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ASSESSING RECEPTIVE LANGUAGE SKILLS OF FIVE TO SEVEN YEAR OLD DEAF CHILDREN

by

Sister Rosemary Gaffney, D.W.

A dissertation submitted to the Graduate Faculty in Speech and Hearing Sciences in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1977

This manuscript has been read and accepted for the Graduate Faculty in Speech and Hearing Sciences in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

ASSESSING RECEPTIVE LANGUAGE SKILLS

OF FIVE TO SEVEN YEAR OLD DEAF CHILDREN

by

Sister Rosemary Gaffney, D. W.

Adviser: Professor Harry Levitt

Teachers, supervisors, audiologists, speech and language therapists and everyone involved in the education of deaf children have long been concerned about the lack of objective, easily-applicable tests for the precise evaluation of language acquisition of young deaf children. This research attempts to provide an easily administered objective screening test of various English syntactic structures for use with young deaf children and norms with which a child or a group of children can be compared.

This screening test assesses the deaf child's ability to comprehend negation, yes/no interrogation and Wh- questions. It examines the deaf child's use of the English syntactic strategies of word-order and inflections. Vocabulary items seem to be appropriate for a pre-school age child. This receptive language test may be administered in the child's preferred mode of cummunication (speech, sign, gesture) and responses are limited to indicating the correct picture from four possible alternatives for Part I, and simple one-word or gesture manifestations of comprehension for Part II. No reading or writing ability is necessary. Test administration requires approximately fifteen minutes and the pictures have a high level of appeal for children of this age

bracket.

Results indicate that degree of hearing impairment, reported school I.Q. score, months of schooling and school attended are not significant variables for the subjects tested. Girls achieved higher scores than the boys did overall. Syntactic ability, as measured by the test, increased significantly with age. Deaf children of deaf parents (8% of the population) scored significantly higher than the deaf children of hearing parents. As was expected, the subjects found yes/no questions easier to answer than Wh- questions. The order of qcquisition of Wh- questions roughly corresponds with that of hearing children and appears to be somewhat less delayed than was previously reported.

ACKNOWLEDGEMENTS

Any study on language, and especially any study on the language of deaf people, entails an effort to ensure that words express one's precise meanings. Too often, various meanings are attributed to the same word, expressions have lost their primary significance and certain words themselves give rise to ambiguity. However, to express gratitude, there seems to be almost general agreement on the word "thanks".

My most sincere thanks are due to Professor Harry Levitt, my major adviser, for stimulating precise thought and expression during the course of this study and for his effective assistance and generous help. Professors Katherine Harris and Helen Cairns, as members of my committee, helped bring this work to fruition by sharing their expertise and their time.

Others, too numerous to mention individually, have contributed to the completion of this dissertation. To my religious congregation, the Daughters of Wisdom, to my family, to my many friends and colleagues and students, to my young deaf subjects and their teachers, to all who have participated in so many ways, my thanks.

To my deaf parents, who taught me years ago the precise meanings of words, their use, and so much else, my gratitude.

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Sister Rosemary Gaffney, D.W.

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CHAPTER ONE

INTRODUCTION

People in general and educators in particular have always been intrigued by deafness. All through history mention is made of this anomaly and of the ubiquitous search for a solution to its enigma. Aristotle, Roman Law, the Mosaic Law and the New Testament all speak of the deaf...either to legislate on the rights and obligations of those afflicted or to speculate on the concomitant handicaps of deafness and its inevitable consequences.

Great educators throughout the centuries have attempted to use their talent to teach the deaf. Cardano de Padua, Pedro Ponce de Ledn, Juan Pablo Bonet, Bulwer, Dalgarno, Saint Francis de Sales, l'Abbe de l'Epee, Alexander Graham Bell, Mere Yves, S. Richard Silverman and other gifted teachers have tried to answer some of the questions that arise concerning individuals born with a profound hearing loss: Do they acquire language? Are they able to learn to read and write? Do they acquire grammatical rules as normally hearing individuals do? Do they pass through developmental stages as they acquire language? Are there differences in the linguistic structures acquired when a different sense modality (i.e. vision instead of hearing) has been the medium of acquisition? Is linguistic retardation inevitable? Is a multisensorial approach beneficial or detrimental to the acquisition of language? Are some of the language problems associated with deafness due to the fact that language is often taught formally to the deaf child in school while a normally hearing child acquires language informally by being exposed to a linguistic environment?

Society now understands that the deaf can not only be educated, but can also become productive and creative men and women. However, there are still many unanswered questions concerning the language acquisition of the deaf and the best means to achieve this.

Teachers, supervisors, audiologists, speech and language therapists, parents and others involved in the education of deaf children have long been concerned about the lack of objective easily-administered tests for the evaluation of progress in language acquisition of young deaf children and especially for some adequate technique of objective measurement and evaluation of language facility of the young deaf child. It should not be necessary to wait until a deaf child can read and/or write before testing his language ability, for it is diagnostically crucial to have adequate knowledge about a child's language development during the years in which language acquisition has traditionally been considered more rapid and easier. Parents and teachers want to, and need to know if there is a developmental sequence followed by deaf children, and if so, whether a particular child or group of children is following it. They must know whether there is a need for ancillary help in certain linguistic areas and the feasibility of facilitating one syntactic structure more than another at a specific time in a child's development.

Recent psycholinguistic studies, especially those of Brown (1970), McNeill (1970) and Menyuk (1969) theorize that language is acquired in successive stages and that children first form tentative primitive grammars and then continually modify and discard these grammars until they resemble the linguistic rules of the adults in the child's

environment. If this is so, then it is urgent to detect deviancies early, if they exist in the language structure of the deaf child, so that his primitive grammars may be modified before the grammatical errors become a part of his "permanent" adult grammar.

It has sometimes been observed that a child's reading level is not always equal to his other receptive language skills. There is a need for a test in which reading and/or writing skills neither enhance nor limit an evaluation of basic language skills. In the recent professional literature, references have been made to the frequency of us of various syntactic structures in the reading materials given to deaf children which are not commensurate with the deaf child's linguistic skills (Power, 1971; Russell, Quigley, Power, 1976). Development norms on the acquisition of these structures should also be of invaluable assistance in the preparation and/or use of these materials.

It is well known that children's language development involves far more than syntax and phonology and that there is a need to take a "more global view" of the language acquisition process than has sometimes been taken. As early as 1970, Bever asserted that, "It is indeed time to expand our horizons beyond the treatment of syntax to more inclusive treatments of language behavior...and recognize that language behavior is itself a variety of interacting systems." However, all languages are grammatical, in the sense that the meaning of a message is not fully determined merely by any combination of the meaning of its elements, and in order to understand the meaning of a sentence and its semantic relations to other expressions, one must

know not only the meaning of its lexical elements but also how they interrelate. This interrelation in turn depends to a great extent on the syntactic structure of the sentence.

This study is concerned with the acquisition by deaf children of a specific kind of linguistic knowledge; syntax, which, although only one of the interacting systems of language behaviour, is a most important one. This study attempts to add to the growing body of knowledge about the acquisition of syntax by young deaf children and in particular, to provide an easily administered objective screening test of various basic syntactic structures, to be used with young deaf children, and also, some very general norms with which a particular deaf child or group of deaf children can be compared. It seeks answers to the questions:

1. Are young deaf children capable of processing any of the syntactic structures included in the test, and if so, which ones?
2. What percentage of the deaf children tested have acquired these particular syntactic structures at a specific chronological age?
3. Is there any pattern or order of acquisition of syntactic rules apparent in these young deaf children, and if so, does this order agree with that of hearing children?
4. Will data collected on deaf children of this age-group correlate with that collected on older deaf children by other researchers, as reported in the professional literature?

CHAPTER TWO

THE ACQUISITION OF LANGUAGE

The more knowledge one has about the process, stages and theories of language acquisition in normal children, the better able one is to use this information as a model for the study of language acquisition in deaf children. Much has been written in the past decade on language acquisition. New insights have emerged, some old theories have been revised and the field of psycholinguistics has recently made great contributions to our knowledge about language and how it is acquired. However, there is still much to be learned about the complex process of how children learn to speak grammatically. The following pages will contain a brief overview of what is currently known or hypothesized about language acquisition in the normal child.

CURRENT THEORIES OF LANGUAGE ACQUISITION

Theories of language acquisition attempt to account for how children acquire language. They can be broadly subdivided into two main theories: behaviorist and nativist. The behaviorist view of language acquisition claims that children imitate their parents and siblings and are rewarded for their correct attempts. Supposedly, ungrammatical utterances are ignored or punished. In this way, following the laws of all learning, grammatical utterances increase, and ungrammatical ones decrease, and children learn to speak correctly.

It is evident that many aspects of language acquisition are not explained adequately by this theory of behavior shaping. Recent research has shown that parents do not reward only grammatical

utterances but are very accepting of all their young child says (Brown and Hanlon, 1970; Brown, Cazden and Bellugi, 1969). When parents correct their children's speech, they often correct the truth of the statement or the mispronunciation of certain speech sounds, but they rarely correct faulty syntax. This theory does not account for the child's use of expressions he is evidently not imitating (such as "Frank spitted at me." or even "Mommy sock") because these expressions are not used by others in the child's environment. The theory does not account for the fact that after most children have used syntactically correct forms (i.e. Daddy went to work.) and have been positively reinforced for them, by being understood, they then use incorrect forms (i.e. Daddy goed to work.) for a time. Nor does this theory explain why all children seem to pass through the same developmental stages regardless of the conscious efforts or formal linguistic knowledge of their parents. Most children learn to correctly generate the basis structures of the target language by the age of four or five. The extremely rapid acquisition of language is not easily explained by learning theory. Therefore, it is reasonable to seek other theories to account for this behavior or to supplement learning theory to explain this behavior.

The other main theory of language acquisition is that of the nativists. Nativists believe that children are genetically endowed with ability to learn language, although they differ in opinion on what is innate, from Lenneberg, (1961) who assumed a species-specific language-facilitating organization of the brain, to McNeill who claimed that "the concept of a sentence may be part of man's innate capacity" (McNeill, 1970, page 2). Most proponents of this theory

believe that a human child is born with a facility to acquire language, not with any specific knowledge of grammatical rules. (Rees, 1972). They believe what Chomsky has explicitly stated:(1964, p.37) "that it is a mistake to assume that past the very earliest stages, much of what the child acquires, is acquired by imitation." Slobin's theory of language acquisition is that each child creatively constructs his language on his own, in accordance with innate and intrinsic capacities (1974,p.40). Each child develops his own theories concerning the structure of the language he hears, and then modifies and discards these theories as he progresses. He forms a variety of word categories which at first do not always correspond to those in adult language. Nativists like Slobin believe that a child's mind is somehow programmed to process the sorts of structures which characterize human language and that he has innate ways of processing linguistic information. They accept Lenneberg's hypothesis that the human brain is programmed in such a way that when enough language has been heard a child will abstract rules, become aware of patterns and construct his own grammar. They explain the increasing complexity of the child's linguistic rule system by the wider worldview and cognitive development of the growing child who needs more complex forms to express increasing knowledge. The nativists' theory is strengthened by the evidence that language acquisition is interlocked with physical and intellectual development and that linguistic milestones correlate with maturational achievements. (Lenneberg, 1972; Bzoch & League,1971 Schlesinger, 1972; Schlesinger & Meadow, 1972).

Evidence that a child does acquire rules is found in his verbal behavior. For example, at an early stage of development many children

consistently use "allgone" as the first word of two-word utterances which contain "allgone" and rarely or never use it as the final word. One could assume that these children's primitive grammars, at this stage of their development contain the rule: "When allgone is used in two-word utterances, it is used in initial position." At another stage, a child may consistently express the past tense by adding -ed to verbs in the present tense and say "played," "laughed," "walked," "talked," "comed," "seed," "writed," and "sleeped." One could assume that, rightly or wrongly he has learned the rule: "The past tense of verbs is formed by adding -ed to the present tense." Of course the child cannot explicitly state this rule. Subsequently, rules are rejected and refined until they approximate the linguistic rules of the adults living in the child's environment.

The theory that children are born with an innate predisposition to learn language is further confirmed by the existence of linguistic universals. Linguistic universals are those aspects of language which are found in all the world's languages. All human languages show basic similarities but if any feature of language is found in all of them, it could be assumed that it stems from an innate characteristic of human beings. Since language universals do exist, it would seem that, as Cairns and Williams (1973) say, "human beings are born preprogrammed in such a way that the communication system they develop will conform to the universal constraints on human languages." Data have been accumulated (Slobin, 1966; Bowerman, 1970; Kernan, 1969; McNeill, 1966; Bar-Adam, 1971; Park, 1970; Leopold, 1949 and Tolbert, 1971) showing that normal children everywhere, learning any of the world's languages, go through approximately the same stages

in more or less the same sequence at roughly the same ages. The earliest grammars of children learning different languages are remarkably alike. In fact Slobin comments that they read like direct translations one from another. Every language has an underlying structure and a surface structure. All have rules which bridge the gap between underlying and surface structures, and the operations performed by the rules are very similar from language to language.

Every known language utilizes the same basic grammatical categories (sentences, noun phrases, verb phrases, etc.) and every language utilizes the same grammatical relations between these categories (subject, predicate, verb and object, etc.). Children the world over also appear to use similar strategies to acquire language. For example, word order is usually the first grammatical mechanism used, whether the language of the adults in the environment is highly dependent on word order or not. As children enter the two-word stage, they begin to differentiate between word classes and many children use two categories of words at this time. Each word class appears in its own fixed position. One would expect children hearing and learning English to use this strategy because in English, word-order is extremely important. "Cats bite babies." and "Babies bite cats." are two completely different sentences although the words in each are identical. However, research by Gvozdev reported by Slobin (1966) on children learning Russian, a highly inflected language, shows that most Russian children also begin their acquisition of grammar by using uninflected forms in rigid word order. The genetic endowment of normal children apparently includes both innate knowledge of language universals and a set of strategies which facilitates

the acquisition of grammar.

These are the two main theories (behaviorist-nativist) concerning language acquisition although there exist several modified versions of each one. They lead us to some important considerations about that aspect of language which is referred to as grammar.

GRAMMAR

Language has been defined as a rule-governed system of arbitrary symbols used to express thought. Grammar deals with the rules that govern language and make it an efficient vehicle of thought. Grammar is the relationship between the thought expressed (meaning of the sentence) and the arbitrary symbols (words) used to express it. The meaning of a sentence is of course, more than the sum of the meanings of the individual words it contains (Miller, 1965). Chomsky referred to a deep structure and a surface structure of sentences. Although some psycholinguists claim that Chomsky's deep structure is essentially the meaning of a sentence, it is easy to see that Chomsky was correct in postulating more than one level of language. The existence of ambiguous sentences (sentences with more than one meaning) is clear proof of this. The sentence "They are visiting relatives" is a classic example. The sentence can mean either: "Those people are visiting their relatives." or "Those people are relatives who are visiting." The occurrence of such sentences leads to seeking a deeper level at which the different meanings can be distinguished.

Additional evidence that there must be more than one level of language is the ability to paraphrase. After hearing a sentence one sometimes asks: "What was meant by that?" Then the speaker explains

the meaning of the sentence. Actually he expresses the underlying structure by another surface structure for clarification.

Grammar then is the knowledge or competence human beings must have in order to use language (Slobin, 1974), in order to relate thought to its verbal expression. Several theories of grammar have emerged (left-to-right probabilistic, phrase structure, etc). Syntactic theory as developed within the framework of the transformational generative grammar of Chomsky has been selected as a model for this dissertation.

TRANSFORMATIONAL GRAMMAR

Transformational grammar uses "transformations" to indicate the relationship between the underlying structure of a sentence and its surface structure. A "transformation" is a rule for adding, deleting, substituting or re-arranging elements of a sentence. For example, the sentences "The boy pushes the girl." and "The girl is pushed by the boy." have exactly the same meaning or underlying structure. To produce the sentence "The girl is pushed by the boy." the passive transformation was used to transform the underlying structure into the passive surface structure.

$T_{pass.}$: $N.P._1 + V + s + N.P._2 \quad N.P._2 + ls + V + ed + N.P._1$.

where $N.P._1$ = the boy

V = push

$N.P._2$ = the girl

The theory of transformational grammar has served as the basis for what many psycholinguists currently believe about language acquisition in children. It is hypothesized that the child who is acquiring language must mainly learn the rules governing the transformation in order to produce questions, negative sentences, passives and other grammatical constructs. The concept of transformations greatly facilitates the task of the child because with relatively few basic rules he can generate all the grammatical and none of the ungrammatical sentences in his language. It is logical to assume that in three or four years a child is able to learn these basic rules. It is hard to believe however that in this same timespan a child can learn to imitate all the sentences of his language, given the infinite number of possible sentences in any language.

Dale (1972) has shown that it is rare for only a single transformation to change an underlying structure into a surface structure. When a number of transformations are required, intermediate structures may result after each one. Some of the sentences generated by children who are in the process of language acquisition closely resemble these "intermediate" structures, as does some of the language of deaf children. Adherents of transformational grammar explain that the speaker has applied some of the transformations necessary but not all of them.

DEVELOPMENT OF INFLECTIONS

Word order as a linguistic strategy has already been discussed. Another device used in many languages to indicate syntactic structure is a system of inflection. Slobin (1970) and others, (Cazden, 1968; Dale, 1972) have found that inflections appear in a child's language

when he progresses from the two-word stage to the three-word stage. Inflections with concrete references are the first developed. Bellugi (1964) listed the order of emergence of inflections in the speech of two of her subjects as present progressive (ing), plural on nouns (s), past on regular verbs (ed), possessive on nouns ('s), and third person singular on verbs (s). The order of emergence for both children was identical although the rate of language development was very different. According to Slobin the major determinants of the acquisition of an inflection are its frequency of occurrence by the adults in the child's environment, its transformational complexity and its "semantic content." By "semantic content" is meant the significance of the intellectual content of the idea expressed by the inflection.

Since irregular (strong) verbs are more frequent in English than regular (weak) verbs, many children begin by imitating the correct irregular form (came, ran, saw, etc.) When they first acquire the rule "Add -ed for the past tense" children overgeneralize and treat both regular and irregular verbs alike. This explains why children "progress" to "comed", "runned" and "seed". Later they realize that each irregular verb follows its own rules and again begin to use them correctly. A similar process occurs for the plural of nouns. The first morphological rules acquired are general rules and it is only somewhat later that a child deals with exceptions to and restrictions on these rules. Inflections that express more complex ideas, such as number agreement between subject and verb or the cases of pronouns are acquired later.

COMPETENCE AND PERFORMANCE

When speaking of language acquisition it is helpful to differentiate between two aspects of language. Chomsky (1965) referred to the knowledge (both innate and qcquired) of a language and the rules governing it that an individual possesses, as his linguistic COMPETENCE. Although a speaker of English may not be able to explicitly state the grammatical rules of his language he "knows" them in such a way that he speaks according to these rules. The use of the knowledge of one's language in the production of sentences and in the comprehension of sentences produced by others is called linguistic PERFORMANCE. Since it is impossible to study a child's linguistic competence directly, the following section will treat the manifestation of this competence, the child's linguistic perofrmance in Production and Comprehension.

PRODUCTION

The techniques commonly used in studies of language acquisition often focus on the child's production of utterances. Several different techniques have been used:

a) Some researchers have made longitudinal collections of speech samples and then constructed the grammars that presumably produced these samples (Braine, 1963; Brown and Fraser, 1964; Miller and Ervin, 1964; Brown, Cazden and Bellugi, 1969).

b) Studies have been made of spontaneous utterances dealing with a specific syntactic construction, i.e. negation, interrogatives, auxiliaries (Bellugi, 1965, 1967; Brown, 1968).

c) Specific tests have been devised to investigate particular syntactic constructions (Berko, 1958; Lee, 1969, 1970; Bzoch & League, 1971).

d) Subjects sometimes have been given ungrammatical utterances and asked to correct them. (Quigley, Wilbur, Power, Montanelli, Steinkamp, 1976).

The results of studies of these types were used to obtain the following information concerning the stages of development that children demonstrate in their acquisition of language.

STAGES OF LANGUAGE DEVELOPMENT

STATE I: HOLOPHRASTIC STAGE

At about the time of a child's first birthday, he utters his first meaningful speech sound, his first true word. Speech sounds prior to this event, such as babbling and imitations of speech sounds made by adults are considered pre-linguistic because they are apparently meaningless. With this first word, a child begins to demonstrate that he is acquiring language. The one-word stage, often called the holophrastic stage because some psycholinguists believe that a child expresses a complete idea in a word, lasts until about the age of 18 to 20 months in most children. The very first words are often nouns, adjectives or self-invented words (McNeill, 1970). Children seem to use these words as comments and it is difficult to understand what a child is saying unless you also see what he is doing. Holophrastic utterances are closely linked to action - what the baby is doing or what he wants to do, or what he wants others to do. Many of these utterances are also expressions of the child's emotions (disapproval, desire, pleasure).

STAGE II: TWO WORD STAGE

As the child's worldview expands so does his need for language. At about 18 to 24 months the child begins to string two words together. He can now express recurrence (more milk), desire (want milk), question (where milk), nonexistence (allgone milk), attribution (bad milk), possession (baby milk), location (there milk), nomination (that milk), notice (hi milk), agent-action (baby drink), agent-object (baby milk), action-object (drink milk), and conjunction (milk soda). Two-word utterances appear simple but developmental psycholinguists (Braine,1963, Brown, Bellugi and Fraser, 1964; Miller and Ervin, 1964) have been able to show that they follow linguistic rules. This stage is really the beginning of syntax. As has already been said, the first syntactic strategy used by many children the world over is word-order. In the two-word stage, children begin to differentiate between word classes and often use two categories of words. Although children's early categories do not coincide with the different word classes of adults, they can be broadly separated into content words, such as milk, shoe, mommy, daddy, and function words, such as allgone, more, my, big and that. Braine (1963) called these two categories "open" and "pivot". Although there is overlapping in these early categories and it would be oversimplification to try to fit all of a child's utterances into them, it is evident in the research of Brown and Bellugi (1964), Miller and Ervin, (1964), Braine (1963) and Bloom (1970) that their subjects were using word order as a syntactic strategy. Each word class appeared in its own fixed position in the following productions: "here baby", "here dolly", "here arm", (Miller and Ervin, 1964), "allgone shoe",

"allgone vitamins", "allgone lettuce", Braine, 1963), "more cereal", "more hair curl", "more milk", (Bloom, 1970) and "Mommy sock", "Mommy dress", "Mommy lunch" (Brown and Bellugi, 1964). This behavior might be expected in children learning English, but it is also apparent in children learning many other languages.

STAGE III: THREE WORD STAGE

Revealing as two-word utterances appear to be of an underlying rule structure, children quickly pass on to the three-word utterance stage. It is during this period that some of the basic syntactic structures used in adult language appear in primitive form, usually negation and interrogation. The child's language begins to more closely approximate that of the adults in the environment. Auxiliaries appear, tenses are marked and rules of inversion are observed. This is the stage when syntactic rules are refined. A detailed look at the acquisition of negation will demonstrate that it too offers evidence that children acquire their own rule system, and then progressively discard and refine these rules until they ressemble those of the adults in the child's environment. The question still remains however, just how these rules are learned. McNeill (1970) claims that children are unable to avoid forming relations between underlying and surface structures (page 87). He presents convincing evidence that in most cases grammatical rules are at first too general and that children slowly learn the appropriate restrictions. He says that although children obviously must have some experience with sentences in their language to arrive at the structural change of a transformation, very

little experience seems necessary for it. The main contribution of experience appears to be to limit the quickly discovered structural changes.

STAGE IV: NEAR TO ADULT COMPETENCY STAGE

Once children have reached the stage of language acquisition where the syntactic structures of negation and interrogation have been incorporated and refined, their speech closely resembles that of the adults in their environment. During the subsequent stage, often called the near to adult competency stage, children acquire mastery of subject-verb agreement, case endings on personal pronouns (me and him ate it.), elimination of the double negative and a few other constructs. At this stage, the basic syntactic structure of most children's sentences appears to be that of adult grammar.

STAGE V: ADULT COMPETENCY STAGE

By the age of five or six there are few salient differences between a child's grammar and an adult's grammar. (Kessel, 1970) However, psycholinguistic research (C. Chomsky, 1969) has shown that there may still be some major syntactic differences between a child's and an adult's comprehension of specific constructions such as "ask-tell", "easy to see - hard to see", "promise" and others. She concluded that all natural languages are extremely complex and that the more complex aspects are the last mastered. She believes that this mastery is not complete until the age of nine or ten.

STRUCTURE SPECIFIC STUDIES

As previously discussed, many studies of language development have considered specific syntactic structures. The acquisition of negation and interrogation have most frequently been investigated presumably because these are among the first syntactic structures acquired.

NEGATION

The acquisition of negation has been extensively studied and reported in the literature (Klima, 1964; Klima and Bellugi, 1966; Slobin, 1966; McNeill and McNeill, 1968; Bloom, 1968; McNeill, 1970; Williams and Cairns, 1973; Cairns and Cairns, 1976.). Most developmental psycholinguists agree that the acquisition of negation probably begins with headshaking in the holophrastic period and external sentential negation in the two and three word utterance stages. For external sentential negation children simply prefix or suffix a negative element (usually no or not) to any utterance: "milk no", "no singing song", "wear mitten no". McNeill (1970) found that children learning many different languages use external sentential negation and he claims that it may be a language-learning universal. It appears that children have acquired the rule: "To negate, say NO before any utterance" or "To negate, add No after any utterance."

In the next phase, children move the negative particle into the sentence to produce "Here not a house." and "I no want envelope." Since children at this period of language development are not yet using "can" and "do" as auxiliaries, they use "can't" and "don't" as

holistic negative elements and not as contractions of "do not" and "can not". This explains why they produce grammatically correct negative sentences such as "He can't have the puzzle." and "I don't like muffins." before they produce grammatically correct (according to adult standards) sentences with auxiliaries in the affirmative. It is only later that children come to realize that "don't" and "can't" are auxiliary verbs combined with negative elements. It is only when the transformational rules governing auxiliaries (inversion, do-support, etc.) are incorporated into a child's grammar that he can begin using auxiliary verbs in affirmative sentences. It is at this point that a child can finally produce both "My dolly can walk." and "My dolly can't talk."

The negative quantifier "any" presents special difficulties for children because, according to adult grammar, it should appear only in negative sentences. Up to this time the child says "I don't want some." and "I don't want none." or "I don't want no carrots." As he listens to the speech of others, he continues to refine his own grammar and realizing that the adults in his environment do not use double negatives, will add new rules to his set: "One negative marker per sentence is sufficient" and "In negative sentences use 'any' as a quantifier." At this period the child begins to say "I don't want any carrots." The basic syntactic rules governing negation have now been acquired and although a child may make mistakes at times he often realizes he does so and sometimes corrects himself.

Considering the semantic dimensions of negation, McNeill and McNeill (1968) found that Japanese children begin their acquisition of negation with the denial of the truth of statements and the existence

of objects. They then use negation to express rejection on internal grounds and later negate the simultaneous truth of another statement (entailment-nonentailment). Bloom (1968) found that her English learning subjects proceeded in a slightly different order: rejection, then non-existence, and finally, denial.

INTERROGATION

Like negation, questions appear at the very beginning of language acquisition (Bellugi, 1965). Children learning to understand and speak English must learn the syntactic rules concerning three types of questions, often referred to as YES/NO, WH- and tags. Both Yes/No and tag questions require a "yes" or a "no" for an answer (Is the baby pretty?, Daddy came home, didn't he?) but tags are much more complicated syntactically and the rules for them are acquired later in the child's language development (Brown and Hanlon, 1970). Wh- questions contain one of the wh- words (who, what, when, where, why, etc.) or their variations (whose, whom etc.) Each wh- question must be answered in a specific way: where calls for a locative, who for an animate noun phrase, etc.

Bellugi (1965) described the stages in the production of interrogatives. At first, questions are extremely simple and the strategy of most children is simply to use rising intonation (Daddy home?) The early wh- questions have little internal structure and are usually limited to "What....doing?" and "Where....going?" Negative questions are negative utterances with rising intonation (No more milk?) In the next stage there are still no auxiliaries in the child's lexicon so there is as yet no inversion of subject and auxiliary. Some of the

wh- words are merely preposed to the child's utterances as question introducers (What book name? Why you smiling?)

By Stage III the auxiliary system has developed and is used in both negatives and questions. Consistent subject-auxiliary inversion is evidence that the child has acquired this transformational rule for yes/no questions. "Do" is sometimes used but tense is often marked on both do and the main verb, contrary to adult usage (Did you broke that part?) Wh- questions however do not show subject-auxiliary inversion and "do", even when necessary by adult standards is often omitted, Why you caught it? What we saw?) At this point the wh- word fulfills its role in the sentence and stands for a particular constituent (What he can ride in?) Dale (1972) believes that children at this stage have developed all the transformations (do, question, negation, etc.) but that there is a limit to how many they can apply to a single sentence. By the end of this stage, however, children are correctly producing both yes/no and wh- questions most of the time.

DEVELOPMENT OF AUXILIARIES

The first "auxiliaries" that appear in a child's speech are almost always associated with negation. Between the ages of 2½ and 3 years children produce sentences similar to those produced by the subjects of Brown, Gazden and Bellugi (1968): "I can't catch you.", "I don't like him.", "Don't leave me.", etc. As previously discussed psycholinguists have shown that in these early sentences the child is using "can't" and "don't" as a holistic negative element (much as he uses "no" and "not"), and not as a combination of "can+not" and

and "do + not". At this stage the child does not as yet use any type of auxiliary in affirmative sentences. He says "I do it." " I have it?" and not "I can do it." "Can I have it?! So the first "auxiliaries" are not really auxiliaries at all.

Two to six months later (McNeill, 1970) negation and the auxiliary are no longer linked together and the first true auxiliaries appear, usually in sentences like "Can I have it?" and "I can do it." Bellugi found that once initiated, the development of the auxiliary system is "rapid and pervasive, suggestive of a carefully prepared complex system which is intricately hooked up to the child's previous language system." In one month's time one of Bellugi's subjects increased her production of auxiliary verbs in all contexts dramatically. At age 26.5 months there were 14 auxiliaries in the speech sample collected. At age 27.5 months there were 53. Bellugi found that along with growth in numbers, there was also a growth in variety with several auxiliaries used with many different main verbs.

The auxiliary verb system is very complicated in English and the child has to acquire many basic principles, such as "Number and tense are always marked on the first part of the verb construction whatever it is." "The auxiliary verb "be" in a sentence requires that the main verb carry the suffix -ing." "The auxiliary verb "have" in a sentence requires that the main verb carry the suffix -en, or its equivalent." In the development of the auxiliary system, as for the development of other aspects of language, the more complex forms are mastered later than the simple forms. The five or six year old child however has acquired the basic knowledge necessary to use this complicated

system correctly.

COMPREHENSION

Up to this point, only the production aspect of language has been under consideration. To describe adequately language acquisition in children, comprehension of language, also a form of linguistic performance must be included. There is widespread belief that children understand language (both in general and specific grammatical features) before they produce it. To provide evidence for this hypothesis Fraser, Bellugi and Brown (1963) devised the Imitation, Comprehension and Production Test in which 3 year old children were asked to imitate, produce and demonstrate comprehension of sentences about pictures. Ten basic syntactic structures were included. On all the items, comprehension exceeded production.

Several different techniques have been used in studies of linguistic comprehension:

a) Some studies have measured comprehension by asking subjects to indicate which of a set of pictures correspond to a particular sentence (Fraser, Brown and Bellugi, 1963; Lee, 1969)

b) In other studies, children have been asked questions and their responses were analyzed (Bellugi, 1965; Brown, 1968; Ervin-Tripp, 1970)

c) Researchers have also elicited imitations of sentences since Slobin and Welsh (1968) demonstrated that children assimilate model sentences into their current linguistic structures (Brown and Fraser, 1964; Miller, 1973).

d) In some studies of comprehension, subjects have been given commands

and are assumed to have understood if the command is obeyed (Bever, Mehler and Valian, 1967)

Results of some of these studies are summarized below.

WORD ORDER

As well as being one of the earliest syntactic strategies children use in speech production, word order is also used as a strategy for the comprehension of sentences. Recent studies on young children's comprehension of the passive voice have high-lighted the fact that many children consider the first noun phrase of a sentence as the agent, the verb as the action and the second noun phrase as the object of the action. This strategy leads of course to miscomprehension of sentences like "The boy is pushed by the girl." and "The pony is ridden by the girl." The first of these two sentences is said to be reversible because either of the noun phrases could presumably indicate the subject of the action. The second is non-reversible because only one of the two noun-phrases could logically be the agent and this makes comprehension easier.

Slobin in 1966 tested the ability of children of kindergarten age (and older) to deal with passive voice sentences in a picture verification experiment. He showed the subjects a picture of a girl riding a pony and asked whether the sentences "The girl is ridden by the pony.", "The girl is riding the pony." and others were true or not. Slobin's subjects found verification of non-reversible sentences easier than verification of reversible sentences. Bever, Mehler and Valian repeated the experiment with 2, 3 and 4 year old children and found no

differences in scores between reversible (The dog chases the cat.) and non-reversible sentences (The policeman eats the candy.) when both are active. For passive sentences the youngest children performed at about chance level. The girls from 3;8 to 4;0 and the boys from 4;0 to 4;4 appeared to interpret any noun-verb-noun sentence as agent-action-object of action, except for non-reversible sentences. For these, the children's semantic knowledge and their knowledge of the world aided in the correct interpretation.

This reliance on word order by children in the early phases of language acquisition is not only apparent in their spontaneous speech and in their comprehension of sentences but also in their imitations of adult speech. Brown and Fraser (1964) asked six children under the age of three to repeat sentences after them. Imitations of the stimulus sentence "I am very tall." produced "tall", "I tall.", "I very tall.", "I'm very tall." "Very tall." and "I very tall.". The sentence "I do not want an apple." produced "I do apple.", "I do a apple.", "I do not want apple.", "I don't want apple.". Of 78 responses, not one changed the given word order, although words were deleted, modified or substituted in almost every response.

NEGATION

Research on the comprehension of negation includes sections of Fraser, Bellugi and Brown's Imitation, Comprehension and Production Test already mentioned. The items dealing with negation produced the highest overall scores (followed by subject-object contrasts in the active voice, singular-plural marked by is and are, singular-plural

marked by inflections, subject-object in the passive voice, etc.) Interestingly there was a difference of only 4 points between the mean scores for comprehension (71%) and those for imitation (75%) on the negation items, although differences between imitation and comprehension on the other 9 contracts averaged 20 points. (The subjects achieved a score of 50% on the production section of the negation items.)

QUESTIONS

The comprehension of questions in young language-learners has been studied and discussed by several developmental psycholinguists (Ervin, 1964; Ervin-Tripp, 1970; Brown, 1968; Shipley, Smith and Gleitman, 1969; Slobin and Welsh, 1968; Kuczaj and Maratsos, 1975; Cairns and Hsu, 1976). Kuczaj and Maratsos (1975) elicited both yes/no and wh- questions from a subject at age 2;7 and again at 2;10. At age 2;7 his imitations all preserved the correct yes/no question intonation but of 16 grammatical questions, only 2 were imitated correctly. The subject (Abe) deleted the auxiliary in 10 of his responses. For wh- questions, Abe imitated only 1 correctly, deleted the auxiliary verb for 5 and inverted the auxiliary verb for 1. At age 2;10, the subject imitated 10 grammatical yes/no questions correctly and corrected 9 of 10 ungrammatical ones as he repeated them. However, not one of the grammatical wh- questions was imitated correctly due to the non-inversion of the auxiliary verb. The results of this study show consistency between the stages of comprehension of questions and those of production of questions as described by Bellugi (1965).

Another facet of the development of questions in young children was studied by Ervin-Tripp (1970) who asked 24 children (aged 1;9 to 4;2) questions about a picture book to try to discover the linguistic strategies they use to arrive at the appropriate answers. In her detailed analysis of the subjects' responses, she found three stages of development. At first, the children gave rote-learned answer routines (fall down) or associative responses to stressed words in the questions. In the second stage some wh- words (what, where and who) had acquired semantic and syntactic features, that is, the children "knew" that "what" requires an inanimate noun phrase as an answer, "where", a locative adverb and "who" an animate noun phrase. Unfamiliar wh- words were simply assigned the features of another wh- form already in the lexicon of the child. This explains why children at first answer "when" questions with noun phrases or locatives (When do you brush your teeth? Toothpaste.). By Stage III all the common wh- forms have distinctive semantic features although these do not fully correspond to adult features, and wh- questions are answered appropriately most of the time.

Ervin-Tripp (1970) found that children first respond appropriately to yes/no questions, then to questions containing what, where, what-do, why, who-subject, how, where-from, who-object and when, although there was no rigid order and differences in order of acquisition across subjects existed. In their responses Ervin-Tripp's subjects seemed to use the word-order strategy mentioned earlier concerning agent-action-object so that whenever they heard a question with a transitive verb without an object immediately following it, they

responded to the question by supplying the object of the verb, for example, "Where is Daddy reading? Read book." Other strategies used by Ervin-Tripp's subjects at this stage of language acquisition were: to reply appropriately to any familiar question word, to give a causal explanation if there is an animate subject and an intransitive verb (subjects over 3 years old) and for other intransitive verbs, to respond with a location or direction, for example, "When will the truck go? Truck go there."

Ervin Tripp found that children discriminated questions from statements and imperatives very early because even her youngest subjects (1;9) already did so. She thought that this may be due to the fact that at least 25% of the questions adults ask young children are repeated.

The study of the language acquisition of normal children has received new impetus in recent years. The contributions of developmental psycholinguists to knowledge of this topic have been considerable. Descriptive studies have traced the stages of language development and experimental studies have attempted to explain how children acquire specific aspects of language. Although there is still much to be learned about the complex process of language acquisition in normal children, the information that has already resulted has served to stimulate new interest in the study of the language acquisition of the young deaf child.

Since research (Brill, 1969; Furth, 1966; Levine, 1974; Meadow, 1968; Vernon, 1968;) has shown that deafness per se does not appear to cause any basic cognitive deficit, there is every reason to be-

lieve that deaf children do not acquire language normally because they do not hear the spoken language of those about them, or do not perceive enough of it to be able to abstract the underlying grammatical rules. The problem is to make language perceptible to them through means such as amplification of speech sounds, speechreading, signs, and/or printed words.

Since the language input of deaf children is not as vast, as rich, as varied or as easily accessible as that of hearing children, acquisition of syntax by deaf children will almost inevitably be retarded. However, if there are no other confounding variables, the deaf child should follow the normal sequence of syntax development. The present research is based on this hypothesis.

CHAPTER THREE

REVIEW OF RELATED LITERATURE

It is evident from a review of the related literature that there is a need for further research on the language acquisition of deaf children. Few attempts have yet been made to investigate the acquisition of syntactic structures by young deaf children and there is confusion and conflicting evidence in this area. Some investigators (Pressnell, 1973; Schlesinger, 1972; Cooper, 1967) found that deaf children acquired structures similar to those acquired by hearing children but that the process was much slower; others (Brannon, 1968; Sarachan-Deily and Love, 1974; Teervoort, 1967) found that deaf children acquired different structures. Studies(Greenstein, Greenstein, McConville and Stellini, 1974; Withrow, 1966) exist that reveal a significant correlation between age and linquistic performance, and others (Cooper, 1967; Monsees, 1969) show only a low correlation, if any, between these two variables. Tests used in this research have often been devised for and standarized on hearing children and the validity of this approach is questionable. Some language scales exist but these are subjective evaluations and were devised to assess skills such as speechreading, hearing discrimination, speech, etc. rather than basic linguistic abilities. Because of the difficulty of communicating with young deaf children, researchers have often deferred systematic investigation in this area or have concentrated on the deaf child's ability to understand and use written language and waited until subjects could read and write. A review of the litera-

ture shows the need for further study of the acquisition of syntax by young deaf children and for an objective means to accomplish this research.

Rate of syntactical acquisition

Pressnell (1973) studied both the comprehension and production of syntax in the oral language of 47 deaf children aged 5 to 13. She first administered the Northwestern Syntax Screening Test (NSST) which was developed by Lee in 1968 for use with normal-hearing children. Both the Receptive and Expressive sections were incorporated into her study. The subject is asked to point to one of four pictures in response to a stimulus sentence and then to another of the same four pictures in response to a second related sentence. The 20 items of the receptive section of the NSST deal with 12 different constructions: prepositions, personal pronouns, negatives, plurals, reflexive pronouns, verb tenses, possessives, subject-object identification, Wh- questions, yes/no questions, passives and indirect objects. Recent research (Quigley, 1973) has already shown that the majority of 10 year old deaf children have not acquired some of these structures at all and are only in the initial phases of acquisition of some of the others. For younger deaf children it is evident that a simpler test is indicated.

Pressnell also obtained a Developmental Sentence Score (Lee, 1970) and compared the results with Lee's norms for hearing children. Although the Developmental Sentence Scoring Procedure could in some circumstances be used with older deaf children, it is not appropriate

for use with young prelingually deaf subjects because it requires a speech sample of 50 spontaneous sentences. These sentences must be complete, different, consecutive and intelligible. The speech and language of most young deaf children is not sufficiently advanced to use this technique.

Pressnell concluded that deaf children acquire syntax, as measured by the NSST, at a significantly slower rate than hearing children do, because their scores were so low. She found differences in the order of acquisition for particular verb constructions between the deaf subjects and children with normal hearing. She attributes these differences to the order in which verb forms are presently taught in many schools for the deaf and to the visual and auditory cues these constructions may contain. Pressnell's results indicate that there is greater improvement in the scores of deaf children between the ages of 5 and 9 years than in their scores between the ages of 9 and 13 years. This finding highlights the need for more research on the acquisition of syntax during the early years of the deaf child's language development, when intervention can be most beneficial.

Schlesinger (1972) reported on her study of 4 deaf infants whose families used American Sign Language with them from the time they were born. Videotapes of the child and his mother communicating with each other were made and analyzed. Then the cognitive and linguistic growth stages were charted and compared with the developmental milestones of hearing children, and of deaf children whose parents do not sign. Schlesinger reported that she found similar syntactical development in the hearing child who used spoken English and the deaf

child who used sign language from early childhood. She described the deaf children's first spontaneous utterances, the pivot stage and the early phase of the acquisition of negation. She reported that one of the subjects, Ruth, at age 3, correctly indicated the appropriate picture when two were presented to her with the signed sentences: The girl pushes the boy./ The boy pushes the girl. The boy is sitting./ The boy is not sitting. The paint is falling./ The paint fell. At this age Ruth reportedly had a sign vocabulary of 348 words, most of which were nouns (246) but which also included adjectives, verbs, adverbs, interjections, pronouns, prepositions and conjunctions (listed in order of frequency). Schlesinger concluded that Ruth acquired grammatical structures in the same order although somewhat more slowly than most hearing children reported in the literature.

Schlesinger, a psychiatrist, studied these children from a psychological point of view. She gave no data concerning whether a sign was in the child's expressive or receptive vocabulary nor what criteria had to be met before a sign was considered to have been incorporated into the child's vocabulary. No controlled experimental evidence was given as support for claims and the number of subjects she worked with is small. This study is included here because it shows that some deaf children appear to be acquiring grammatical rules much earlier than was previously thought, but replicable, controlled experiments have to be done with larger numbers of subjects so that the results can be generalized.

In 1967 Cooper attempted to construct a test to assess deaf children's ability to comprehend and to use articles, tenses, prep-

ositions, word order, negation, agreement, subordination and active-passive relation. His subjects ranged from 9 to 20 years of age, were prelingually deaf, orally trained and had at least second grade reading skills. His test consisted of five subtests (80 items) which evaluated the ability of the subjects to: (a) reproduce in writing 20 sentences, each shown on an overhead projector for 4 seconds, (b) distinguish between 20 grammatically correct and incorrect sentences, (c) encircle the error in 20 grammatically incorrect sentences and write in the correct word, (d) choose which of two pictures corresponded to a sentence printed below them (10 items) and (e) select the appropriate suffix in 10 items each as: "Ann can cook. She did it yesterday. Yesterday she (cooking, cook, cooks, cooked.)."

Cooper's results showed no significant differences between the younger deaf children (aged 9 to 14) and the older ones (aged 15 to 20) but all his deaf subjects had lower scores than the third grade hearing children in the control group. The scores obtained on Cooper's morphology test correlated highly with the subjects' reading levels. It could be argued that items from Cooper's test measured short term memory and other skills (visual perception) and the subjects' ability to read and write as well as their syntactic ability. This research indicates some of the difficulties encountered in the construction of valid language tests for young deaf children and the evident need for them.

In another article Cooper (1967-b) reported on a revision of his test. This time he had 140 deaf subjects (orally trained, prelingually deaf, aged 7 to 19 years) select the correct picture from

4 alternatives, suggested by nonsense words used in sentences. His procedure was similar to the Berko model. His aim was to assess their ability to apply 21 morphological rules, in particular derivational suffixes (farm -er) and inflectional suffixes (farm -s). Results again showed substantial correlations between the scores achieved and the subjects' reading and vocabulary grade equivalents. The percentage of deaf subjects passing each item increased erratically and inconsistently with chronological age but the average score of the 19 year old deaf subjects did not reach that of the 9 year olds in the hearing control group.

Cooper's attempts to satisfy the evident need of a syntax test for young deaf children may have succeeded if he had concentrated on fewer basic structures, had chosen another mode of response than writing, had used simple, familiar vocabulary rather than nonsense words and had not made success contingent on reading ability.

Differences in syntactic structures acquired

Brannon (1968) compared the linguistic word classes in the spoken language of normally-hearing, hard of hearing and deaf children, aged 8.7 to 18.5 years. His study showed that significant degree of hearing loss have negative effects on oral language in that the oral language of orally trained deaf children contains fewer auxiliaries and other expanding words (prepositions, quantifiers, conjunctions) and fewer different words than the spoken language of children with normal hearing. Brannon found that profound hearing loss limits the oral output of word tokens in all classes, especially adverbs, pro-

nouns and auxiliaries. There is an overuse of nouns and articles and the language of deaf children contains more naming words and fewer abstract words which cannot be associated with tangible referents. According to Brannon, hearing impairment interferes with the learning of function words much more than with the learning of content words.

Since difficulties with function words indicate problems with syntax, Brannon's study indicates that information is needed on the deaf child's knowledge of the rules that govern function word classes as they are used to indicate negation, interrogation and other syntactic structures.

Sarachan-Deily and Love (1974) studied the underlying grammatical rule structure in 42 prelingually deaf adolescents between the ages of 15 and 19, using a modified version of Savin and Perchonock's (1965) immediate short-term memory span technique. They used active, passive, negative and passive-negative sentences in an immediate sentence recall experiment with these subjects and a control group of hearing high school students of the same age. Sentences were projected on a screen (for 10 seconds) and subjects wrote as much as they could remember.

Sarachan-Deily and Love interpreted their results as an indication of differences between the syntactic structures of congenitally deaf students and hearing teenagers. Deaf subjects often deleted even major items (subjects, objects or main verbs) of the stimulus sentence when they repeated it. "Has," "was," "the," and "by" were frequently omitted. "Was" and "has" were substituted for each other or replaced by "did". Word order was incorrect and whole sentences were agrammatical: "The cake was a whole by the hungry child" was recalled for "The whole cake was eaten by the hungry child. Half (49.6%) the

sentences of the deaf subjects violated English syntax.

Although this study has produced some information it does not tell us at what point in the deaf child's linguistic development deviant structures appear nor whether the errors are inter-related. It would be helpful to know whether syntactic rules are acquired correctly and then distorted or whether deviant rules are learned. No data on whether the deviancies mentioned are resistant to remedial teaching are given. There is an urgent need to examine the language skills of younger deaf children for this information.

Tervoort (1967) reported on an analysis of the communicative structure of 48 prelingually deaf subjects aged 7 to 17 which was done over an 8 year period. The subjects were all students of average intelligence at residential schools for the deaf, two schools in the United States, and two in the Netherlands. Although all the subjects were being taught to speak and to speechread, none of them engaged in oral private conversation without some signing. For the study, pairs of Dutch and American subjects in private unmonitored conversation using both speech and signs were filmed and the films later decoded with the help of the subjects themselves, of some deaf adults and of the subjects' teachers and parents.

Tervoort found that only 35% of the total number of sentences (12,900) were grammatically correct. The grammatical quality of the sentences showed a highly significant development over age in the two American schools but the pupils of one Dutch school showed no development in grammaticality at all. This study showed that at all age levels and in both languages there are 4 main types of grammatical deviations: omission, (I live Royal Center.); inversions (Mother my

sew dress.); superfluities (I wonder why Oswald shot to him.) and substitutions (Who are she?). Tervoort found an overall growth in vocabulary capacity and efficiency from ages 7 to 17, but vocabulary is only one aspect of language development. He could find no known syntactic rules in either English or Dutch according to which the 8,385 ungrammatical sentences could be analyzed. Tervoort's study focused on syntactic rules in general. If one or a few specific constructions had been studied, especially the simple ones acquired early by hearing children (negation, question formation) an improvement with age and years of schooling might have been found. In free, unmonitored conversation, constructions correctly incorporated into a child's syntactic system may just not have surfaced. Since many schools for the deaf in the United States are now using forms of sign language that conform to English word order and may use morphological marking, new studies on the acquisition of syntax are called for.

Rating Scales of Language Performance

Monsees (1969) asked teachers to rate the communication skills of 69 prelingually deaf children born between January 1964 and December 1965 (approximate span of a rubella epidemic). The subjects were between 40 and 64 months of age at the beginning of the study which attempted to examine differences in language-learning abilities manifested by a group of post-rubella deaf children. Monsees was seeking a predictive index of language achievement which she considered essential for early identification of children with secondary language-learning disorders as a basis for early differentiation of an

educational/rehabilitative approach. She found that although group differences were statistically significant, etiology is a poor predictor of language potential in any individual case, and that there was multiple causation of hearing loss for 63.8% of her subjects.

With reference to each child's language performance and in relation to the other children in the group, teachers were asked to rate each child on a nine point scale considering new vocabulary expressions and other linguistic material taught. Rating scales are subjective tools and satisfactory reliability is difficult to achieve. in studies that use them. Comparing subjects with others in a small related group gives little valid information that can be generalized to a larger population. In the opinion of Monsees there is a great need in the area of education of the deaf for a uniform scale of linguistic performance. More than for another subjective rating scale, there is need for an objective means of measuring the syntactic skills of young deaf children and of studying the rate and order of acquisition of syntactic structures in these children.

For Monsees' subjects, age showed a low negative correlation with the language rating and none of the etiological factors of rubella, Rh negative blood, problems of pregnancy or birth were significantly correlated with language achievement. Degree of hearing loss, quality of the home environment and the subject's active participation in his surroundings were the principal significant variables.

In 1970 Monsees undertook a similar study on 57 prelingually deaf subjects between the ages of 52 and 76 months, with a mean hearing loss of 93.6dB in the better ear. Her revised language Rating Scale was an attempt to assess the actual linguistic performance of

each child along the following parameters: size and content of vocabulary and the ability to comprehend and use prepositions, plurals, pronouns, questions and verb tenses. She again found that age and etiology were non-significant and that the child's hearing loss, home environment and active interest in his surroundings were crucial variables. None of Monsees' subjects used manual or simultaneous communication and she realized that her rating scales were not suited for use with deaf children who do.

Greenstein, Greenstein, McConville and Stellini (1974) studied the language acquisition process in 30 deaf infants and attempted to measure the contributions of such variables as hearing levels, training methods, age at initiation of special education and the quality of the mother-child relationship. Until the children reached the age of 3 years language skills were evaluated by having the subjects' teachers complete the Receptive-Expressive Emergent Language Scale (REEL) of Bzoch and League (1971) every 6 months. The REEL is a standardized rating scale developed to assess the communication skills of hearing children up to the age of 3 years. Like many observational techniques the REEL scale is subjective, and it is also somewhat vague. One item is: "10 to 11 months - appears to understand simple questions like Where is the ball?." It is difficult to know what "Appears to understand" implies and exactly on what to base one's decision to check yes or no.

When Greenstein's subjects reached the age of 40 months, the Lexington Preschool Oral Language Assessment was used. This procedure was specifically designed to measure the speech and language skills

of 3 year old hearing-impaired children. It consists of play situations which follow a standard script which provides 311 scorable items classified into 4 scales: directions, auditory, elicitation and imitation. This is also a subjective scale and is more an evaluation of a child's beginning speech, auditory and lip-reading skills than an assessment of his language skills. Even the quality of the mother-child relationship was evaluated by observational methods in a series of laboratory situations.

The results of Greenstein et al. imply that the earlier the child had been admitted into the Infant Program, the better were his "language" skills, and that the quality of the reciprocal mother-child relationship was the crucial variable. However, the average age of admission for the deaf children of deaf parents (who received superior ratings) was approximately 10 months earlier than for children of hearing parents. It would seem that an alternate interpretation to Greenstein's results might be that the crucial variable is the early identification of the deaf child and the subsequent earlier resolution of the trauma of the parents. This would lead to an earlier emphasis on language acquisition. Greenstein's study has also been interpreted as an indication of the possibility of a short, early critical period or cut-off point after which language is never adequately acquired normally. It is of course, also possible that the subjects who demonstrated poor language skills had other problems besides deafness, such as minimal brain damage, that were not yet diagnosed. Studies have shown that many deaf children of deaf parents have peripheral deafness while many of the other children in schools for the deaf have additional handicaps that render the acquisition of

language even more difficult.

The Lexington Preschool Oral Assessment used in the study does not measure syntactic skills. Greenstein's research again highlights the need for an objective instrument that can measure the syntactic skills of young deaf children.

Withrow (1966) developed a receptive communication scale for prelingually deaf children from age 5;7 to age 14;6. The Illinois Communication Scale consists of five parts: I contains isolated vocabulary words presented with a carrier phrase and pictorial multiple choice items with four pictures to choose from; II contains simple sentences that could be graphically represented in pictorial multiple choice form. Only Parts I and II could be administered to children who do not read. Parts III, IV and V were verbal multiple choice items for which the subject simply checked the sentence that he considered correct. III was a filmed story, wordlessly dramatized by a young girl, about which ten questions were asked; IV, a narrated story supplemented by three cartoon-type pictures interspersed in the narration. Ten questions were asked about the story. V consists of random phrases and sentences with no visual clues as to the sentence or phrase. The question forms used in the Illinois Communication Scale were: When, What color was, How many, Where, What happened when, What was, What did....do, Did and Why.

Five forms of the scale were constructed, each designed to assess one mode of communication: auditory reception, lipreading and listening, lipreading, fingerspelling and sign language. Preliminary testing showed that the subjects could not do the auditory reception

section as a group test and this was excluded. Sign language proved to be the easiest communicative mode for Withrow's population. The response curve for fingerspelling started below the lipreading curve but at age ten rose rapidly and from then on, the fingerspelling scores were superior to the lipreading scores.

Withrow explicitly stated that the purpose of his test is to assess receptive communication modalities and not language skills, thus he gives no results at all concerning the correct responses to the question forms or other syntactic structures used in the test. He does not mention specific language difficulties that may have been encountered by different age groups or even whether the grammatical structures used were appropriate for the ages of the subjects. Although no specific language results were reported, a significant improvement was reported for all modes of communication with age.

Rodda, Godsave and Stevens (1974) also used a rating scale completed by teachers in their study of 102 prelingually deaf children from kindergarten to grade 5 (no chronological ages given) to determine the interaction between speech and language skills and hearing loss, intelligence, years of schooling and academic achievement. They found, however, that speech and language ratings increase between kindergarten/grade 1 and grades 2/3 but then seem to remain at a fixed level. They concluded that academic achievement is advanced at the cost of speech and language in grades 4 and 5. Since there is no differentiation between speech and language in this study the results are somewhat ambiguous. Teachers of deaf children frequently understand the speech of their pupils when naive listeners find it unintelligible and teacher-ratings of this type are seldom unbiased.

Syntactic ability of older deaf children

Quigley (1973, 1974, 1975, 1976) and his associates at the Institute for Research on Exceptional Children at the University of Illinois, using a set of tests they devised called the Test of Syntactic Ability (TSA) have recently produced much information on language patterns of the deaf, the age of acquisition of some specific syntactic structures, apparent deviancies, etc. This is one of the very few tests devised for and standardized on deaf subjects. The TSA consists of 22 subtests which include 6 major syntactic areas (negation, question formation, conjunction, pronominalization, relativization and verbs) considered essential for a functional command of English. The TSA is in booklet form and the subject must be able to read and write.

Quigley's population consisted of 450 prelingually deaf students between the ages of 10 and 19 years; 50 at each year level. These subjects were chosen from residential and day programs, oral and manual schools, according to geographic regions, in an attempt to obtain a representative sample of all the deaf students in schools for the deaf in the United States. All the subjects had an I.Q. of at least 80 on the WISC or WAIS and had no other apparent disability.

Results showed significant improvement on all tasks with age although even the youngest hearing subjects (age 8 years) consistently obtained higher scores than most of the deaf subjects (ages 10-19 years). Deaf children to the age of 17 interpreted passive sentences in terms of the surface word order of their constituents and even at age 17, only 40% of the subjects correctly produced passive sentences. In the comprehension section of Quigley's study the 17 year old deaf subject scored lowest (35% correct) on agent-deleted

passive sentences, somewhat higher (60% correct) on reversible passives and highest (65% correct) on non-reversible passive sentences. Considering interrogatives, Quigley et al. found that Yes/No questions were easier for deaf subjects of all ages to understand than Wh- or tag questions. However, the 10 year old deaf subjects responded correctly to these questions only 48% of the time (1974, graph, p.704). Since this is one of the first constructions acquired by young hearing children, this low score raises questions concerning the validity of this section of the test. Perhaps choosing one answer from several written alternatives is not the best procedure for deaf children of this age. Ten year old children's reading skills are not always commensurate with their other linguistic abilities and difficulties in reading could limit a child's performance on this type of test, although the technique may be acceptable for older children.

CONCLUSION

Relatively little research has been done on the language acquisition of young, prelingually deaf children and almost none on their acquisition of syntax in any form of comprehension or production. A few investigators have used language rating scales completed by parents or teachers but these are subjective evaluations rather than objective evidence. Other researchers have used instruments devised for and standardized on children with normal hearing. There are descriptive studies of some stages of language acquisition of a very small number of young deaf children. No study has shown the order of acquisition of basic syntactic structures in deaf children below the age of 7 and little is known about the stages of development of these children or

or what linguistic strategies they use to comprehend and produce sentences.

This review of the literature concerned with the language acquisition of the deaf reveals a need for systematic research on the acquisition of syntax by young deaf children and an objective means of data collection, with high validity to ensure that it is actually testing the deaf child's syntactic ability, and high reliability so that different examiners will obtain identical or very similar scores from the subjects.

CHAPTER FOUR

DESCRIPTION AND RATIONALE OF THE SYNTAX TEST

Since there are no standardized receptive language tests that evaluate the syntactic ability of young deaf children, a screening test was devised which attempts to assess the ability of five-to-seven year old prelingually deaf children to use the rules governing the comprehension of the following forms:

(A) The three semantic dimensions of negation: non-existence, rejection and denial, with and without "do support".

(B) Yes/No Interrogation: with and without "do support".

(C) Wh- Questions: Who, (subject and object), What (subject and object), When, Where and Why.

(D) Word-order Relations: Subject-Verb-Object, active and passive.

(E) Plurality: Noun forms, Verb forms.

Because of the age and the limited attention span of the children to be screened, the instrument was devised to be administered individually, in approximately fifteen minutes, although it is not a timed test. The vocabulary used is extremely simple, even repetitive. Each word was incorporated into the test only after it was heard or seen used in a pre-school class of five year old deaf children where a corpus of spontaneous utterances was collected by the author before the initiation of this study.

The test consists of two main parts. The first section contains

13 sets of 4 pictures each. The acceptable response to this section is simply pointing to the picture that corresponds to each stimulus sentence signed and/or spoken by the examiner. The pictures were drawn expressly for this test by a prelingually deaf college-age art student and appear to have a high level of appeal for preschool deaf children. The items of Part I were randomized so that not all the sentences concerning negation, plurality or surface word order are given in sequence. Each subject was given the sentences in the same order. Each item was presented to the subject with the carrier-phrase: "Show me....".

Section II uses a series of simple yes/no and Wh- questions about a single large picture. A one-word or gesture response is sufficient for this part of the test but mere pointing was not accepted because it would have given rise to ambiguity. For example, for the item "Where is the cup?" it is not sufficient to point to the cup in the picture because then the examiner would have no way of ascertaining whether the subject recognized the word/sign 'cup' or was responding to the question 'Where'.

SECTION I

Negation Subtest

Language development has been described as the evolution of a series of linguistic systems increasing in complexity and reflecting changes in the child's syntactic rules (Ervin, 1970). The linguistic concept that best fits into this description appears to be negation. The stages in the acquisition of the syntactic rules governing nega-

tion by children with normal hearing were discussed in Chapter II. Since this aspect of grammar has already been extensively studied and discussed in the literature (Klima, 1964; Klima and Bellugi, 1966; McNeill and McNeill, 1968; Slobin, 1966; Bloom, 1968; McNeill, 1970; Cairns and Williams, 1973; Cairns and Cairns, 1976) for normal-hearing children, and since it is one of the earlier acquired grammatical concepts, it was decided to include aspects of negation in the present test. No systematic study on the comprehension of negation by very young deaf children has been reported in the literature but Schlesinger (1972) claimed that the syntactic development of negation is similar for the hearing child and the deaf child who has used sign language from early childhood.

The preliminary test devised for the present research uses the following items involving negation:

Battery A: Item 1. There is no ice-cream. (non-existence)
4. There is no cat. (non-existence)
2. The boy does not want a bath. (rejection)
10. The boy does not want to eat. (rejection)
7. The pencil is not broken. (denial)
11. The boy has no shoes. (denial)

Battery B: Item 4. There are no children. (non-existence)
9. There is no milk. (non-existence)
3. The child does not want to play. (rejection)
10. The girl does not want the juice. (rejection)
1. The toothbrush is not broken. (denial)
6. The boy has no hat. (denial)

Surface Word Order Subtest

Word order is governed by specific grammatical rules that are acquired very early in life by children with normal hearing, as evidenced by much of the research on children's two-word utterances discussed in Chapter II. To gather some information on the young deaf child's ability to use the rules governing word order in English, two items were included in each battery of the test. These specifically test the rule, often alluded to as SVO, which implies that the first noun phrase in a sentence is the subject and the second noun phrase is the object.

Battery A: Item 9. Father points to mother.

13. Mother kisses baby.

These two items appeared with subject and object reversed as items 8 and 12 of Battery B.

Also included in the Surface Word Order subtest is an item in the passive voice. As presented above Quigley (1973) found that sentences in the passive voice are very difficult for deaf students to comprehend and produce, and concluded that many of his 17 year old deaf subjects had not yet mastered the transformational rules governing this structure. His results show that many deaf adolescents appear to interpret passive sentences in terms of the surface word order of their constituents. Fraser, Bellugi and Brown (1963) found that their three year old hearing subjects did the same. Turner and Rommetveit (1967) say that this is a common linguistic characteristic of subjects with normal hearing until the age of 8 or 9. The item in the passive voice was incorporated into the first section of the Syntax Test to obtain some knowledge of how young deaf children handle this construc-

tion.

Battery A: Item 6. The girl is pushed by the boy.

This sentence is used with subject and object reversed for Battery B.

Plurality Subtest

The ability to distinguish the linguistic constructions indicating plurality is one of the very early achievements of children who are in the process of language acquisition, as was discussed in Chapter II. Dale (1972, page 53) says that the plural inflection on nouns appears to be the first inflection developed for both English and Russian children. Bellugi (1964) reported that Adam used -s to indicate the plural on nouns at 33 months and Eve produced it at 24 months. Schlesinger (1972) affirms that one of her deaf subjects, Ruth, could correctly distinguish between boy and boys in sign language by the age of 3, but was unable to distinguish irregular plurals that were dependent upon auxiliary verb inflections, for example, the difference between "The sheep is eating." and "The sheep are eating." until the examiner signed "Two sheep are eating."

To obtain some information about young deaf children's comprehension of plural morphology, four items on plurality were included in the present test:

Battery A: Item 12. The boys can walk. (plural-regular noun)

8. The children can sleep. (plural-irregular noun)

3. The sheep is running. (Third person singular present tense-irregular verb to be)

5. The fish are swimming. (Plural-present tense

irregular verb to be)

Battery B: Item 2. The girls can walk. (plural-regular noun)

13. The children can sleep. (plural-irregular noun)

5. The fish is swimming. (third person singular present tense-irregular verb to be)

11. The sheep are running. (plural present tense irregular verb to be)

SECTION II

Yes/No Interrogation Subtest

Even very young hearing children distinguish between Yes/No and Wh- questions as was discussed in Chapter II. Ervin-Tripp(1970) suggested that the age for studying the initial discrimination of questions must be at the very onset of speech, at least well before the age of 21 months when such discrimination was already established in her youngest subject. Young hearing infants often use rising intonation as their first interrogative device both for comprehension and production. The earliest devices and stages of question formulation in deaf children have yet to be described in the professional literature. Quigley (1974) reported that deaf subjects between the ages of 10 and 18 find yes/no questions easier to answer correctly than Wh- questions, or than tag questions which are a more complicated form of yes/no interrogation.

To gather some information on how deaf 5 to 7 year olds deal with this type of interrogation, two yes/no questions were included in each battery.

Battery A: Item 19. Is mother brushing her teeth?

25. Do you brush your teeth in school?

Battery B: Item 22. Is father eating a banana?

19. Does the boy eat in school?

Wh- Questions Subtest

Ervin-Tripp(1970) found an approximate order of acquisition for Wh- questions in children with normal hearing: What, Where, What-do, Whose, Who, Where-from, How and When. By the age of four most children have acquired the adult form of these constructions although there is some variability in the order of acquisition for different children. Cairns and Hsu (1976) while studying a subgroup of these Wh- questions found some variability in order of acquisition in their 3 to 5½ year old hearing subjects. Their results showed the following order of difficulty: Who - Why - When and How.

Quigley, Wilbur and Montanelli (1974) studied question formation in deaf students aged 10 to 19 years and concluded that the major stages in the development of question formation follow the same order for both deaf and hearing subjects although deaf children seem to go through the stages much later in chronological development. The 10 year olds in their study found Who-subject easier than Where, which in turn was easier than Who-object and When. Levitt's study (1976) showed that his 11, 12 and 13 year old deaf subjects found What questions (What shape, What size, What color) easiest, and How questions (How scared, How happy, etc.) which he calls intensive, the most difficult.

In order to obtain information on how younger deaf children deal with Wh-questions 14 of these were incorporated into the test design.

Battery A: Item 16. Where is the cup? (Where)

26. Where is the girl? (Where)

24. When does the girl brush her teeth? (When)

27. When does mother brush her teeth? (When)

21. Why does the girl brush her teeth? (Why)

23. Why does mother help the girl? (Why)

17. Who is brushing her teeth? (Who-subject)

20. Who has a dress? (Who-subject)

14. Who do you see in the picture? (Who-object)

22. Whom is mother helping? (Who-object)

15. What is yellow? (What-subject)

18. What is on the sink? (What-subject)

28. What has mother in her hand? (What-object)

29. What is the girl brushing? (What-object)

Battery B: Item 15. Where is the boy? (Where)

25. Where is the cup? (Where)

23. When will father eat? (When)

27. When will the boy brush his teeth? (When)

21. Why does the boy eat? (Why)

28. Why does father help the boy? (Why)

20. Who is eating? (Who-subject)

24. Who has a cup? (Who-subject)

14. Who do you see in the picture? (Who-object)

26. Whom is father helping? (Who-object)

17. What is yellow? (What-subject)

18. What is on the table? (What-subject)

16. What is the boy eating? (What-subject)

29. What has father in his hand? (What-object)

Mode of communication and rationale

The test devised for the present research can be administered in the preferred mode of communication of each subject: speech and speech-reading, speech and fingerspelling, Total Communication with signed English or any other version of Sign Language that conforms to the rules of English syntax. It is evident that Ameslan cannot be used because surface word order and plurals are being tested and Ameslan follows sui generis grammatical rules. The test has been used satisfactorily with schools using signed English as one dimension of Total Communication, with students of oral schools where the examiner did not sign at all, with students who fingerspell with speech and with hearing children. It has not yet been administered in written form although this is feasible. Since this research focuses on syntactic acquisition and not on communicative modalities, no statistical study was made concerning this aspect of the test.

Revised Syntax Test

Based on the results of this study, the Syntax Test has been modified. The revised Syntax Test which is currently being used as a research tool, can be found in the Appendix.

CHAPTER FIVE

PROCEDURE

SUBJECTS

The subjects were 86 congenitally deaf pupils of 8 different day and/or residential schools for the deaf on the Eastern Coast of the United States. 44 boys and 42 girls participated in the study. All the subjects were between 61 and 94 months of age except 2 younger girls and a boy who were included in the project at the specific request of their teachers. Two of these younger children have deaf parents. The 19 subjects over 84 months were included in the study because they were in the same classrooms as the younger children. The mean age of the total population was 76.2 months with a standard deviation of 9. For the girls, the mean age was 77.3, standard deviation 9; and for the boys 75, standard deviation 9.

Audiological data

The audiological records in the schools revealed a wide range of hearing levels for these subjects. The mean hearing threshold in the better ear was 97dB with a standard deviation of 16 dB (ANSI, 1969). Audiograms were available for 93% of the subjects. The audiological records of 6 children were unobtainable at the time of the study.

I.Q. scores

There were difficulties in obtaining I.Q. scores from some schools and when these were available several different standardized test batteries had been used, including the Merrill-Palmer, the Hiskey-

Nebraska, the WISC and the Leiter International Performance Scale.

For these reasons, the Raven Coloured Progressive Matrices, a form perception test that assesses intellectual function was administered, (1973 reprint). Sets A, Ab and B were administered by the examiner to 54 subjects. These sets evaluate the chief cognitive processes of which children 5 to 11 years old are usually capable. Set A evaluates the perception of identity and change in 12 continuous patterns, Set Ab the apprehension of discrete figures as spatially related wholes in 12 geometric drawings and Set B assesses the ability to deal with analogous changes in 12 spatially and logically related figures. The three sets together assess a child's present clarity of observation and level of intellectual development. No verbal instructions are necessary for this test which has been widely used with deaf children. The subject simply points to one of six alternative drawings which complete the pattern given at the top of each page. The results of the Raven are shown in Chapter VII.

Familial deafness

Definite information concerning the existence of familial deafness was available for 68 of the subjects. Of these, 12 had close deaf relatives: 6 had deaf parents and 6 had older deaf siblings. Only these same 12 children had other close deaf relatives, grandparents, aunts or uncles.

Special education

Information concerning the amount of special education received was available on 71 of the 86 subjects. The mean of these children

was 34 months with a standard deviation of 15 months. Two children had only 6 months of schooling, 13 had less than 24 months, 49 had between 2 and 4 years and 10 children had more than this. Children with deaf parents or siblings had significantly more special education than those with no familial deafness.

Teachers' estimate of subject's linguistic ability

Information concerning the teacher's estimate of the subject's linguistic ability was available for 59 subjects. Of these, 9 were considered below average, 35 were considered average and 15 above average. Only one child with familial deafness was considered below average. Statistical analysis revealed that neither sex, age, degree of hearing loss nor length of time spent receiving special education influenced these teacher ratings.

MODE OF ADMINISTRATION OF THE SYNTAX TEST

Each child was tested individually in the presence of another researcher who recorded the child's responses. Both the child and the examiner (who is well-versed in communicating with the deaf) were comfortably seated at a table. The test was not timed and the children were given the opportunity to practice for a brief period. Then the pictures were shown to the child, one page at a time. If a child wanted an item repeated, this was done. The test was administered in whichever mode of communication the subject preferred: speech with speechreading, signed English with simultaneous speech, or fingerspelling with simultaneous speech. The Syntax Test followed the administration of Sets A, Ab and B of the Raven Coloured Progressive

Matrices. After the testing session each subject was given a lollipop for his cooperation.

SCORING OF RESPONSES

For Section I the correct response is either picture number 1,2, 3, or 4 depending on the position of the picture that corresponds to the stimulus picture. Only rarely did the experimenter repeat a sentence and when this was done, it was noted by the recorder. The first picture indicated was always the answer scored. For Section II, to be scored correct, the answer had to be appropriate to the stimulus question, that is, a nominal as response to what; an animate nominal in response to who and whom; a locative in response to where and a temporal adverb in response to when. For the yes/no items, either yes or no was considered correct since both indicated discrimination of this type of question. When subjects said/signed "I don't know" they were urged to answer something and the same was done when a subject responded to a question by pointing. Examples of accepted answers are: When will father eat? Later - tomorrow - after the boy.

Do you brush your teeth in school? Yes - no.

Whom is mother helping? Girl - the girl.

Where is the girl? There - in the bathroom - bathroom.

Who has a dress? Mother - the mother - Lady - the big girl.

What has mother in her hand? Towel - the towel - yellow towel.

Why does mother help the girl? Love girl. Girl know no. Girl little-mother big.

Why does the girl brush her teeth? Clean - pretty teeth - dirty teeth no. Mother says brush teeth.

After the administration of the test, these responses were coded on computer coding sheets as either 1=correct, 2=incorrect and key punched for computer input. Correct responses were summed and the percentage correct for the entire test or for each subtest is the score.

CHAPTER SIX

RESULTS

This chapter includes the results of the study on the syntactic ability of five to seven year old prelingually deaf subjects. The main thrust is the evaluation of the Syntax Test used to evaluate this ability. The results are given in the following sequence:

I To evaluate the validity and reliability of the Syntax Test, which will be discussed in Chapter Seven, it is necessary to show the correlation between test batteries, between total scores, between scores on subtests dealing with the same structure and between scores on different subtests. Pearson Product-Moment Correlation Coefficients were chosen since this is a commonly used method to evaluate internal consistency.

II To demonstrate construct validity (Anastasi, 1973) Pearson Product Moment Correlation Coefficients are shown between Syntax Test scores and other variables: I.Q., the Raven Coloured Progressive Matrices Test and age.

III After the results pertinent to the construct validity and to the reliability of the Syntax Test, the actual results of the administration of the Syntax Test to 86 prelingually deaf children are given: total scores and scores on each of the subtests (percentage correct.)

IV An item analysis was performed to discover if any single item (or items) of the Syntax Test was different in any unusual way from the other items. Test items were then ranked according to the

percentage of correct responses obtained from the subjects.

V An error analysis was made on Section I to obtain information concerning the incorrect responses of subjects. One of the strengths of this technique is that it shows whether a child is processing anything at all. It is extremely helpful in uncovering what influences a subject in his choice of an incorrect response.

VI Results pertaining to the sex and ages of the subjects are shown. Analysis of variance were performed because this is a powerful technique which includes the essence of the t test. Analysis of variance also shows main effects and interactions when one variable, for example, age or sex, can be controlled.

VII A proximity plot using Shepard's analysis of proximities was made to facilitate a better understanding of the total underlying pattern of interrelations in the data.

VIII Results pertaining to the hearing control group and to the group of deaf subjects with familial deafness are given.

I Correlations between test batteries:

Either Test Battery A or Battery B was randomly administered to 86 prelingually deaf subjects: 43 subjects took each battery. Twenty of these subjects were given both Battery A and Battery B. The Pearson correlation co-efficient for these scores are shown in Table 6-1.

	Total Scores B	Negation B	Yes/No B	Wh-Questions B	Plurality B	Word Order B
Total Scores A	.91 .001					
Negation A		.80 .001				
Yes/No A			.90 .001			
Wh-Questions A				.83 .001		
Plurality A					.47 .018	
Word Order A						.09 .35

Table 6-1 Pearson Correlation Coefficients for Scores of Battery A and Battery B. Significance levels are given below each correlation Coefficient. N=20

As is seen in Table 6-1, there is a high correlation between Battery A and Battery B. Both the entire tests A and B and the subtests of Negation. Yes/No Interrogation and Wh-questions elicit very similar scores and the Plurality subtests are moderately correlated. The subtests involving surface word order do not show a statistically significant correlation. These results will be discussed in the Interpretation of Data Section of Chapter Seven.

Pearson Product-Moment Correlations were computed between scores for each subtest and the total scores to obtain subtest-total test correlations. The results are shown in Table 6-2 and Table 6-3.

	Negation	Plurality	Word Order	Yes/No	Wh-Questions
	A	A	A	A	A
Total Scores A	.87 .001	.75 .001	.48 .016	.79 .001	.90 .001
Negation A		.48 .016	.30 .1	.71 .001	.72 .001
Plurality A			.43 .03	.59 .003	.58 .003
Word Order A				.28 .11	.24 .15
Yes/No A					.60 .003
Wh- Questions A					

Table 6-2 Pearson Correlation Coefficients for the total scores and subtest scores of Battery A. Significance levels are given below each correlation coefficient. N=20.

Table 6-2 and Table 6-3 reveal the degree of consistency that exists in the two batteries of the Syntax Test. Again the subtest on surface word order shows low correlation with some of the other subtests, especially with those dealing with Negation and with Yes/No questions. This is less apparent in Battery A than in Battery B.

	Negation	Plural ity	Word Order	Yes/No	Wh- Questions
	B	B	B	B	B
Total Scores B	.86 .001	.68 .001	.34 .073	.63 .002	.93 .001
Negation B		.41 .036	.05 .425	.75 .001	.67 .001
Plurality B			.22 .171	.14 .28	.66 .001
Word Order B				.05 .418	.34 .07
Yes/No B					.39 .045
Wh-Questions B					

Table 6-3 Pearson Correlation Coefficients for the total scores and subtest scores of Battery B. Significance levels are given below each correlation coefficient. N=20.

II Correlations between test scores and other variables

Table 6-4 shows the Pearson Product Moment Correlations between scores on the subtests of the Syntax Test and other pertinent variables. I.Q. correlated significantly with the Yes/No subtest, the Wh-subtest and the Negation subtest. The scores achieved on the Raven Coloured Progressive Matrices Test correlated significantly with the age of the subjects for each of the three sets, A, Ab and B (See Table 6-4)

	RAVEN A	RAVEN Ab	RAVEN B	AGE	I.Q.	NEGATION	PLURALITY	WORD ORDER	YES/NO	WH-QUESTION
RAVEN A		.4375 .001 N=52	.4138 .001 N=52	.5011 .001 N=53	.	.3520 .005 N=53				
RAVEN Ab			.5941 .001 N=51	.4719 .001 N=52		.2629 .03 N=52	.3154 .058 N=26	.2005 .077 N=52		
RAVEN B				.4270 .001 N=52		.3021 .015 N=52			.3524 .01 N=26	
AGE						.3159 .002 N=86		.2044 .03 N=86		
I.Q.						.3124 .026 N=39			.5086 .001 N=39	.3862 .008 N=39
NEGATION							.3862 .001 N=86	.2714 .01 N=86	.5971 .001 N=86	.5265 .001 N=86
PLURALITY								.1882 .041 N=86	.2288 .017 N=86	.3988 .001 N=86
WORD ORDER									.3612 .001 N=86	.4790 .001 N=86
YES/NO										.3863 .001 N=86
WH-QUESTIONS										

Table 6-4 Pearson Product-Moment Correlations between Scores on Subtests of the Syntax Test and other variables. Significance levels are given below each coefficient.

III Results of the Syntax Test

Eighty six prelingually deaf subjects were given the Syntax Test. The percentage of correct responses is given as the total score. The means of the total scores across all ages are given in Table 6-5.

Battery	mean	S.D.	N
A	.45	.1	43
B	.44	.2	43
A + B	.44	.2	86

Table 6-5 Total Scores (percentage correct) obtained by 86 prelingually deaf subjects on the Syntax Test.

Results of each subtest

The five subtests of the Syntax Test yielded the following mean scores:

SUBTEST	Battery A			Battery B			Both Batteries		
	mean	s.d.	n.	mean	s.d.	n.	mean	s.d.	n.
Yes/No	.59	.4	43	.50	.4	43	.55	.4	86
*Negation	.45	.2	43	.47	.3	43	.46	.3	86
*Plurality	.41	.2	43	.47	.2	43	.44	.2	86
Wh-Questions	.43	.1	43	.44	.2	43	.43	.2	86
*Word Order	.47	.2	43	.35	.2	43	.41	.2	86

Table 6-6 Mean scores achieved on Syntax Test Subtests

* These subtests have four alternatives and the scores shown have been corrected for chance correct due to random guessing according to the following formula: $P_{true} = \frac{N P_{observed} - 100}{N-1}$

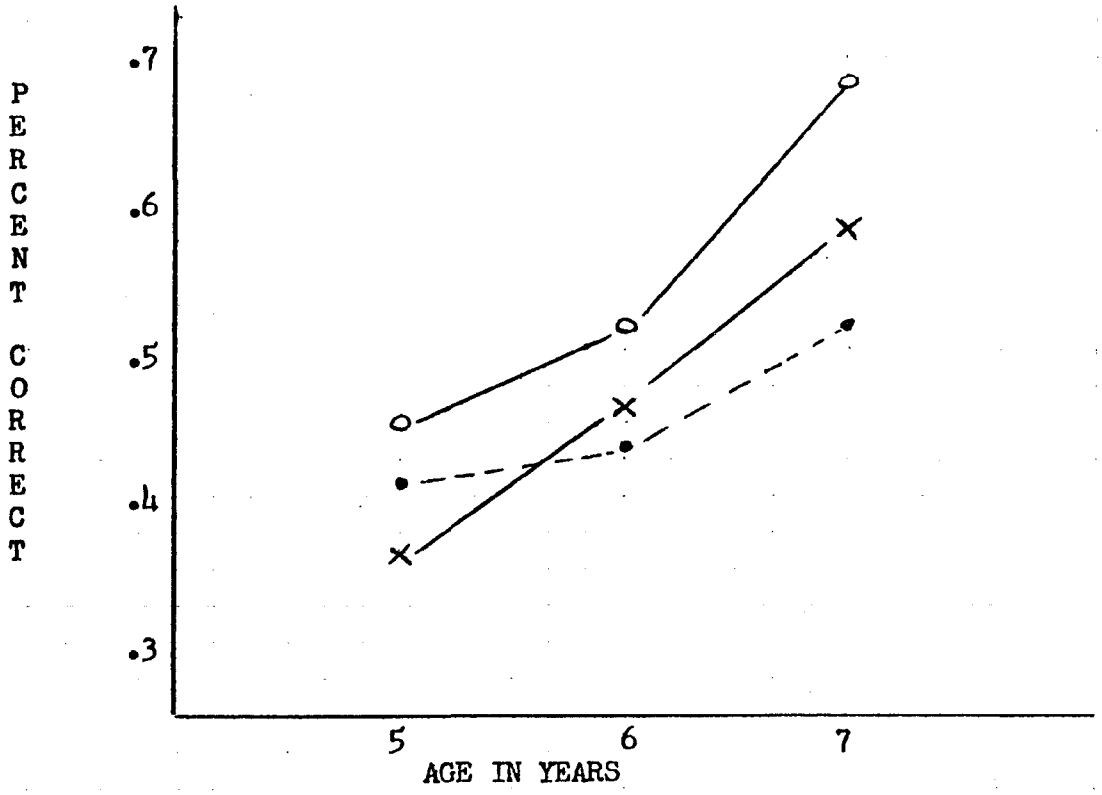


FIGURE 6-1 Mean scores obtained on Negation (x___x), Yes/No (O___O) and Wh.Questions (o---o) subtests.

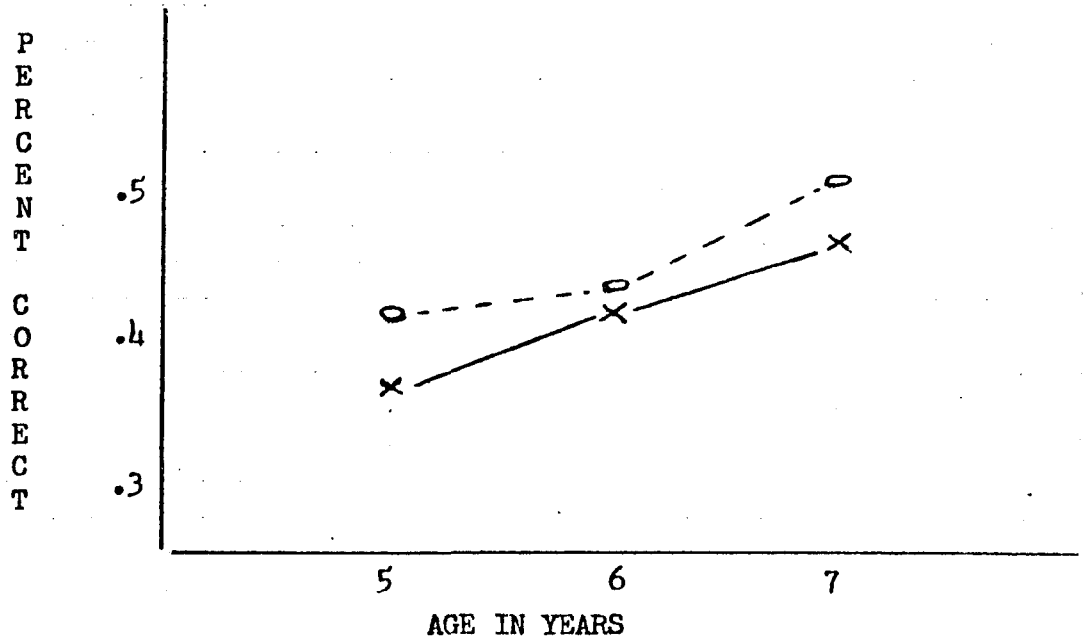


FIGURE 6-2 Mean scores obtained on Surface Word Order (x_____x) and Plurality (o-----o) subtests.

Yes/No Interrogatives Subtest

Results show that of all the items on the test the deaf subjects of all ages found the items dealing with Yes/No interrogation the easiest. The mean correct responses across all ages and both batteries was .55. Subjects found Yes/No questions with do support somewhat easier to answer correctly than when do was not used. (with do support = .58; without do = .51). Thirty-three subjects obtained a perfect score on this subtest. The average score increased from .45 at age 5 to .52 at age 6 and to .68 at age 7.

Pearson Correlation Coefficients were significant at a probability level of ($p < .001$) between Yes/No interrogatives and I.Q. scores and Negation, for Battery A. There were significant correlations between Yes/No scores and I.Q. scores, ($p < .01$) Negation, ($p < .001$), Surface Word Order ($p < .001$) and Wh-questions ($p < .001$) for Battery B.

Negation

Negation ranked second easiest of the structures tested for the subjects; and four subjects obtained a perfect score (6 items correct). Pearson correlation coefficients were significant at a probability level of ($p < .001$) between Negation and Plurality, Surface Word Order, Yes/No Interrogation and Wh-questions. The average score for this subtest for all the subjects across both batteries was.46. Mean scores increased from .36 at age 5 to .46 at age 6, and .58 at age 7.

The items on the different semantic categories of negation were answered correctly in this order: rejection items correct .54; non-existence items .42, and denial items .41. (See Table 6-7)

NEGATION	Battery A			Battery B			Both Batteries		
	mean	s.d.	n.	mean	s.d.	n.	mean	s.d.	n.
Rejection	.55	.3	43	.52	.4	43	.54	.3	86
Non-existence	.44	.4	43	.41	.4	43	.42	.4	86
Denial	.36	.3	43	.47	.4	43	.41	.4	86

Table 6-7 Mean scores obtained by prelingually deaf subjects on items dealing with three types of negation.

Plurality

Results on this subtest produced an overall mean score of .44. Six subjects received a perfect score on this subtest (4 items correct). The average score for the 5 year olds was .42, for the 6 year olds, .43 and for the 7 year olds, .51.

Pearson Correlation Coefficients were significant at a probability level of ($p < .001$) between the Plurality subtest and the Negation and Wh-questions subtests.

The subjects found the pluralization of regular nouns (boy+s, girl+s) easiest, as indicated by correct score of .50. The irregular plural "children" was found most difficult with a mean score of .38, and the irregular verb "to be" was also considered difficult, ("is" received a mean score of .41 and "are" .47).

Surface Word Order

The mean correct score for the three items dealing with Surface Word Order was .44. Three subjects (ages 76, 79 and 88 months) had all three items correct. Seventeen subjects (20%) had all three items wrong. Mean scores increased from .36 at age 5, to .41 at age 6, to .47 at age 7. The items dealing with the reversible passive were clearly the most difficult on this subtest with a mean correct response of only .31, while the mean score of the other two items was .45.

Pearson correlation coefficients were significant at a probability level of ($p < .001$) between the scores obtained on the Surface Word Order subtest and the Wh-question subtest, the Yes/No Interrogation Subtest and the Negation subtest. Surface Word Order was also correlated with age ($p < .01$) and with that part of the Ravens ($p < .07$) that deals with the ability to perceive discrete figures as spatially related wholes.

Wh-questions

In the statistical analysis all the Wh-questions were first considered as a unit. The mean correct score on Wh-questions was .43 for Battery A, .44 for Battery B and .43 for all subjects across both batteries. Two subjects (ages 81 and 91 months) received a perfect score on this subtest (14 correct responses). The average score for the 5 year olds was .41, for the 6 year olds it was .43, and for the 7 year olds .49.

Pearson correlation coefficients were significant ($p < .001$) between the Wh-questions subtest scores and the scores on the Negation,

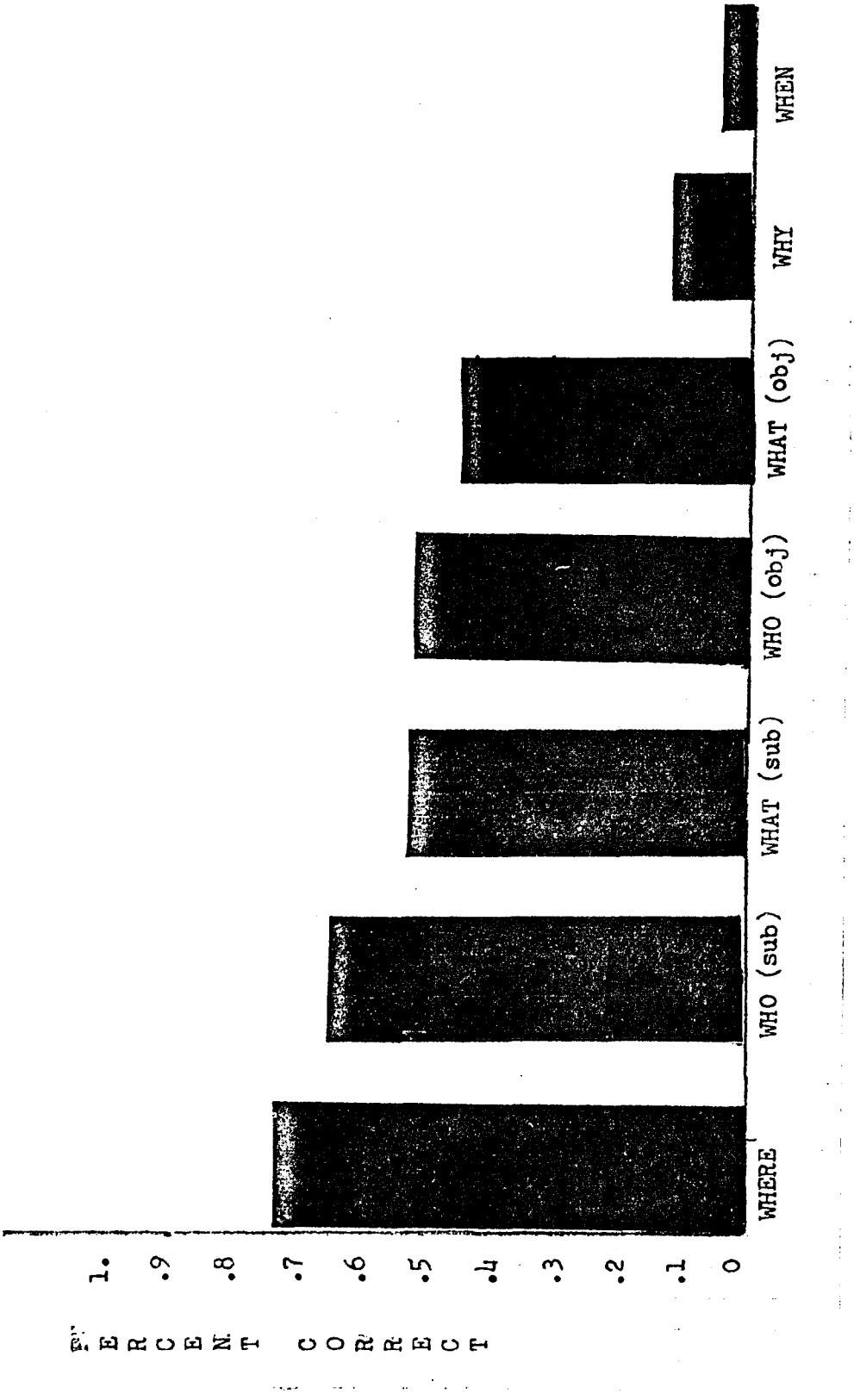


FIGURE 6-3 Mean scores obtained by deaf subjects for Wh questions.

Plurality, Surface Word Order and Yes/No interrogation subtests. The Wh-questions subtest correlates at the .001 level with the I.Q. score.

Considering the Wh-questions separately the 86 deaf subjects achieved a mean of .74 for Where, .61 for Who-subject, .51 for What-subject, .51 for Who-object, .47 for What-object, .13 for Why and .05 for When.

WH-QUESTIONS Average Scores by Age Groups

	5 years N=22	6 years N=41	7 years N=20	totals N=83
WHERE	.73	.71	.83	.74
WHO (subject)	.66	.65	.53	.62
WHAT (subject)	.54	.45	.60	.52
WHO (object)	.57	.54	.45	.52
WHAT (object)	.32	.44	.70	.47
WHY	.11	.12	.23	.14
WHEN	.04	.03	.10	.05

Table 6-8 Average Scores obtained for Wh-questions according to age group.

An analysis of variance (See Table 6-9) was performed on this subtest and two main effects were found. Age was significant at the .009 level and type of Wh-question (When, Where, Why, Who, What) was significant at the .001 level.

ANALYSIS OF VARIANCE

AGE GROUP BY-WH-QUESTION TYPE (Where, When, Why, Who, What)

Source of variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	33.903	8	4.238	41.861	0.001
Age	0.958	2	0.479	4.734	0.009
Type	32.945	6	5.491	54.236	0.001
2 Way Interaction	1.856	12	0.155	1.528	0.109
Age Type	1.856	12	0.155	1.528	0.109
Explained	35.760	20	1.788	17.661	0.001
Residual	56.694	560	0.101		
Total	92.453	580	0.159		

Table 6-9 Analysis of Variance: Age Group by Wh-Question Type (Where, When, Why, Who, What).

IV Item analysis

Each of the 54 different items of the 2 batteries were rank-ordered according to difficulty, based on the responses of the subjects. This rank order can be found in Table 6-10. This analysis was used to demonstrate the need to revise the Syntax Test. Based on this analysis, the two batteries were collapsed into one, some items were eliminated and others were slightly modified. The 32 items of the Revised Syntax Test and the pictures to be used with them are found in the Appendix. The rationale and procedure for this revision are in Chapter VII.

RANK ORDER OF DIFFICULTY OF TEST ITEMS (BOTH BATTERIES)

RANK	ITEM	BATTERY	TYPE	RESULTS
1.5	Where is the cup?	A&B	Wh-Quest.	.81
1.5	What is yellow?	A&B	Wh-Quest.	.81
4.	Where is the girl?	A	Wh-Quest.	.79
4.	Who is brushing her teeth?	A	Wh-Quest.	.79
4.	The boy does not want to eat.	A	Negation	.79
6.	Who do you see in the picture?	A&B	Wh-Quest.	.77
7.	What is the boy eating?	B	Wh-Quest.	.75
8.	Do you brush your teeth in school?	A	Yes/No	.71
9.	There is no ice-cream.	A	Negation	.68
10.5	Where is the boy?	B	Wh-Quest.	.67
10.5	Who has a dress?	A	Wh-Quest.	.67
12.	Who is eating?	B	Wh-Quest.	.65
13.	Father points to mother.	A	Word Order	.60
14.5	The boy has no shoes.	A	Negation	.59
14.5	The boy can walk.	A	Plural	.59
16.5	Is father eating?	B	Yes/No	.56
16.5	The girl does not want the juice.	B	Negation	.56
18.	The boy has no hat.	B	Negation	.54
19.	Is mother brushing her teeth?	A	Yes/No	.51
21.	The child does not want to play.	B	Negation	.49
21.	The girls can walk.	B	Plural	.49
23.5	The sheep are running.	B	Plural	.47
23.5	Mother points to father.	B	Word Order	.47
25.	The fish are swimming.	A	Plural	.45
26.5	There is no milk.	B	Negation	.44
26.5	Does the boy eat in school?	B	Yes/No	.44
28.5	What has mother in her hand?	A	Wh-Quest.	.43
28.5	The sheep is running.	A	Plural	.43
30.	What has father in his hand?	B	Wh-Quest.	.42
32.	The boy does not want a bath.	A	Negation	.41
32.	Baby kisses mother.	A	Word Order	.41
35.5	The pencil is not broken.	A	Negation	.40
35.5	The toothbrush is not broken.	B	Negation	.40
37.	The girl is pushed by the boy.	A	Word Order	.38
38.	There are no children.	B	Negation	.37
39.	The children can sleep.	A&B	Plural	.36
41.5	There is no cat.	A	Negation	.35
41.5	Mother kisses baby.	B	Word Order	.35
41.5	What is on the table.	B	Wh-Quest.	.35
41.5	Who has a cup?	B	Wh-Quest.	.35
44.	Whom is father helping?	B	Wh-Quest.	.33
45.	Whom is mother helping?	A	Wh-Quest.	.27
46.	What is on the sink?	A	Wh-Quest.	.24
47.	The boy is pushed by the girl.	B	Word Order.	.23
48.	Why does the girl brush her teeth?	A	Wh-Quest.	.19

RANK ORDER OF DIFFICULTY OF TEST ITEMS (BOTH BATTERIES) con't

RANK	ITEM	BATTERY	TYPE	RESULTS
49.	Why does father help the boy?	B	Wh-Quest.	.12
50.	Why does the boy eat?	B	Wh-Quest.	.12
51.	Why does mother help the girl?	A	Wh-Quest.	.10
52.5	When will the boy brush his teeth?	B	Wh-Quest.	.07
52.5	When will father eat?	B	Wh-Quest.	.07
54.	When does the girl brush her teeth?	A	Wh-Quest.	.05
55.	When does mother brush her teeth?	A	Wh-Quest.	.03

Table 6-10 Rank Order of 55 items of original two batteries, according to correct responses obtained from test administration.

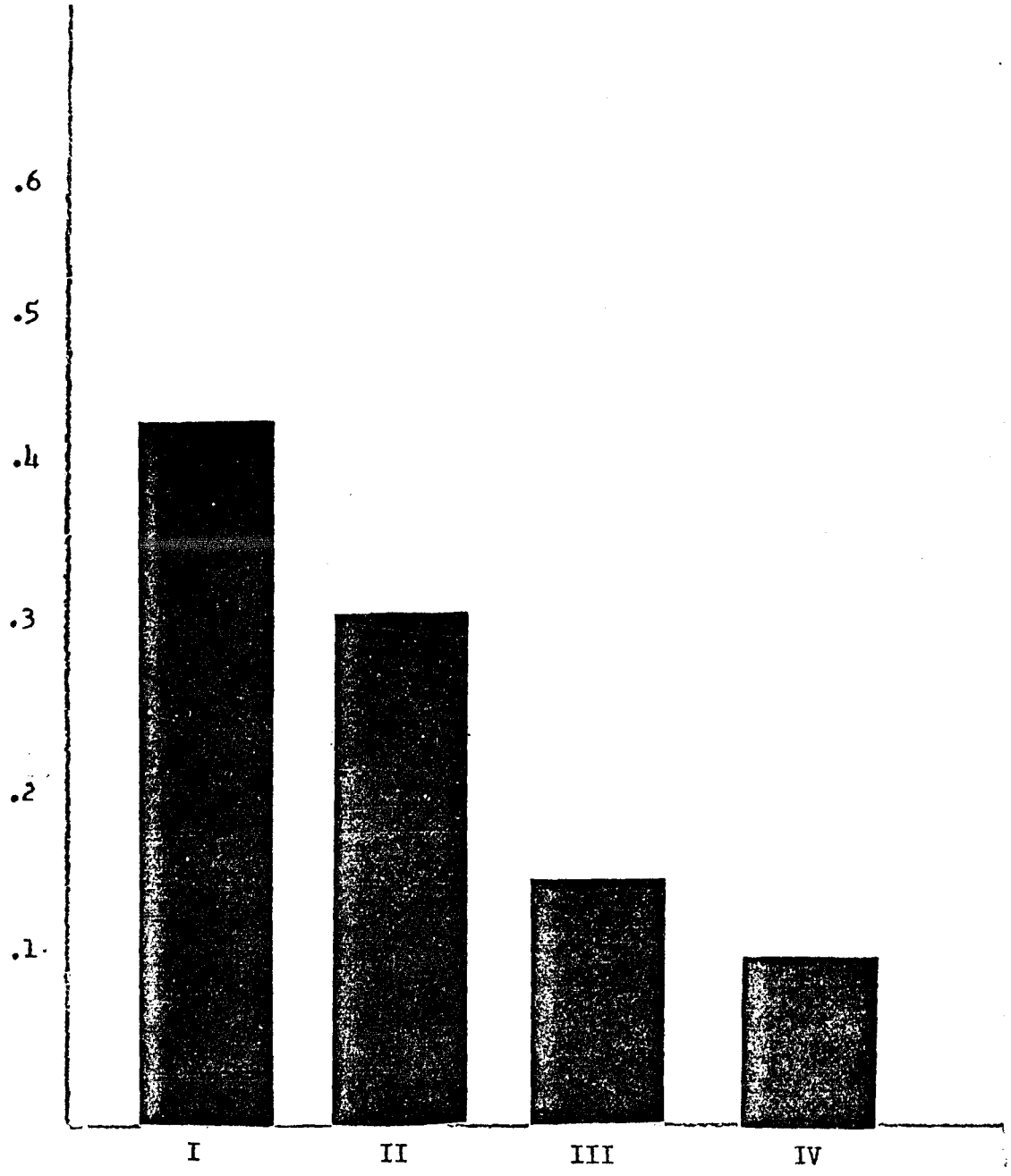


FIGURE 6-4 Analysis of errors made by deaf subjects on the Syntax Test. Category I=correct response. Category II=opposite to the correct response. Category III=some correct element. Category IV=irrelevant response.

V. Error analysis

An analysis was made of the erroneous choices made by the subjects on the 13 items of Section I. All the items of this section are forced choices of one picture from four alternatives. The results of this analysis are shown in Figure 6-4 and will be discussed in Chapter Six. The errors made by the subjects were divided into three categories, according to the picture chosen. Category I contains the correct responses, Category II, responses which are opposite to the correct response, Category III contains responses with some correct element and Category IV are irrelevant responses. The key to which responses were given for each item will be found in the Appendix.

VI. Results pertaining to the sex and ages of the subjects

Sex

There were 44 boys and 42 girls tested. The girls scored consistently higher than the boys on the entire test and on all the subtest, as shown in Table 6-11.

Subtest	Girls' Scores			Boys' Scores		
	mean	s.d.	n.	mean	s.d.	n.
Negation						
Battery A	.49	.2	19	.42	.2	24
B	.54	.3	23	.38	.3	20
A+B	.52	.3	42	.40	.3	44
Plurality						
Battery A	.46	.3	19	.38	.2	24
B	.52	.3	23	.40	.2	20
A+B	.49	.3	42	.39	.2	44
Surface Word Order						
Battery A	.46	.2	19	.47	.2	24
B	.44	.2	23	.25	.2	20
	.45	.2	42	.36	.3	44
Yes/No						
Battery A	.58	.3	19	.60	.4	24
B	.63	.4	23	.35	.4	20
A+B	.61	.4	42	.48	.4	44

Subtest	Girls' Scores			Boys' Scores		
	mean	s.d.	n.	mean	s.d.	n.
Wh-Questions:						
Battery A	.44	.2	19	.42	.2	24
B	.49	.2	23	.38	.1	20
A+B	.47	.2	42	.40	.2	42

Table 6-12 Mean scores obtained by prelingually deaf boys and girls on subtests of the Syntax Test.

The entire test (all subtests, 29 items) gave the following results for the boys and the girls.

	Girls' Scores			Boys' Scores		
	mean	s.d.	n.	mean	s.d.	n.
Total Scores:						
Battery A	.46	.1	19	.43	.1	24
B	.51	.2	23	.37	.1	20
A+B	.49	.2	42	.40	.1	44

Table 6-13 Mean Total Scores obtained by prelingually deaf boys and girls on the Syntax Test.

Three analyses of variance were performed. The first consisted of a three-way effects model for the following factors: sex, battery, section. As was explained in Chapter Four, there are two sections of the Syntax Test. Section I deals with negation, plurality and surface word order. Section II deals with yes/no questions and Wh-questions.

The analysis of variance presented in Table 6-14 indicates that sex was a main effect, significant at the .003 level. It also indicates that there was a two-way interaction between sex and test battery, significant at the .057 level. As shown in Table 6-13, the girls achieved very similar mean scores on both batteries, while the

boys achieved higher mean scores on Battery A than on Battery B. The analysis of variance reveals no significant 2-way interaction between sex and section of the Syntax Test nor was there any significant 2-way interaction between test battery and test section. No significant 3-way interaction was found among these variables.

Analysis of variance
sex by battery by test section

Source of variation	Sums of Squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	0.341	3	0.114	3.035	0.030
Sex	0.338	1	0.338	9.026	0.003
Battery	0.006	1	0.006	0.151	0.999
Section	0.002	1	0.002	0.067	0.999
2-way interactions	0.143	3	0.048	1.275	0.284
Sex-Battery	0.134	1	0.134	3.568	0.057
Sex-Section	0.010	1	0.010	0.255	0.999
Battery-Section	0.000	1	0.000	0.003	0.999
3-way interactions	0.004	1	0.004	0.096	0.999
Sex-Battery-Section	0.004	1	0.004	0.096	0.999
Explained	0.488	7	0.070	1.861	0.079
Residual	6.142	164	0.037		
Total	6.629	171	0.039		

Table 6-13 Analysis of variance: sex(2) by battery (2) by section (2).

Age

As shown in Figures 6-1 and 6-2 and in Tables 6-14 and 6-15, the mean scores for each age bracket increased from age 5 to age 7 in all the subtests and in the test as a whole.

SUBTEST	5 years			6 years			7 years		
	mean	s.d.	n.	mean	s.d.	n.	mean	s.d.	n.
Yes/No	.45	.4	22	.52	.4	41	.68	.4	20
Negation	.36	.3	22	.46	.3	41	.58	.3	20
Plurality	.42	.2	22	.43	.3	41	.51	.2	20
Wh-question	.41	.2	22	.43	.1	41	.49	.2	20
Sur. word order	.36	.3	22	.42	.3	41	.47	.2	20

Table 6-14 Mean scores obtained on Subtests of the Syntax Test according to age.

Mean Total Scores	5 years			6 years			7 years		
	mean	s.d.	n.	mean	s.d.	n.	mean	s.d.	n.
Battery A	.41	.1	10	.46	.1	22	.49	.2	9
Battery B	.39	.2	12	.42	.2	19	.55	.2	11
A + B	.40	.2	22	.44	.2	41	.52	.2	20

Table 6-15 Mean total scores obtained on theSyntax Test according to age.

Two analyses of variance were performed. One consisted of a two-way effects model for age group and question type which included the items on negation, plurality and surface word order, which indicated that the subjects' ages was a main effect, significant at the .001 level. The other analysis of variance also consisted of a two-way interaction model between age-group and type of Wh-question (where, when, why, who and what). Age was again significant($p < .009$) as a main effect.

ANALYSIS OF VARIANCE

AGE GROUP BY QUESTION TYPE (Negation, plurality, word order)

Source of variation	Sums of Squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	2.343	4	0.586	4.715	0.001
Age	2.166	2	1.083	8.715	0.001
Type	0.177	2	0.089	0.714	0.999
2 Way Interactions	0.239	4	0.060	0.481	0.999
Age Type	0.239	4	0.060	0.481	0.999
Explained	2.582	8	0.323	2.598	0.010
Residual	29.820	240	0.124		
Total	32.403	248	0.131		

Table 6-16 Analysis of Variance: Age Group by Question Type (Negation, Plurality, Word Order).

ANALYSIS OF VARIANCE

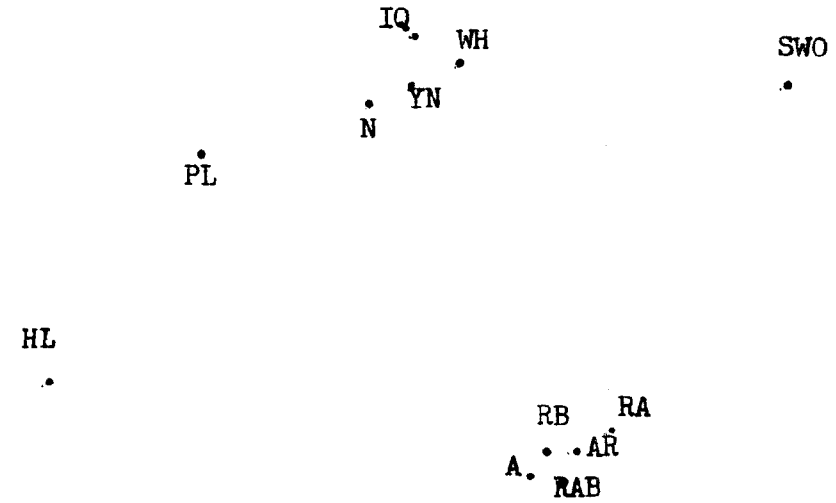
AGE GROUP BY WH-QUESTION TYPE (Where, When, Why, Who, What)

Source of variation	Sums of Squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	33.903	8	4.238	41.861	0.001
Age	0.958	2	0.479	4.734	0.009
Type	32.945	6	5.491	54.236	0.001
2 Way Interactions	1.856	12	0.155	1.528	0.109
Age Type	1.856	12	0.155	1.528	0.109
Explained	35.760	20	1.788	17.661	0.001
Residual	56.694	560	0.101		
Total	92.453	580	0.159		

Table 6-17 Analysis of variance: Age Group by Question Type (Where, When, Why, Who, What).

VII. Proximity Plot

A proximity plot using Shepard's analysis of proximities was made to facilitate a better understanding of the total underlying pattern of



KEY
HL=HEARING LEVEL
IQ= I.Q.
A = AGE
RA=RAVEN SET A
RB=RAVEN SET B
RAB=RAVEN SET Ab
AR =AVERAGE RAVEN
N =NEGATION
YN =YES/NO
WH =WH-QUESTION
PL =PLURALITY
SWO=SURFACE WORD ORDER

Figure 6-5 PROXIMITY PLOT BOTH BATTERIES -- DEAF CHILDREN

interrelations in the data. This is shown in Figure 6-5 and will be discussed in Chapter Seven.

VIII. Results pertaining to the hearing control group and to the group of deaf subjects with familial deafness

Hearing control group

Seventeen randomly-selected children with normal hearing and the same socio-economic background as the deaf subjects were also tested. Ages ranged from 57 months to 78 months with a mean of 65.8 months and a standard deviation of 5.9 months. Although none of these subjects had either deaf parents or siblings, three of them were enrolled in the integrated preschools of two different schools for the deaf.

Results show a mean of .89 on the total scores and one subject with a perfect score. The means of the subtests are found in Table 6-18.

SUBTESTS	MEAN SCORES
Yes/No interrogation	1.00
Wh- Questions	.95
Negation	.85
Plurality	.82
Surface Word Order	.71

Table 6-18 Mean scores of hearing control group on subtests of Syntax Test

All of the hearing subjects answered Yes/No questions correctly both with and without do support. Five of these subjects answered "What is the girl brushing?" incorrectly. Four of these answered "Toothpaste.". No real difficulty was found with any of the Wh-

questions on either battery of the test. All seventeen subjects had at least 75% correct for Yes/No Interrogation and Wh- Questions. Fifteen had reached this level for plurality and twelve for negation. For surface word order thirteen had at least two out of three items correct. For the total scores, only one 58 month old boy scored below 75%, and his score was .73.

Deaf subjects with familial deafness

Twelve deaf subjects, children of deaf parents or who had older deaf siblings, were matched by sex, and as closely as possible by age and school with twelve deaf subjects who had no deaf family members. Test results showed significantly higher means for the first group (family deafness) than for the second (no familial deafness). T tests were computed (df=22) and probabilities obtained from a two-tailed test of significance. These results are found in Table 6-19.

	Group I		Group II			
	mean	s.d	mean	s.d.	t	level of significance
Total Scores	.57	.16	.39	.16	2.67	0.014
Negation	.63	.24	.42	.26	2.01	0.057
Plurality	.46	.23	.38	.27	0.80	0.430
Word Order	.56	.16	.33	.31	2.15	0.043
Yes/No	.83	.32	.58	.35	1.79	0.088
Wh-Questions	.54	.18	.37	.14	2.53	0.019

Table 6-19 Mean total scores and subtest scores for deaf subjects with familial deafness (Group I) and deaf subjects with no deaf family members (Group II).

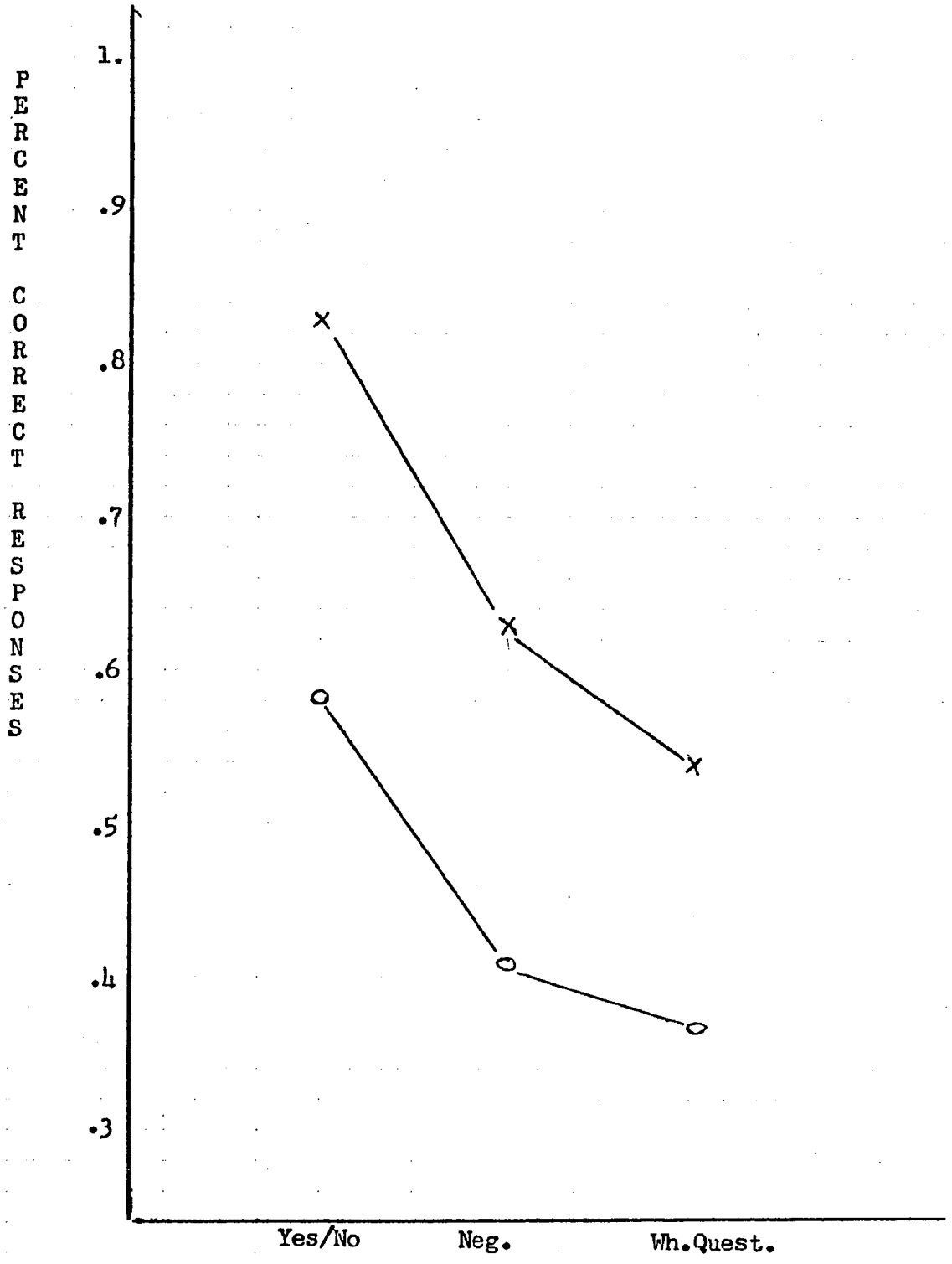


FIGURE 6 - 6 Mean scores on selected subtests of deaf children of deaf parents x_____x and deaf children of hearing parents O-----O.

CHAPTER SEVEN

DISCUSSION

The chapter consists of a discussion of the test results in the following sequence: Part I deals with the validity and reliability of the Syntax Test. Part II interprets the data that resulted from its administration to 86 prelinguistically deaf subjects between the ages of 5 and 7. Part III is a comparison of the test results with results of other research. Part IV treats of the implication of the results of this research.

Part I: Validity and Reliability

Validity

The first section of this chapter is an attempt to accumulate evidence demonstrating the construct validity of the Syntax Test, although this can never really be definitively established. This will be done by showing:

a) that the results of the Syntax Test are in accord with recent psycholinguistic research on the acquisition of syntax by children with normal hearing.

b) that the results of the Syntax Test are in agreement with recent psycholinguistic research on older deaf children.

c) that the results of the Syntax Test correlate significantly with related measures such as the child's intellectual capacity, the Raven Coloured Progressive Matrices and the subjects' teachers' ratings of language ability.

d) that the results of the Syntax Test approximate a normal distribution.

e) that the scores obtained on the Syntax Test when administered to normal children are well within the expected range.

Although it is not possible to prove that a test is valid, there are some accepted approaches that attempt to establish test validity. One effective approach to establishing test validity is to demonstrate that it satisfies two criteria: essentially, that it measure the intended trait (in this case, comprehension of syntax) and that it does not measure some other trait that was not intended (Campbell, 1959). Anastasi (1973) presents construct validity as the most complex type of validation, which is so comprehensive that it encompasses even the procedures characteristically associated with other types of validity. Construct validity is defined as the validation of the theory underlying the test in question. Since it is concerned with a more comprehensive and more abstract kind of behavioral description than those provided by other types of validation (content, predictive, concurrent, discriminant) construct validation calls for a continuing accumulation of information from a variety of sources. Any data throwing light on the nature of the trait under consideration and the conditions affecting its development and manifestations contribute to the process of construct validation. Construct validity, as defined by Anastasi (1973) has served to focus attention on the desirability of basing test construction on an explicitly recognized theoretical foundation. For the Syntax Test devised for the present research, the theoretical foundation is clearly the Developmental Psycholinguistic Theory of Language Acquisition.

Campbell and Fiske (1959) have proposed that one method of demonstrating construct validity is to show that a test correlates with variables with which it should correlate and that it does not correlate with variables from which it should differ. This is done by measuring the same characteristic by different ways and obtaining comparable results and a substantial correlation between the various tests used. In the present case, although there are as yet no other syntax tests for young deaf children with which the Syntax Test is question can be compared, recent psycholinguistic research has produced a rich source of data on the stages involved in the acquisition of syntax in normal children. It would seem that if the results of the instrument in question show the same pattern of development, this would increase its claims of validity. One expects a normal three year old child to be understanding and producing more advanced language than a two year old, and less advanced language than a five or six year old. The results of the Syntax Test used in this research show that the total scores increased with advancing age. The data are shown in Tables 6-14 & 6-15 of the Results Chapter. These data represent one of several indicators that language development is being measured effectively and attests to the validity of the test.

Research by Bellugi (1965), Klima and Bellugi-Klima (1966), by Bloom (1970) Menyuk (1969), Cairns and Cairns (1975), McNeill (1975), Cairns and Hsu (1976) and other developmental psycholinguists also indicates stages in the acquisition of specific syntactic structures, such as negation and interrogation. The normal child increases in mastery of these constructions with age. The results of the present research shows that the means of the subtests dealing with negation

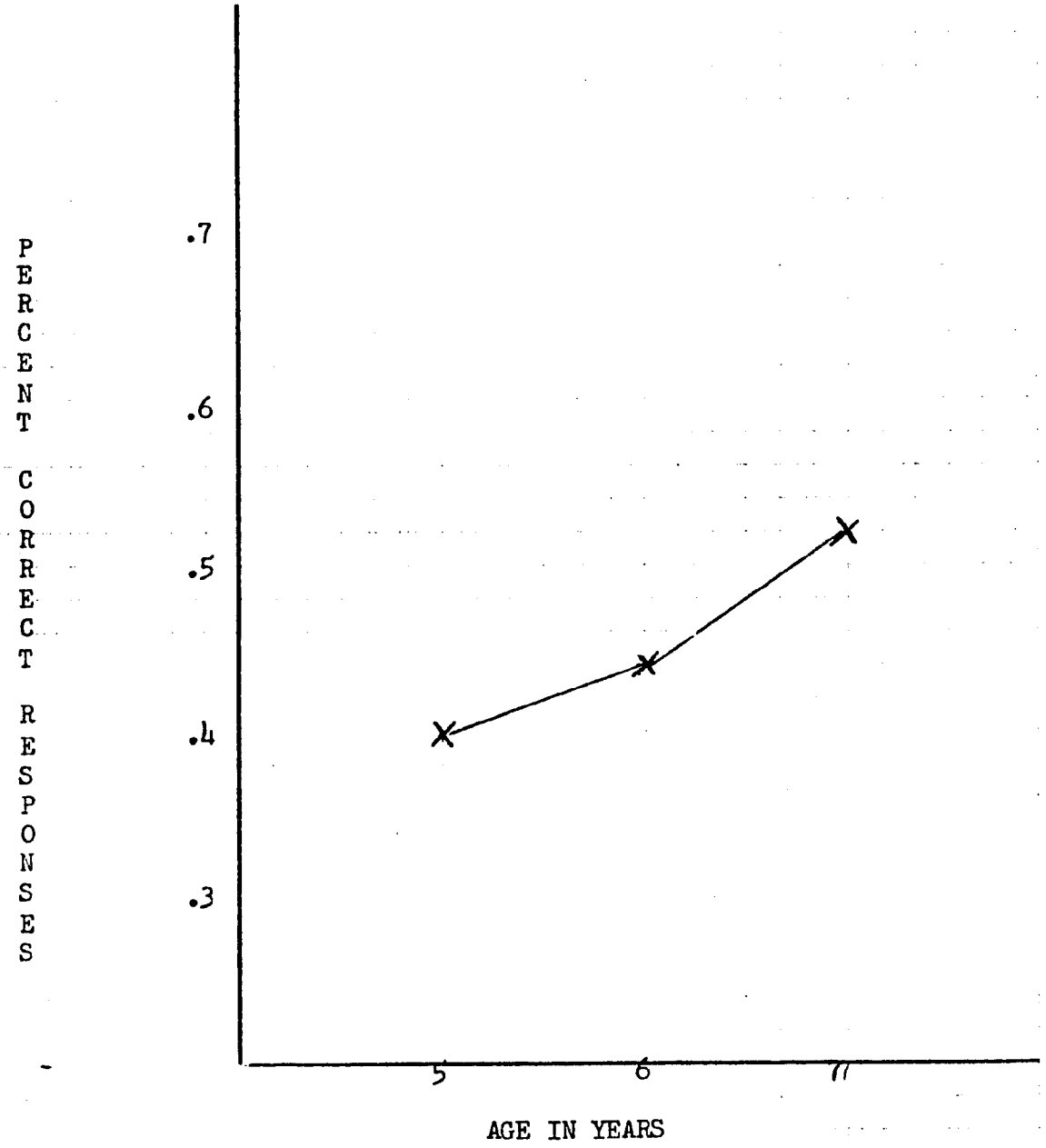


FIGURE 7 - 1 Total scores. Mean total scores obtained by 5, 6 and 7 year old prelingually deaf subjects on the Syntax Test.

and interrogation also increase with age, which is in accord with what one would expect if language were effectively being measured. (See Table 6-14 of the Results Chapter).

Children with normal hearing begin their acquisition of interrogation with Yes/No questions and then Wh- questions. Here again, the results of the present research are in accord with what is known about normal language development, as shown in Table 7-1

	BATTERY A			BATTERY B		
	mean	s.e.	n	mean	s.e.	n.
Yes/No	.59	.06	43	.50	.06	43
Wh-questions	.43	.03	43	.44	.03	43

Table 7-1 Mean Scores of 43 subjects who took Battery A and 43 subjects who took Battery B. Subtests: Yes/No Interrogation and Wh-Questions.

The rules governing the basic syntactic structures of negation and interrogation are qcquired at approximately the same time in many children with normal hearing (Brown & Hanlon, 1970). The scores for the items dealing with these two syntactic structures on the Syntax Test are remarkably similar as shown in Table 7-2.

	BATTERY A			BATTERY B		
	mean	s.e.	n.	mean	s.e.	n.
Negatives	.45	.04	43	.46	.05	43
Interrogatives	.51	.04	43	.47	.04	43

Table 7-2 Mean Scores of 43 subjects who took Battery A and 43 subjects who took Battery B. Subtests: Negatives and Interrogatives.

Research by Quigley (1973) on older deaf children (ages 10-19 years) indicated that Yes/No questions are easier than Wh-questions for deaf subjects of all ages. The results of the present research are in agreement, as shown in Table 7-1. The apparent disparity in the scores of the younger children (5-7 years old) who participated in this research and those obtained by Quigley's subjects (10-19 years old) will be discussed in Section III of this chapter, Comparison with Other Research.

Raven's Coloured Progressive Matrices Test is considered a reliable measure of a child's present capacity for intellectual activity, although by itself it is not a test of general intelligence. (Raven, 1965 reprint). Raven himself advised that it be used in conjunction with a vocabulary test. The Raven evaluates a child's perception of forms and patterns. In particular, Set A assesses the subject's perception of identity and change in continuous patterns, Set Ab evaluates his perception of discrete figures as spatially related wholes and Set B, his recognition of changes in spatially and logically related figures. Since the perception of patterns is linked to the ability to acquire language, the results of the Syntax Test should correlate with the results of the Raven Test. This relationship was substantiated and the Pearson Product-Moment Correlation coefficients for the scores of subtests of the Syntax Test and the scores of selected sets of the Raven Coloured Progressive Matrices are statistically significant. (See Table 7-3)

Raven	Negation	Plurality	Word Order	Yes/No
Set A	.35	.14	.04	.11
	.005	.161	.395	.225
	n=53	n=53	n= 53	n=53
Set Ab	.26	.32	.20	.14
	.03	.058	.077	.158
	n=52	n=52	n=52	n=52
Set B	.30	.08	.04	.35
	.015	.285	.397	.01
	n=52	n=52	n=52	n=52

Table 7-3 Pearson Product-Moment Correlation Coefficients for the scores of subtests of the Syntax Test and the scores of the Raven Coloured Progressive Matrices Test.

One would also predict some correlation between a young child's intellectual capacity and his language development, although other variables influence the language development of deaf children in addition to and perhaps more strongly than general intelligence. Levitt (1976) has shown a moderately high correlation between the receptive language skills of deaf children and their I.Q. The reported I.Qs of the subjects of the present project were statistically significant when correlated with their scores on various subtests of the Syntax Test. (See Table 7-4)

Subtest	I.Q.
Negation	.31 .026 n=39
Yes/No	.51 .001 n=39
Wh-Questions	.39 .08 n-39

Table 7-4 Pearson Produce-Moment Correlation Coefficients for the scores of subtests of the Syntax Test and I.Q. Scores of the subjects.

The scores of the 86 deaf subjects closely approximate a normal distribution. The normality of the distribution is useful in that it provides a convenient basis for narmalizing the data and for detecting which children are significantly better than, or significantly worse than average.

	Normal Distribution	Syntax Test
Scores within 1 standard deviation from the mean	68.26%	72%
Scores within 2 standard deviations from the mean	95.44%	95.35%
Scores falling outside of the above limits	4.56%	4.65%

Table 7-5 Scores obtained on the Syntax Test compared with normal distribution

The "known groups" method is also frequently used in attempting to establish construct validity. This method compares the scores obtained on a test by an experimental group with those obtained by a control group who have already demonstrated the mastery of the skill under study. Since the test items of the Syntax Test are intended to measure comprehension of basic syntactic constructions, it is assumed that children who have already passed through the first stages of language development would achieve high scores on this test. As shown in Table 6-18, five year old children with normal hearing who demonstrated language ability commensurate with their age level achieved high scores on the Syntax Test. Figure 7-2 compares the mean scores of 5 year old children (mean age 5.2) with the mean scores of the top ten deaf subjects (mean age 7.). These results are consistent with the view that the test is a valid measure of syntactic ability.

Another method of empirically validating a test is to use it as a device for predicting some other behavior with which the intended characteristic is presumably related. Since the acquisition of syntax is basic to language development one should be able to preduct that subjects who score high on the Syntax Test will be rated higher in language ability by their teachers than subjects who do poorly on the Syntax Test. Significant correlations ($p < .015$) were found between the subjects' scores on the Syntax Test and their teacher ratings of language ability.

As noted earlier, it is not possible to <u>prove</u> that any test is valid, but it is possible to demonstrate internal consistency and mutual consistency with related measures. This has been done by showing that the results of the Syntax Test are in accord with

psycholinguistic research and that they correlate with related measures.

As more data are accumulated by different examiners one can begin to presume validity, yet even then, this remains essentially an assumption. It is to be hoped that the Syntax Test devised for the present research will in time satisfy these requisites as well as it meets the other criteria for validity.

Reliability

A test is, by definition, reliable to the extent that it yields repeatable scores on two or more administrations. To demonstrate the reliability of the Syntax Test several approaches were used:

a) test-retest method: 20 subjects took both Battery A and Battery B and the results were analyzed.

b) The Syntax Test was used as part of a test battery of an independent research project and the results were compared with those of the subjects of this research.

c) 8 of the subjects took the Syntax Test as part of this research and again, 8 months later, as part of the independent research project. These test results were compared.

d) An analysis of variance was performed.

Test-retest method

To estimate the reliability of the Syntax Test 20 children, ranging in age from 49 to 93 months (mean=80 months) took both Battery A and Battery B of the test on the same day. The subjects were pupils of 3 different schools. Table 7-6 below shows the Total Scores of the 10 subjects who took Battery A first, and Table 7-7, the Total Scores of those who took Battery B first.

I.D. Number	1st battery taken: A	2nd battery taken: B	difference between scores	difference squared
82	.79	.96	.17	.0289
83	.79	.79	0	0
87	.86	.93	.07	.0049
88	.28	.31	.03	.0009
90	.31	.34	.03	.0009
95	.72	.76	.04	.0016
98	.38	.41	.03	.0009
100	.38	.41	.03	.0009
104	.48	.48	0	0
105	.45	.45	0	0
MEANS	.54	.58	.04	.0039

Table 7-6 Total Scores of 10 subjects who took Battery A first

Table 7-7 Total Scores of subjects who took Battery B first

I.D. Number	1st battery taken: B	2nd battery taken: A	differences between scores	differences squared
77	.62	.69	.07	.0049
84	.28	.31	.03	.0009
85	.72	.83	.11	.0121
86	.62	.83	.21	.0441
91	.45	.45	0.	0.
96	.38	.48	.1	.01
97	.48	.62	.14	.0196
99	.66	.69	.03	.0009
101	.48	.48	0	0
102	.45	.45	0	0
MEANS	.51	.58	.07	.009

The score of the second battery taken by the subject was slightly superior to the score of the first battery for 14 of the 20 children. This indicates the presence of a learning factor - due probably to familiarity with the test procedure because it occurred irrespective of which battery was administered first.

The scores of these same 20 deaf subjects who took both batteries of the Syntax Test produced the following correlations:

	B	B	B	B	B	B
TOTAL SCORES A	.91 .001					
NEGATION A		.80 .001				
YES/NO A			.90 .001			
WH-QUESTIONS A				.83 .001		
PLURALITY A					.47 .018	
WORD ORDER A						.09 .35

Table 7-8 Pearson Product Moment Correlations between test batteries.

Aside from the two subtests dealing with Plurality and Surface Word Order the correlations between the two scores for the 20 subjects who took both batteries are reasonably high (statistical significance is well below the .0001 level). The reasons for the low reliability of the Surface Word Order subtest will be discussed in section II: Interpretation of Test Results.

Independent project

More evidence of reliability was accumulated when the Syntax Test devised and used for the present research, was administered to 51 subjects in 6 schools for the deaf as part of an independent research project. The scores obtained are comparable to the results of the present research. (See Table 7-9)

INDEPENDENT PROJECT		PRESENT RESEARCH	
51 subjects		22 subjects	
72-83 months of age		72-83 months of age	
BATTERY A	MEAN	BATTERY A	MEAN
Total Score	.37		.45
Negation	.41		.47
Yes/No	.50		.61
Wh-Questions	.39		.42
Plurality	.36		.42
Surface Word Order	.39		.41
Range of total scores:	.86 - .10		.72 - .21
Median Age	.76.6 months		77.5 months

Table 7-9 Comparison between Independent Project and Present Research Scores by different examiners

Eight of the 51 children who were tested as part of the independent project had previously participated in the research done for this dissertation. Their individual scores, obtained by other examiners, were slightly higher than those obtained for this research,

presumably due to the fact that the subjects were already familiar with the test.

These close scores attest to the reliability of the Syntax Test even when administered by different examiners.

Analysis of variance

Three analyses of variance were performed. The first consisted of a three-way effects model for the following factors:

a) sex

b) battery (A or B)

c) section (I = negation, plurality and surface word order;
II = yes/no interrogation and wh- questions.)

The second analysis of variance consisted of a two-way effects model for age-group and Wh- question type (Where, When, Why, Who and What) and the third analysis of variance also consisted of a two-way effects model for age group and question type (negation, plurality and surface word order). Each analysis of variance is reproduced here as another indication of the reliability of the Syntax Test.

Although the repeatability of the test as a whole appears to be satisfactory, each item of this preliminary version is not equally reliable. Table 6-10 shows some disparity between the results obtained for similar items. This was taken into consideration for the revision of the test.

The repeatability of the test for the same subject appears to be quite good, as evidenced by the scores of the 8 subjects who took the

test and then, eight months later, took it again (See Table 7-10).

The scores of the 20 subjects who took both batteries of the test also indicate quite good repeatability if one takes into consideration the possible effects of familiarity with the test material and procedure. (See Tables 7-6 and 7-7)

The residual error in an analysis of variance is often used as a measure of repeatability. The mean square of the residual error in Table 7-11 is .037, which is marginally above the minimum error variance for data of this type. The mean squares of the residual error in the analyses of variance in Tables 7-12 and 7-13 are higher, .124 and .101 respectively, yet still within the acceptable range. It should be remembered that the arc-sine transformation was used in the analysis of variance. The expected minimum variance of each measurement is 1/n. In this instance n=29, therefore the expected minimum variance is .03. The reliability of the test as a whole is quite good but caution should be exercised in interpreting the scores on individual test items or subsections.

ANALYSIS OF VARIANCE
SEX BY BATTERY BY TEST SECTION

Source of variation	Sum of squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	0.341	3	0.114	3.035	0.030
Sex	0.338	1	0.338	9.026	0.003
Battery	0.006	1	0.006	0.151	0.999
Section	0.002	1	0.002	0.067	0.999
2 Way Interaction	0.143	3	0.048	1.275	0.284
Sex Battery	0.134	1	0.134	3.568	0.057
Sex Section	0.010	1	0.010	0.255	0.999
Battery Section	0.000	1	0.000	0.003	0.999
3 Way Interaction	0.004	1	0.004	0.096	0.999
Sex Battery Section	0.004	1	0.004	0.096	0.999
Explained	0.488	7	0.070	1.861	0.079
Residual	6.142	164	0.037		
Total	6.629	171	0.039		

Table 7-11 Analysis of Variance - Sex by battery, by test section.

ANALYSIS OF VARIANCE
AGE GROUP BY QUESTION TYPE (Negation, Plurality, Word Order)

Source of variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	2.343	4	0.586	4.715	0.001
Age	2.166	2	1.083	8.715	0.001
Type	0.177	2	0.089	0.714	0.999
2 Way Interaction	0.239	4	0.060	0.481	0.999
Age Type	0.239	4	0.060	0.481	0.999
Explained	2.582	8	0.323	2.598	0.010
Residual	29.820	240	0.124		
Total	32.403	248	0.131		

Table 7-12 Analysis of Variance - Age Group By Question Type

ANALYSIS OF VARIANCE
AGE GROUP BY WH- QUESTION TYPE (Where, When, Why, Who, What)

Source of variation	Sums of Squares	Degrees of Freedom	Mean Square	F	Significance
Main Effects	33.903	8	4.238	41.861	0.001
Age	0.958	2	0.479	4.734	0.009
Type	32.945	6	5.491	54.236	0.001
2 Way Interaction	1.856	12	0.155	1.528	0.109
Age Type	1.856	12	0.155	1.528	0.109
Explained	35.760	20	1.788	17.661	0.001
Residual	56.694	560	0.101		
Total	92.453	580	0.159		

Table 7-13 Analysis of Variance - Age Group By Wh-Question Type

In summary, the reliability of the Syntax Test was demonstrated by several approaches:

a) test-retest method: Pearson Product-Moment Correlation between total scores for 20 subjects was r= .91, significant at the .001 level. High correlations between scores were also obtained for the Negation, Yes/No and Wh-Questions subtests.

b) The results of the present research were shown to approximate closely the results of an independent research project on 6 year old prelingually deaf children where the test instrument devised for this dissertation was used.

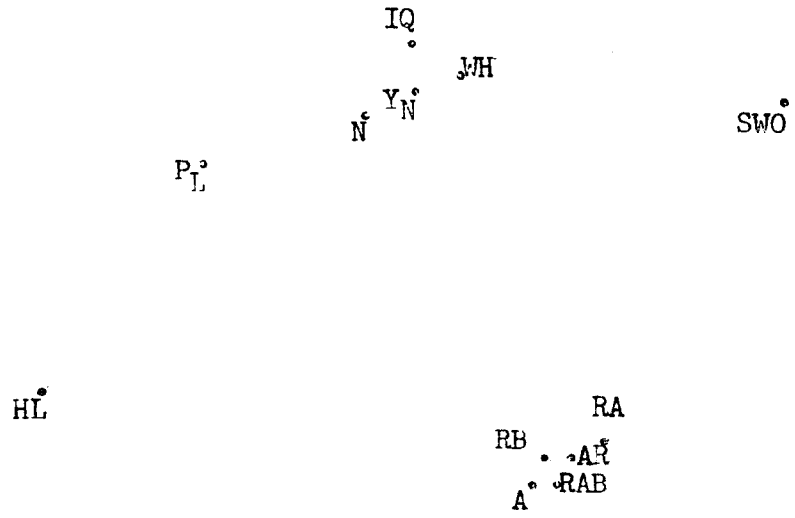
c) 8 subjects were tested by the author and later by other examiners as part of an independent research project. The scores of these 8 subjects attest to the reliability of the test.

d) The residual error terms in the analyses of variance indicate that the repeatability of the test is good.

Part II: INTERPRETATION OF DATA
Multidimensional Scaling

Multidimensional scaling is a powerful technique for analysis of data often used in the social and behavioral sciences. It attempts to discover the pattern or structure that may be hidden in a matrix of empirical data and then to represent that pattern or structure in a geometrical form. The objects under study (traits, stimuli, responses, etc.) are represented by points in the spatial model in such a way that the significant features of the data about these objects are revealed in the geometrical relations among the points. The primary purpose of such a representation is to facilitate a better understanding of the total underlying pattern of interrelations in a set of data. This gain in understanding is achieved through the identification of directions or axes through the spatial representation or the way the points cluster into several homogeneous groups or are ordered around the perimeter of a circle. The particular technique used to interpret the present data is Shepard's "analysis of proximities" (1972). In this approach, the affinities between one object and all the other objects are monotonically related to the corresponding distances from that point to all the other points on the scale. Shepard, (1972, p.6) says that multidimensional scaling "has the ability to extract quantitative metric information from qualitative nonmetric data" and serves as a guide for its careful interpretation.

The spatial representation obtained using Shepard's analysis of proximities is referred to as a proximity plot and is shown in Figure 7-3 for the data obtained from both batteries of the Syntax Test. Each point in the diagram represents one of the subtests of



KEY
HL=HEARING LEVEL
IQ=I.Q.
A =AGE
RA=RAVEN SET A
RAB=RAVEN SET Ab
RA=RAVEN SET B
AR=AVERAGE RAVEN
N=NEGATION
YN=YES/NO
WH=WH-QUESTION
PL=PLURALITY
SWO=SURFACE WORD ORDER

Figure 7-3 PROXIMITY PLOT BOTH BATTERIES-DEAF CHILDREN

the Syntax Test or of the Raven or other relevant information such as I.Q, age, or hearing level. The distance between any two points represents the degree of correlation between the subtests represented by the points. For example, the symbol N represents the negation subtest and the symbol YN represents the Yes/No Interrogation Subtest. These points are fairly close together, which indicates a relatively high degree of correlation between these two subtests. The measured correlations are shown in Table 6-4 of the Results Chapter.

Some general observations can be made: The subtests of the Syntax Test dealing with syntactic constructions, show relatively high correlations with each other,and the points representing them cluster close to I.Q., which indicates a relationship between intellectual capacity and language ability. Hearing level shows a relatively low correlations with the syntactic constructions, with I.Q., with age, and with the subtests of the Raven Coloured Progressive Matrices. Hearing level does not appear to influence a subject's performance on the Raven and appears not to be correlated with language ability among these deaf subjects in whom the range of hearing loss is so small. This is consistent with the findings of Quigley et al. (1975) and of Levitt (1976). The linguistic strategies of word order and inflections (SWO and PL) used by children with normal hearing, as discussed in Chapter II, are quite removed from the cluster of syntactic structures. However, they are clearly closer to these structures than they are to age and to the subsets of the Raven. The subsets of the Raven show high correlation with each other and with age.

The observations that can be made from this proximity plot are the basis of the interpretation of the results of the present research

and of the implications that will be discussed in another section of this chapter.

Developmental Interpretation.

The results of the present research, as shown in Tables 6-5 and 6-6 of the Results Chapter clearly indicate that the 5, 6 and 7 year old prelingually deaf children who participated in this study are in the process of acquiring English syntax, in accord with what is currently known about developmental psycholinguistics. The scores are clearly above chance level. Comparison with the test scores of children with normal hearing reveals that the prelingually deaf children in the study are acquiring English syntax at a slower rate than these hearing children, although the average score of the top 10 deaf subjects (mean age 7;0) was quite close to the average score of the hearing subjects who were only slightly younger, (mean age 5;2).(See Figure 7-2)

The results indicate that deaf children discriminate Yes/No questions from Wh-questions by the age of 5 or 6 and that they find yes/no questions easier to answer than Wh-questions as evidenced by the higher scores achieved for the Yes/No questions.

The concept of negation has apparently already been established in some of the subjects, as evidenced by their scores on the negation subtest. It is also evident that the knowledge of how negation is expressed through language, has to be refined by these children so that their linguistic performance (comprehension and production) more closely follow the syntactic rules governing negation in English.

The disparity in scores between the younger deaf children who participated in this research and the older deaf children who participated in the Quigley study may be attributed to this refinement of linguistic skills.

It seems evident that some subjects have acquired the basic syntactic structures by the age of 7, however the refinement of these structures continues for some years. Carol Chomsky, (1969, p.121) has expressed the opinion that, contrary to the commonly held view that a normal child has mastered the structure of his native language by the time he reaches the age of 6, active syntactic acquisition is taking place up to the age of 9 and even beyond. This progressive refinement of child grammar into adult competence reflects the linguistic complexities of our language system.

Deaf children of deaf parents

Figure 6-6 of Chapter 6 shows the mean test scores of the 12 deaf subjects who have deaf parents or older deaf siblings. These mean scores are compared in the graph with the mean test scores of 12 deaf subjects who have hearing parents. Both groups were matched as closely as possible for age and sex. As can be seen from the graph, the mean scores of the deaf children of deaf parents are significantly higher. Many reasons might be advanced for this superiority in language acquisition by deaf children of deaf parents. Among these reasons is the earlier recognition of the auditory impairment due to their being high-risk cases and consequently an earlier enrolment in Infant Programs in Speech and Hearing Clinics and in Schools for the Deaf. This "early start" hypothesis is associated with the theory that maintains

that there exists a critical period during which children are biologically more "ready" for language acquisition and that once past this readiness period, language is acquired with greater difficulty. Another hypothesis is that deaf parents, or hearing parents who have other deaf children, have resolved many of the problems related to the trauma of having a deaf child. Therefore they relate better to the child, speak to him more, interact more with him and so, the language acquisition process proceeds more smoothly. A still more powerful hypothesis is based on the evidence that has been accumulated showing that a large percentage of deaf children of deaf parents have only peripheral deafness and few if any, of the additional handicaps that render language acquisition particularly difficult, brain damage, visual perceptual problems and mental retardation.

Analysis of errors

An analysis of the errors made by the subjects helps provide insight as to what is processed correctly and what is not. If the subject does not choose the correct response, it is helpful to discover what influences his choice of one of the three alternatives. Responses to the 13 items of Section I of the Syntax Test were divided into 4 categories. Category I consisted of the correct response to each item. Category II consisted of the response which was opposite to the correct response. For example, in negative items, the affirmative response would be included in this category; for the passive items, the active responses would be included and for the plural items, the singular responses would be included. (See Test items and pictures in the Appendix). Category III consisted of responses which were not in-

cluded in Category II but contained some correct element, and Category IV consisted of the least correct responses or the irrelevant ones. The histogram on page 78 shows the percentage of responses that fall into each category. 1118 responses (86x13) were analyzed in this way resulting in 492 correct responses (44%), 345 "opposite" responses (31%), 155 responses with some correct element (14%) and 126 irrelevant responses (11%). The key to this analysis can be found in the Appendix.

III. COMPARISON WITH OTHER RESEARCH

The major study on the syntactic competency of deaf children, done by Quigley, Wilbur, Power, Montanelli and Steinkamp (1976), found that most syntactic structures are not **at all** well established, even among 18 year old deaf students. According to Quigley et al. "only simple transformations, such as negation, question formation and conjunction, are mastered to any significant degree by the age of 18." Quigley's results indicate that syntactic structures develop similarly for deaf as for hearing children, but at a greatly retarded rate. Quigley was mainly dealing with the degree of difficulty of the different structures rather than with their emergence in the language of young children. Since part of **the aim** of the present research is to see whether studies done on younger deaf children would be in accord with the studies done on older deaf children, a comparison with **Quigley's** work is warranted.

Anastasi (1973) refers to the differences in response styles in psychological testing and suggests that these may be worth measuring because they exert significant influence on test results. In

comparing the results of the present research with the results of Quigley's Test of Syntactic Ability, one must be aware of the significant difference between the two instruments, not only in the ages of the subjects for which each was devised, but especially in their form of administration, their structure and their response styles. Quigley's test battery consists of a set of test booklets which must be read, and the required responses are to be written in the appropriate places. Subjects are asked to comment on sentences, and to complete or correct them. They are required to encircle correct answers and to judge the grammaticality of specific strings of words. This last task demands a relatively high level of sophistication in the subjects. The TSA is often administered as a group test. In contrast, the Syntax Test for Young Deaf Children is administered as a screening procedure, on a one-to-one basis, items are presented in the child's preferred communicative mode, pictures are used to attract and to hold the subject's attention and to provide a concrete referent for each item. Subjects are required to answer questions, not to comment on them. Immediate reinforcement is given for responses. The first Section of the Syntax Test uses a closed-response set. The whole testing process is simple and easy. The structures tested are also much simpler than those tested by Quigley's Test of Syntactic Ability, which includes some difficult concepts such as embedding, reflexivization and pronominalization. Some differences in some of the results of the two instruments are shown graphically in Figure 7-4 and are partly attributable to these differences in test structure and in response-styles.

Quigley et al. (1976) found that their 10 year old deaf students achieved a score of 48% correct responses on the yes/no questions of

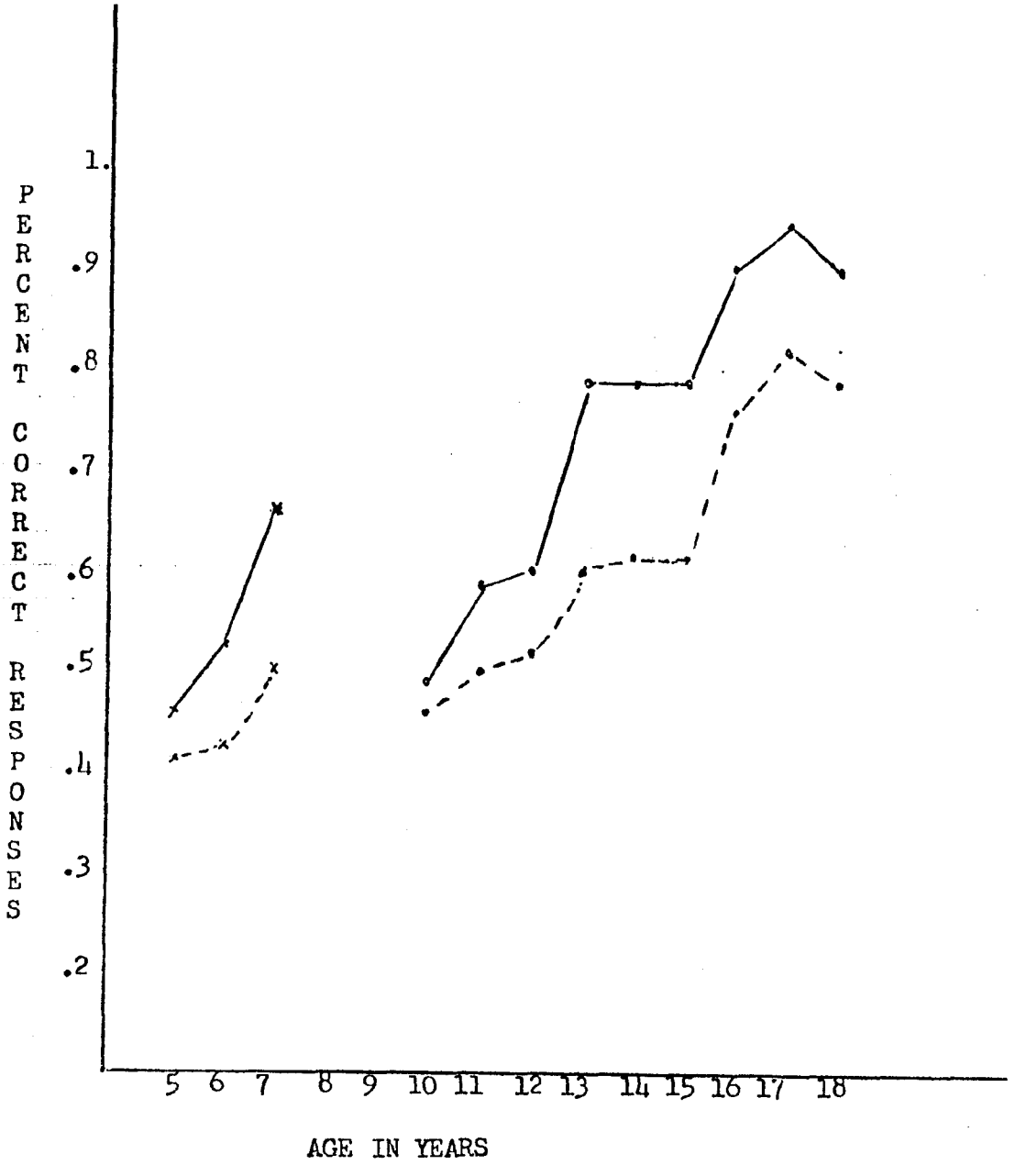


FIGURE 7 - 4 Results of present research x_____x and Quigley scores o_____o for Yes/No Questions _____ and Wh Questions- - - -.

the Test of Syntactic Ability. Developmental psycholinguists has demonstrated that young hearing children acquire this structure very early in their language development. It is difficult to believe that at age 10, after 4 or 5 years of schooling, deaf children do not understand this construction. Results of the present research indicate that a representative sample of prelingually deaf 7 year old subjects achieved a score of 66% correct on the Yes/No questions included in the Syntax Test. The 6 year olds achieved a mean score of 52% and the 5 year olds, a mean score of 48%. Since the subjects did not have to read or write for the present study, it is possible that a more precise evaluation of their basic syntactic ability was obtained.

For Wh- questions, Quigley et al. (1976) reported that their fifty 10 year old subjects comprehend these correctly 44% of the time. For these items, the TSA uses a closed response set. For the Syntax Test, all 14 questions are based on pictures, but the closed response set format was not used for this Section. Results of the Syntax Test produced a mean score of 43% (N=86) with a standard deviation of .18. The scores ranged from all correct to only 1 right. The 7 year old subjects answered 49% of the 14 Wh- questions correctly. The 6 year olds answered 43% correctly and the 5 year olds answered 41% correctly.

As was discussed in Chapter II, it has been shown that children with normal hearing go through a sequence of development for Wh- questions and it is evident from the responses of the deaf subjects that deaf children do too. "Where" appeared to be the easiest Wh- question for the subjects involved in the present study and was answered correctly 77% of the time. For the Where questions on the test (Where is the boy?, Where is the cup?, etc.) a signed or spoken response

was required and pointing was not accepted. The deaf subjects signed or said "here", "there", "in the bathroom", etc. and gave evidence of their knowledge that "where" requires a locative answer.

In the present study the 5, 6 and 7 year olds answered 61% of the Who-subject questions correctly. The responses revealed awareness that "who" requires an animate answer. These younger deaf subjects, like Quigley's older ones, answered who-subject questions correctly more often than who-object questions. These answers also revealed awareness of the necessity of an animate response. Questions like "Who do you see in the picture?" were rarely answered with "flower" or "banana".

As was expected from the studies on hearing children discussed in Chapter II, "when" was considered the most difficult of the Wh-questions and was only answered correctly 8 times in 172 occasions. This is consistent with the findings of Cairns and Hsu (1976). A few children answered "later" or "tomorrow" to questions like "When will mother brush her teeth?" but it is quite evident that the majority of subjects were as yet unable to deal with this construction. Since time concepts and the terminology used to express them are acquired late in children with normal hearing, this result was expected.

"Why" was answered correctly only 22 times in 172 occasions. The deaf subjects often gestured "I don't know" for this question or used inappropriate responses, i.e. "Why does the girl brush her teeth?" was answered "Toothpaste". The few subjects who answered this question correctly used very simple constructions and vocabulary. They answered "Teeth dirty", "Teeth clean pretty", etc. In contrast, a 5 year old girl with normal hearing answered this question with "So Mister

Cavity doesn't come and make little holes in them." Although the basic cognitive concept of causality may be understood by some of these children, their language development was insufficient to enable them to express the concept linguistically.

"What-subject" was somewhat easier than "what-object" (51% - 46%). Since there have been no similar studies on young deaf children reported in the literature, there is nothing with which these results can be compared.

Quigley et al. interpreted the results of their study as an indication that deaf students have basically mastered both the comprehension and production of negative sentences by age 16-18. Schmidt's results (1968, reported by Quigley et al., 1976) indicated that most of his 11, 14 and 17 year old deaf subjects understood the meaning of "not" but that a large number of his 8 year old deaf subjects failed consistently to do so. Schmidt hypothesized that these 8 year olds simply ignored the negative element in negative sentences and processed the sentences as if they were affirmative. These affirmative responses to negative items are similar to the Category II responses discussed on page 110 in the analysis of errors. The results of the present research are in accord with both Schmidt and with Quigley. It is evident that some young deaf subjects begin to demonstrate comprehension of negation when the confounding variable of reading competency is removed from the testing process. However, it is also evident that they are far from having mastered it.

There was no question in the mind of the examiner (based on the responses of the subjects) that many of the prelingually deaf children who participated in the study understood the meaning of "no" and "not"

when these elements were located within a sentence, and that this knowledge increased with age. It would appear that the students currently registered in schools for the deaf acquire the linguistic rules governing negation earlier than has been previously reported in the professional literature.

The low scores on the items dealing with Surface Word Order and the low correlations shown between Battery A and Battery B for this subtest are thought-provoking. The pictures used for both batteries are identical and the subjects and objects of the descriptive sentences were simply reversed. "Baby kisses mother." became "Mother kisses baby." and "Father points to mother." became "Mother points to father." for the second battery. Despite this similarity, The Pearson Product-Moment Correlation Co-efficient was only .09, significant at the .35 level. This was the lowest correlation co-efficient found between any of the identical subtests of the two batteries. (See Table 6-1). One reason for this low correlation between the two batteries for Surface Word Order and for the low scores on this subtest may be that the subjects were simply guessing. Some of the scores obtained on this subtest were at chance level. (See Table 6-11) Another reason may be that many young deaf children simply ignore word order. Stokoe (1972) maintains that sign-users indicate and understand semantic relations by form in noun and verb signs and leave the order of the signs virtually free. Another important consideration, also made by Stokoe (1972) is that meaning, in many instances, is not dependent on the order of the signs but on the direction in which the sign is made. Kohl (1966) asserts that functional words such as "no", "but" and "or" occur less frequently in sign language than in oral

language. Like Stokoe, he believes that some of the differences in syntax between English and Sign language are due to the fact that facial expressions and bodily positions are frequently used in sign language as syntactic indicators. Signs follow each other according to the general principle of keeping verbs and their subjects as close as possible and of keeping the order of the signs as parallel as possible to the order of what is being described.

IV. IMPLICATIONS

It is evident from the data that some deaf subjects between the ages of five and seven who were included in the study are in the process of acquiring syntax. It is also evident that they are making progress at a slower rate in the acquisition of language than do children with normal hearing, although they appear to pass through the same developmental stages. In order to facilitate language acquisition, deaf children should be supplied with a large corpus of utterances from which they can abstract the basic grammatical rules. Teachers and parents of even very young deaf children should use Yes/No interrogation and Wh-questions with them, supplying the answers themselves until the child participates in the interchange. At first the Wh- words which are found to be easiest for deaf children (Where, Who (subject) etc.) should be used frequently in simple questions and all attempts to respond correctly should be rewarded. Frequent repetitions of simple wh- questions in meaningful situations should be made until the child learns such basic rules as: a) "Where" requires a locative answer. b) "Who" requires an animate noun either as the agent or object of the action etc. Although particular emphasis should be

placed at first on the Wh- words which are easiest for deaf children, parents and teachers should not limit themselves to the use of syntactic structures and vocabulary that they think the child can understand. With the help of paralinguistic cues, deaf children come to associate meanings with particular constructions and are thereby able to deduce simple grammatical rules.

Some of the research relevent to the language acquisition of deaf children indicates that hearing parents curtail their speech to their children once the diagnosis of deafness has been made. One of the reasons given for this is the lack of feed-back from child to parent... the child does not answer nor demonstrate comprehension so the mother either limits her speech to her child or almost stops talking to him. Parents and teachers of very young deaf children should be given the opportunity to acquire basic knowledge in developmental psycholinguistics. This would enable them to understand better the process of language acquisition and the developmental stages involved. Parents and teachers who know that interrogation is one of the early syntactic acquisitions will encourage their deaf children to participate in simple answer and question routines. As the child begins to answer for himself, no matter how primitively at first, the mother receives some of the feedback she requires to continue and increase her speech to the child. The more she communicates, the more opportunity her child will have to make associations, to notice patterns and to abstract rules for himself.

Everyone involved in facilitating the language development of deaf children should have information concerning the stages in the

acquisition of specific syntactic structures and of practical ways of assisting the deaf child to pass from one to the next. Negation is one of the syntactic structures that can be facilitated by practical knowledge of the developmental steps involved.

A deaf child's progress in language development should be evaluated periodically. For this purpose a revision of the Syntax Test has been made using the knowledge that has been acquired during the writing of this dissertation. Some weaknesses of the test have been eliminated, and a modified version is currently in use. The items and the pictures used for this modified version can be found in the Appendix. The new Syntax Test is currently being used for two different research projects, one is a communications skills evaluation of young deaf children and the other, a study of different communicative modes used by deaf children.

Revised Version of the Syntax Test

The item analysis, as has been said, revealed the need for a revision of the Syntax Test. Since the subtests (negation, wh-questions, yes/no interrogation, surface word order and plurality) are in agreement with what is known about normal language acquisition from recent developmental psycholinquistic research, these remained the same.

The test format was also deemed satisfactory except that for Section II, to maintain the interest of the young subjects two large

pictures are used for the referents for the Yes/No and Wh-questions instead of only one.

The item analysis of the two batteries of the Syntax Test was made comparing the number of correct responses to each item by 3 different subsets of subjects: the deaf subjects (N=86), the hearing control group (N=17) and the subjects of an independent study (N=52). The 55 original items were then ranked according to these results. Each of the skills evaluated by the Syntax Test is included in two items of each battery. For example, comprehension of rejection is tested by items 2 and 10 of Battery A and 3 and 10 of Battery B. Comprehension of "Where" is tested by items 16 and 26 of Battery A and items 15 and 25 of Battery B. Yes/No question discrimination is tested by items 19 and 25 of Battery A and 19 and 22 of Battery B. From these four items on each topic, the two items that produced the most similar results for the deaf subjects were chosen for the revised version after they were carefully matched for structure. For example, the items on rejection produced the following scores:

Battery A	item 2	The boy does not want a bath.	.41
Battery A	item 10	The boy does not want to eat.	.79
Battery B	item 3	The child does not want to play.	.49
Battery B	item 10	The child does not want the juice.	.55

It was decided to retain A-2, "The boy does not want a bath," and B-10, "The girl does not want the juice." since the results were close and the structures were matched. The Wh-question "Where" produced the following scores:

Battery A	item 16	Where is the cup?	.87
Battery A	item 26	Where is the girl?	.79

Battery B	item 15	Where is the boy?	.67
Battery B	item 25	Where is the cup?	.74

It was decided to retain "Where is the cup?" and include a new similar item "Where is the flower?"

Each item was studied closely and some structural modifications were also made. A very slight revision of the pictures permitted the use of "Mother touches father" in the place of "Mother points to father." In order to have two items of each structure a second passive sentence was included, "The baby is kissed by mother.". No change of pictures was needed for this item. There are four Yes/No questions (two with do support, two with subject auxiliary inversion) in the revised test which contains 32 items. Some items of the original battery were ambiguous, such as "The boy has no shoes." and "The boy has no hat." for denial. These were eliminated, and replaced by "The toothbrush is not broken." and "The boy is not asleep.".

The revised version of the Syntax Test which can be found in the Appendix is presently being used as a research tool.

CHAPTER EIGHT

CONCLUSION

The greatest handicap connected with deafness is the obstacle it poses for the acquisition of language. The earlier in life language can be acquired, the fewer are the limitations that deafness imposes. In the past, this fact has been recognized and attempts have been made to hasten and facilitate the acquisition of language by the establishment of infant programs, by the early diagnosis of deafness through neonatal audiometry, and the immediate initiation of auditory training and language therapy. Although the great need for a valid and reliable procedure to evaluate progress in language acquisition in young deaf children has been evident, there was nothing available. The present research produced a screening test that can be administered in speech, sign, fingerspelling or writing, by teachers or parents. No elaborate equipment is required. The basic syntactic structures which are acquired early by children with normal hearing (negation and interrogation) have been incorporated, as well as two of the linguistic devices (word order and the plural inflection) used to express meaning and utilized at the very genesis of normal language development. Eighty-six prelinguistically deaf children from 8 different schools for the deaf were tested and mean scores for 5, 6 and 7 year olds were computed.
A statistical analysis of the items included in the two batteries indicated areas where modifications were required and a revision of the test was made and is already in use. The test scores obtained by

the young deaf subjects indicate that 5 to 7 year old deaf children are definitely in the process of acquiring the basic syntactic structures included in the test. A developmental sequence of language acquisition similar to that of children with normal hearing was demonstrated, but the rate of acquisition is somewhat retarded when prelinguistically deaf subjects are compared to hearing children. The linguistic devices of word order and inflections are less evident in deaf children than in hearing children. Evidently a different set of strategies is used by these children who are often simultaneously exposed to signed and spoken English.

The results of a test of this type can be used as a partial basis for school or class placement, as a screening procedure to reveal areas in which remedial work may be necessary, to assess a student's progress, or to evaluate the efficacy of a teaching technique. Much further research is necessary in the area of language acquisition of deaf children. Actually there are no standardized language tests available for these students although there is a proliferation of them for the hearing child. There is much that we still need to know concerning the language acquisition of the deaf. It is now well known that deaf people can acquire language, that they are able to learn to read and write and that, exposed to a linguistic environment, they do acquire grammatical rules as do children with normal hearing. It has also been demonstrated that they pass through developmental stages of language acquisition similar to those of the normally-hearing. Some researchers have found differences in the linguistic structures acquired but it is not yet known whether these alleged differences

are real differences or simply intermediate steps perhaps due to the fact that language is acquired more slowly, that a different sense modality (vision instead of hearing) has been the medium of acquisition, or to some other variable or combination of these. Linguistic retardation is common but it is not yet known whether it is inevitable. More psycholinguistic information has to be gleaned and subsequently made available to the parents and teachers of deaf children. Since there are still many unanswered questions concerning language acquisition in general, it is not surprising that there is as yet much to learn concerning the language acquisition of the deaf. However, for the deaf, so much depends on this information and the resultant increased efficiency in language acquisition that this research should be considered urgent and given priority.

APPENDIX I: BACKGROUND INFORMATION COLLECTED ON EACH SUBJECT

BACKGROUND INFORMATION SHEET:

DATE. . . . . .

NAME. . . . . .

IDENTIFICATION NUMBER . . . . . .

SCHOOL . . . . . .

SEX. . . . . .

HEARING STATUS (hearing or deaf) . . . . . .

AGE IN MONTHS. . . . . .BIRTHDATE. . . . . .

DEAFNESS IN FAMILY . . . . . .

HEARING LOSS - RIGHT EAR - PURE TONE AVERAGE . . . . . .

HEARING LOSS - LEFT EAR - PURE TONE AVERAGE . . . . . .

SCHOOL I.Q. . . . . TEST. . . . . .

DATE OF I.Q. TEST. . . . . .

SPECIAL EDUCATION IN MONTHS. . . . . .

DATE OF ADMISSION TO SCHOOL. . . . . .

TEACHER'S ESTIMATE OF LINGUISTIC ABILITY . . . . . .

RAVEN Set A . . . . . .

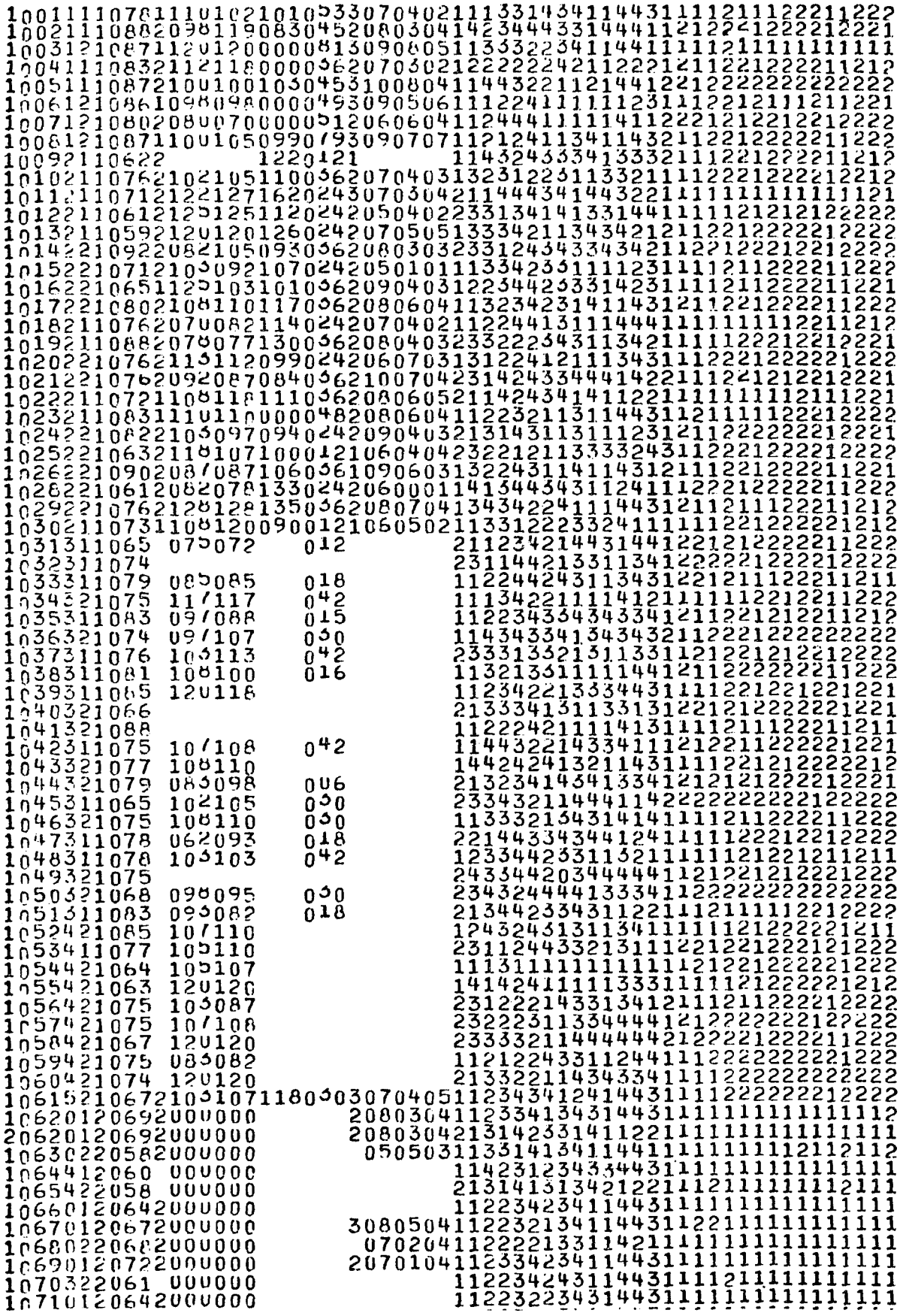
RAVEN Set Ab . . . . . .

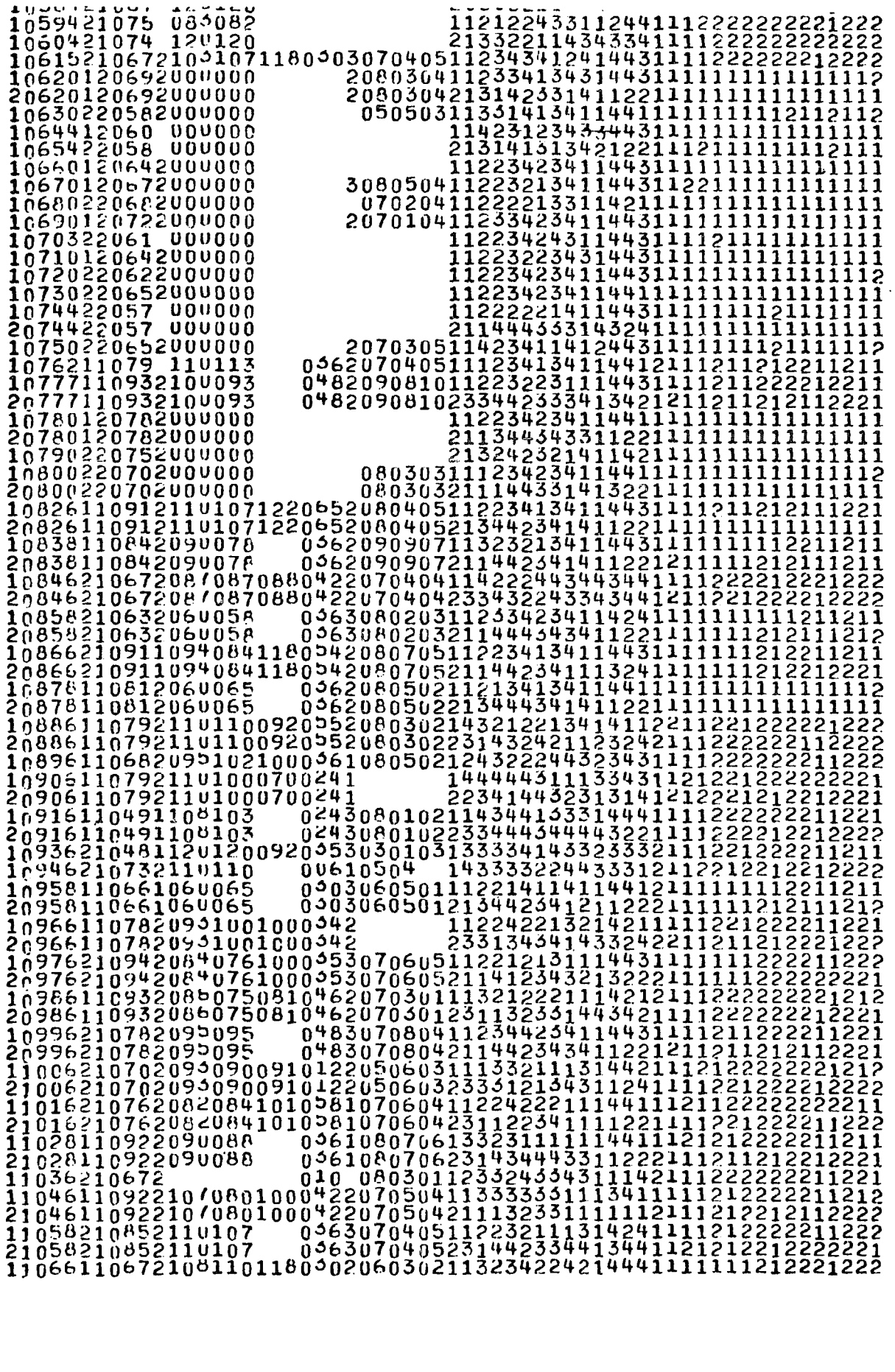
RAVEN Set B . . . . . .

BATTERY TAKEN FIRST. . . . . .

COMMENTS. . . . . .

COLUMNS	
1 - 2 - 3 - 4	Identification number
5	School
6	Sex (1=girl, 2=boy)
7	Hearing status (1=deaf, 2=hearing)
8 - 9 - 10	Age in months
11	Deafness in family (1=yes, 2=no)
12 - 13 - 14	Hearing loss in right ear
15 - 16 - 17	Hearing loss in left ear
18 - 19 - 20	I.Q. (from school records)
21 - 22 - 23	Months of special education
24	Teacher's estimate of language ability (1=below average, 2=average, 3=above average)
25 - 26	Raven A score
27 - 28	Raven Ab score
29 - 30	Raven B score
31	Battery (1=A, 2=B)
32 - 44	Responses to Section I
45 - 60	Responses to Section II (1=correct, 2=incorrect)





APPENDIX II: TEST ITEMS: BATTERY A

BATTERY A

SECTION I

1. Show me: There is no ice-cream.

2. Show me: The boy does not want a bath.

3. Show me: The sheep is running.

4. Show me: There is no cat.

5. Show me: The fish are swimming.

6. Show me: The girl is pushed by the boy.

7. Show me: The pencil is not broken.

8. Show me: The children can sleep.

9. Show me: Father points to mother.

10. Show me: The boy does not want to eat.

11. Show me: The boy has no shoes.

12. Show me: The boys can walk.

13. Show me: Baby kisses mother.

SECTION II

14. Who do you see in the picture?

15. What is yellow?

16. Where is the cup?

17. Who is brushing her teeth?

18. What is on the sink?

19. Is the mother brushing her teeth?

20. Who has a dress?

21. Why does the girl brush her teeth?

22. Whom is mother helping?

23. Why does mother help the girl?

BATTERY A (continued)

24. When does the girl brush her teeth?

25. Do you brush your teeth in school?

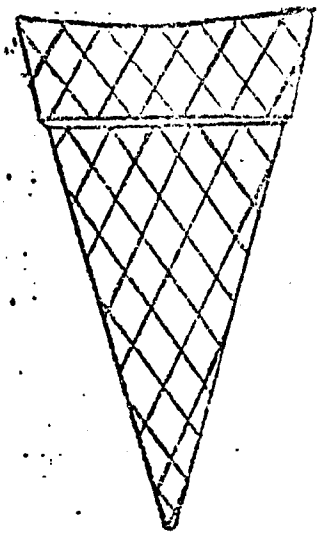
26. Where is the girl?

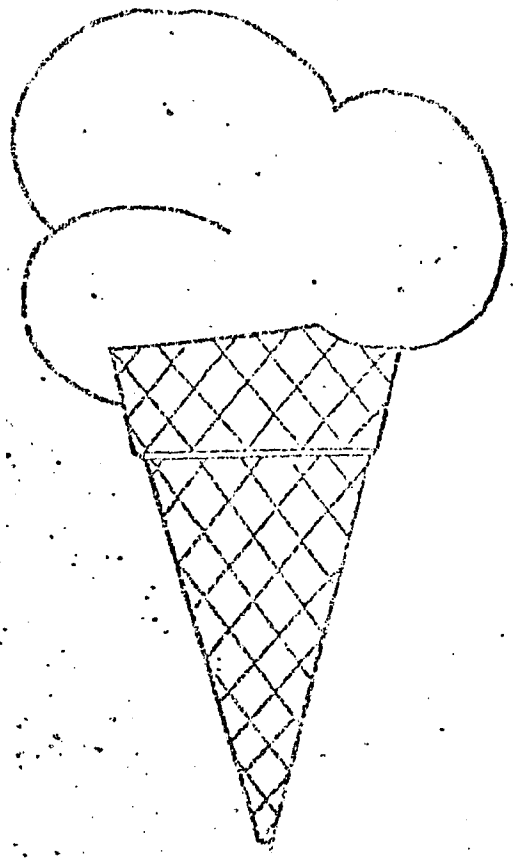
27. When does mother brush her teeth?

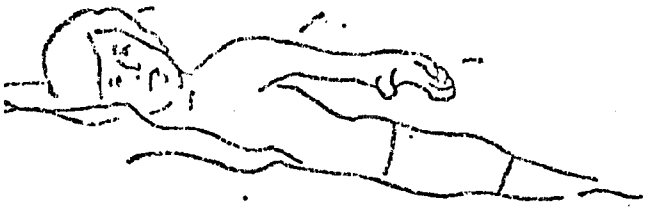
28. What has mother in her hand?

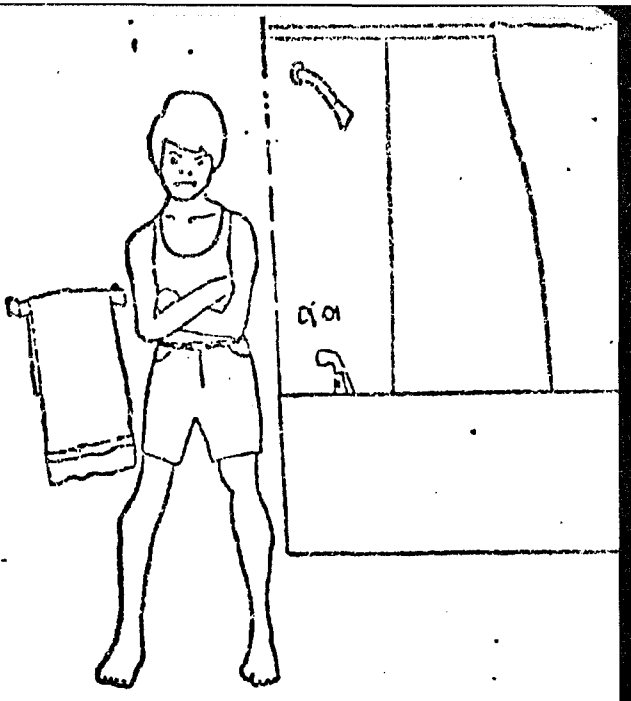
29. What is the girl brushing?

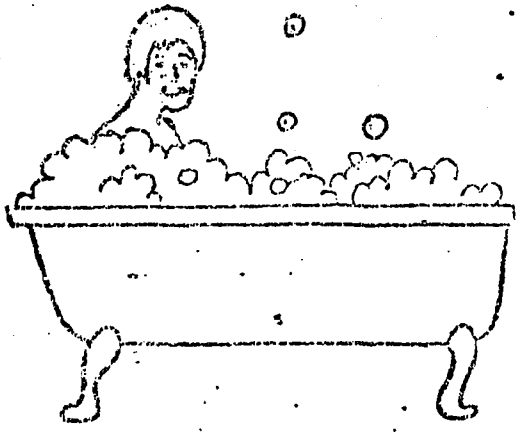
APPENDIX III: PICTURES USED FOR BATTERY A - SECTION I and II

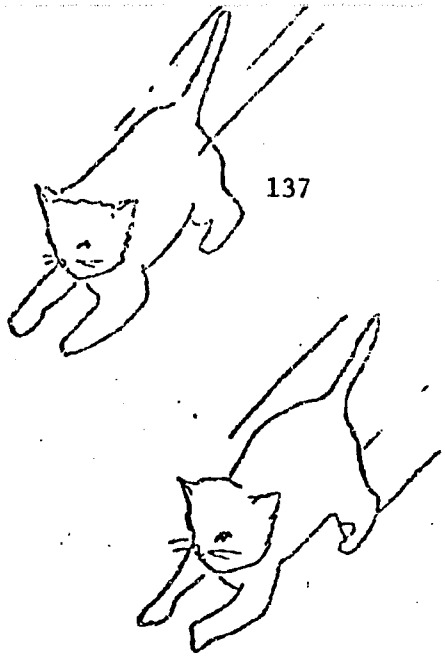


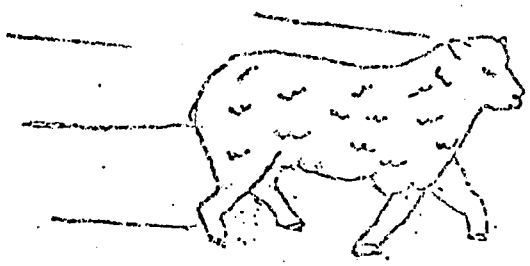


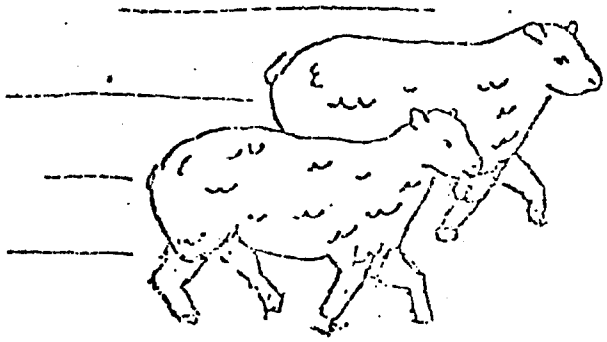


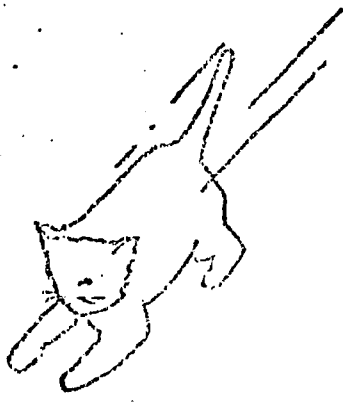


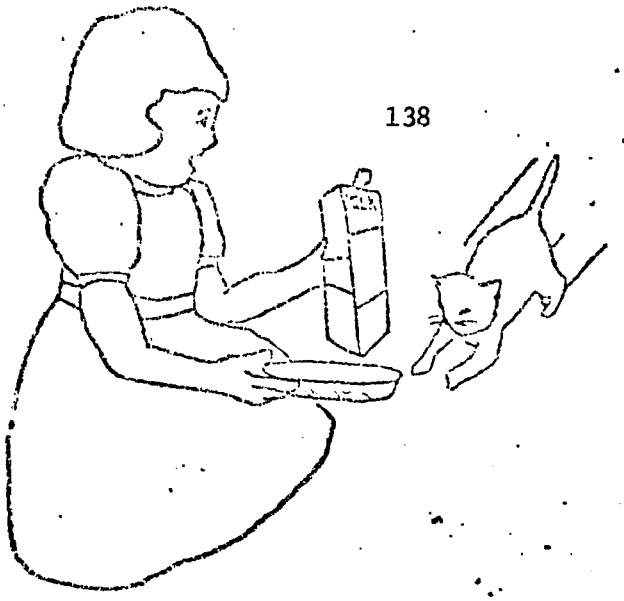


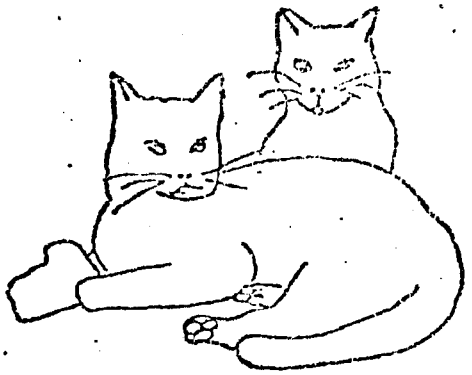


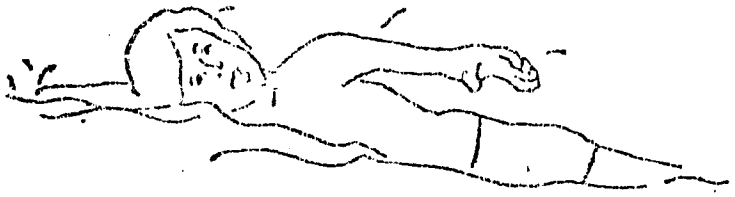


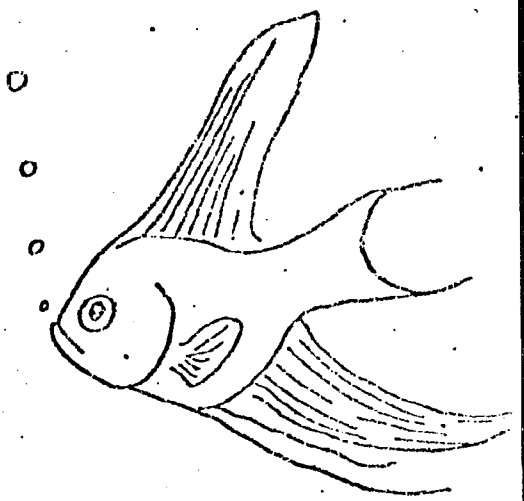


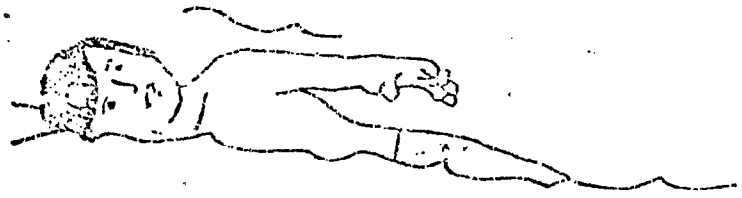


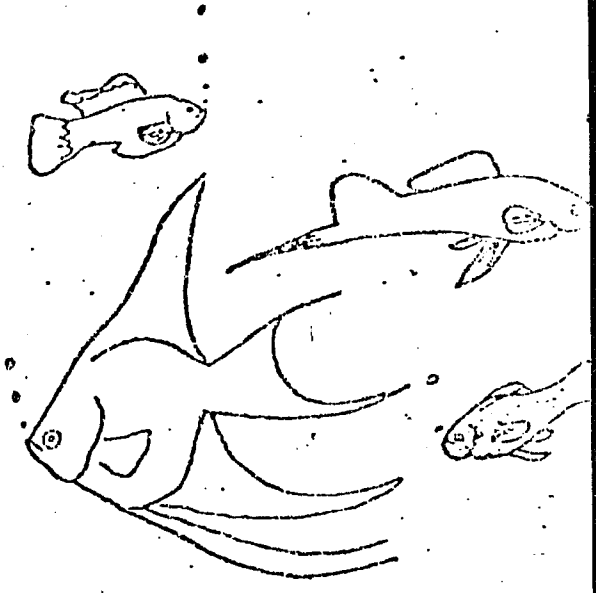


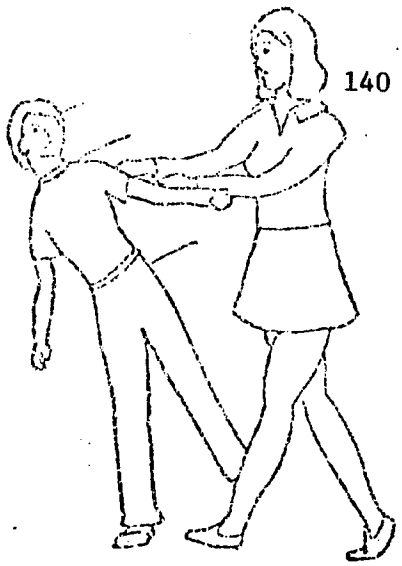


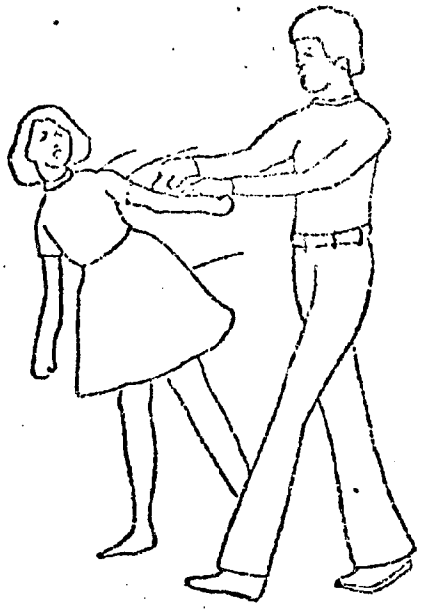


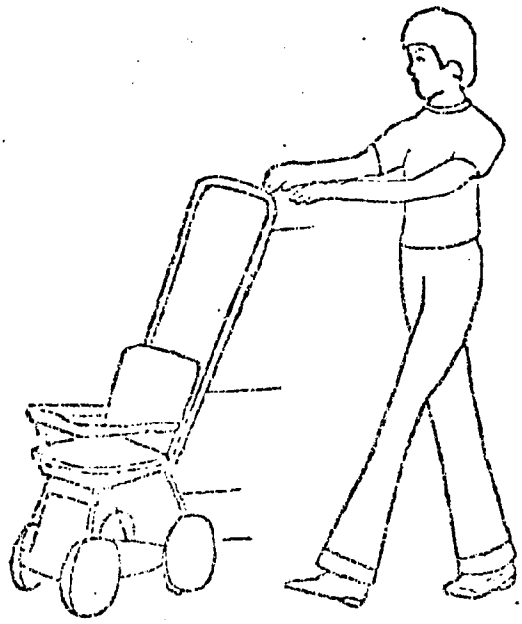


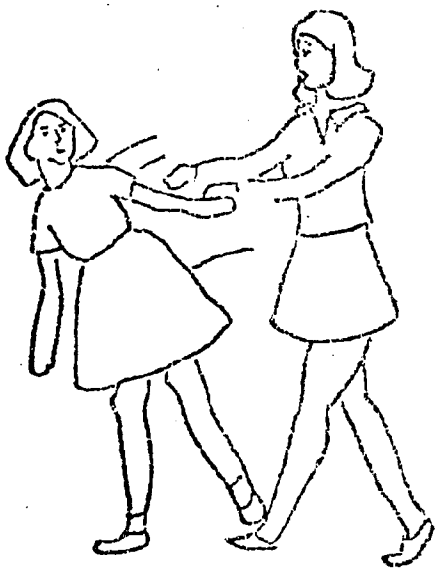


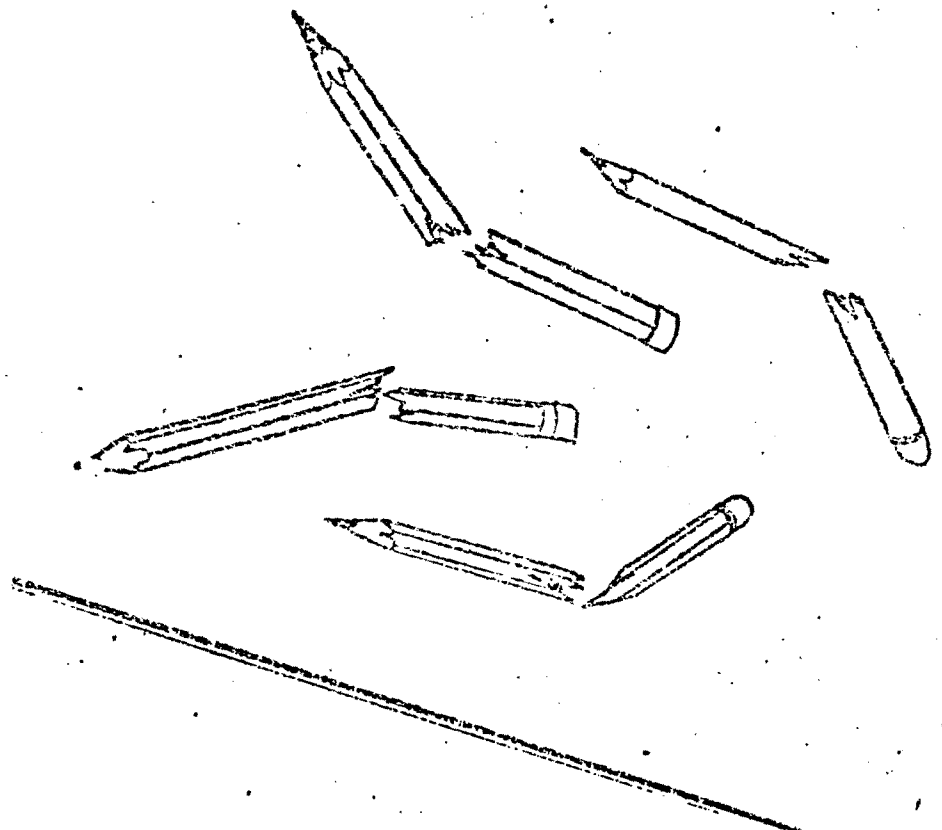


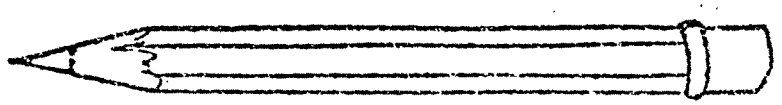


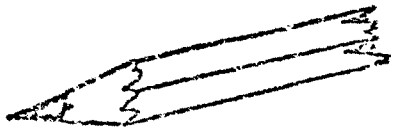


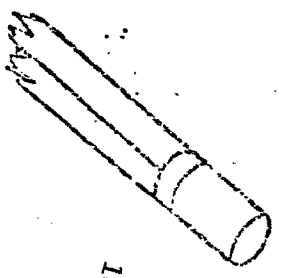


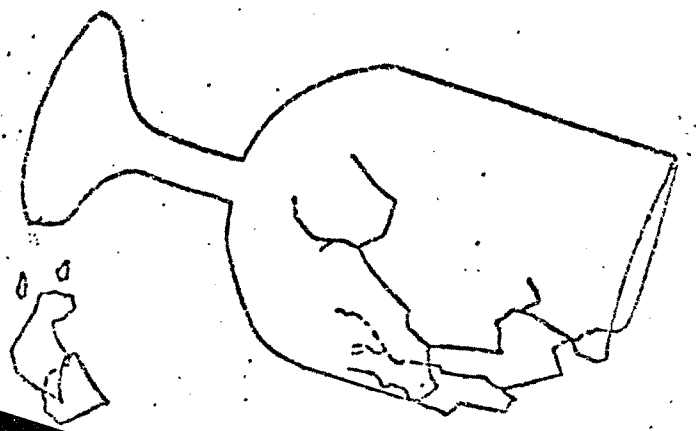


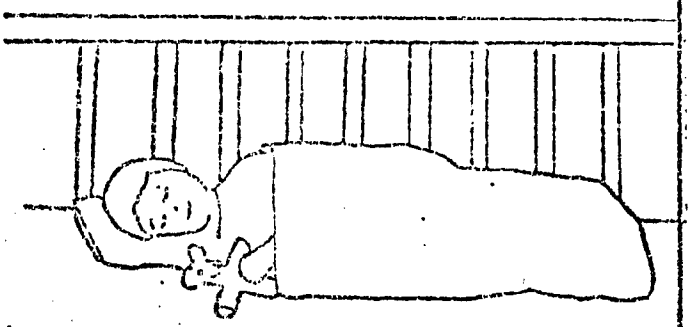


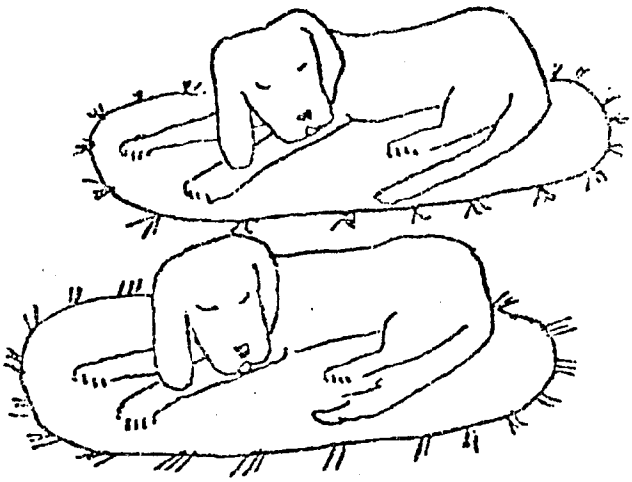


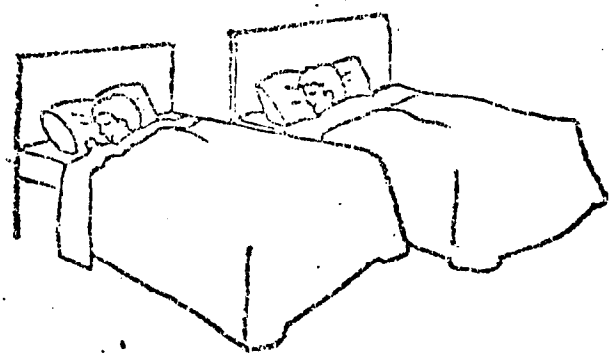


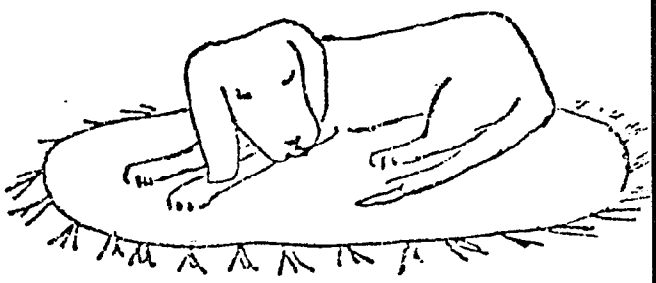


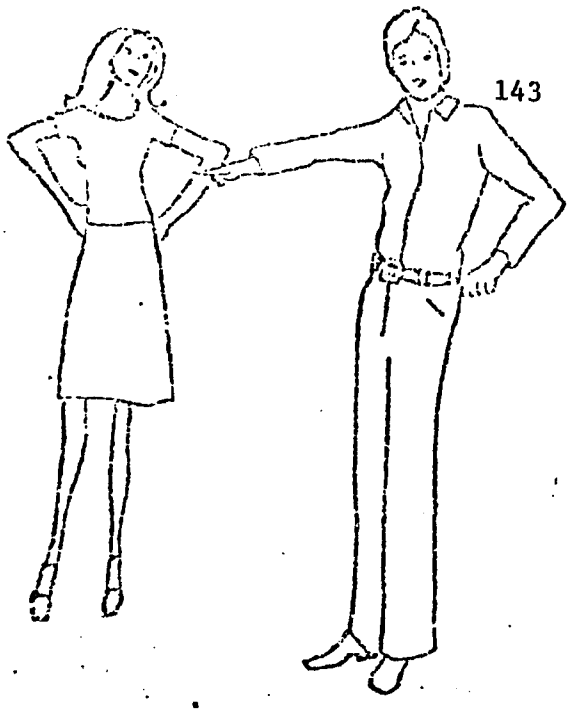


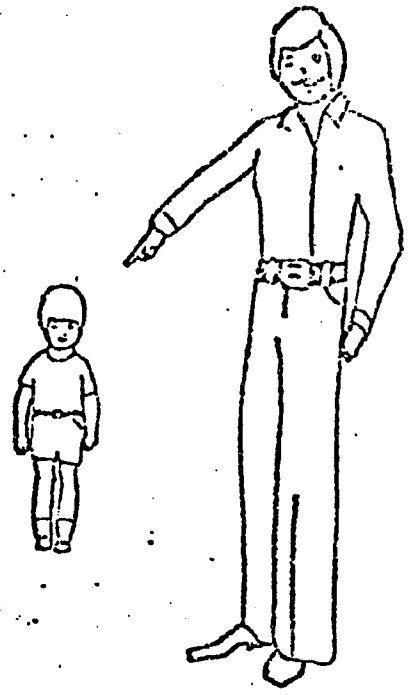


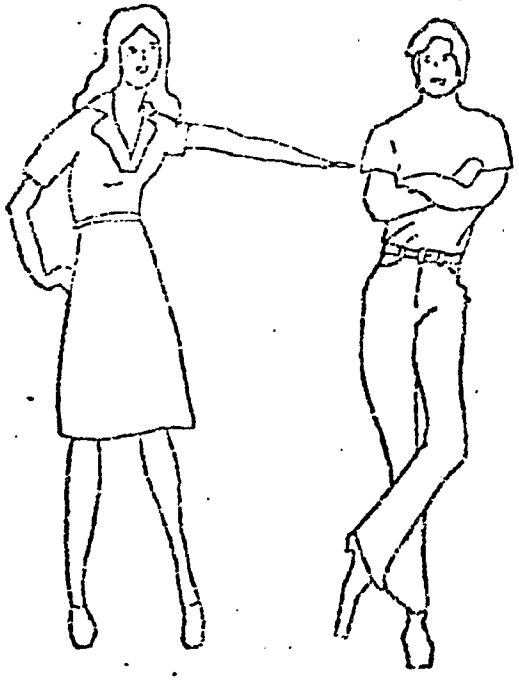


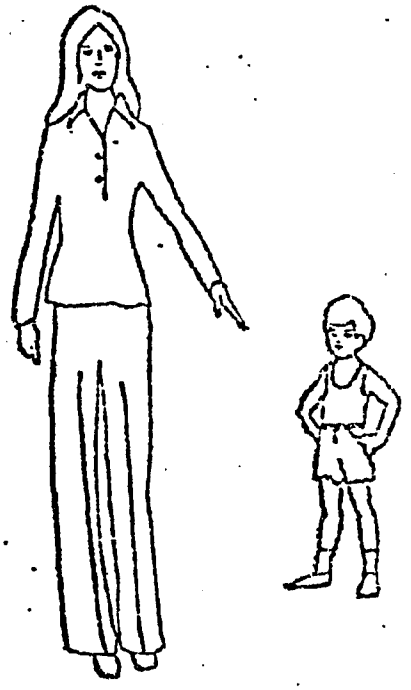


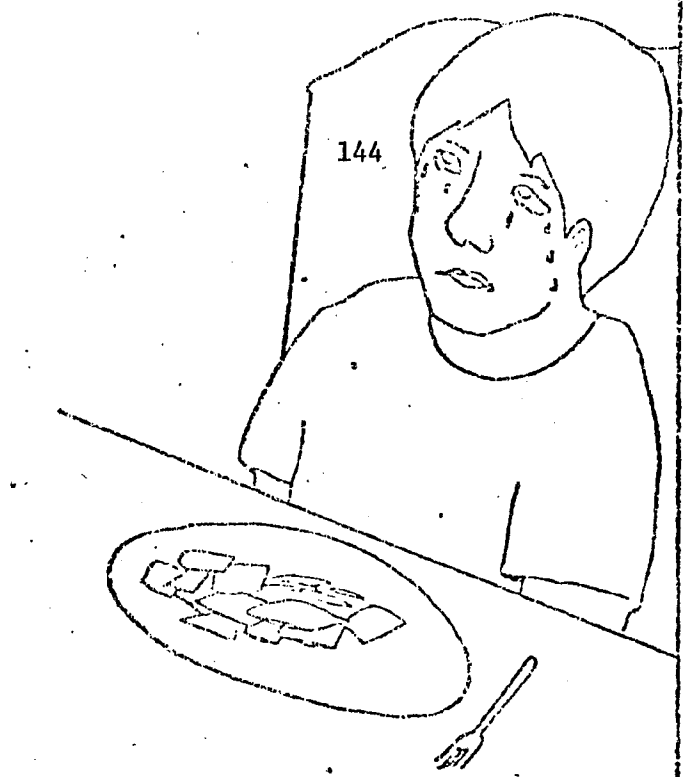


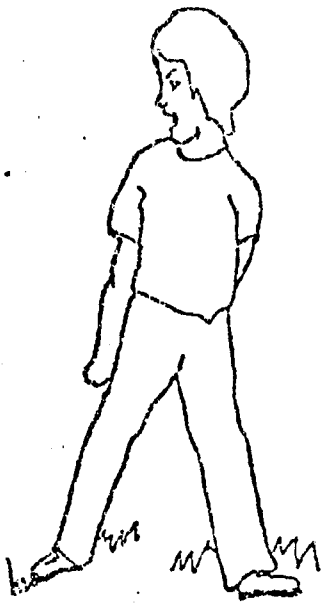


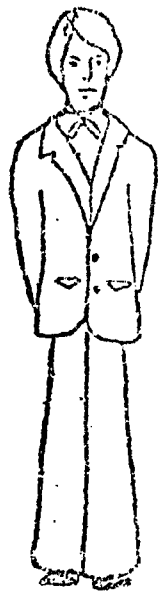


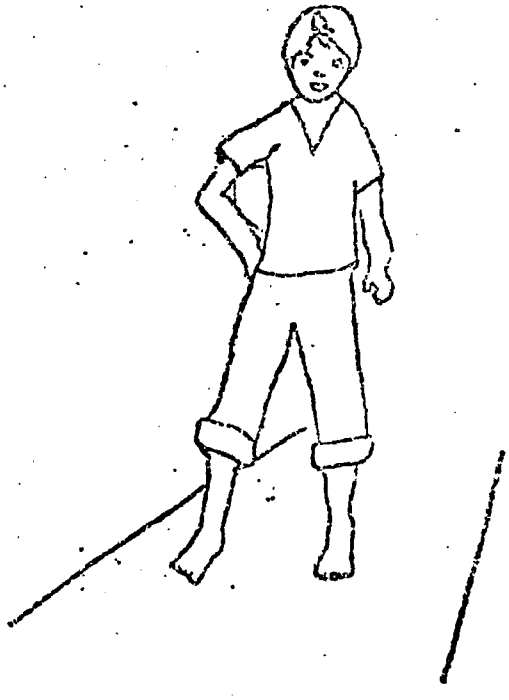


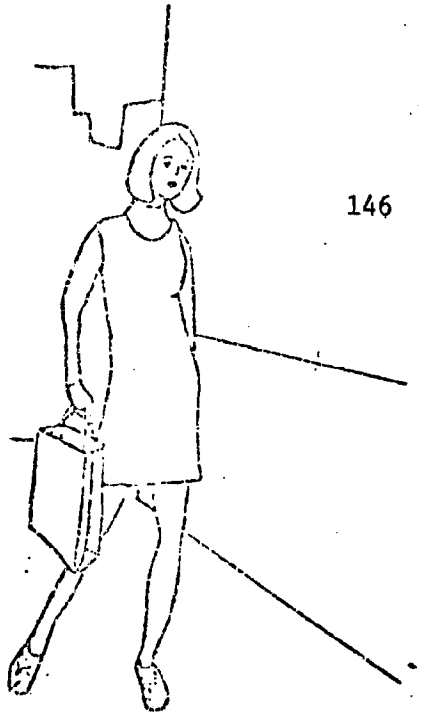


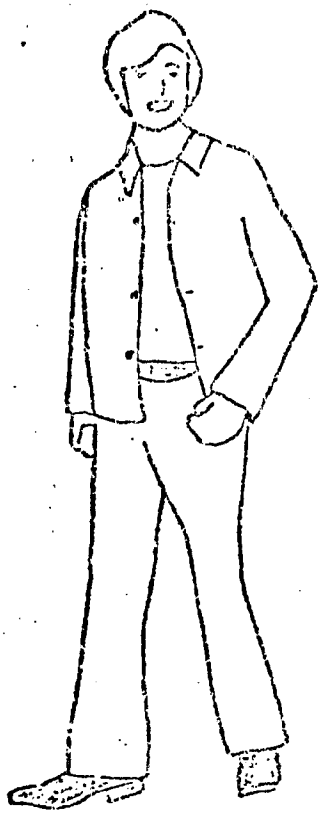


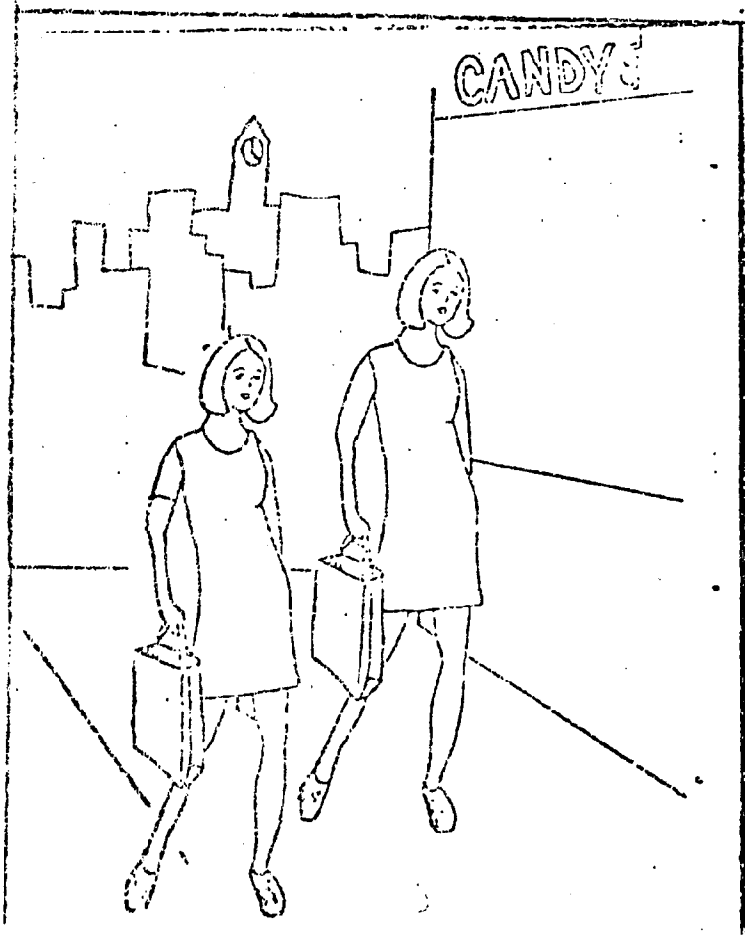








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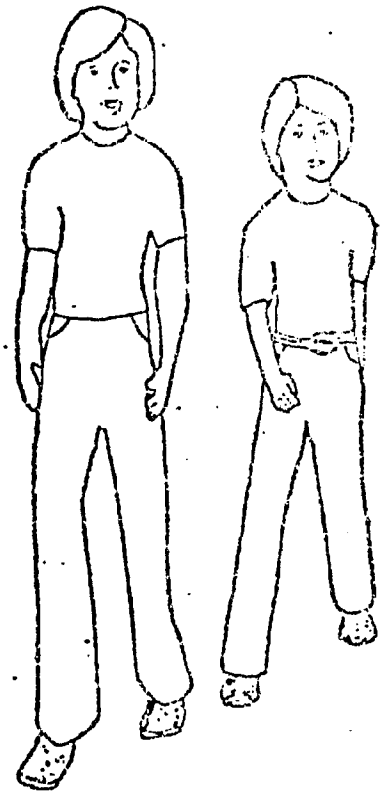
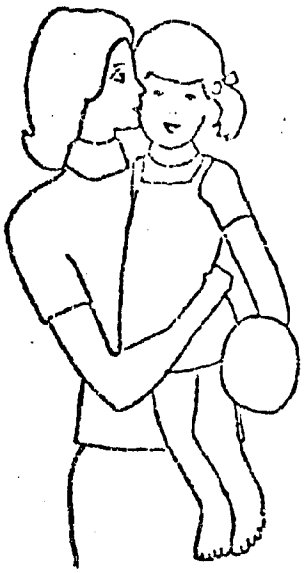
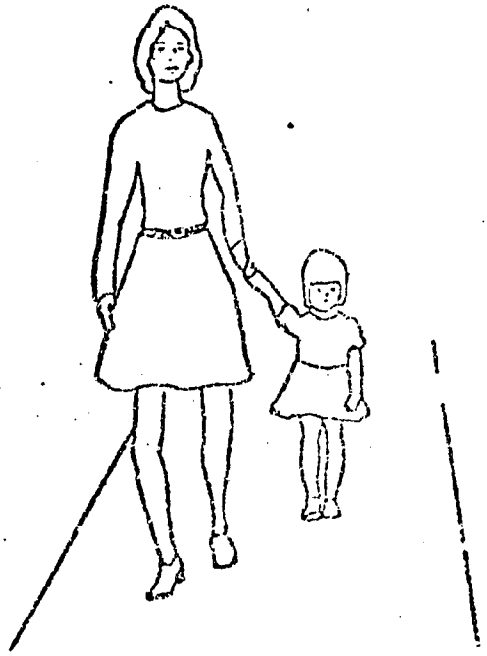
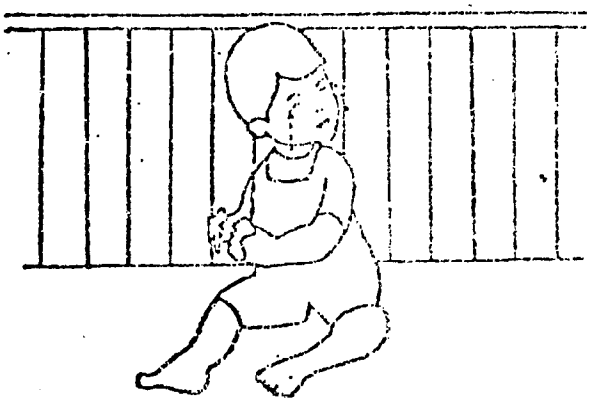
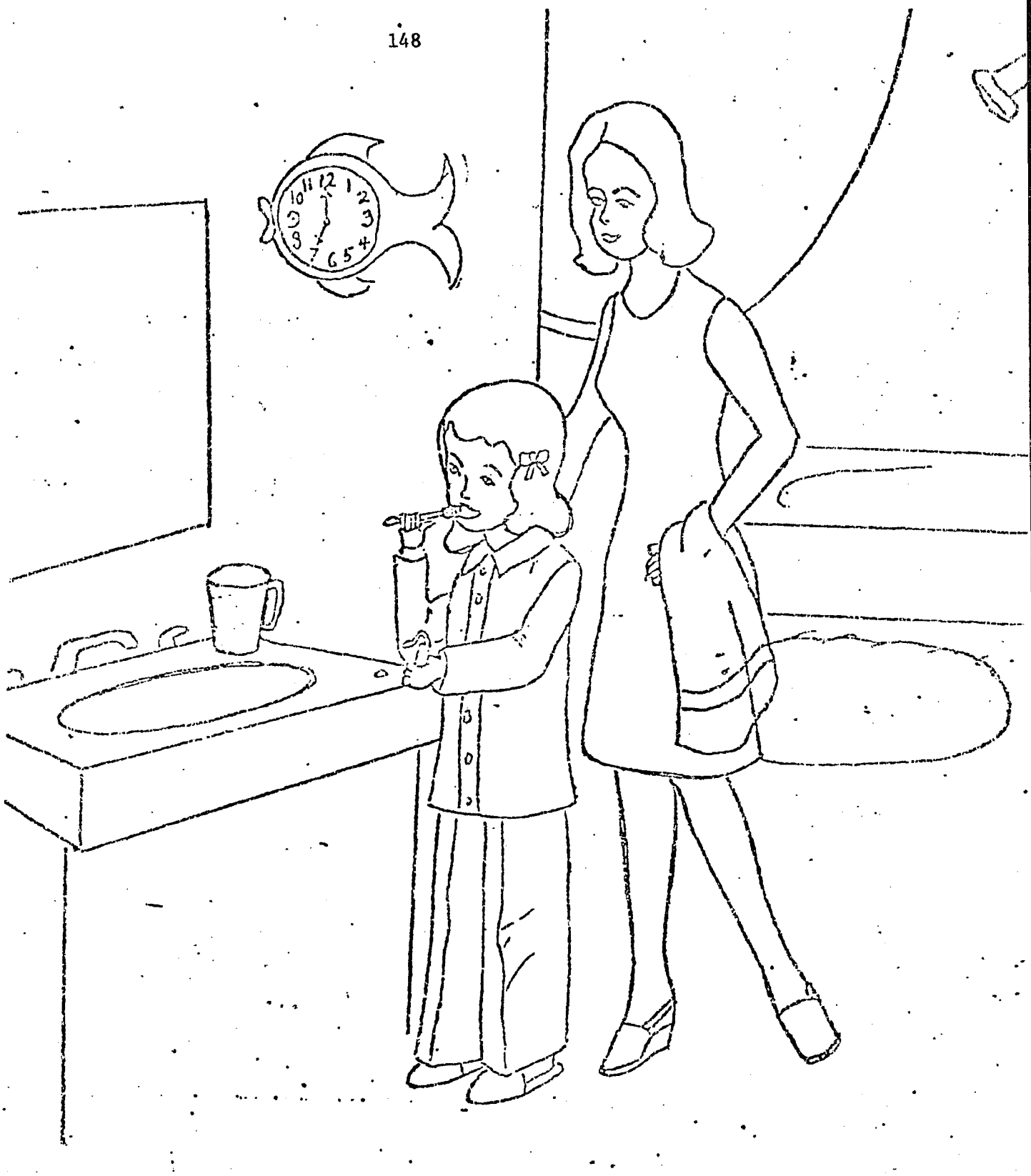










APPENDIX IV: TEST ITEMS - BATTERY B

BATTERY B

SECTION I

1. Show me: The toothbrush is not broken.

2. Show me: The girls can walk.

3. Show me: The child does not want to play.

4. Show me: There are no children.

5. Show me: The fish is swimming.

6. Show me: The boy has no hat.

7. Show me: The boy is pushed by the girl.

8. Show me: Mother kisses baby.

9. Show me: There is no milk.

10. Show me: The girl does not want the juice.

11. Show me: The sheep are running.

12. Show me: Mother points to father.

13. Show me: The children can sleep.

SECTION II

14. Who do you see in the picture?

15. Where is the boy?

16. What is the boy eating?

17. What is yellow?

18. What is on the table?

19. Does the boy eat in school?

20. Who is eating?

21. Why does the boy eat?

22. Is father eating?

23. When will father eat?

24. Who has a cup?

BATTERY B (continued)

25. Where is the cup?

26. Whom is father helping?

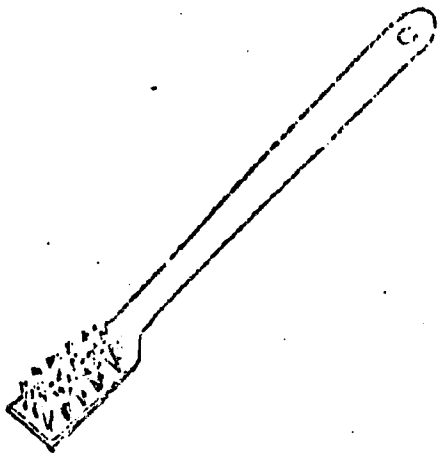
27. When will the boy brush his teeth?

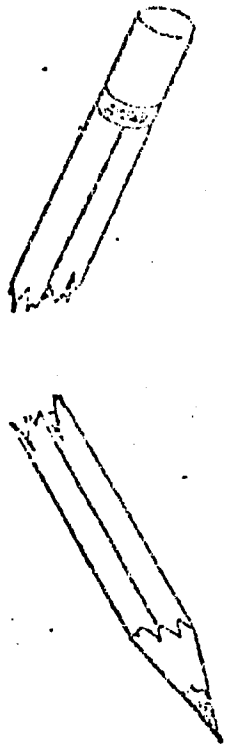
28. Why does father help the boy?

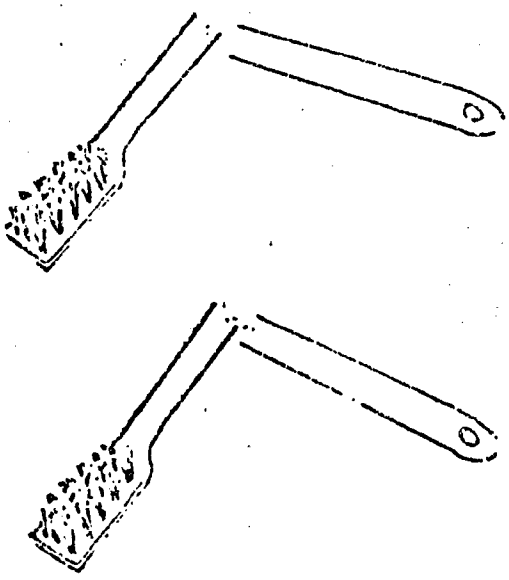
29. What has father in his hand?

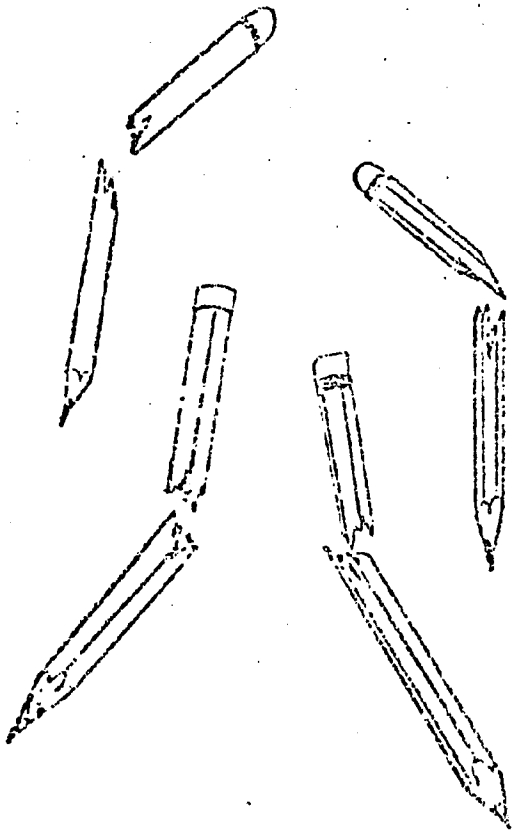
APPENDIX V: PICTURES USED FOR BATTERY B

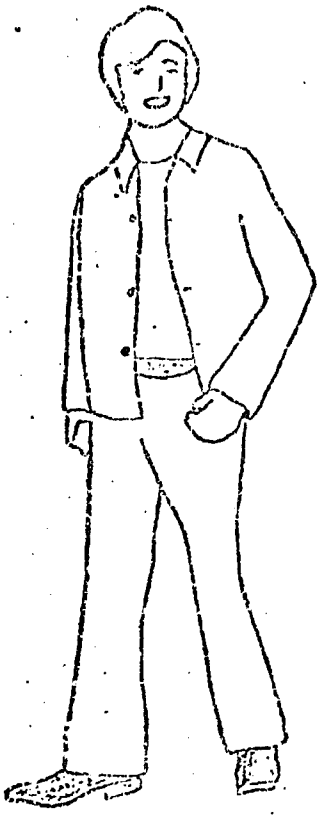
SECTIONS I and II

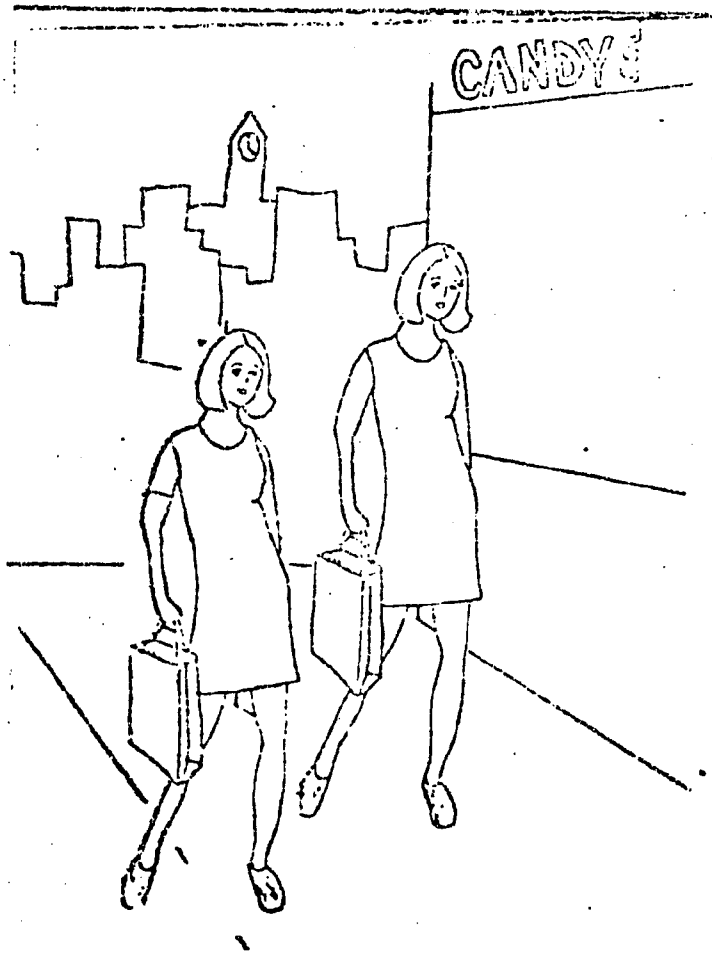








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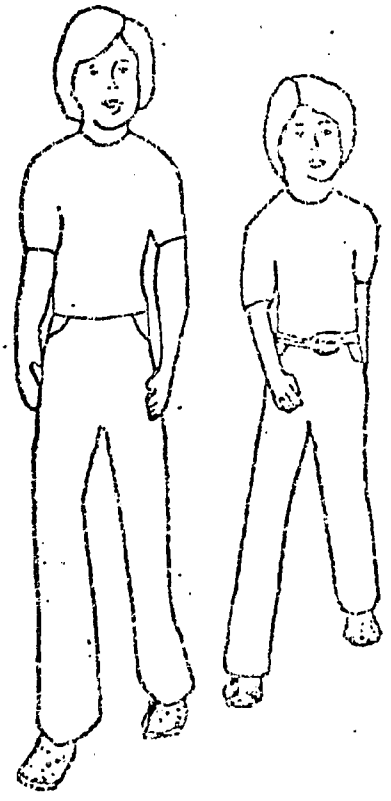

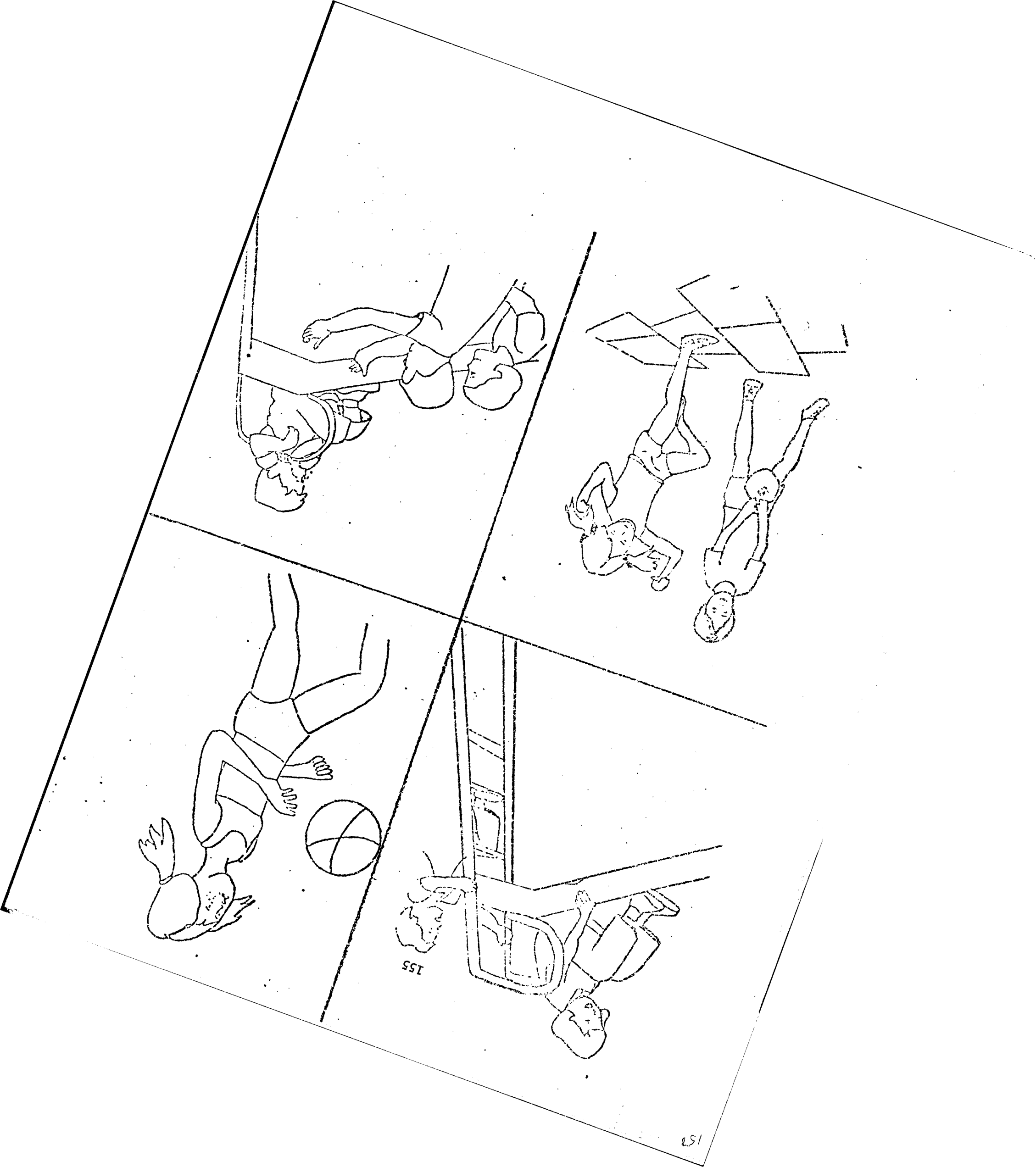

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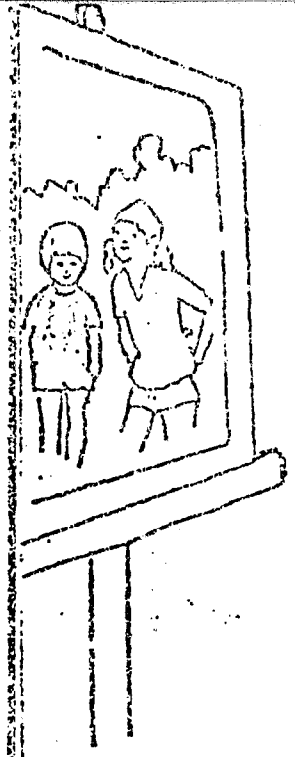

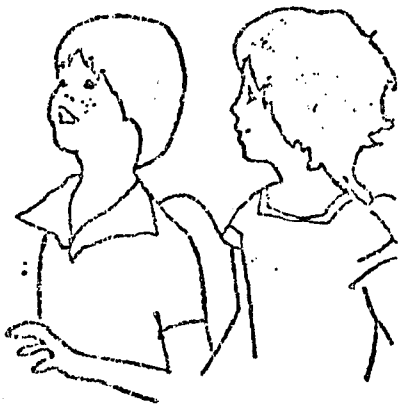

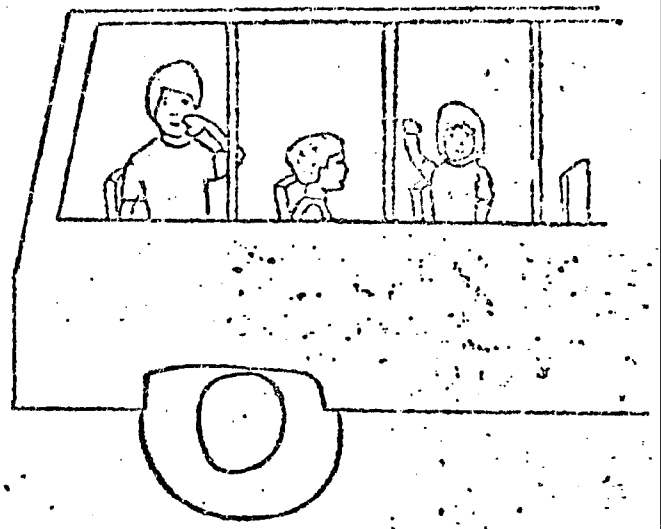

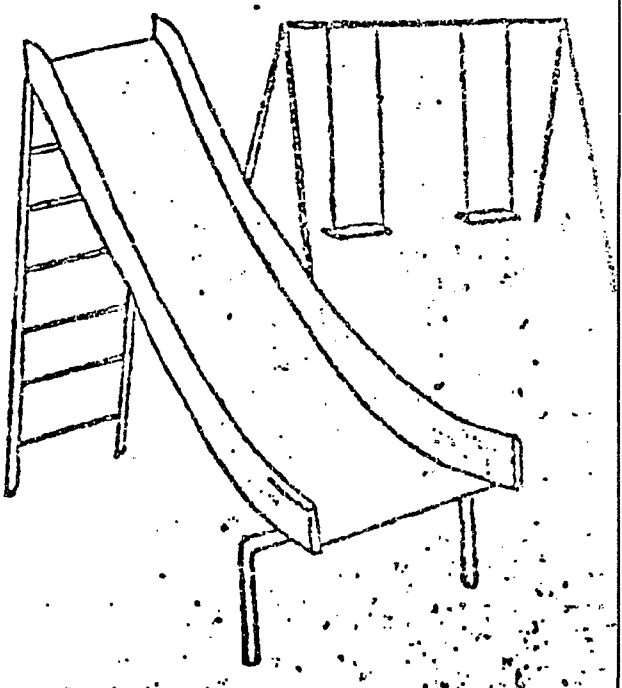

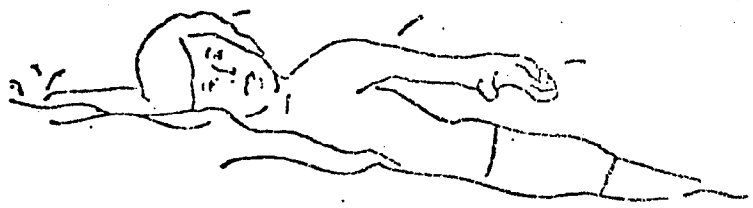

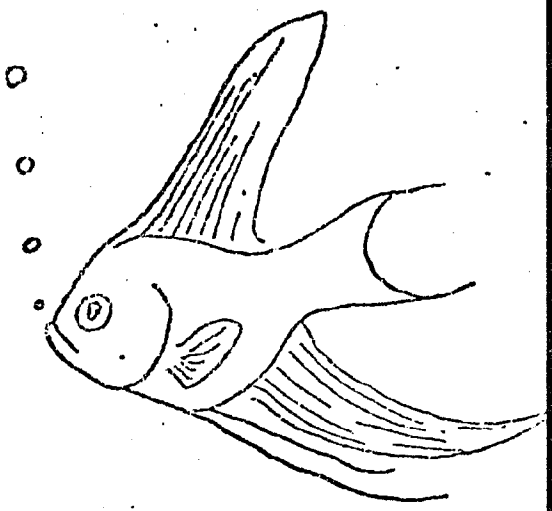

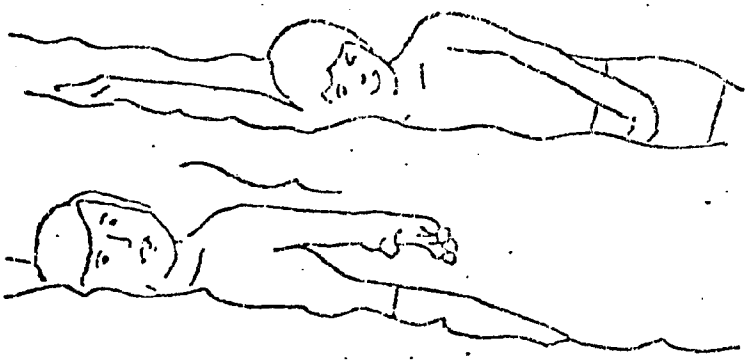

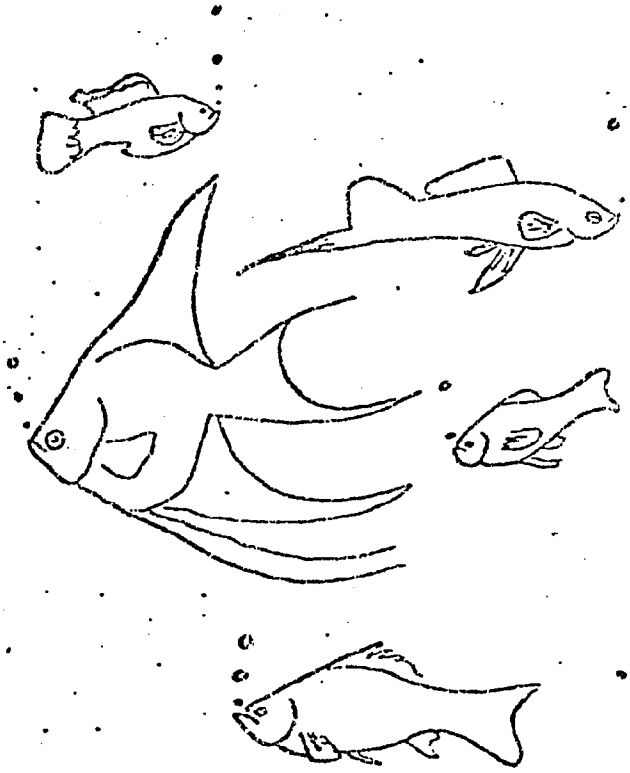

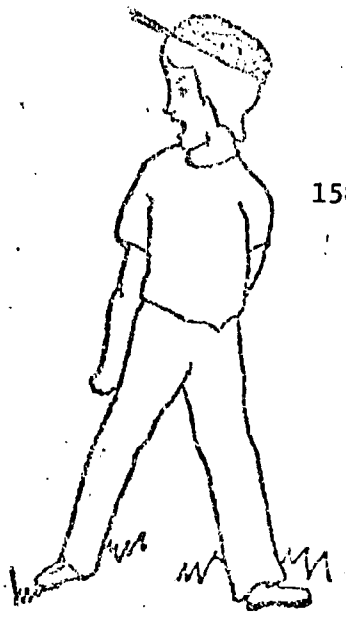

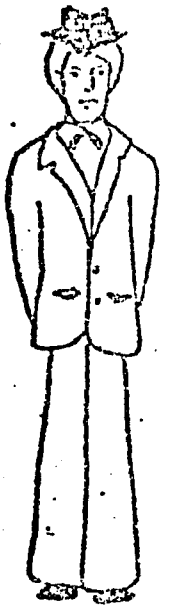

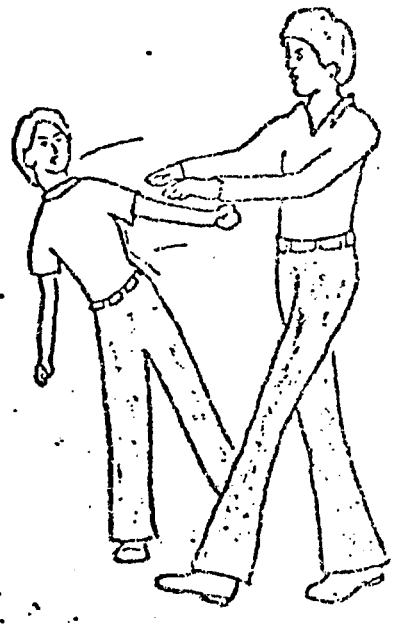

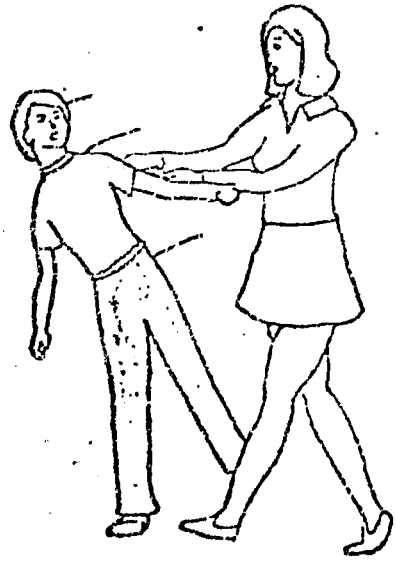

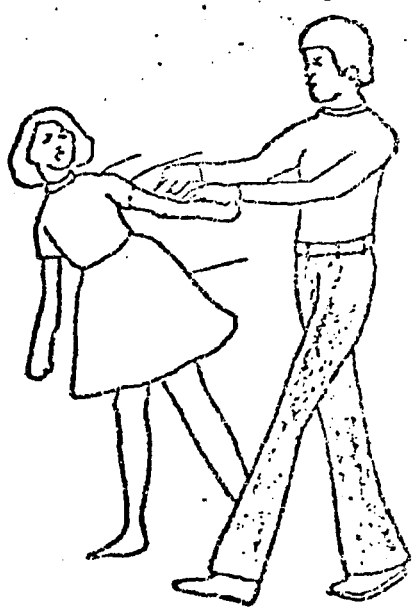

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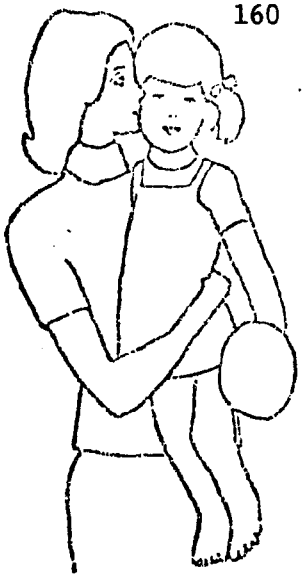

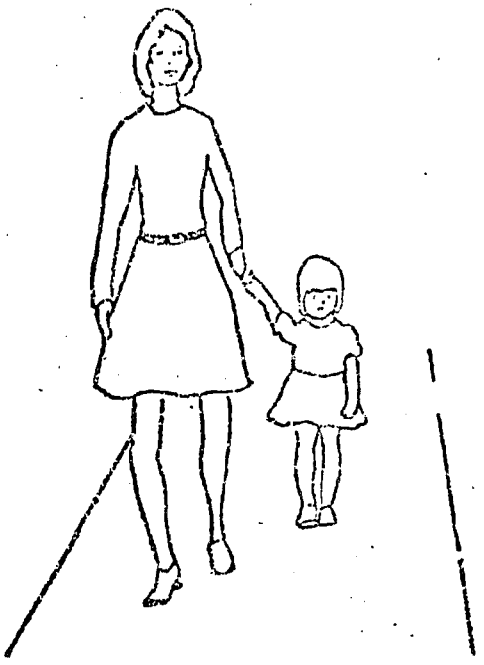

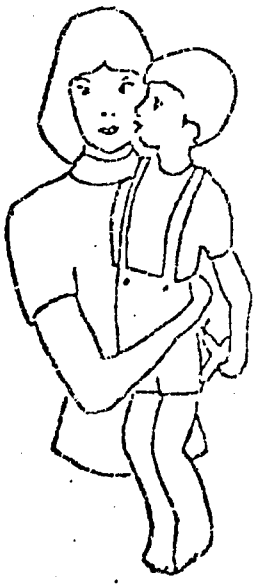

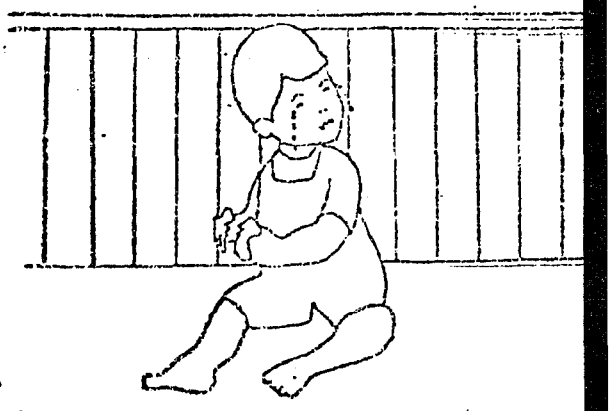


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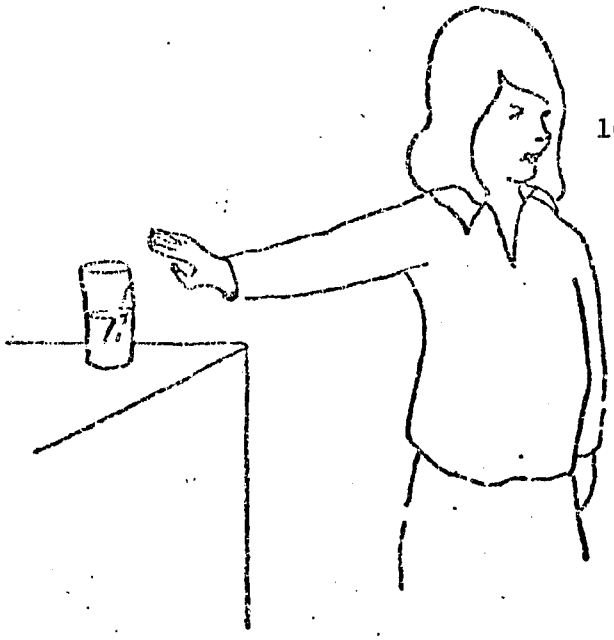

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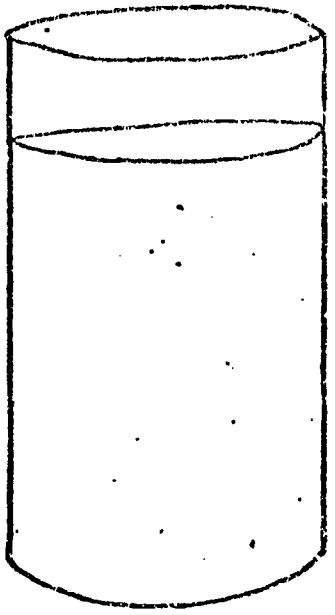

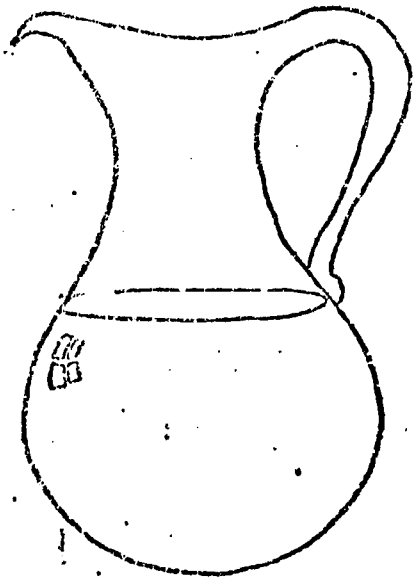

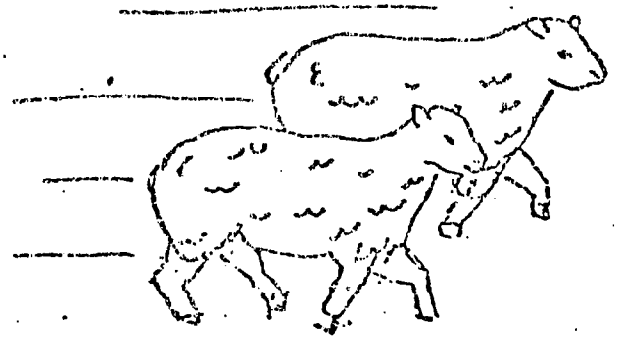

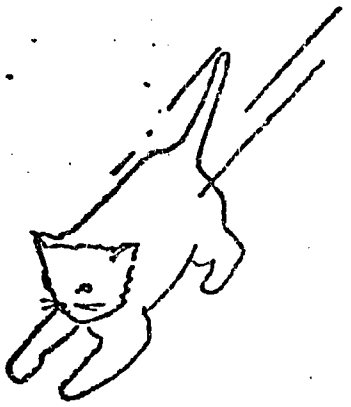

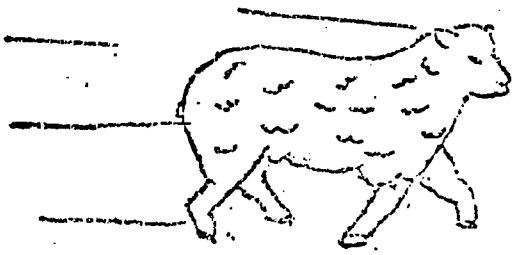

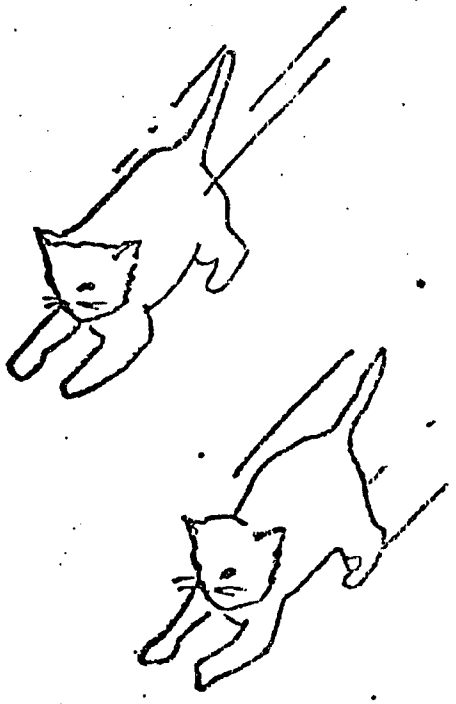

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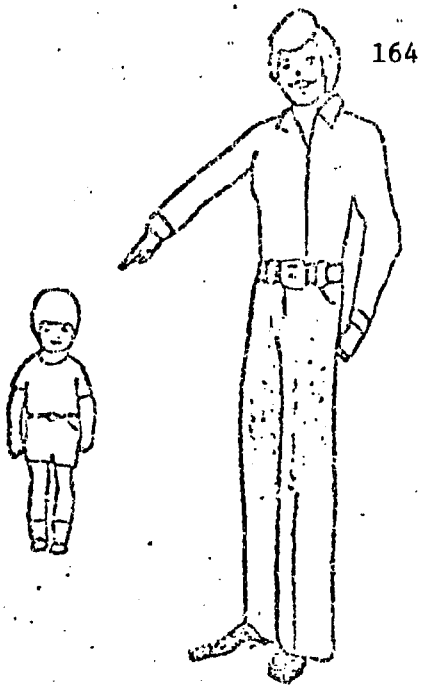
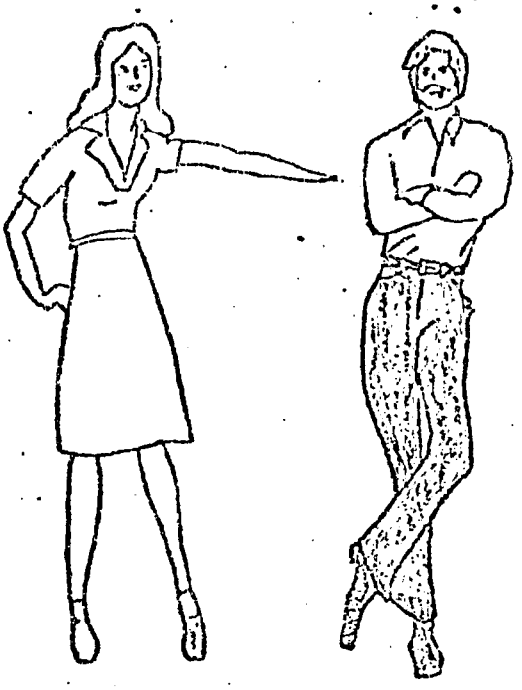
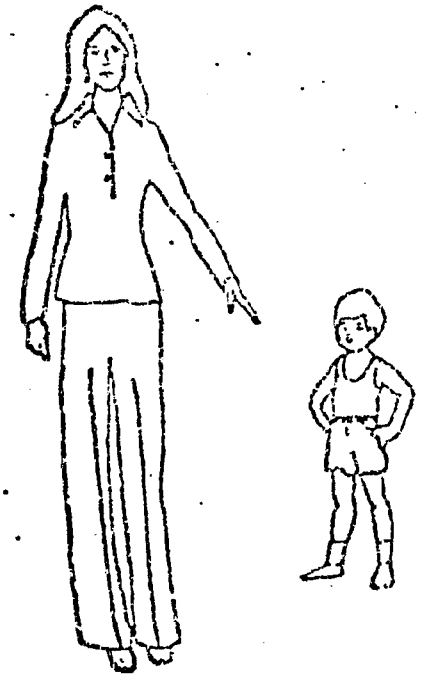
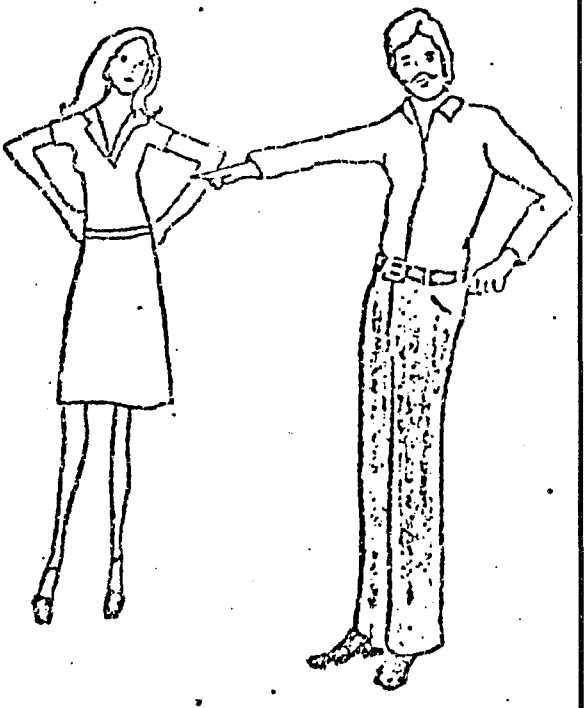
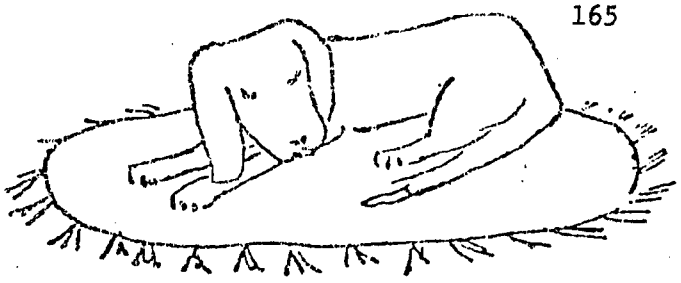
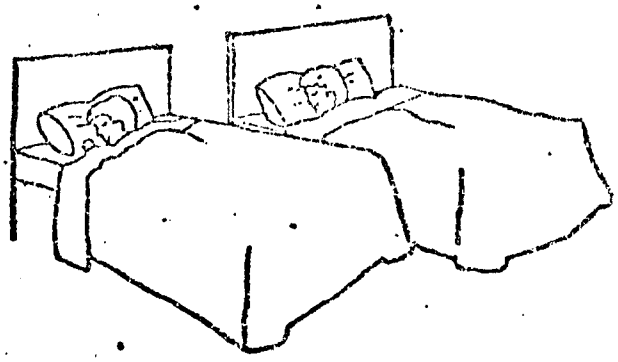


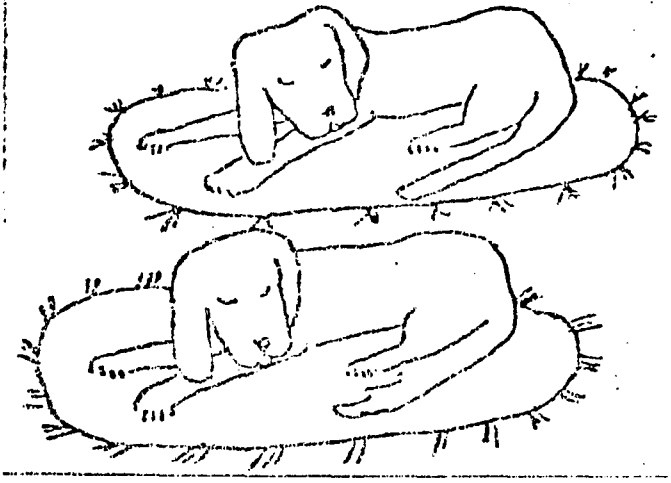


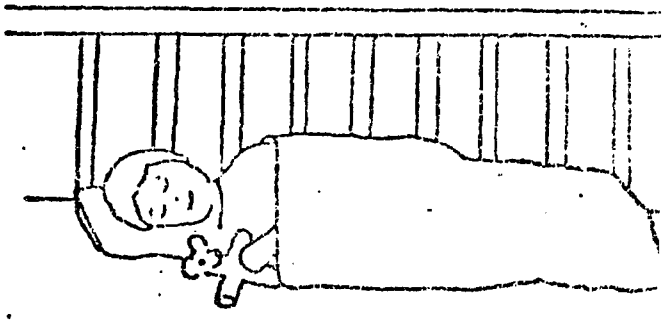


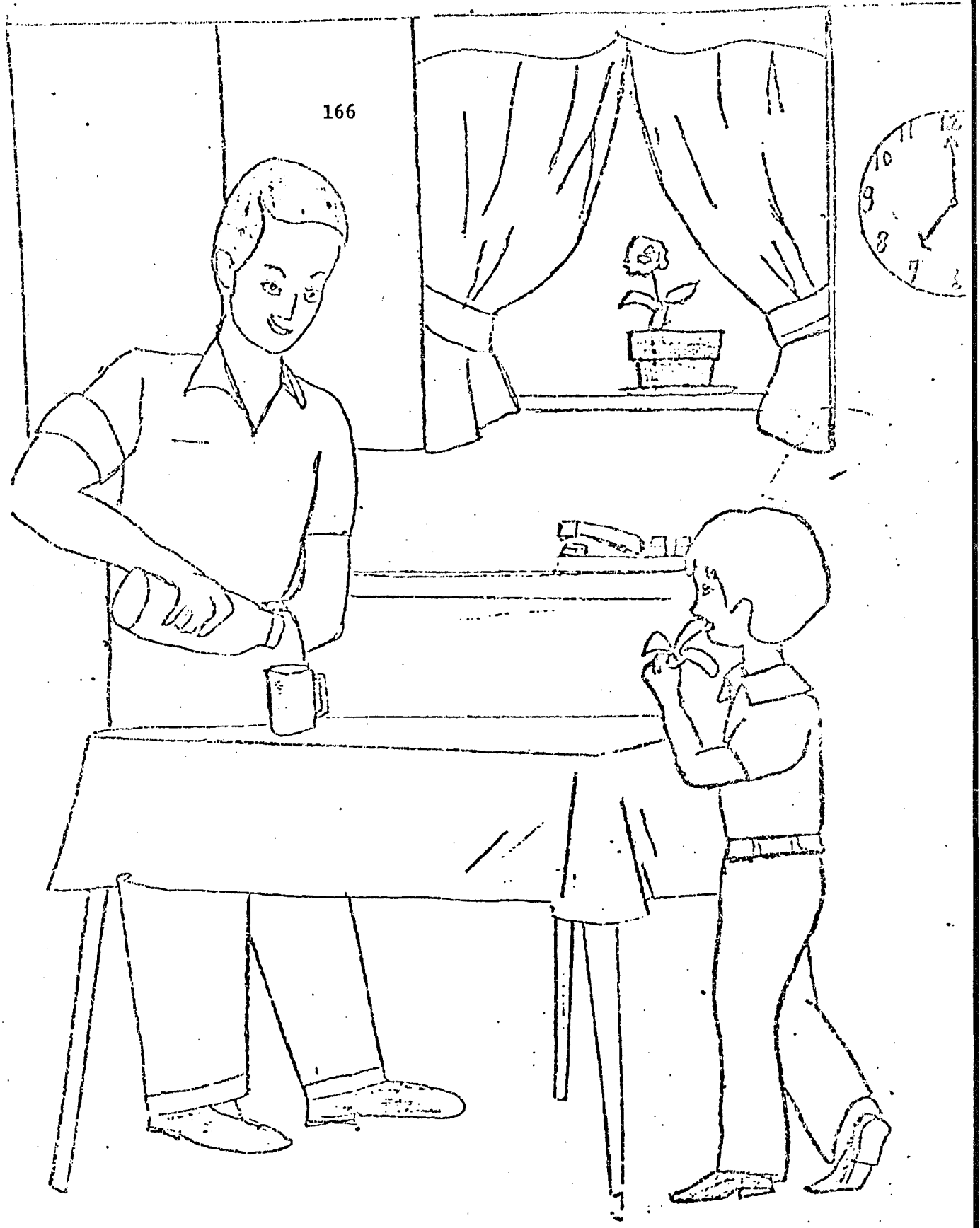












APPENDIX VI: TEST ITEMS: MODIFIED VERSION OF THE SYNTAX TEST

SYNTAX TEST

NAME. . . . . .

DATE. . . . . .

SECTION I

1. Show me: There is no child.
2. Show me: There is no cat.
3. Show me: The boy does not want a bath.
4. Show me: The girl does not want the juice.
5. Show me: The toothbrush is not broken.
6. Show me: The boy is not asleep.
7. Show me: The girl is pushed by the boy.
8. Show me: The baby is kissed by the mother.
9. Show me: Mother touches father.
10. Show me: The cat chases the sheep.
11. Show me: The girls can walk.
12. Show me: The fish bites the hook.
13. Show me: The pencil broke.
14. Show me: The sheep run.

SECTION II

PICTURE A

15. Does the girl brush her teeth?
16. Who is the mother helping?
17. Is mother brushing her teeth?
18. Who is wearing a dress?
19. What is the girl brushing?
20. What is yellow?
21. Where is the cup?

SYNTAX TEST con't

22. Why is the girl brushing her teeth?

23. When does mother brush her teeth?

PICTURE B

24. Who is father watching?

25. Is the father eating a banana?

26. Who is eating a banana?

27. Does the boy eat a banana?

28. What is father pouring?

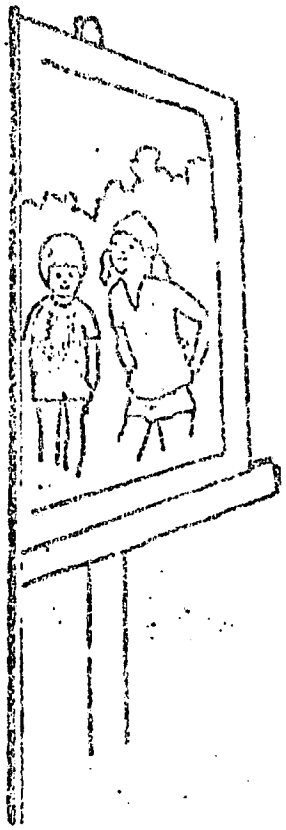
29. Where is the flower?

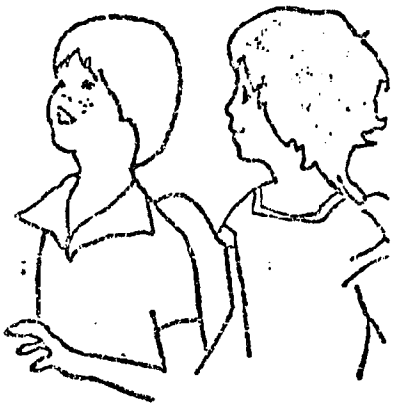
30. What is blue?

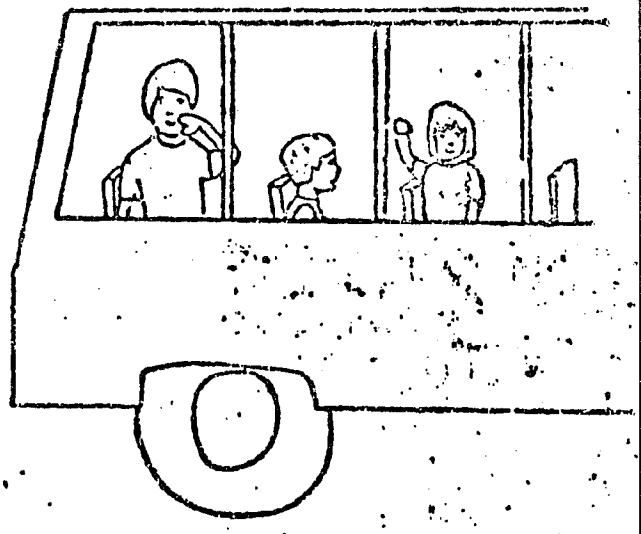
31. Why is father helping the boy?

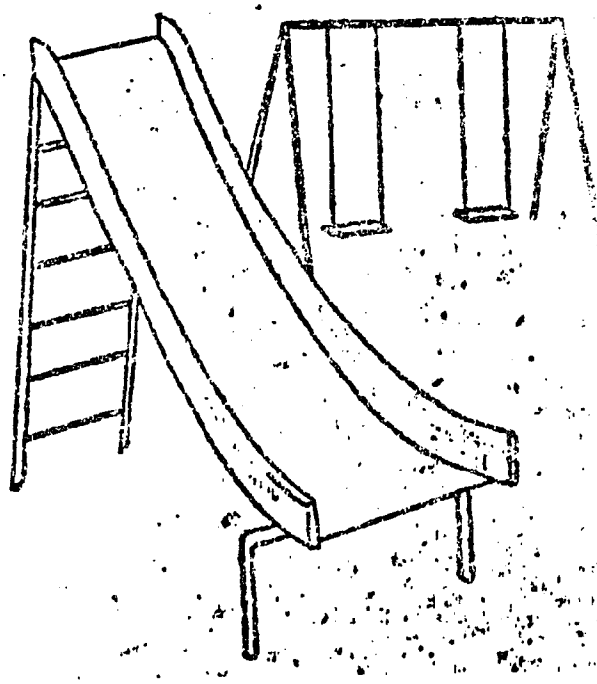
32. When does father drink his milk?

APPENDIX VII: PICTURES USED FOR MODIFIED VERSION OF THE SYNTAX TEST









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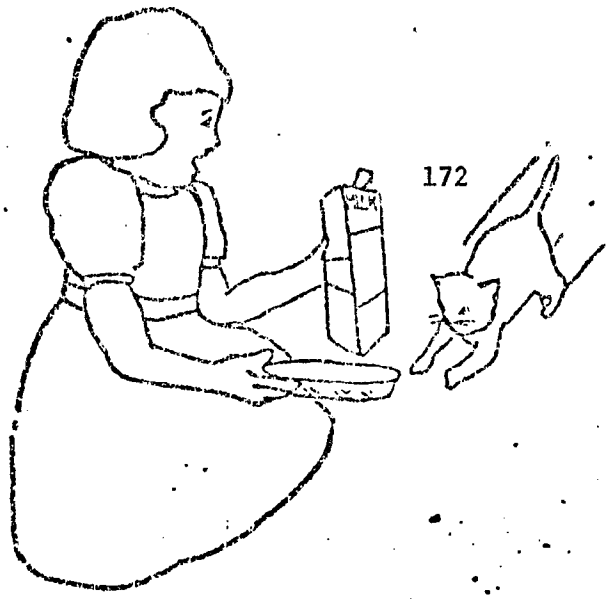

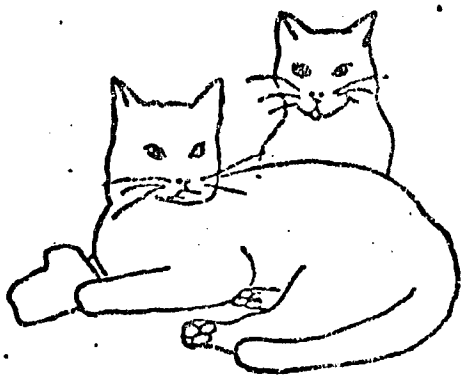

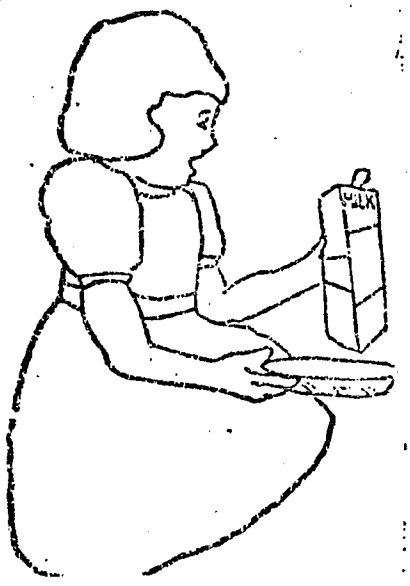

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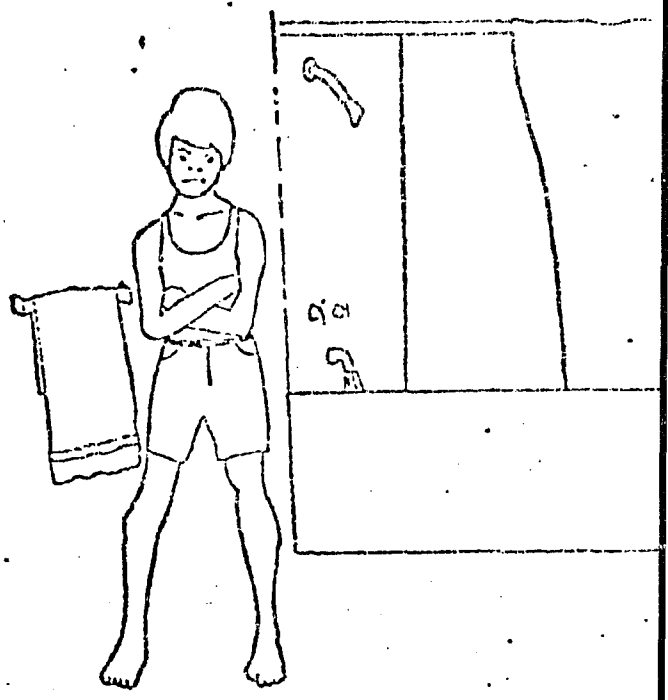

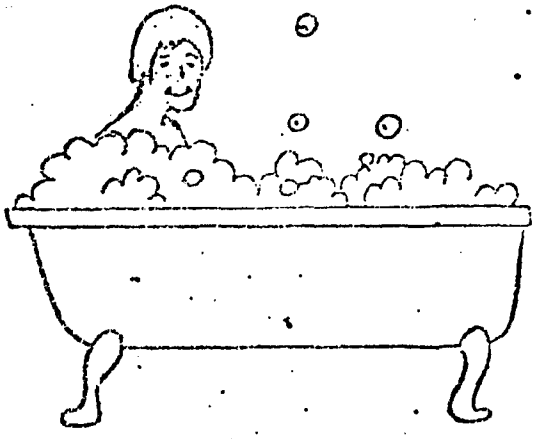

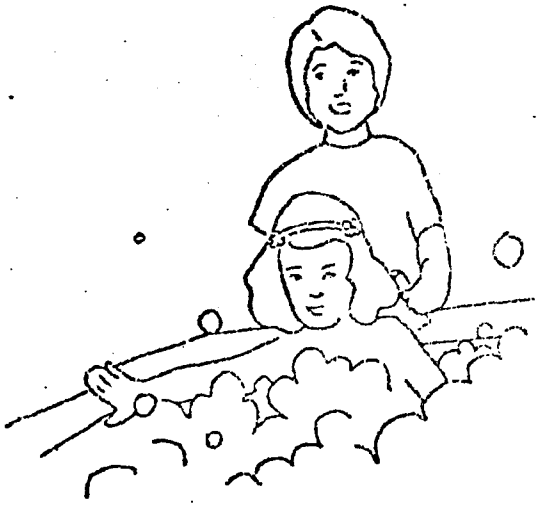

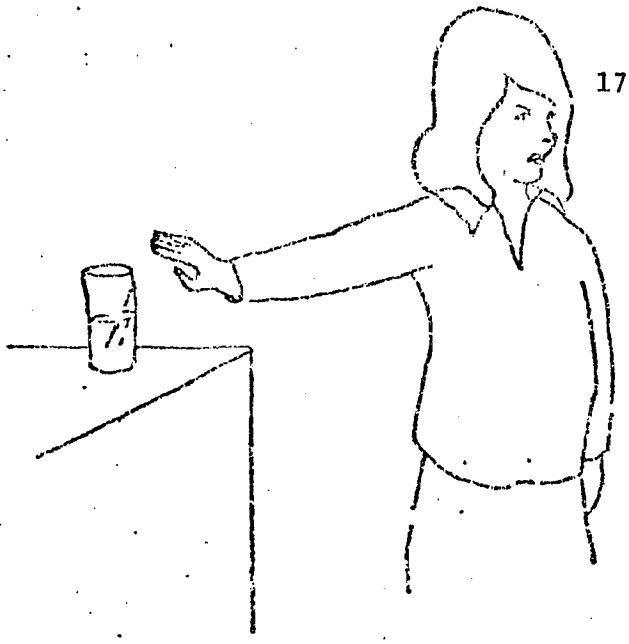

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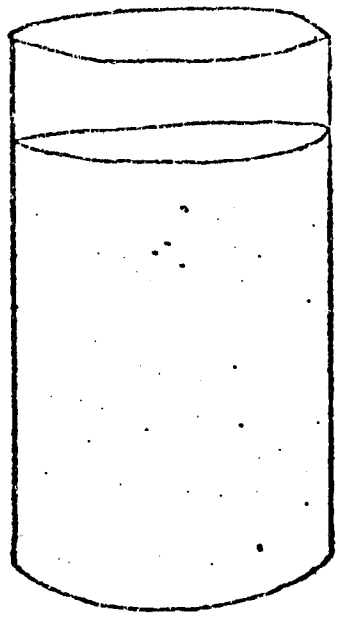

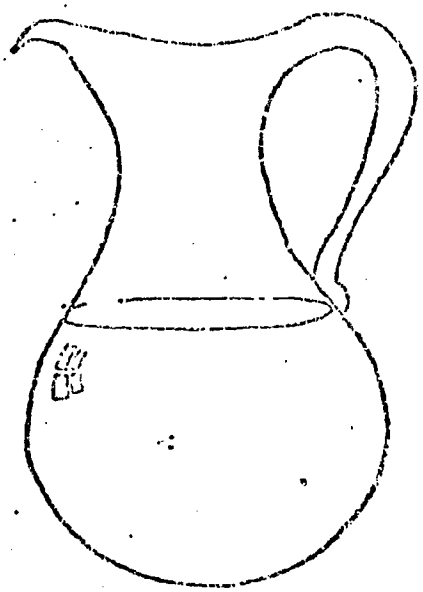

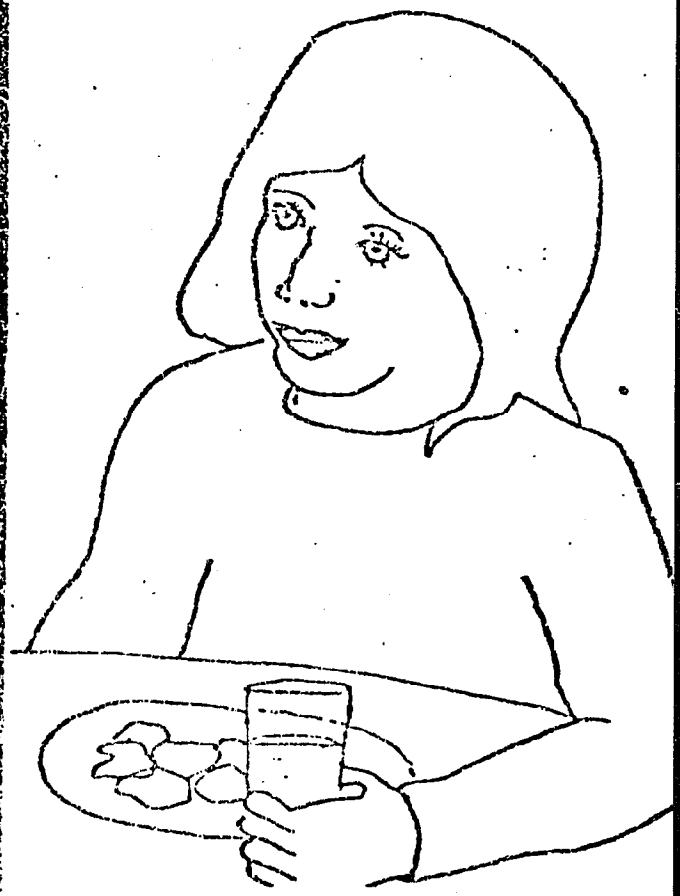

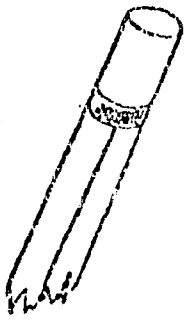

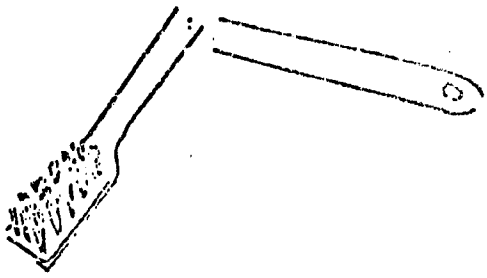

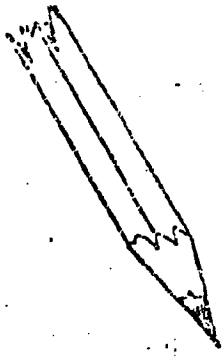

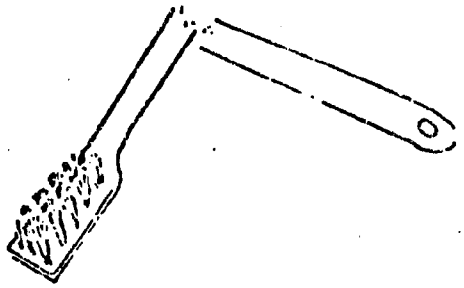

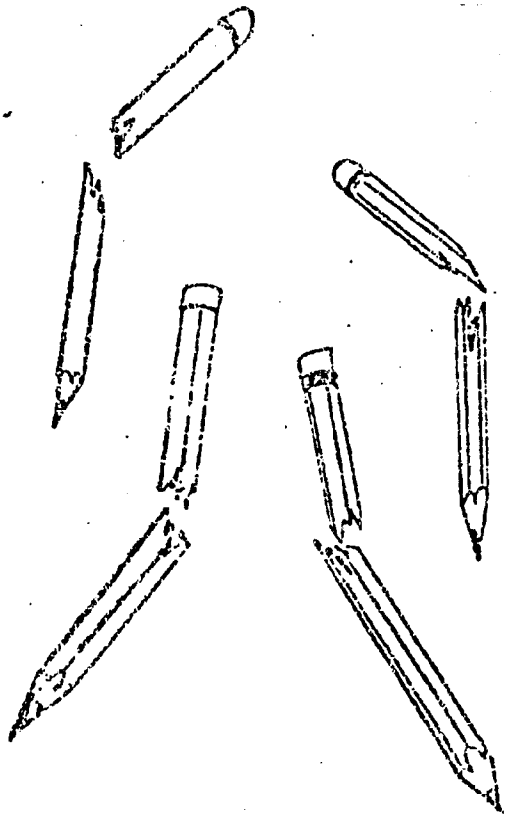

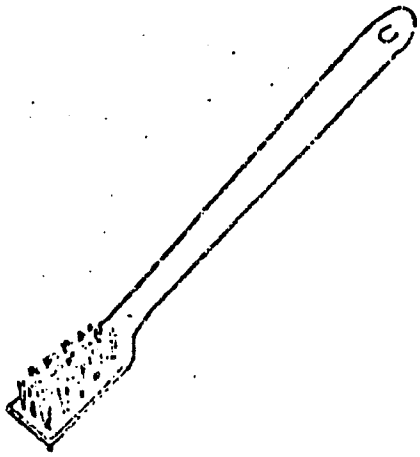

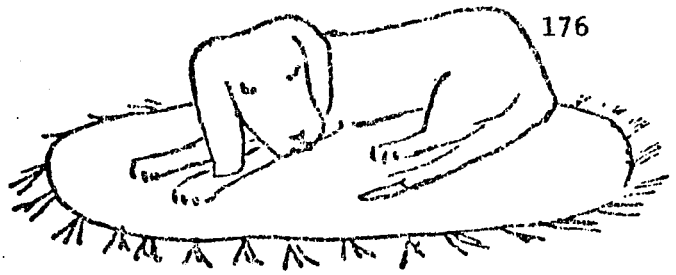

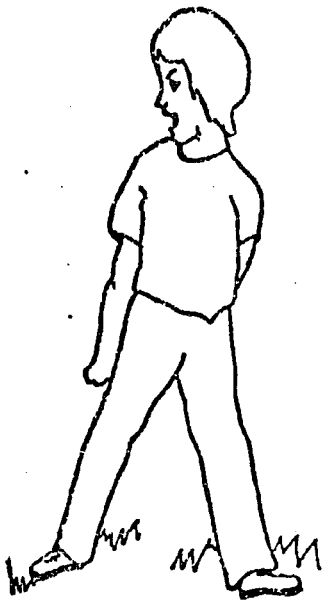

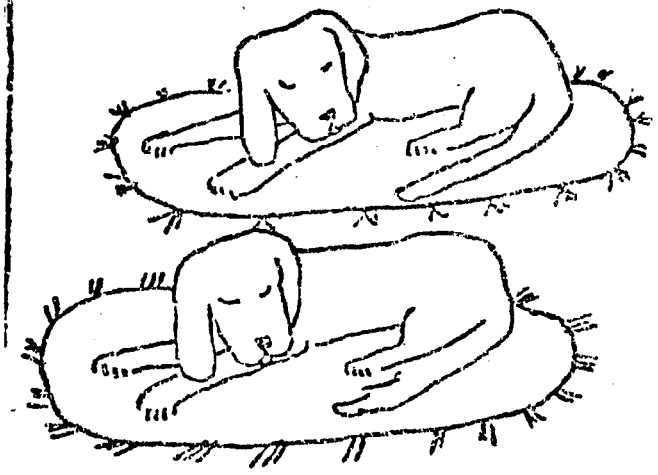

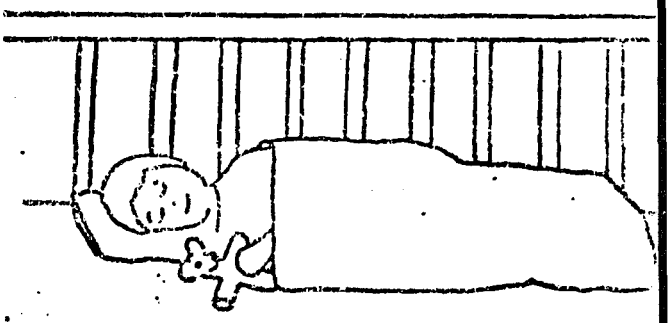

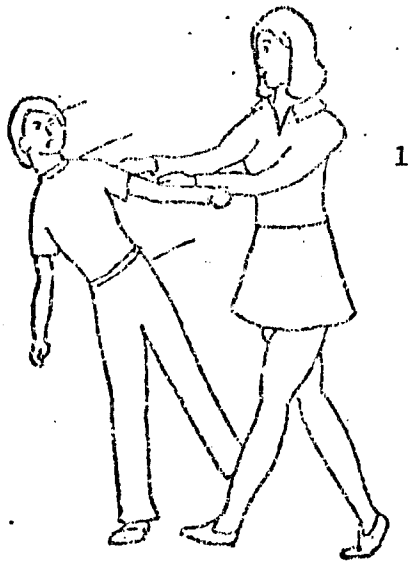

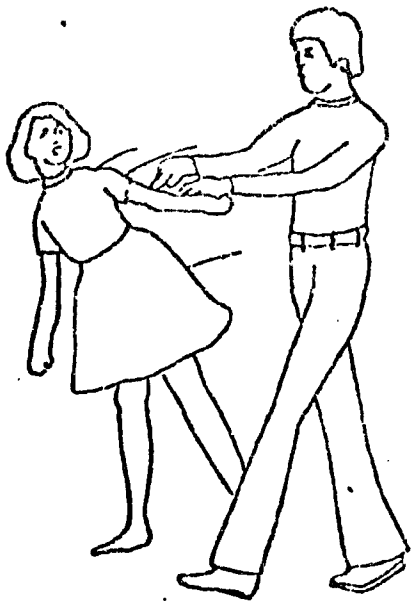

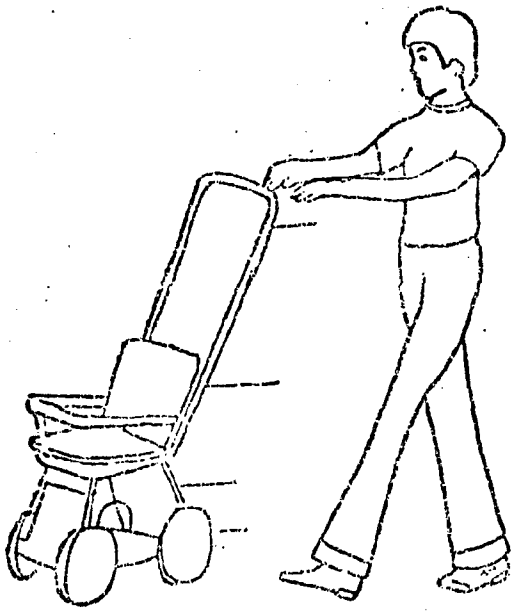

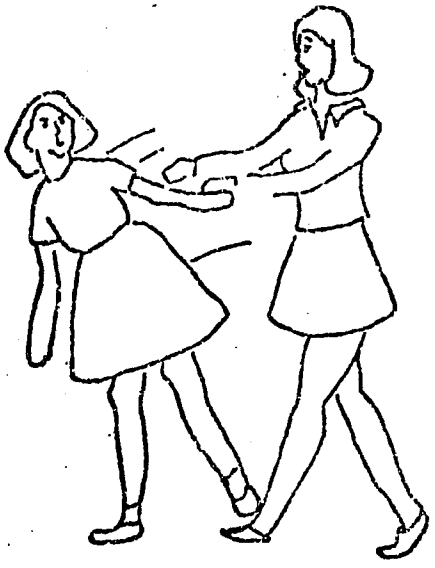

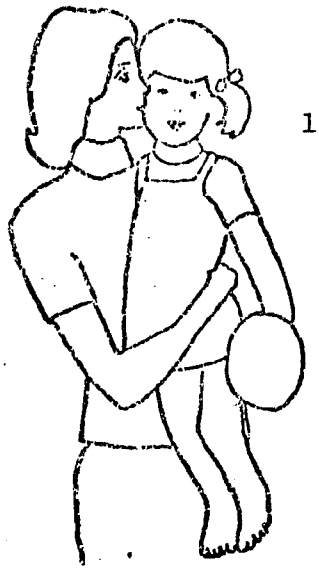

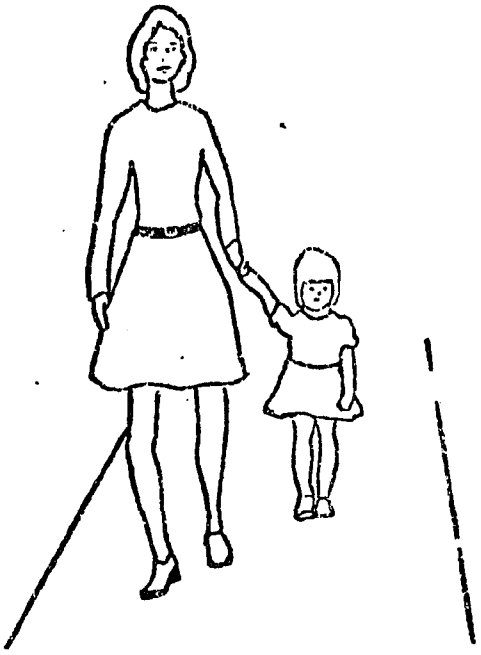

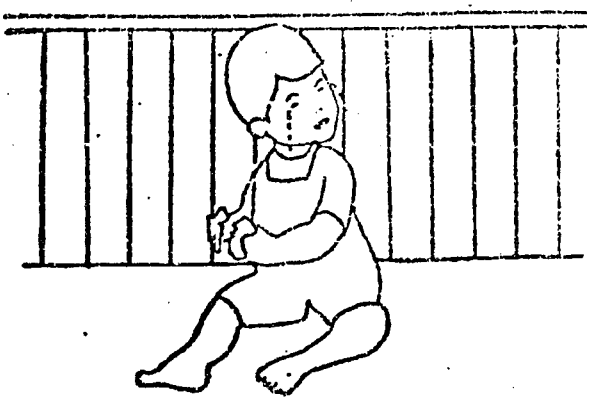

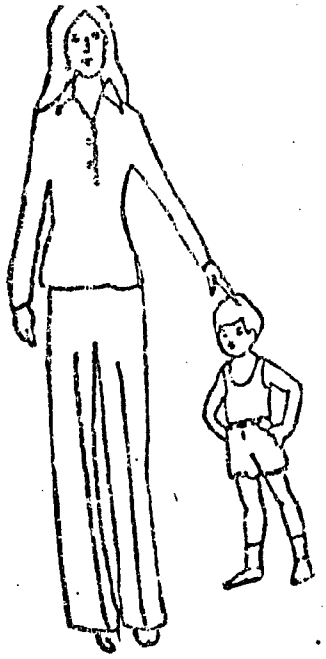

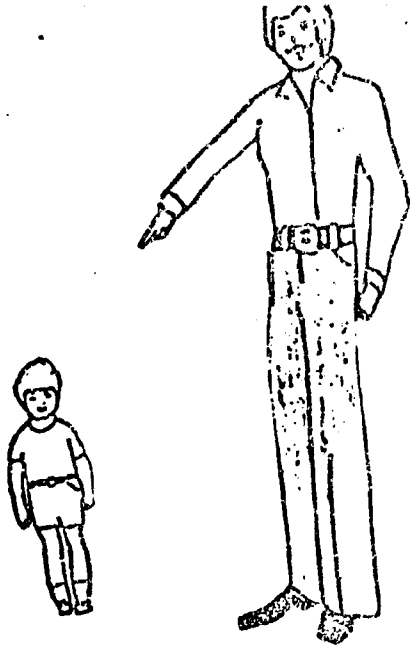

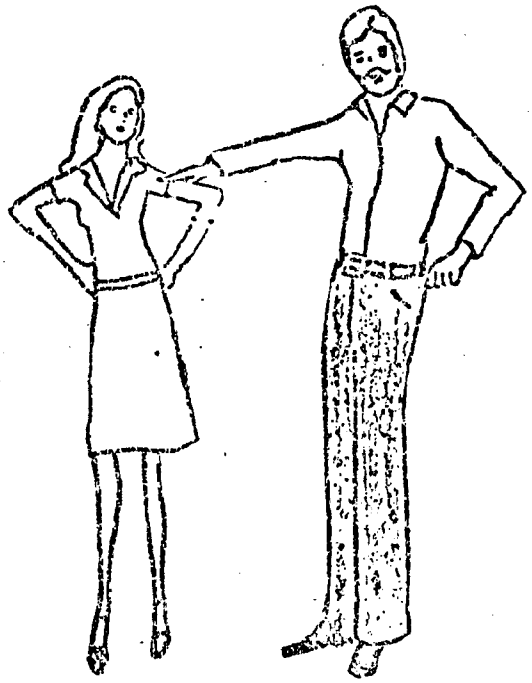

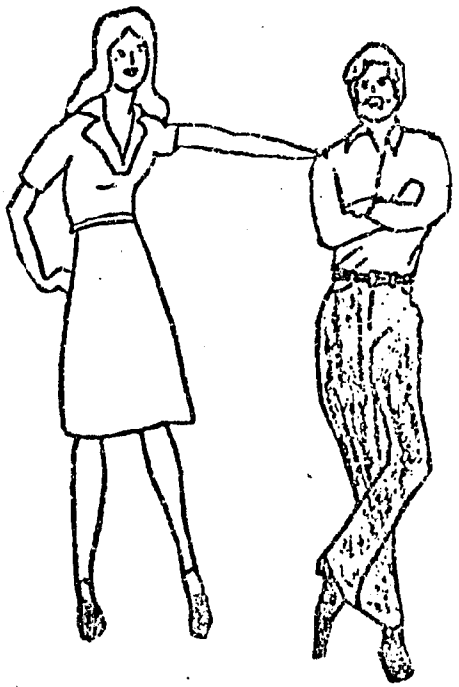

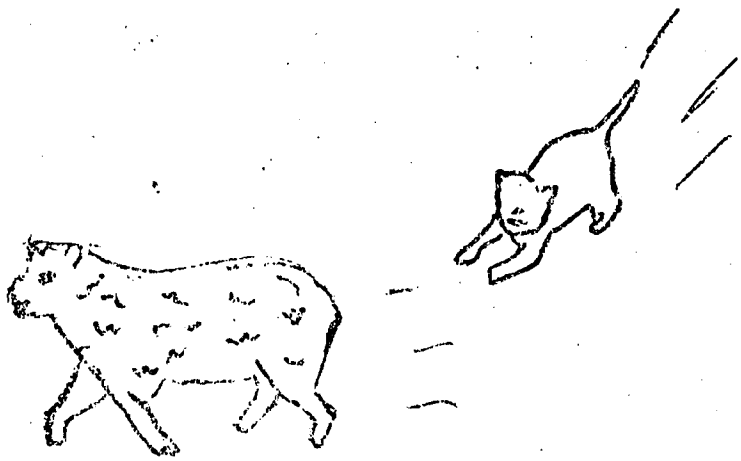

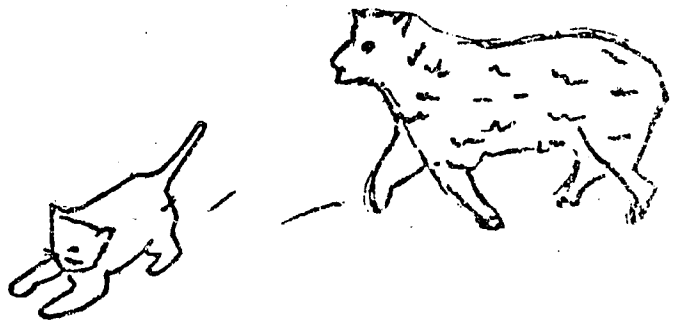

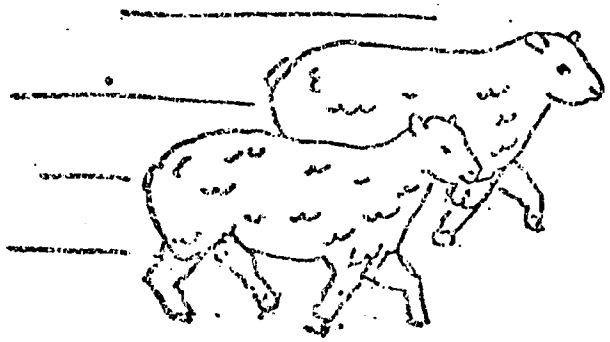

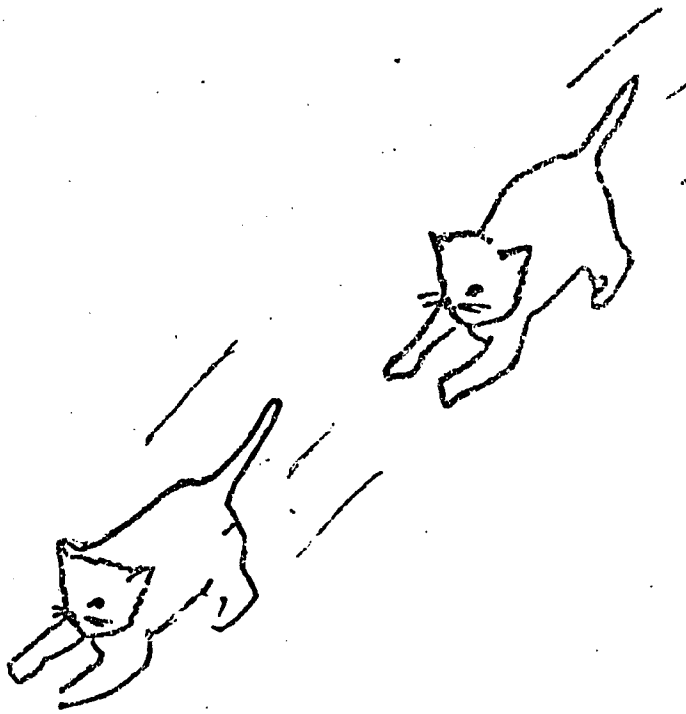

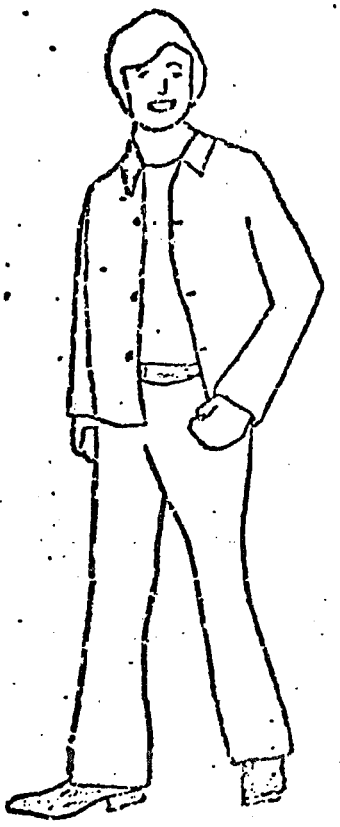


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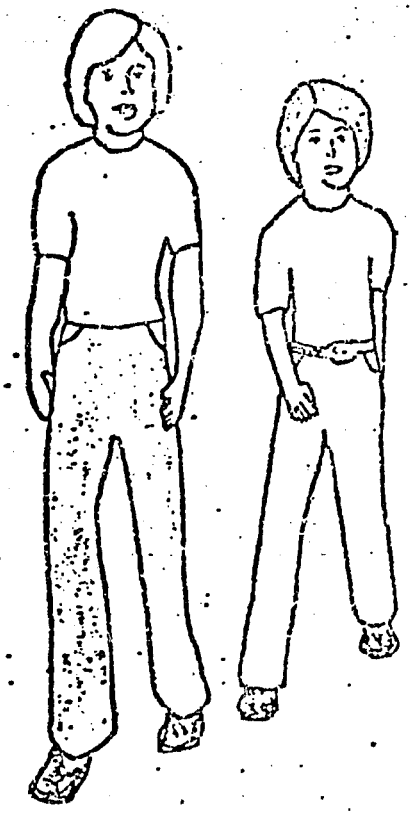

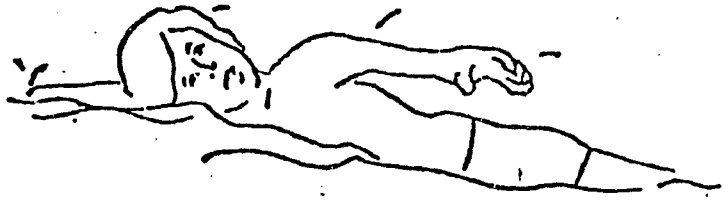

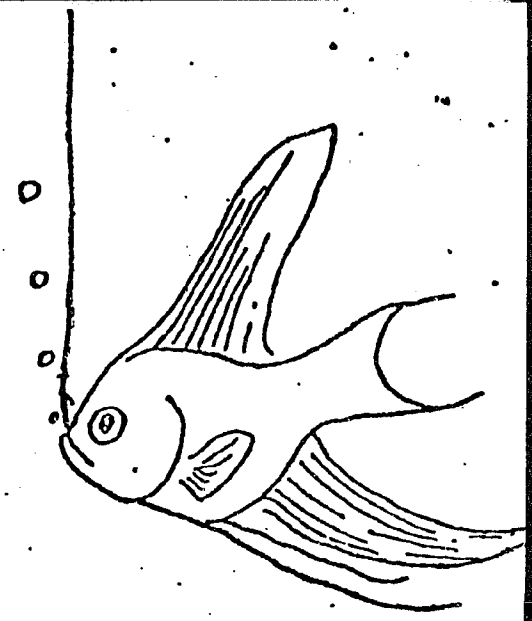

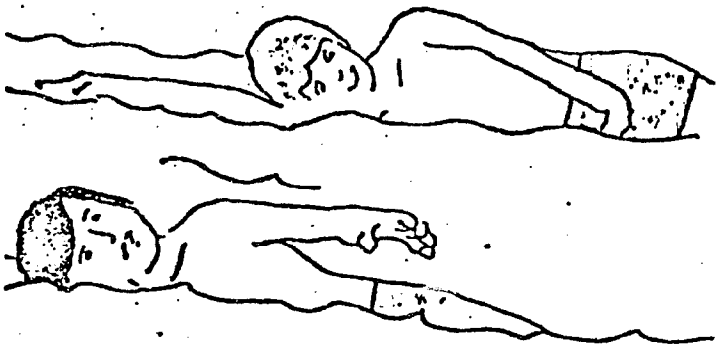

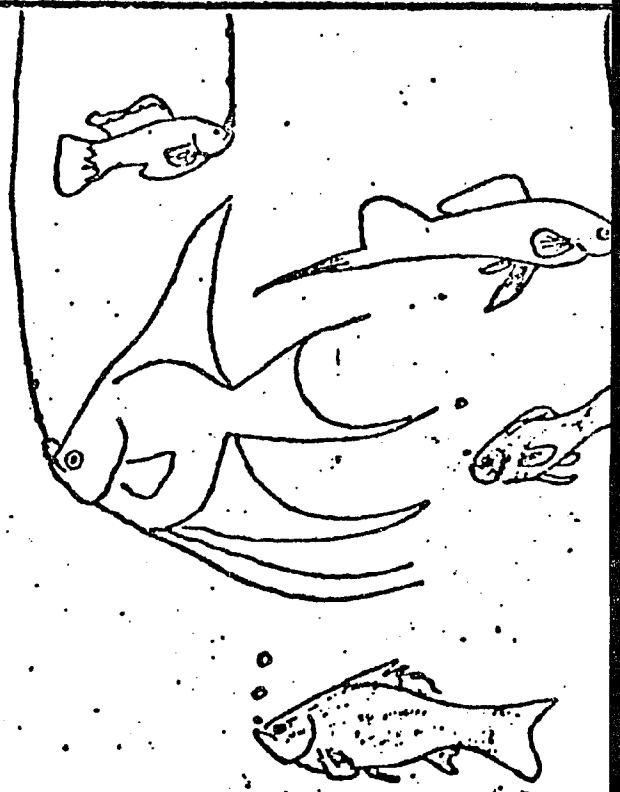

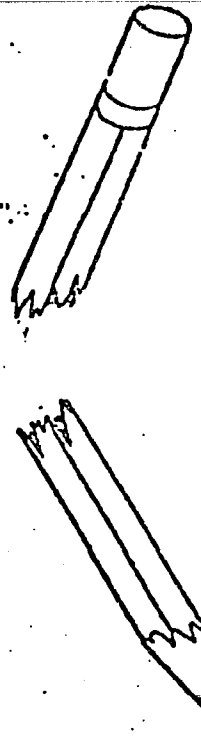

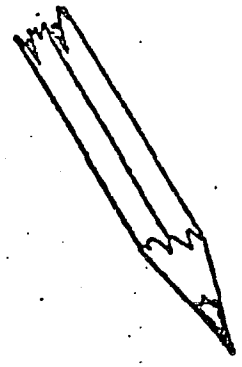

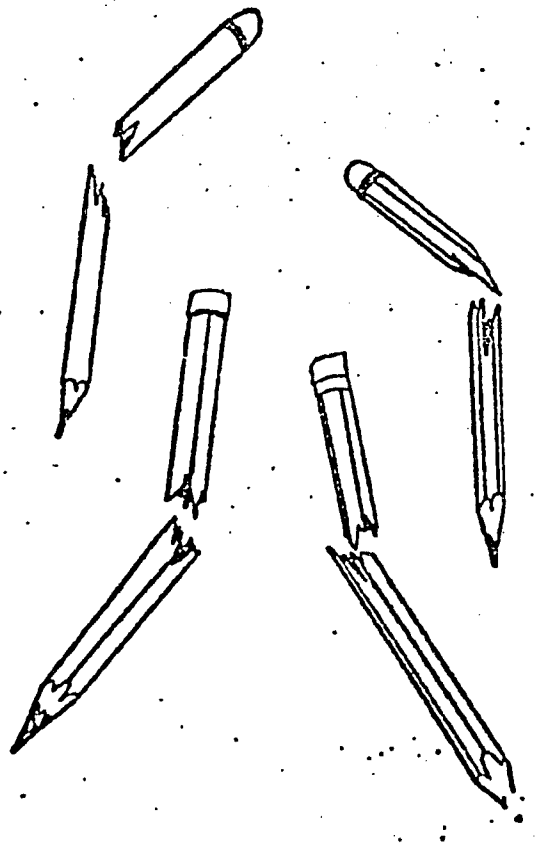

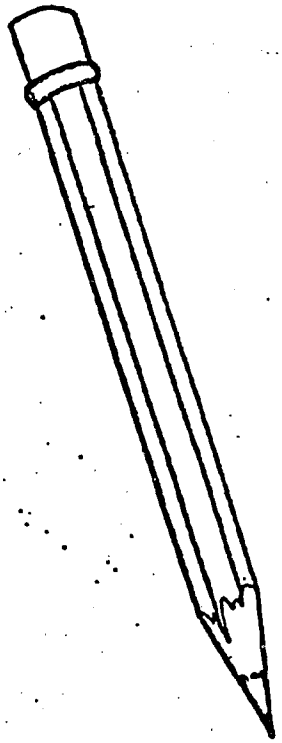

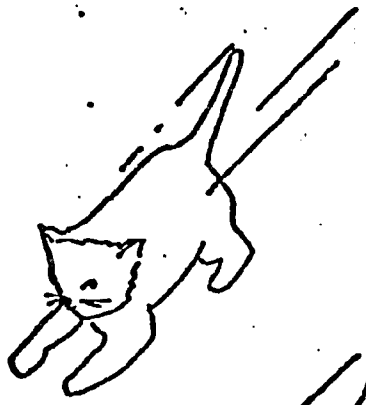

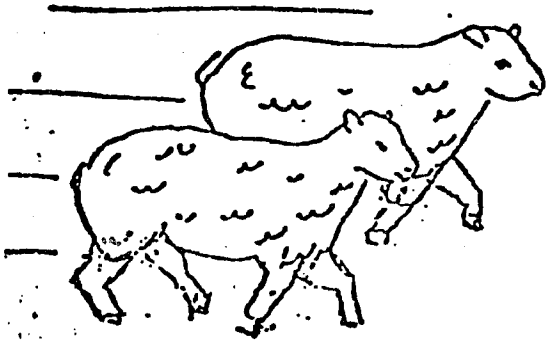

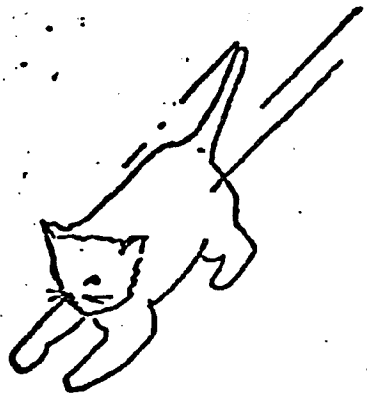

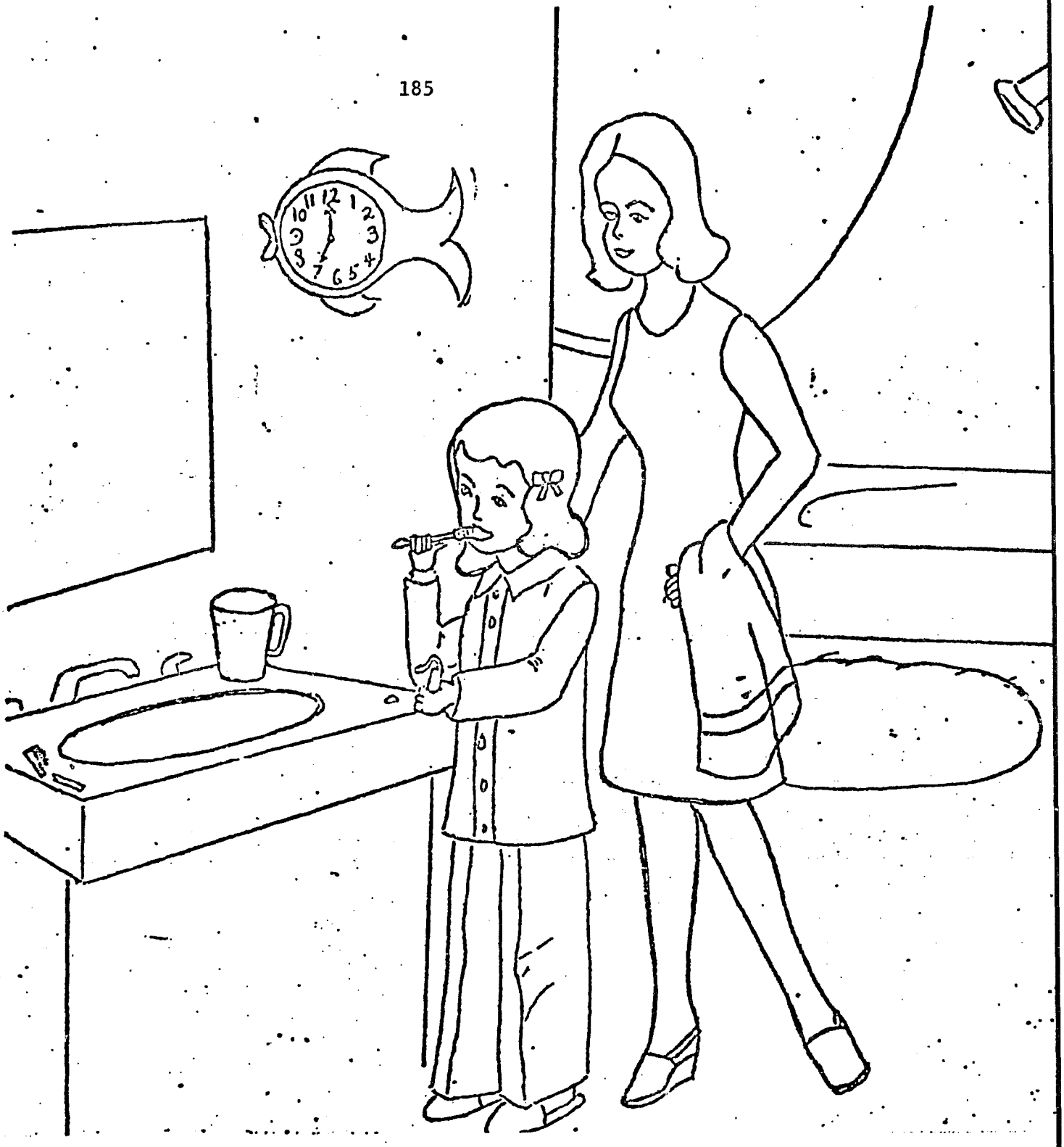

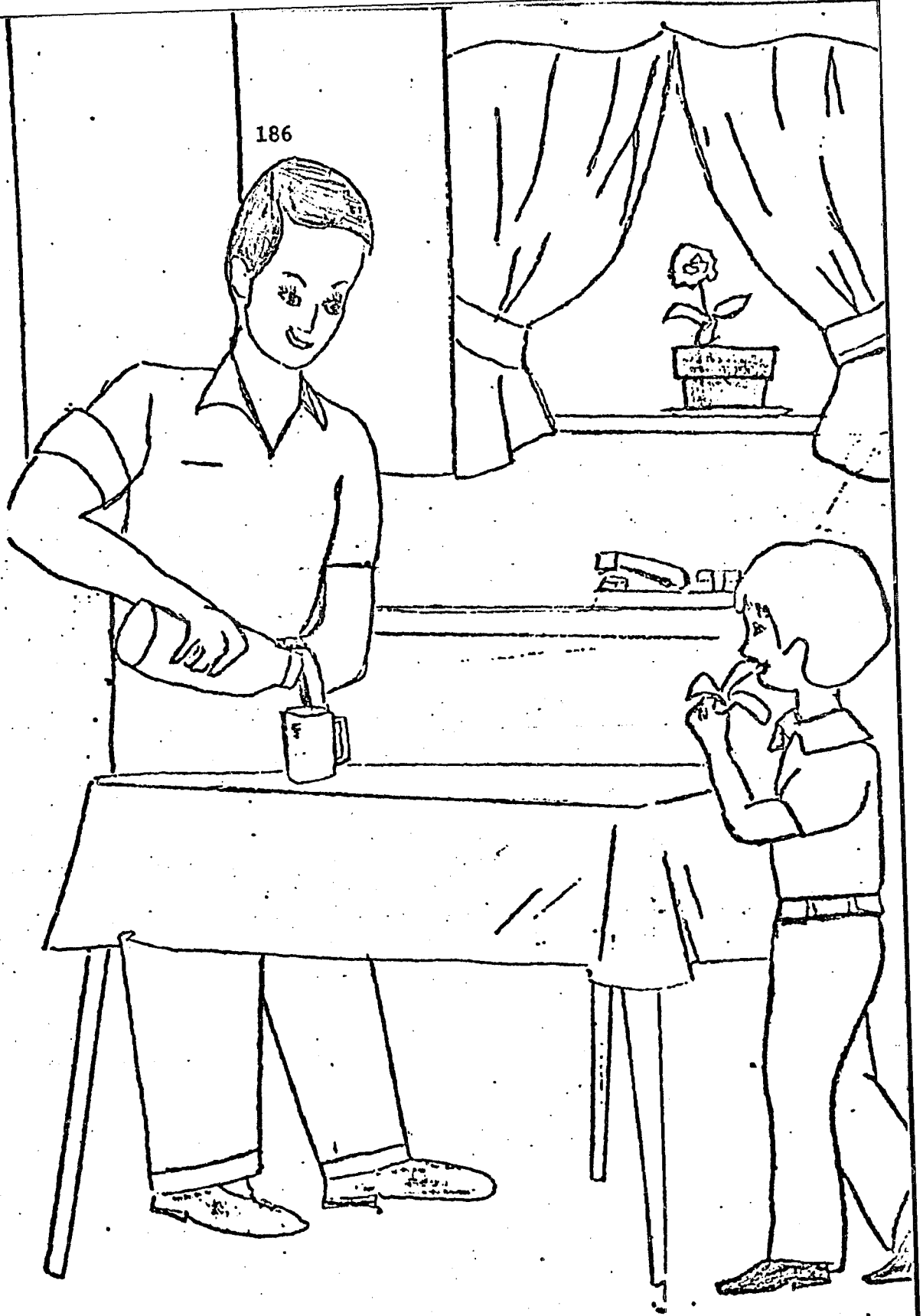

APPENDIX VIII: KEYS TO CORRECT RESPONSES

	Battery A	Battery B	Revised Test
1.	1	1	4
2.	2	3	3
3.	2	4	2
4.	3	4	1
5.	4	2	4
6.	2	3	2
7.	4	3	2
8.	3	1	1
9.	1	4	4
10.	1	1	1
11.	4	1	3
12.	4	2	2
13.	3	2	1
14.			3

APPENDIX IX: ERROR ANALYSIS

KEY TO ERROR ANALYSIS

Category I = correct response
Category II= opposite to correct response
CategoryIII= some correct element
Category IV= irrelevant response

Battery A: Section I

Item #	I	II	III	IV
1	1	2	3	4
2	2	3	4	1
3	2	3	4	1
4	3	2	4	1
5	4	2	1	3
6	2	1	4	3
7	4	1	3	2
8	3	1	4	2
9	1	3	2	4
10	1	3	2	4
11	4	1	2	3
12	4	3	1	2
13	3	1	2	4

Battery B:

1	1	3	2	4
2	3	1	4	2
3	4	2	1	3
4	4	1	2	3
5	2	4	1	3
6	3	4	1	2
7	3	4	2	1
8	1	3	2	4
9	4	2	3	1
10	1	4	3	2
11	1	3	4	2
12	2	4	3	1
13	2	4	3	1

RESULTS OF ERROR ANALYSIS

		I	II	III	IV
Battery A:					
	1	26	6	6	5
	2	15	12	8	8
	3	14	23	4	2
	4	12	11	16	4
	5	20	17	4	2
	6	17	13	5	8
	7	8	17	15	3
	8	15	15	10	3
	9	25	10	3	5
	10	32	5	3	3
	11	20	12	8	3
	12	22	7	6	8
	13	19	15	2	7
Battery B:					
	1	17	23	2	1
	2	21	19	1	2
	3	21	6	9	7
	4	17	4	10	12
	5	21	18	0	4
	6	24	4	11	4
	7	10	23	2	8
	8	15	18	0	10
	9	19	3	12	9
	10	23	12	7	1
	11	21	19	3	0
	12	20	14	5	4
	13	18	19	3	3

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