1 to 3
2 to 11	6 to 11	7 to 11	

TABLE III
CORRELATION COEFFICIENTS FOR RELATIONSHIP BETWEEN COMPREHENSION OF CAUSE
AND EFFECT STRUCTURES, READING ABILITY, AND CHRONOLOGICAL AGE

	STR 1	STR 2	STR 3	STR 4	STR 5	STR 6	STR 7	STR 8	STR 9	STR 10	STR 11
Reading Ability	.31*	.28*	.28*	.30*	.35*	.31*	.28*	.34*	.30*	.27*	.37*
Age	.05	.11	.08	.13	.02	.07	.07	.11	.10	.19	.04

*p<.05.

For identification of structures see page 37.

Table III reports the results of this analysis which establish that the hypothesis was accepted.

H₄: There is no significant relationship between the level of reading ability and comprehension of cause and effect structures by hearing impaired students.

A Pearson product-moment correlation was computed between reading level and score. There was a significant positive correlation of .42 between the two variables ($p < .0001$). The hypothesis was rejected.

H₅: There is no significant relationship between chronological age and comprehension of cause and effect structures by hearing impaired students.

A Pearson product-moment correlation was computed between total test score and chronological age. There was a correlation coefficient of .12 between the two variables. No significant differences were found at the .05 level. The hypothesis was accepted.

In summary, hypotheses 1, 2, and 4 were rejected; hypotheses 3 and 5 were accepted. Conclusions and discussions of these results are presented in Chapter V.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

The purpose of the study was to test the comprehension of the various cause and effect structures encountered by hearing impaired students. A test was developed by the researcher to evaluate the comprehension of these structures. By using the scores from this test the structures were ranked so that they may be placed in appropriate order on the Receptive Language Scope and Sequence Chart used at the Tennessee School for the Deaf in Knoxville, Tennessee. By determining the correct order of difficulty of these structures, a skills hierarchy for teaching receptive language could be established.

The subjects who participated in the study were eighty hearing impaired students at the Tennessee School for the Deaf. The students ranged in age from 8 to 16 and were in grades 2 through 7. The paper and pencil format allowed for group administration of the test. The students' age, reading level, and IQ were recorded on the test booklet. The completed data received was compiled for statistical analysis by computer using Pearson product-moment correlation and an analysis of variance with repeated measures. Tukey's (HSD) Multiple Comparison Test was used to determine the location of significance of difference between group means.

The following null hypotheses were developed from the research questions:

1. There are no significant differences in difficulty among the eleven cause and effect structures by hearing impaired students as a group.

2. There is no significant relationship between reading ability and comprehension of each of the eleven cause and effect structures by hearing impaired students.

3. There is no significant relationship between chronological age and comprehension of each of the eleven cause and effect structures by hearing impaired students.

4. There is no significant relationship between the level of reading ability and comprehension of cause and effect structures by hearing impaired students.

5. There is no significant relationship between chronological age and comprehension of cause and effect structures by hearing impaired students.

Conclusions

The following results were based upon the data obtained in the study.

A significant difference in difficulty exists among the following cause and effect structures:

because of for/to

because of so

from for/to

from so

for-pos-ing. . . . for/to

for-pos-ing. . . . so

because. for/to

In the study done in 1983, Wilbur assumed that the why question itself is responsible for problems that children have with the cause and effect relationship. This researcher contends that it is the series of complex cause and effect structures to which why questions are directed, from and which they (why questions) are transformed, that makes this area of language so difficult.

By using the group mean score the cause and effect structures may be ranked by level of difficulty.

Structure	Mean Score
because of (2)	3.6875
from (6)	3.6250
for-pos-ing (7)	3.6125
because (1)	3.5875
that (4)	3.5250
too-for-to (9)	3.4625
so that (5)	3.4375
such that (8)	3.4375
so . . . that (10)	3.3875
so (11)	3.2625
for/to (3)	3.2000

The preceding information can prove helpful to the classroom teacher. When teaching any concept, it is important to present the material in a planned sequence. The items easiest to understand should be introduced first, only teaching the more complex concepts after the initial ones have been mastered. In referring to the group mean scores the students had the least trouble with because of and from. Perhaps it is because these words are more recognizable to the hearing impaired students tested. The structures which received the lowest scores were so and for/to.

Through the ranking of the cause and effect structures, the findings suggest an appropriate placement on the Receptive Language Scope and Sequence Chart at the Tennessee School for the Deaf. This study suggests that the structures because, because of, from, and for-pos-ing should be presented with the emerging understanding of the causal relationship. Then the more difficult structures (so, for/to) can be built from this base. Finally, a teacher should keep in mind that it sometimes takes many more examples and varied approaches to help a student master the more complex material.

The language delay and subsequent reading problems encountered by deaf children have been a prime focus of this study. Trybus and Karchmer (1977) report that only 10% of hearing impaired 18-year-olds nationally can read at or above the 8th grade level. In light of this fact, it should not be surprising that the majority of students participating in this study read between a 1.7 and 2.9 reading level.

This created a lack of dispersion across reading levels which may have influenced the analysis of the research questions concerned with cause and effect structures and reading level.

The analysis of data shows a significant relationship between comprehension of each of the cause and effect structures and reading ability. The (S0) structure had the highest correlation coefficient ($r = .37$). In other words, the students' ability to understand the (S0) structure was strongly influenced by reading level. The (S0 . . . THAT) structure had the lowest correlation coefficient (.27). The range of correlation coefficients was between .27 and .37. There was a significant positive correlation between every cause and effect structure and reading ability.

There was also a significant relationship between the level of reading ability and the students' overall score on the test of comprehension. A positive correlation of .42 existed between the two variables. This further supports the idea that as a student's reading ability increases, so does the level of comprehension of cause and effect structures. Because reading ability is so important in language comprehension, it is vital that researchers continue to investigate ways to improve the reading ability of deaf individuals.

According to the results of the data, comprehension of cause and effect structures was not greatly influenced by chronological age. As in the case of reading level, the analysis may have not been sensitive to this question because of unequal dispersion across age levels.

There is another possible explanation for the results of the data concerning chronological age and the comprehension of cause and effect structures. The Receptive Language Curriculum at the Tennessee School for the Deaf is fairly new. The older students in the study have had less exposure to the curriculum. Consequently, they do not have as clear an understanding of the structures included in the curriculum as do the younger students.

Educators generally assume that a child will progress academically as the chronological age increases. In the case of cause and effect structures, this did not happen. The older children did not consistently score higher on the test. Therefore it is important for teachers to look beyond chronological age when examining a student's progress regarding cause and effect structures. This study has shown that while there is no significant relationship between chronological age and comprehension of cause and effect structures, reading ability plays an important part in the deaf child's understanding of cause and effect structures.

Limitations

Several noticeable limitations should be weighed in interpreting the results.

1. The small number of subjects limited the ability to generalize about the results.
2. The dispersion of subjects across reading levels was limited.

3. The study tested the comprehension of the child's understanding of the syntactic structures pertaining to cause and effect. It is also important to remember that the child's understanding of the structure in relation to context and content is an integral part of the mastery of language.

4. Because the Receptive Language Curriculum at the Tennessee School for the Deaf is relatively new, some students have had more exposure to the curriculum than others.

5. A significant number of students (18) received 100% correct on the test of cause and effect structures. This may have affected the analysis of the data.

Suggestions for Further Research

1. The test of the comprehension of cause and effect structures has proved a reliable instrument. It received a correlation coefficient of +.96 on the split-halves test of reliability. It could be used with larger groups of deaf children in a variety of settings.

2. Many areas of language acquisition by deaf children remain unexplored. Similar studies should be conducted on these structures so that a complete skills hierarchy for language instruction can be developed.

3. More reading materials such as Reading Milestones (Quigley and King, 1981) should be made available to educators for the deaf. Also materials for even younger children are greatly needed.

4. The reading problems of the deaf were very apparent in this study. The majority of students read between a 1.7 to 2.9 reading level. Research should continue to investigate ways to improve the reading level of deaf individuals.

5. The student's ability to read affected the scores on this test. An alternative way to test cause and effect structures should be developed.

BIBLIOGRAPHY

BIBLIOGRAPHY

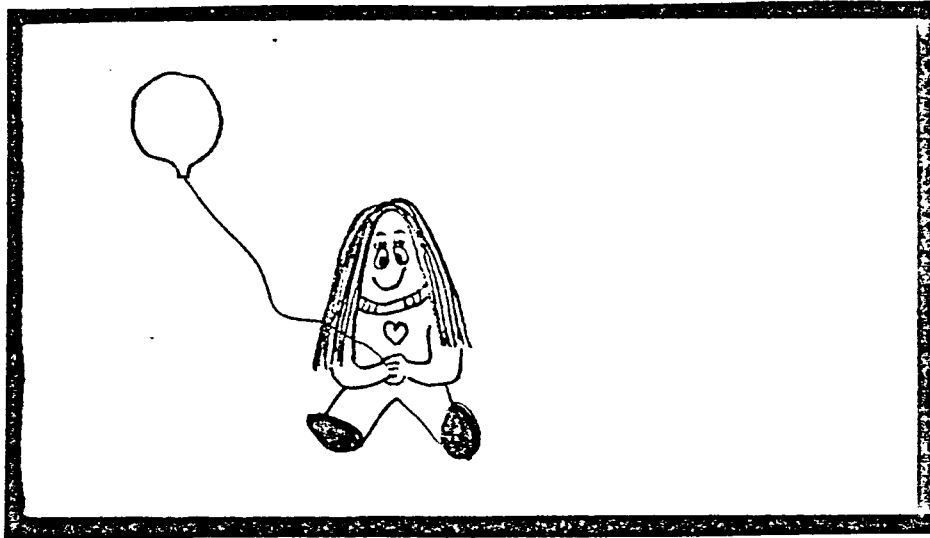
- Bloom, L. and Lahey, M. Language Development and Language Disorders. New York: John Wiley and Sons, 1978.
- Brown, R. The development of wh questions in child speech. Journal of Verbal Learning and Behavior, 1968, 7, 279-290.
- Carnine, D. and Silbert, J. Direct Instruction Reading. Columbus, Ohio: Charles E. Merrill, 1979.
- Carrow-Woolfolk, E. An Integrative Approach to Language Disorders in Children. New York: Grune and Stratton, 1982.
- Furth, H. G. Thinking Without Language. New York: The Free Press, 1966.
- Goda, S. Language skills of profoundly deaf adolescent children. Journal of Speech and Hearing Research, 1959, 2, 369-376.
- Goldin-Meadows, S. and Feldman, H. The creation of a computer system: A study of deaf children of hearing parents. Sign Language Studies, 1975, 8, 225-236.
- Gregory, S. The Deaf Child and His Family. New York: Wiley and Sons, 1976.
- Hall, R. and Ramig, C. Linguistics and Reading. Columbus, Ohio: Charles E. Merrill, 1978.
- Hargis, C. English Syntax. Springfield, Illinois: Charles Thomas, 1976.
- Harris, G. Language for the Preschool Deaf Child. New York: Grune and Stratton, 1971.
- Heider, F. and Heider, G. Studies in the psychology of the deaf. Psychological Monographs, 1941, 6, 242.
- Klima, E. and Bellugi, U. Syntactic regularity in the speech of children. In C. Ferguson and D. Slobin (Eds.), Studies of Language Development. New York: Holt, Rhinehart, and Winston, 1973.
- Kretschmer, R. and Kretschmer, L. Language Development and Intervention With the Hearing Impaired. Baltimore: University Park Press, 1978.

- LaSasso, C. National survey of materials and procedures used to teach reading to hearing impaired children. American Annals of the Deaf, 1978, 123, 22-30.
- Liben, L. S. Deaf Children: Developmental Perspectives. New York: Academic Press, 1978.
- Lyon, V. W. Report of 1931 survey of the Illinois School for the Deaf. American Annals of the Deaf, 1933, 78, 157-175.
- Miller, J. Review of academic achievement. Volta Review, 1958, 60, 302-304.
- Moore, D. F. Proceedings of International Conference on Oral Education of the Deaf, 1967, 1363-1382.
- Moore, D. F. Current research and theory with the deaf. In Liben (Eds.), Deaf Children: Developmental Perspectives. New York: Academic Press, 1978.
- Moore, D. F. Psycholinguistics and deafness. American Annals of the Deaf, 1979, 115, 37-48.
- Myklebust, H. R. The Psychology of Deafness. New York: Grune and Stratton, 1960.
- Pugh, G. Appraisal of the silent reading abilities of acoustically handicapped children. American Annals of the Deaf, 1946, 91, 331-335.
- Quigley, S., Wilbur, R., and Montanelli, D. Question formation in the language of deaf students. Journal of Speech and Hearing Research, 1974, 17, 699-713.
- Quigley, S., Steinkamp, M., and Power, D. Test of Syntactic Abilities-A Guide to Administration and Interpretation. Beaverton, Oregon: Dormac Inc., 1981.
- Quigley, S. and King, C. Reading Milestones. Beaverton, Oregon: Dormac Inc., 1981.
- Quigley, S. and Kretschmer, R. E. The Education of the Deaf. Baltimore: University Park Press, 1982.
- Reamer, J. Mental and educational measurements of the deaf. Psychological Monographs, 1982, 29, 120-130.
- Russell, K. W. and Quigley, S. Linguistics and Deaf Children. Washington, D. C.: Alexander Graham Bell Association for the Deaf, 1976.

- SAS Users Guide, Cary, North Carolina: SAS INC., 1971.
- Schlesinger, H. and Meadow, K. Sound and Sign. Berkeley, California: University of California Press, 1972.
- Streng, A. H. and Kretshmer, R. Language, Learning, and Deafness: Theory Application and Classroom Management. New York: Grune and Stratton, 1978.
- Trybus, R. J. and DiFrancessca, S. Studies in Achievement Testing, Hearing Impaired Students, 1973, Office of Demographic Studies, Gallaudet College, Series D, 2.
- Trybus, R. J. and Karchmer, M. A. School achievement scores of hearing impaired children: National data on achievement status and growth patterns. American Annals of the Deaf, 1977, 122, 62-68.
- Wilbur, R., Goodhart, W. and Montandon, E. Comprehension of nine syntactic structures by hearing impaired students. Volta Review, 1983, 85, 328-345.
- Wrightstone, J. W., Aranow, M. S. and Muskowitz, S. Developing reading test norms for deaf children. Test Service Bulletin no 98. New York: Harcourt, Brace, and World, 1962.
- Wrightstone, J. W., Aranow, M. S. and Muskowitz, S. Developing test norms for deaf children. American Annals of the Deaf, 1963, 108, 311-316.
- Wulburt, M., Inglis, S., Kriegsmann, E. and Mills, B. Language delay and associated mother-child interactions. Developmental Psychology, 1975, 11, 61-70.
- Zwickey, A. M. and Zwickey, A. How come and what for. Ohio State University: Working Paper in Linguistics, No. 8, 1971, p. 174-185.

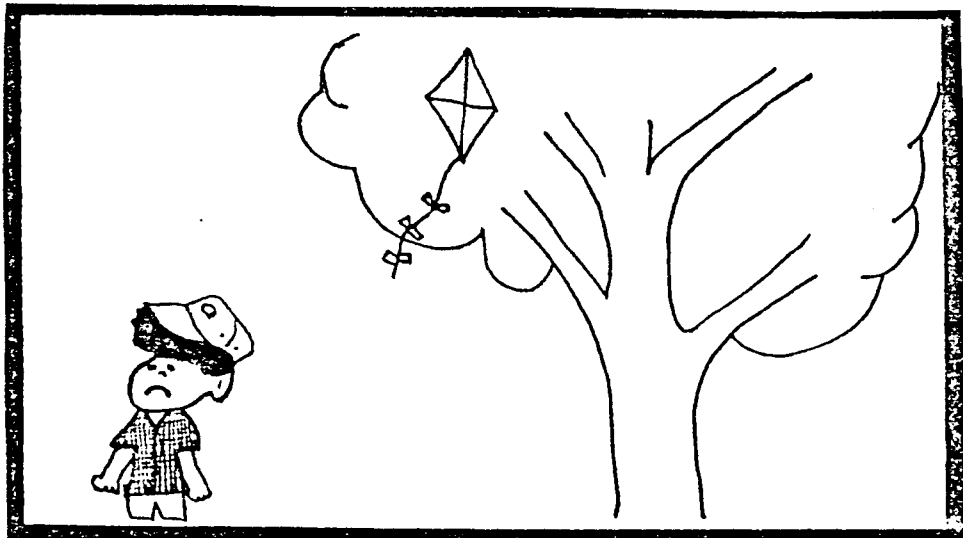
APPENDIX

QUESTIONNAIRE



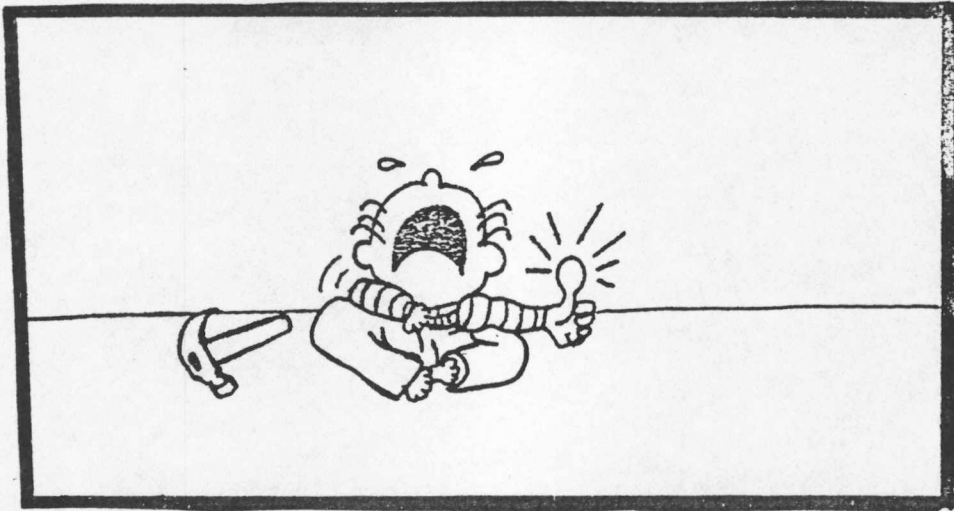
Why is the girl happy?

- ☐ because she is a girl
- ☐ because she has a car
- ☐ because she is happy
- ☐ because she has a balloon



Why is the boy sad?

- ☐ because the boy is sad
- ☐ because the kite is in the tree
- ☐ because the boy is in the tree
- ☐ because the kite is sad



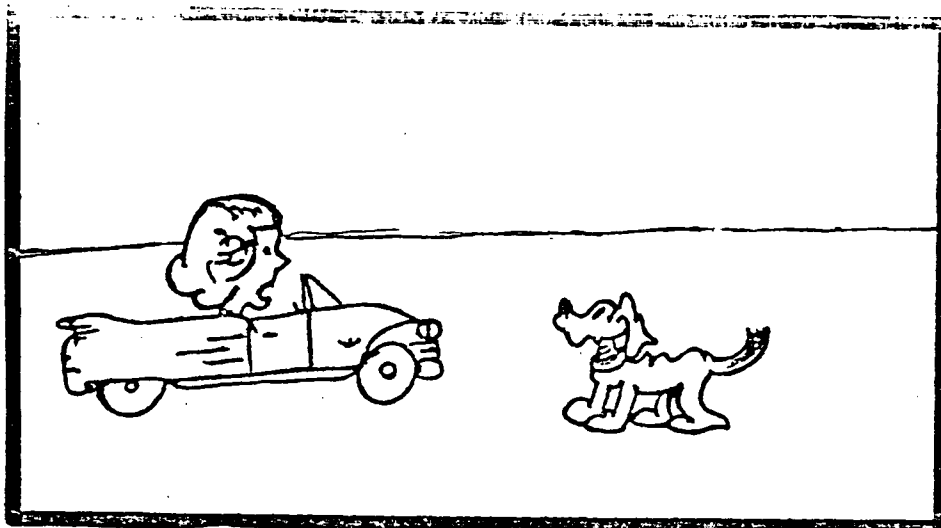
Why did the boy cry?

- ☐ because the boy cried
- ☐ because the boy hurt a hand
- ☐ because the boy hurt a foot
- ☐ because the boy was happy



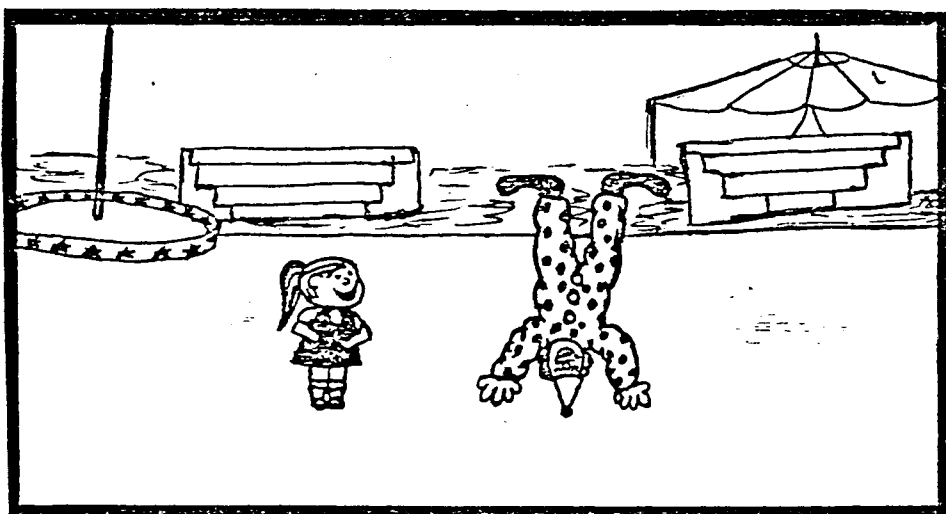
Why did the girl say "Thank you"?

- ☐ because Mother said "Thank you"
- ☐ because the girl said "Thank you"
- ☐ because Mother gave the girl a gift
- ☐ because Mother was happy



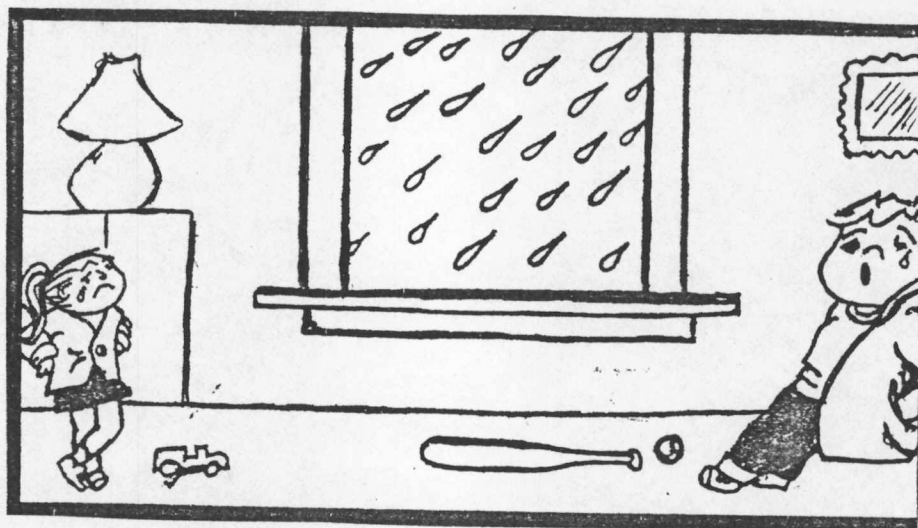
Why did Mother stop the car?

- ☐ () because Mother was in the car
- ☐ () because the dog saw the car
- ☐ () because a dog was in the road
- ☐ () because the dog was in the car



Why did the girl laugh?

- ☐ () because the clown laughed
- ☐ () because the clown was funny
- ☐ () because the girl was funny
- ☐ () because the clown saw the girl



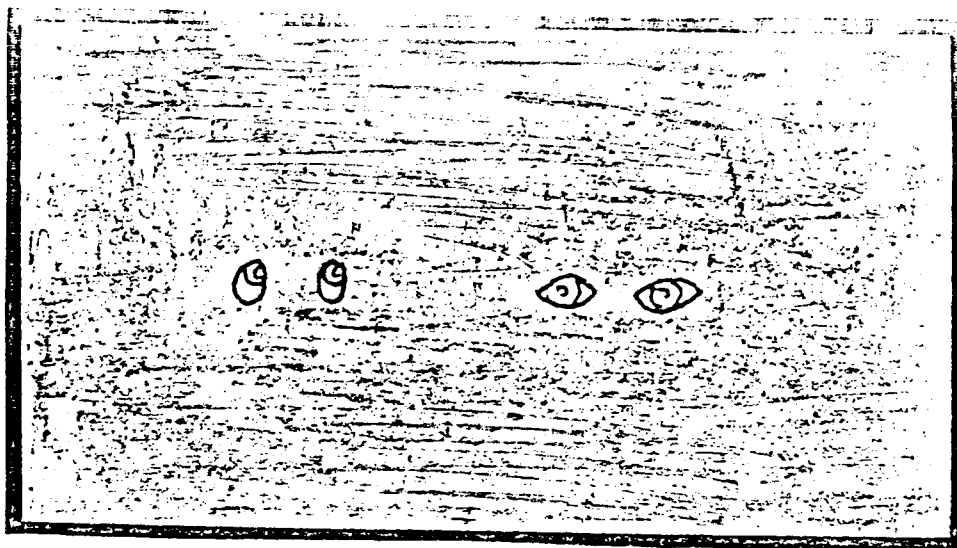
Why can the children not play outside?

- ☐ because of the children
- ☐ because of the rain
- ☐ because of the play
- ☐ because the children can not play



Why does the girl have gifts?

- ☐ because of the birthday
- ☐ because of the gifts
- ☐ because of the girl
- ☐ because of the table



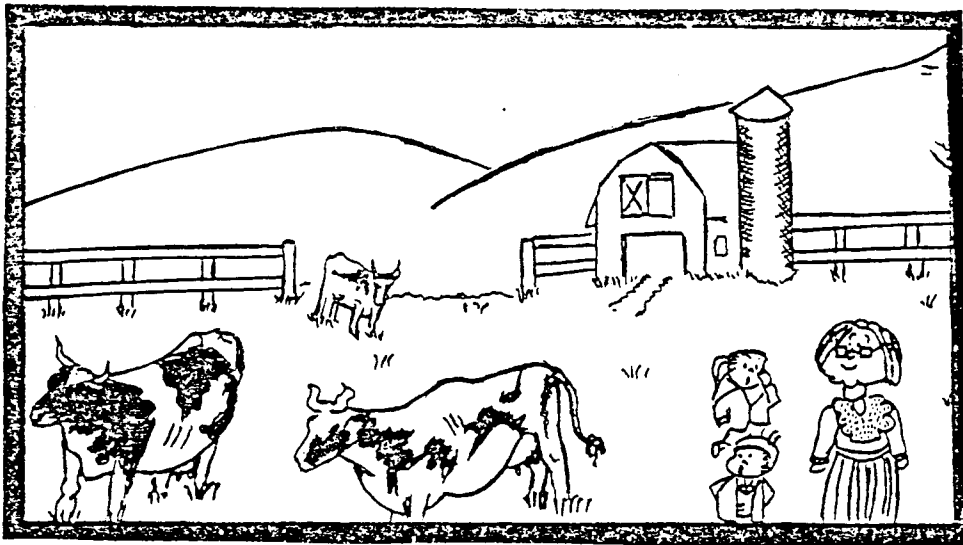
Why could the boys not see?

- ☐ because of the day
- ☐ because of the children
- ☐ because of the sun
- ☐ because of the dark



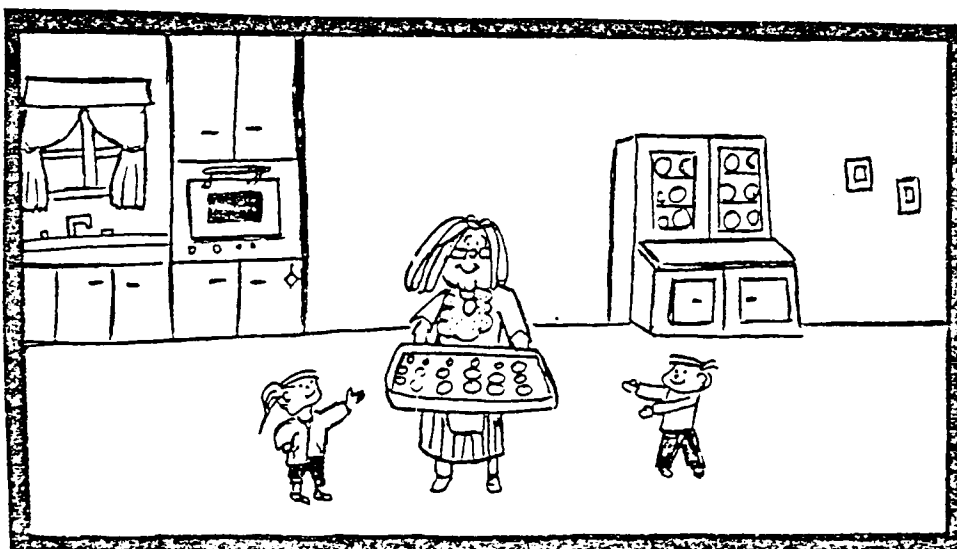
Why did the girl run?

- ☐ because of the run
- ☐ because of the girl
- ☐ because of the lion
- ☐ because of the bear



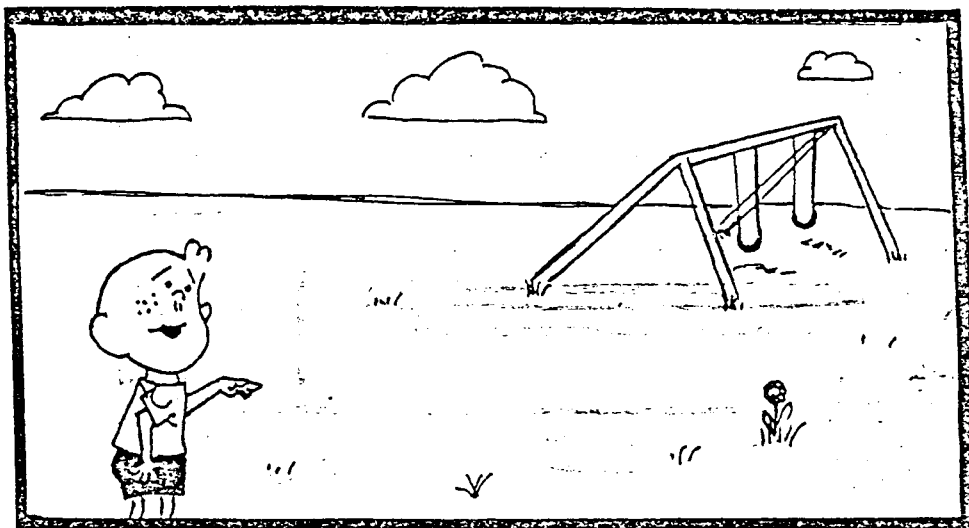
Why did Mother go with the children?

- ☐ to see Mother
- ☐ to the zoo
- ☐ to the farm
- ☐ to see the cows



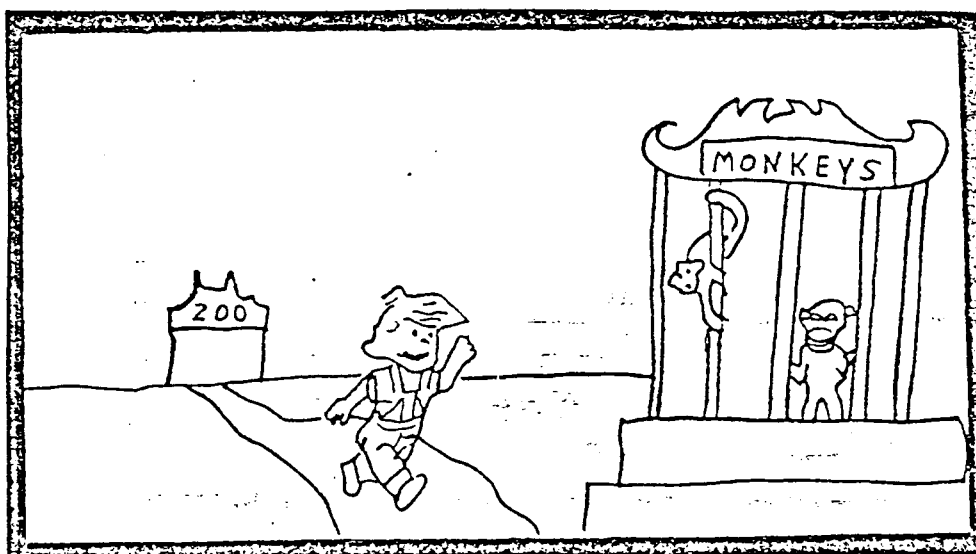
Why did Mother make some cookies?

- ☐ for Mother to make
- ☐ for the cookies
- ☐ for the children to eat
- ☐ for some cookies



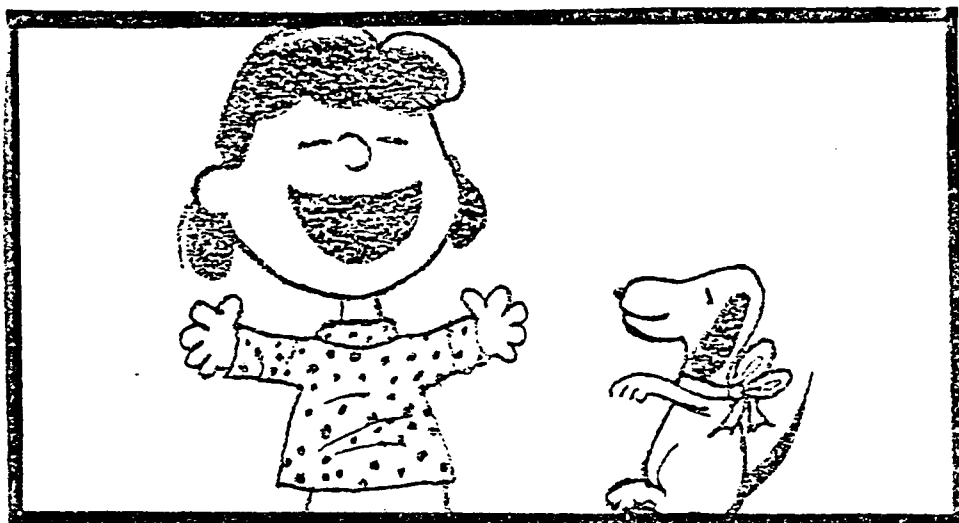
Why did the boy go to the park?

- ☐ to the boy
- ☐ to go
- ☐ to swing
- ☐ to the park



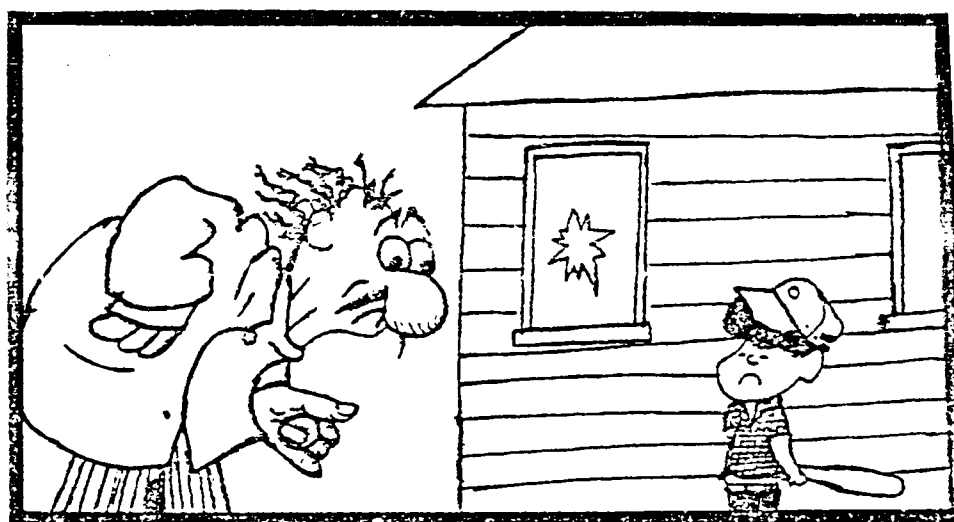
Why did the boy walk to the zoo?

- ☐ to see the monkeys
- ☐ to see the boy
- ☐ to the monkeys
- ☐ to the zoo



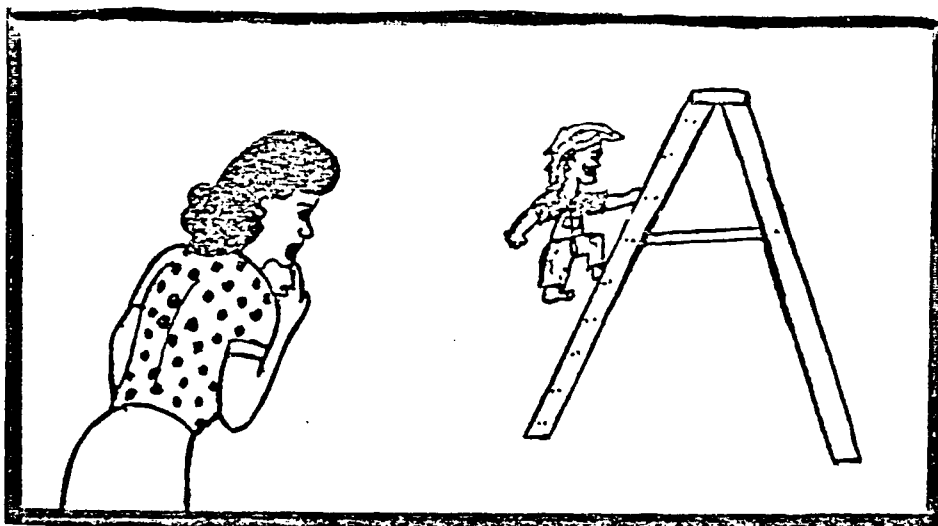
Why was the girl happy?

- ☐ that the puppy was happy
- ☐ that the girl was happy
- ☐ that she got a puppy
- ☐ that she got a girl



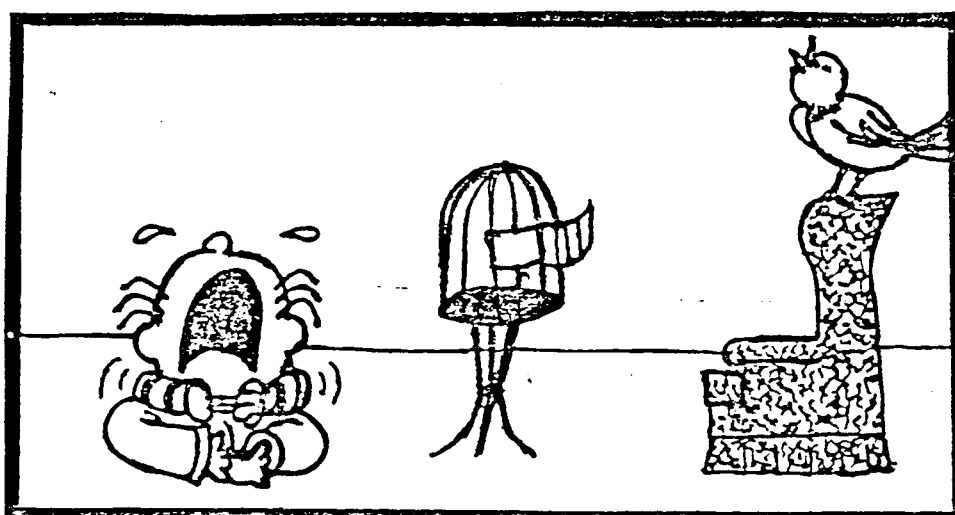
Why was the man angry?

- ☐ that the boy saw the window
- ☐ that the man was angry
- ☐ that the boy broke the window
- ☐ that the man was big



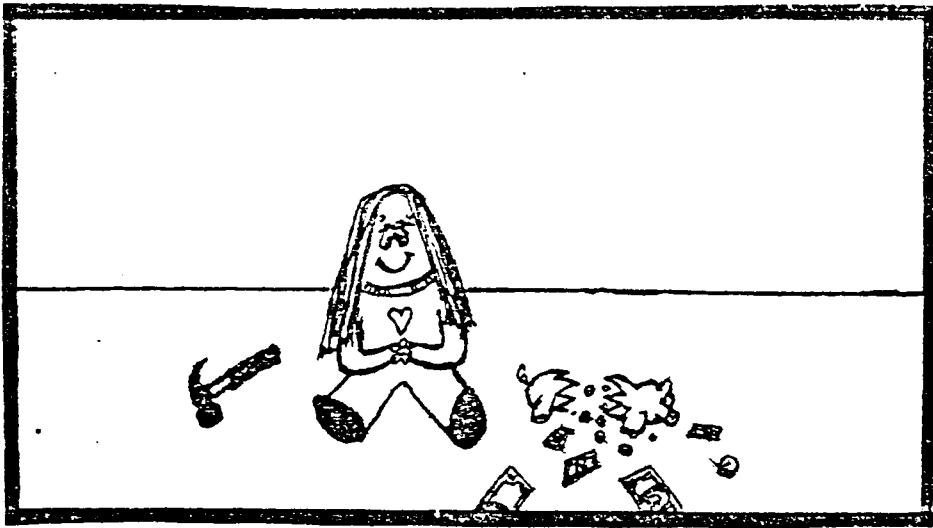
Why is Mother afraid?

- ☐ () that Mother is afraid
- ☐ () that the boy will fall
- ☐ () that Mother is not happy
- ☐ () that the boy saw Mother



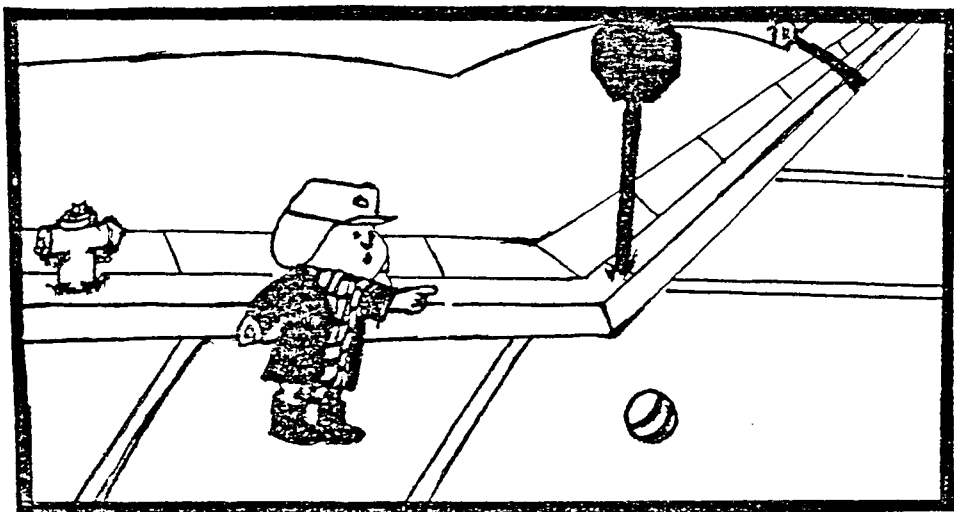
Why was the boy sad?

- ☐ () that the boy flew out
- ☐ () that the boy was sad
- ☐ () that the bird was sad
- ☐ () that the bird flew out



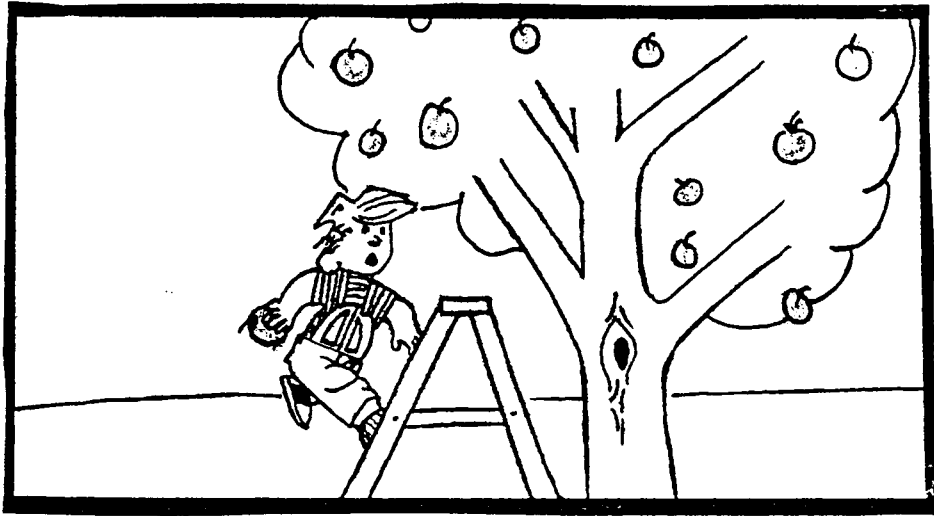
Why did the girl break the bank?

- ☐ () so that she could have a bank
- ☒ (x) so that she could have some money
- ☐ () so that she was happy
- ☐ () so that she could break the bank



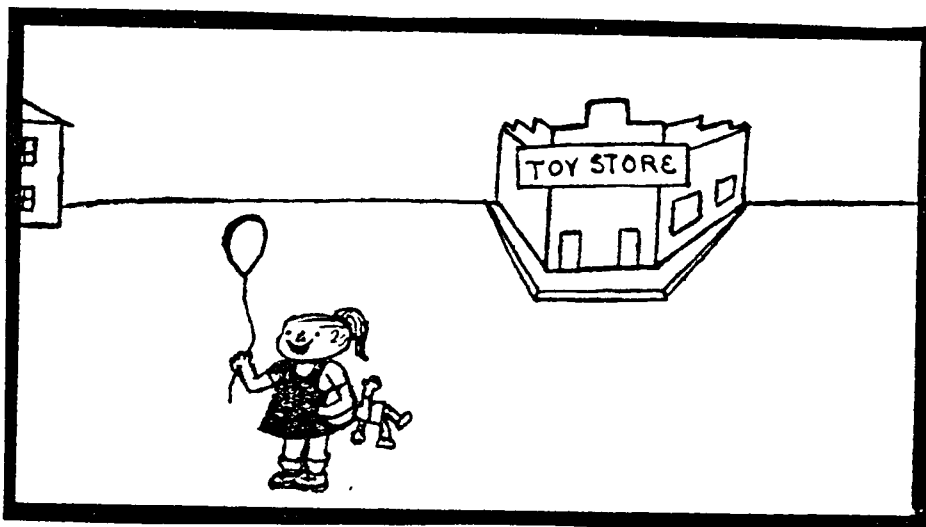
Why did the boy walk in the street?

- ☐ () so that he could walk in the street
- ☐ () so that he could see the car
- ☐ () so that he could get the ball
- ☐ () so that he could get the car



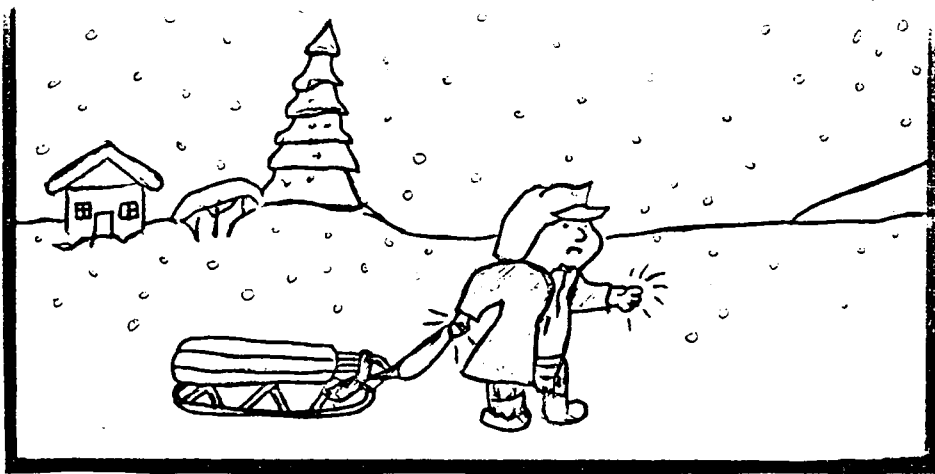
Why did the boy climb the tree?

- ☐ so that he could climb the tree
- ☐ so that he could get the tree
- ☐ so that the tree was big
- ☐ so that he could get the apple



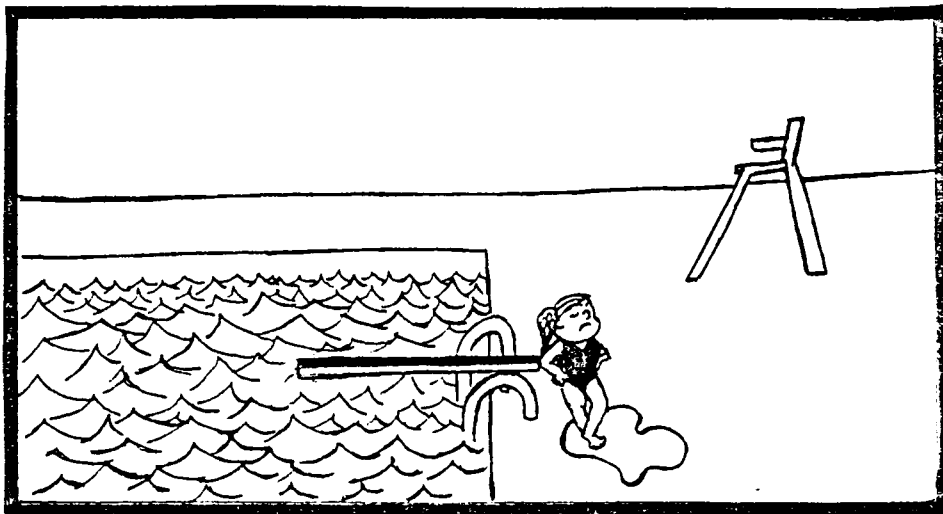
Why did the girl go to the store?

- ☐ so that she could buy some toys
- ☐ so that she could go to the store
- ☐ so that the store was good
- ☐ so that the girl was happy



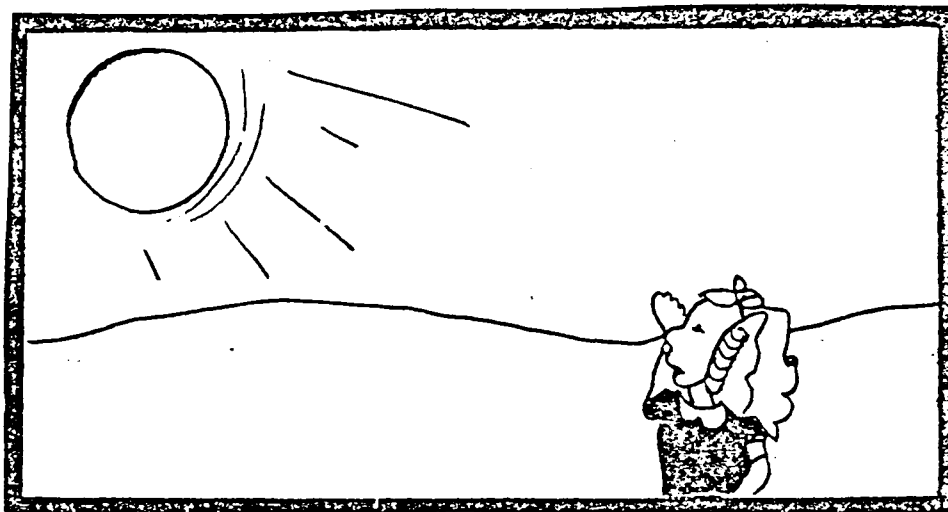
Why did the boy's hands turn blue?

- ☐ from the cold
- ☐ from the blue
- ☐ from the hands
- ☐ from the boy's hands



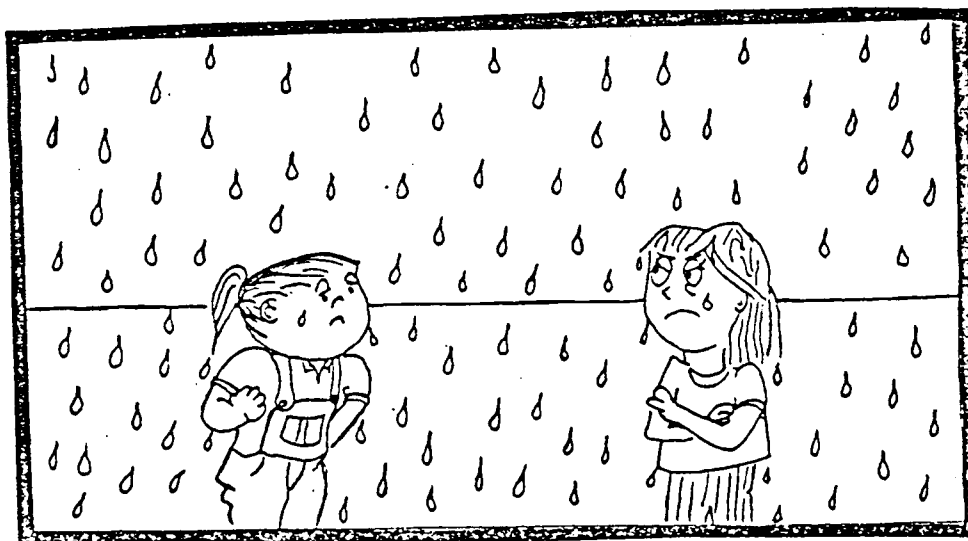
Why was the girl tired?

- ☐ from the girl
- ☐ from the tired
- ☐ from running
- ☐ from swimming



Why did the girl's eyes hurt?

- ☐ from the bright sun
- ☐ from the eyes
- ☐ from the hurt
- ☐ from the girl



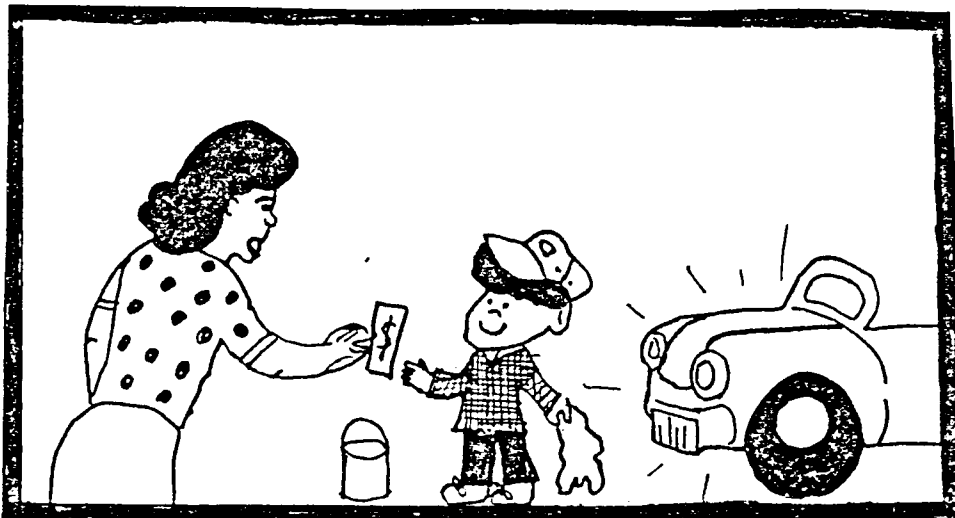
Why are the children wet?

- ☐ from the children
- ☐ from the day
- ☐ from the outside
- ☐ from the rain



Why did the woman thank the boy?

- ☐ () for the boy
- ☐ () for thanking the boy
- ☐ () for helping
- ☐ () for running



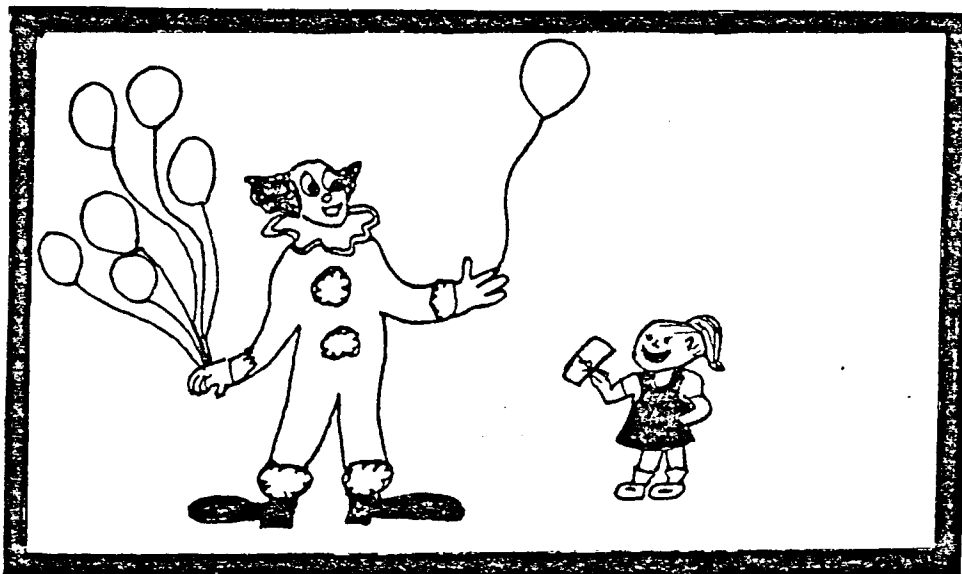
Why did the woman give the boy some money?

- ☐ () for washing the car
- ☐ () for giving some money
- ☐ () for the woman
- ☐ () for the boy



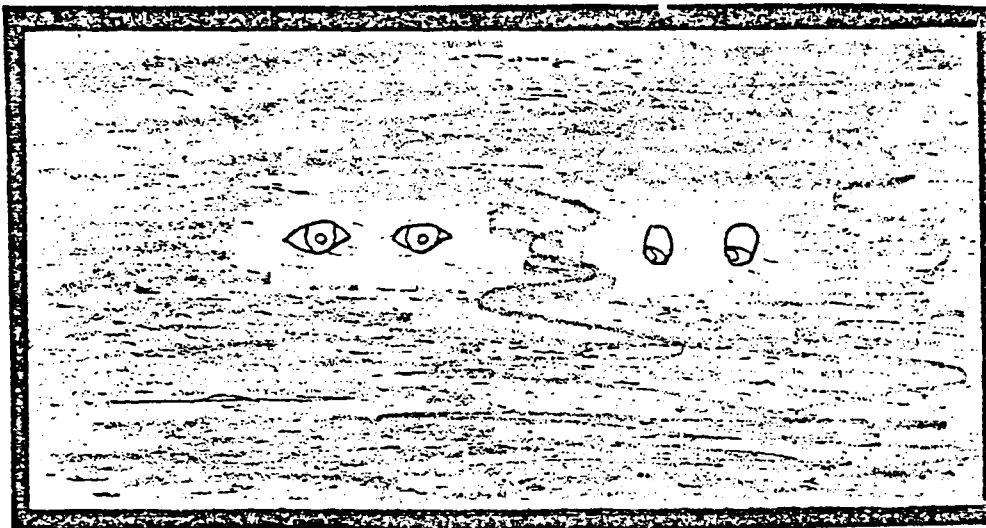
Why does the girl have a rope?

- ☐ for having a rope
- ☐ for giving
- ☐ for jumping
- ☐ for seeing a rope



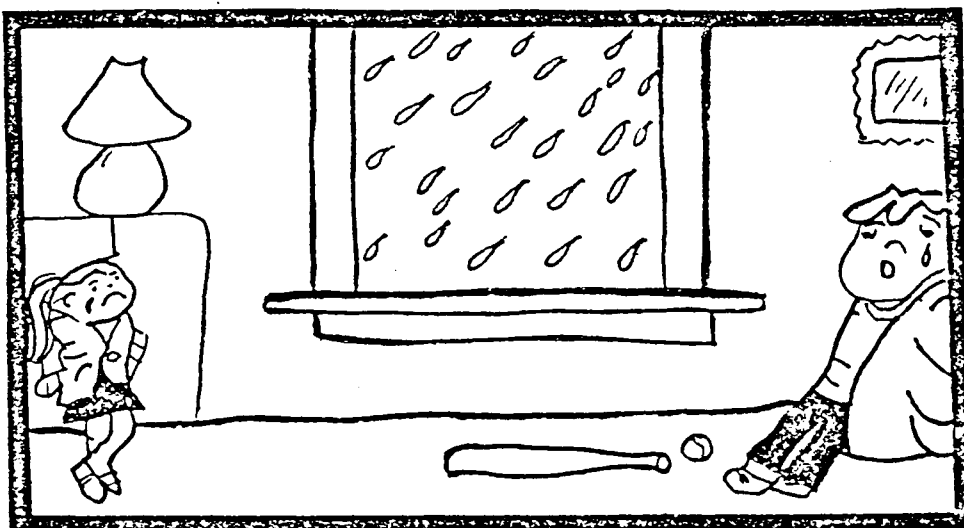
Why does the girl have a dollar?

- ☐ for buying a balloon
- ☐ for seeing the clown
- ☐ for having a dollar
- ☐ for buying a clown



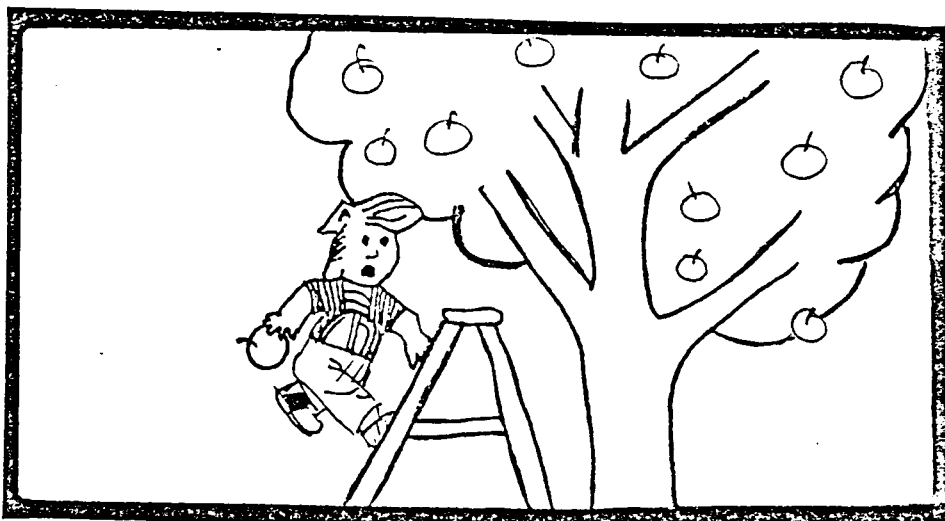
Why couldn't the boys see?

- ☐ because of the day
- ☐ because of the dark
- ☐ because of the children
- ☐ because of the sun



Why can't the children play outside?

- ☐ because the children can't play
- ☐ because of the children
- ☐ because of the rain
- ☐ because of the play



Did the boy get the apple?

☐ yes

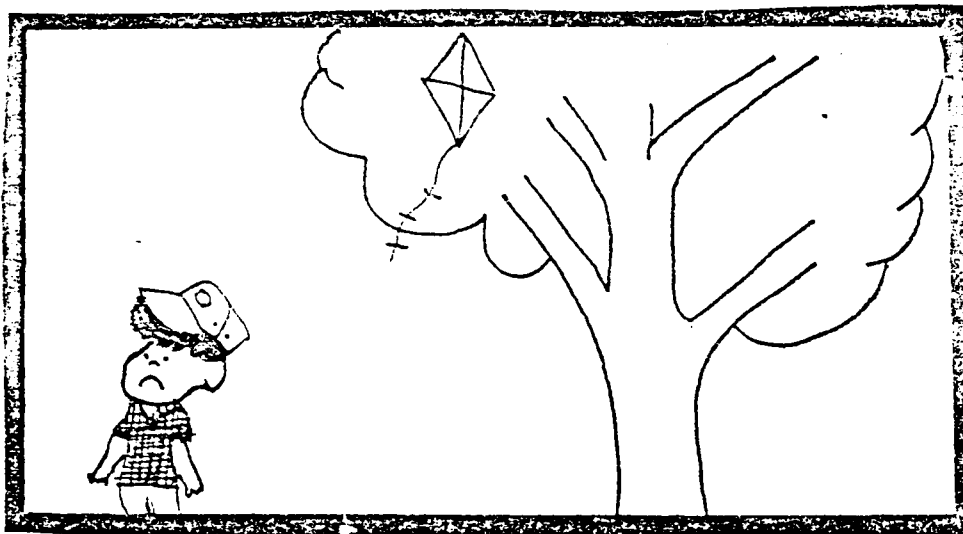
☐ no



Did the girl get some toys?

☐ yes

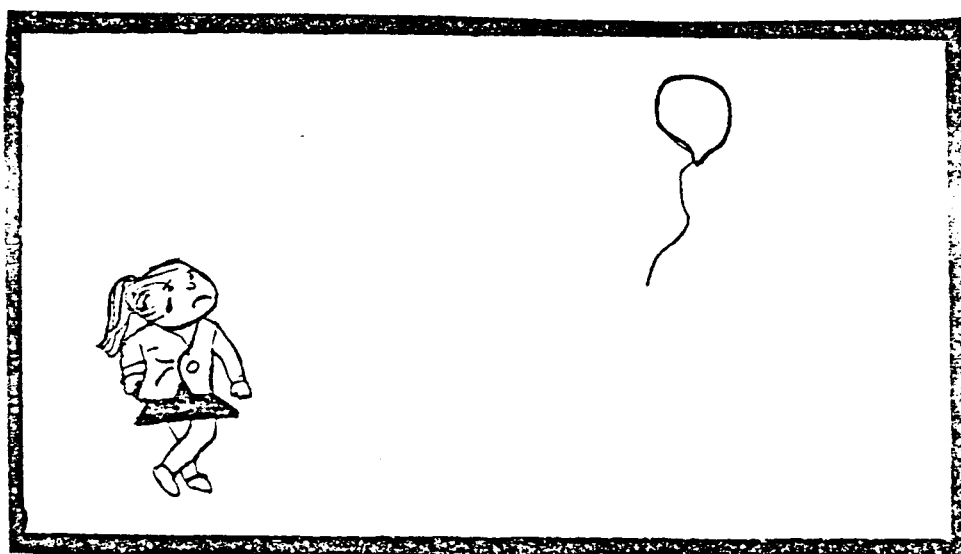
☐ no



Did the boy get the kite?

☐ yes

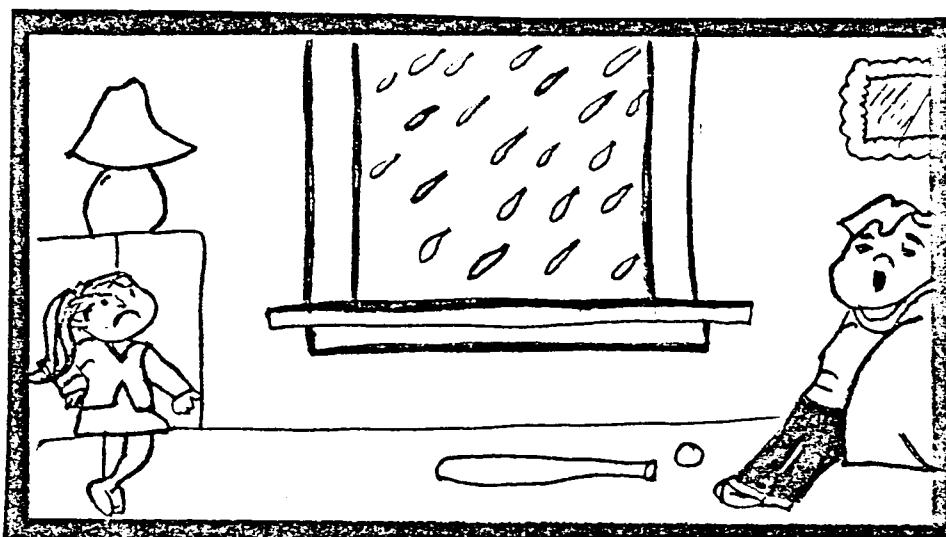
☐ no



Did the girl get the balloon?

☐ yes

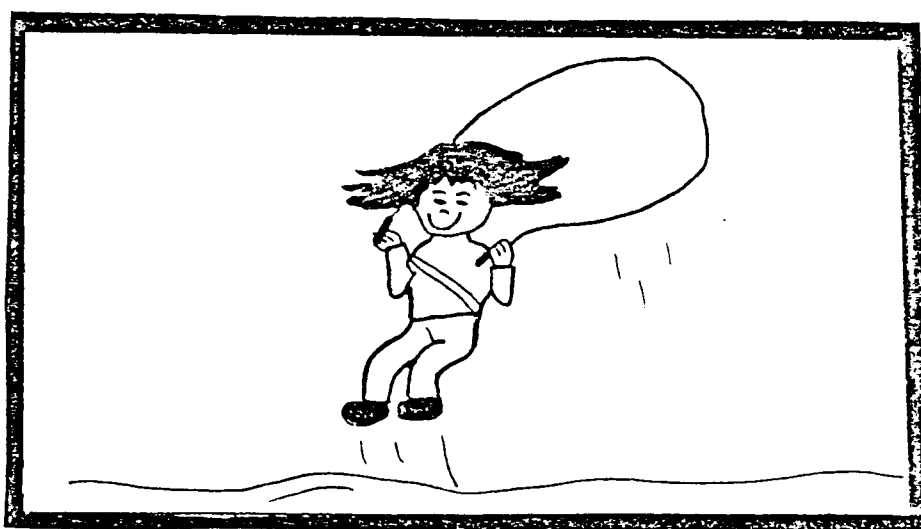
☐ no



Could the children play outside?

() yes

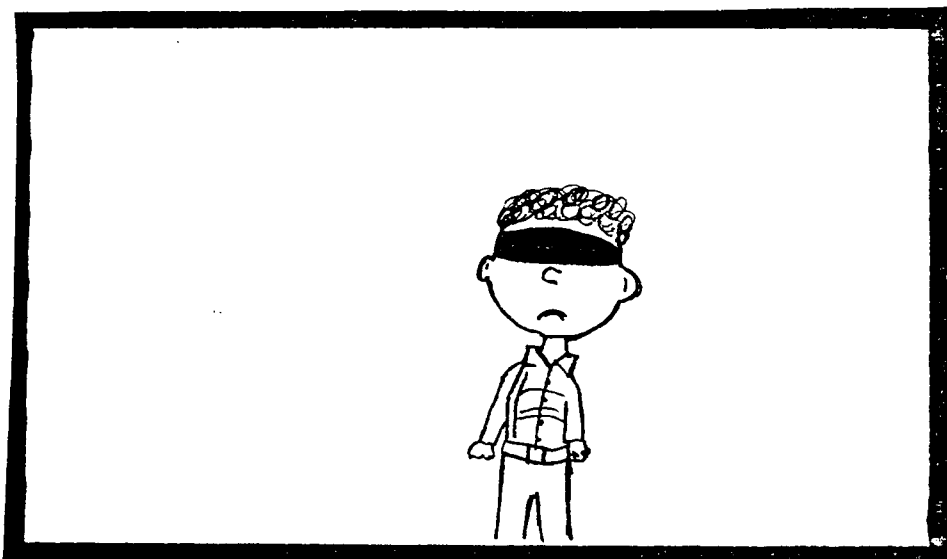
() no



Could the girl jump the rope?

() yes

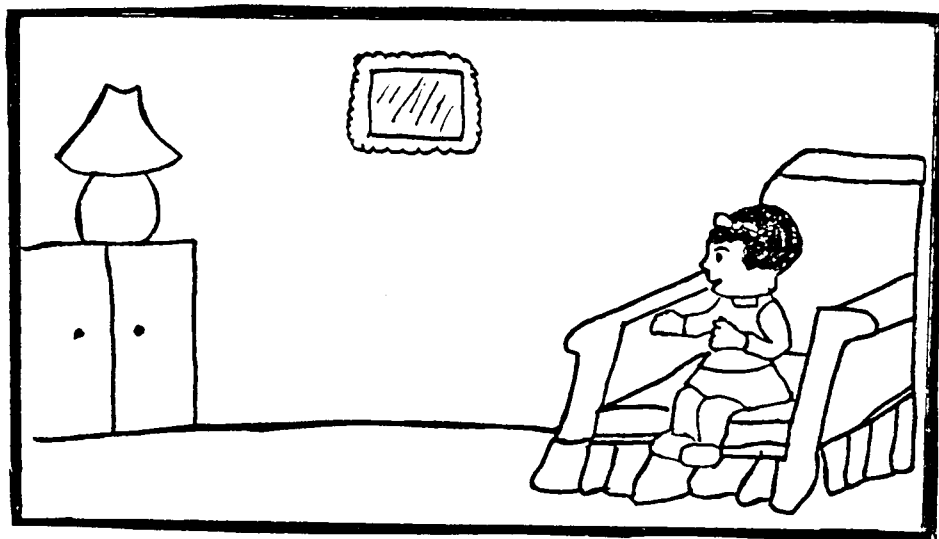
() no



Could the boy see?

() yes

() no



Could the girl sit in the chair?

() yes

() no

It is such a cold day that the girl has on a coat.

Why does the girl have on a coat?

- ☐ () because it is such a pretty day
- ☐ () because the girl has on a coat
- ☐ () because it is such a hot day
- ☐ () because it is such a cold day

He was such a sleepy boy that he went to bed.

Why did the boy go to bed?

- ☐ () because he was such a good boy
- ☐ () because the boy was big
- ☐ () because he was such a sleepy boy
- ☐ () because the boy went to bed

It was such a windy day that the girl's hat blew off.

Why did the girl's hat blow off?

- ☐ because it was such a sunny day
- ☐ because the girl's hat blew off
- ☐ because it was such a windy day
- ☐ because it was such a pretty day

The boy had such a clean room that Mother was happy.

Why was Mother happy?

- ☐ because the boy had such a clean room
- ☐ because the boy was happy
- ☐ because Mother was happy
- ☐ because the boy had such a big room

The ball was too fast for the boy to catch.

Why did the boy not catch the ball?

- ☐ because the ball was red
- ☐ because the ball was too fast
- ☐ because the boy was too fast
- ☐ because the boy did not catch the ball

It was too cold for the children to go outside.

Why did the children not go outside?

- ☐ because it was too hot
- ☐ because the children did not go outside
- ☐ because the children were happy
- ☐ because it was too cold

The food was too hot for the boy to eat.

Why did the boy not eat the food?

- ☐ because the food was good
- ☐ because the boy did not eat the food
- ☐ because the boy was too fat
- ☐ because the food was too hot

The kite was too high for the girl to get.

Why did the girl not get the kite?

- ☐ because the kite was too high
- ☐ because the girl was too high
- ☐ because the girl did not get the kite
- ☐ because the kite was too big

The girl ate so much candy that she was fat.

Why was the girl fat?

- ☐ because the girl ate so much candy
- ☐ because the girl was fat
- ☐ because the candy was good
- ☐ because the girl was good

The boy had so many cookies that he gave a cookie to the girl.

Why did the boy give the girl a cookie?

- ☐ because the cookies were good
- ☐ because the girl was happy
- ☐ because the boy was happy
- ☐ because the boy had so many cookies

The dog was so little that I almost walked on it.

Why did I almost walk on the dog?

- ☐ because I almost walked on the dog
- ☐ because the dog was so big
- ☐ because I was so little
- ☐ because the dog was so little

The clown was so funny that the girl laughed.

Why did the girl laugh?

- ☐ because the girl laughed
- ☐ because the clown was so funny
- ☐ because the girl was funny
- ☐ because the clown was so happy

It was 8:00 so the boy went to bed.

Why did the boy go to bed?

- ☐ because the boy was happy
- ☐ because the boy was bad
- ☐ because the boy went to bed
- ☐ because it was 8:00

Mother gave the boy a gift so the boy said "Thank you".

Why did the boy say "Thank you"?

- ☐ because Mother gave the boy a gift
- ☐ because the gift was pretty
- ☐ because the boy said "Thank you"
- ☐ because Mother said "Thank you"

It was very hot so the boys went swimming.

Why did the boys go swimming?

- ☐ because the boys were cold
- ☐ because the boys were fast
- ☐ because it was very hot
- ☐ because it was very cold

The car looked bad so I washed it.

Why did I wash the car?

- ☐ because the car looked bad
- ☐ because the car looked pretty
- ☐ because I washed the car
- ☐ because I looked bad

VITA

Teresa Nelson McMahan was born in Knoxville, Tennessee on November 29, 1955. She attended elementary schools in Knoxville and graduated from Fulton High School in June 1973. The following September she entered the University of Tennessee, Knoxville, and in June 1977 she received a Bachelor of Science degree in Deaf Education.

She started teaching at the Tennessee School for the Deaf in Knoxville in September 1977. She taught there until the birth of her daughter in January 1982. She entered the Master of Science program in Special Education at the University of Tennessee, Knoxville in the Spring of 1982.

She is married to Greg McMahan and has two children, Alicia and Grant.