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PALSTIED CHILDREN AND ITS IMPLICATIONS FOR
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LANGUAGE PERFORMANCE
IN DYSARTHRIC CEREBRAL PALSID CHILDREN
AND ITS IMPLICATIONS FOR LANGUAGE ACQUISITION

by

LEONARD FLUM

A dissertation submitted to the Graduate
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Abstract

LANGUAGE PERFORMANCE IN DYSARTHRIC CEREBRAL PALSTED
CHILDREN AND ITS IMPLICATIONS FOR LANGUAGE ACQUISITION

by

Leonard Flum

Adviser: Professor Philip N. Hood

In 1962 Eric Lenneberg reported on the language competency of a congenitally anarthric child, concluding that speech practice was unnecessary for the acquisition of language. The present investigation assessed this claim by means of systematic measurement of language functioning in cerebral palsied children varying in degree of dysarthria.

To allow for the possibility that dysarthric children reveal differing degrees of deficits in the semantic, phonological, and syntactic components of language and, furthermore, that they might function asymmetrically as between receptive and expressive modes, a total of nine tasks were selected or devised. These included: the Peabody Picture Vocabulary Test and the vocabulary subtest of the Wechsler Intelligence Scale for Children (WISC) to assess receptive and expressive lexical functions; a picture-plate test and modified Berko test to assess receptive and expressive morphological functions; picture-plate tests to assess receptive and expressive capacities to use the passive construction; picture-plate tests to assess receptive

and expressive capacities to use the indirect object construction; and a spontaneous connected speech test to assess overall expressive functioning. Pretesting with 16 normal children revealed that all the newly created tests were well within the capacities of nine-year-old children.

The tests were administered to 64 cerebral palsied children whose average chronological age and mental age were 15 years and 11 years, respectively. They were divided into four groups according to whether their dysarthria was: (I) severe, i.e., anarthric; (II) moderate, i.e., intelligible less than 50% of the time; (III) mild, i.e., mostly intelligible; or (IV) absent, i.e., no observable speech deficit. It was found that none of the receptive tasks distinguished among the groups, whereas three of the expressive tasks did. These were the lexical task (WISC), the indirect object task, and the spontaneous speech task. Multiple regression analyses established that no combination of group specifications or of receptive performances distinguished among the groups, while combinations of expressive performances did, with the best discrimination afforded by the spontaneous speech task. In contrasting the expressive tasks which did distinguish the groups with those which did not, it was found that those language functions which in normal children develop latest yielded the best discriminations.

In comparisons between the cerebral palsied children and the normal control subjects, it was established that the latter group was superior on all tasks but that the degree of disparity varied. Thus the best (non-dysarthric) group was almost normal on the spontaneous speech task, but only 70 percent of normal on the lexical and indirect object tasks.

It was concluded that the failure to find differences in receptive functioning among the four experimental groups supports the assertion that practice is not essential to the attainment of language competence. Conversely, the presence of some expressive differences reflects the differential effects of dysarthric constraints on speaking performance.

ACKNOWLEDGMENTS

Most dissertation projects are neither the accomplishment of a brief moment in time, or the product of a single individual's efforts. Rather, they generally represent an accomplishment of a long and often painstakingly arduous journey along a tortuous route. In the time from inception to completion, many have usually affected it and must share in the joy of its completion. This dissertation is testament to these truths.

The project began somewhat yeast-like in that it grew and grew, continually modified by a skilled and devoted professional team. I shall forever be in debt to the many who supported me during this exciting period. No graduate student could have been more fortunate in having so expert a team actively assisting him: Professor Helen Cairns, a psycholinguist with great professional expertise, integrity, and strong convictions; Professor Louis Gerstman, an extraordinarily proficient experimental psychologist with superior expertise in peripheral disciplines; and Professor Phillip Hood, dissertation director, and speech and language pathologist whose talents may be likened to bed-rock: solid, formidable, and dependable. Each member of this team gave more than

is generally called for, in that they gave of their expertise and humaneness.

To my unsung benefactors whose yeoman efforts on my behalf made the completion of this dissertation a reality, I will be forever grateful. To my wife, sons, family, colleagues, and friends who went without my physical presence for so long a time, I can only say thank you for your support and encouragement.

The completion of a dissertation generally represents an accomplishment of some fulfillment; I share it with all those who made its completion possible.

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CHAPTER I

THE PROBLEM

In the fifteen years that the writer has been professionally associated with dysarthric cerebral palsied children, there has seldom been a failure in communication. Empirical comparisons of language usage among the cerebral palsied do demonstrate differences, but nonetheless, except where serious aphasic difficulties exist, communication has always been possible.

In 1962, Eric Lenneberg reported to the linguistic community on a single case of an eight-year-old child with congenital anarthria. His major conclusion was that speech practice, which was not possible in this anarthric child bereft of expressive function, is unnecessary for the acquisition of language. This "intellectual bombshell" has survived intact after more than a decade of frequent citation in papers and quotation in lectures. Psycholinguists tend to proclaim its veracity and behavioral psychologists tend to minimize, rationalize, or even ignore its implications. Yet, in twelve intervening years, neither group has subjected his assertion to scientific validation.

This writer has for some time analyzed the linguistic skills and abilities of cerebral palsied individuals in order to evaluate, diagnose, recommend and provide therapy programs of habilitation.

The literature concerning the language dysfunction of the cerebral palsied has provided minimal support in carrying out these professional endeavors. Comprehensive linguistic study of this population has not been evident. Indeed, much that is done in professional clinical practice seems premised upon trial-and-error experience and clinical intuition.

The availability to the writer of considerable numbers of dysarthric cerebral palsied children provided an impetus to scientifically test, through a controlled large-scale study, that which Lenneberg postulated more than a decade ago; namely, that speech practice is unnecessary for the acquisition of language. The study would be of a population revealing varying degrees of dysarthria, ranging from anarthria at one extreme to absence of dysarthria at the other, and with two intervening degrees of impairment. Such a study would be of professional concern to the writer as well as to many students of psycholinguistic phenomena. A study of this kind would, hopefully, determine whether language acquisition and usage are correlated with degree of intelligible speech production.

Since the literature concerning language acquisition among the cerebral palsied is at best minuscule, there is no available information concerning matters of the developmental order of the acquisition of syntax and morphology. Most professionals have relied upon clinical insights and judgments made from studies of normally developing children. Lenneberg, Nichols and Rosenberger (1964), studying language acquisition among a mentally retarded mongoloid population,

and Menyuk (1971), writing on the subject of deviant linguistic behavior, suggest that the sequence of language learning phases and the synchrony of emergence of different language aspects, remain undisturbed by conditions of retardation. Will similar findings obtain for the linguistic functioning of the cerebral palsied ?

Intrinsic to the Lenneberg thesis that speech practice is unnecessary for the acquisition of language is the implication that language acquisition is dependent not upon some outside forces which may shape its development, but upon inherent biological determinants. This view appears to be the foundation upon which Lenneberg and other psycholinguists base much of their conceptual constructs.

Those views, however, seem to be in conflict with any psychological theories of language acquisition dependent on the presence of an appropriate linguistic response system. For this behavioral camp, it is a fundamental assumption that responding abilities develop earlier than understanding abilities, and that speech practice is essential to continued linguistic development.

A well-crafted study of language functioning among cerebral palsied children should permit a choice between the two views just presented. Before describing the present study, however, the following chapter summarizes what is known about normative language development, discusses the problems associated with measuring the behaviors of cerebral palsied children and concludes with the hypotheses that govern the present research.

CHAPTER II

THE REVIEW OF THE LITERATURE

Most children learn to communicate in the language code of their culture. This somewhat simplistic observation is true regardless of the society viewed. It also appears true that in any culture there are those children who speak better than some, and others who speak poorer than most. Communication is a set of activities which includes speaking, listening, understanding, reading, and writing. These activities all utilize an underlying language code. Consequently, language development, its acquisition and use, has become the concern of many, including linguists, psycholinguists, psychologists, speech and language pathologists, and educators.

The thrust of most language research has been to investigate the normal child in our society. In recent years much work and research has been directed towards understanding the development of language in the normal child. Because these tasks have not been completed we do not yet know and understand all psycholinguistic phenomena. Yet knowledge of such matters has been greatly advanced, and many generalizations have been made concerning language acquisition and development in the normal child and adult.

However, the language of the handicapped child and adult is frequently one which is less than perfect, and frequently different

than that of the normal person. The question of how such handicapped people acquire and develop language is of considerable interest. Many speculate that the course of language acquisition may be impaired or deterred as a consequence of such handicap. Others suggest that all children develop and acquire language in a similar manner. The research evidence is, at best, minuscule in this area. Consequently, the possibility of linguistic differences and their implications concerning acquisition, presents an intriguing research possibility, and was the goal of this study.

Clinical observation of handicapped children who present communicative differences strongly suggests that they frequently demonstrate some or all of the following characteristics:

1. impaired speech intelligibility.
2. faulty articulation patterns.
3. telegraphic speech.
4. grammatical structures which appear to be impaired.
5. smaller vocabularies than normally developing children.
6. limited conceptual and cognitive development.
7. language impairments generally associated with perceptual and/or childhood aphasia.

In observing such differences among the communicatively handicapped, one cannot help but speculate as to how these differences come about. Is there a relationship between type of handicap and communication, and do children with severe communicative dysfunction develop language in an orderly manner ?

In order to understand communication, it is critical to differentiate initially between speech and language. The term "speech" differs from "language", although in many studies of children, especially among the handicapped, the terms appear to be used synonymously (Menyuk, 1971). While the noun, speech, has a verb or action analog, to speak, the noun, language, has no such similar analog. Thus it appears as if language is something we must understand as a body, encompassing rules and having structure which presents the means of expressing ideation. Speech, as used by most, implies the overt behavior of language usage. Language refers to underlying linguistic knowledge; Slobin (1971) suggests, as do others, that this underlying knowledge constituting language can only be inferred from the language user's overt behavior of speaking and understanding speech. It then seems plausible to see speech as behavior, and language as the underlying knowledge represented within the speaker and listener. Linguists have attempted to define this knowledge in terms of identifying its features and component parts. Psychologists, in general and psycholinguists, in particular, have attempted to identify and define the processes by which such knowledge is acquired. Thus, linguists are engaged in describing language structure. Psychologists want to know how children acquire such structures or systems, and how these systems function, as people are actually speaking and understanding language. Psycholinguists desire to go beyond describing overt linguistic behavior, and attempt to postulate underlying structures and processes which may account for the

linguistic behavior of children. Slobin (1971) suggests that the overt linguistic behavior cannot be studied without a theory of structure; and the study of structure without a concern about the overt behavior is not possible.

Another distinction seems necessary in order to understand the linguistic behavior of children regardless of the presence or absence of handicap. It is important to differentiate between linguistic competence and linguistic performance, a distinction sometimes glossed over by many speech pathologists. All children learn language, but to understand the implication of this learning of language it is useful to consider this in terms of the competence/performance dichotomy (Cairns and Cairns, in press). In Slobin's introduction to his recent work Psycholinguistics (1971), the competence/performance dichotomy has been defined as "a distinction between what an individual is theoretically competent of speaking and understanding and what he actually does speak in given situations." Cairns and Cairns suggest that when the child develops linguistic competence, he develops an internal representation of the grammar of his language which eventually allows him to make judgments with reference to his grammar. It is believed by most linguists and psycholinguists (Lenneberg, 1967; McNeil, 1970) that the linguistic principles related to competence are represented in the human adult central nervous system. Although the specific relationship between the brain and the language is fraught with controversy, there is little disagreement that a child's linguistic know-

ledge is represented in his brain either structurally or functionally (Cairns and Cairns). Linguistic performance skills on the other hand, are those abilities which allow a child to encode his thoughts into utterances and decode the utterances of others. Therefore, performance includes both the ability to speak and the ability to comprehend.

It should be noted that comprehension is constrained by factors other than linguistic competence and may also be related to the level or degree of cognitive and/or conceptual development. An example of this may be seen in a sentence such as: "Time is relative." In this sentence the syntactic relationships are simply expressed. However, the above example demonstrates a cognitive relationship not readily understood by many, especially children.

A concept of linguistic universals, as postulated by Chomsky (1965), has become a frame of reference for many linguists and psycholinguists. These language universals are presumed to be a reflection of the human child's cognitive capacity for language learning. Katz (1966) and Slobin (1971) discuss language universals in terms of the features which may be found in languages, which demonstrate similarities in phonetic, phonological, and syntactical domains. Linguistic universals are those aspects of linguistic structure and content which are common to all human languages. For example, every language utilizes vowels and consonants and syllable structure; every language also utilizes sentences demonstrating subjects, predicate verbs, and object relationships. These forms are examples of linguistic universals underlying the structure of sentences in all languages (McNeill, 1970).

Structure of a Language

The system of rules describing the structure of a language is its grammar. The grammar of a language consists of a semantic, phonological, and syntactic component (Chomsky, 1965). Utterances are not merely a collection of words strung together to make an idea or sentence. All meaningful utterances have some kind of hierarchical structure described by the rules of the grammar. Grammatical markers may identify the word class, specify the word relationship, signal meanings for ongoing activity, or indicate plurality, etc. An utterance becomes more than a disconnected group of words through its order and use of markers. Slobin (1971) suggests that grammar lies between the speech sounds you hear or say and the meanings you connect with them.

Although vocabulary is learned by rote and continues to be learned throughout life, sentences are not learned by rote and almost all sentence forms are learned by middle childhood. Most sentences one hears do not contain new words and one hardly ever creates a new word. Yet each speaker is continually creating new sentences. If one examines the utterances of an adult speaker or writer for any given segment of time, the likelihood of sentence replication is remote, unless this was the intention of the speaker or writer. People are continually creating new sentences each time they are involved in the act of communication. The central question is how to account for the creative ability of humans to understand and produce novel sentences. Linguists account for this ability by assuming that each

individual knows a small set of rules of his language (his grammar or linguistic competence) which will describe (generate) an infinite number of sentences.

Slobin (1971) strongly urges that the psycholinguist's use of the word "rules" does not mean that people can state explicit rules of grammar, or that children learn such rules. When psycholinguists say the native speaker must learn the rules of his language, they mean he must behave and act as though he knows the rules. In a similar manner, a child must begin to learn the rules of his language code early in life. Learning the language code is more than acquiring a lexicon. The child must discover how underlying grammatical relationships are expressed. Superficially similar sentences may not have similar meanings. The following are sentences with similar surface structures but vastly different underlying grammatical relationships:

1. John is eager to please.
2. John is easy to please.

In order to distinguish between these two superficially similar structures one must have knowledge of the internal structure as well. The person who possesses such knowledge immediately understands that in sentence 1 the noun, "John", is the subject, or actor of the verb, "please", whereas in sentence 2, the noun, "John" is the object of the verb "please". In order to understand those two sentences, one must be able to somehow derive the underlying relations when presented only with the surface form. Consequently, in doing this one has separated the surface structure from its deeper structure. Chomsky

(1968) said in this regard: "It is clear, in short, that the surface structure is often misleading and uninformative and that our language involves properties of much more abstract nature not directly related to the surface structure."

The ability to distinguish surface structure from deep structure is dependent upon a knowledge of the system of rules which map (or transform) deep structures into surface structures. This knowledge of the rules has been described by linguists as linguistic competence. The presence of adult linguistic competence is not an "all or nothing" effect, rather it is developed over a period of years. The developing linguistic competence of the child (as well as the developed competence of the adult) is assumed to underlie an array of linguistic behaviors including production, comprehension, and judgment about the meaning of utterances (Cairns and Cairns).

In the generative transformational theory of grammar (Chomsky, 1965), there are three components:

1. The syntactic component consisting of phrase structure rules, which generate deep structure before applying transformations, and transformational rules. The latter map deep structures into surface structures. There is also a specification of the order in which transformational rules can be applied. Concerning this order it has been variously suggested (Chomsky, 1965; Carroll, 1967; Shiefelbusch, Copeland and Smith, 1967) that children learn transformational rules in the order in which it is necessary to apply them in the construction of the sentence frame. Brown and Hanlon (1970)

have suggested that the rules of order are learned from the simplest to the most complex. However, this point of simplest to most complex has not been observed in the work of McNeill (1970) or in the research of Bates (1967). These later researchers agree that there is a natural order in the emergence of grammar which depends upon the scope of the rules being learned, with the most comprehensive rules requiring the least time and experience with language, and consequently appearing first. Rosenbaum and Jacobs (1968) suggest that the deep structure is related to surface structure through its transformations and the number and type of transformations used are correlated to linguistic maturity.

2. The phonological component of the grammar contains phonological rules which describe the sound pattern of the language, accounting for stress, phonotactic constraints, intonation contours, segment structure, and morphophonemic alternations. These rules map surface structures into phonetic representations.

3. The semantic component of the grammar interprets syntactic and maps them into a representation of the meaning of the interpreted sentence.

Comprehension, Memory, and Meaning

In studies of speech perception it has been frequently demonstrated that the hearer assigns a perceptual structure to speech sounds on the basis of his knowledge of the rules of the language. Likewise, the listener is an active interpreter of the syntax he hears based upon his competence with the language. The child does not seem able to deal adequately with rules he has not yet assimilated.

Concerning the memory for sentences, Slobin (1970) suggests that meaning and grammatical form are stored separately or independently in the brain, and that underlying meaning is more persistent than surface structure. However, short term memory is an important performance variable (Miller and Isard, 1964). People tend to hear and remember sentences in terms of their knowledge of the grammar; more familiar forms are recalled more easily, and the less familiar forms require more effort. Savin and Perchonok (1965) demonstrated that the passive, e.g. "The ball has been hit by the boy", was for adult subjects psycholinguistically more complex than matched active form sentences.

Slobin (1971), in reviewing a number of studies, concluded that sentences expressed in the passive voice are more difficult for young children and require more time to process. Menyuk (1969) suggests that there is evidence to indicate that children's recall of sentences is dependent upon the structure of the sentences and their grammatical competence, rather than on the sentence length. The child may be able to deal with sentences expressed in the passive voice, provided there is some contextual cue within the sentences to give him some assistance. In sentences where the possibility of noun phrase and object phrase are irreversible, the child has no difficulty in dealing with the passive, e.g. "The horse was hit by the man." The child has little difficulty in determining that the horse cannot hit the man. However, in sentences in which the possibility of reversibility is present the child has considerably more difficulty, i.e. "The boy was hit by the girl." In this last sentence example, the young child's difficulty is that

he confuses the actor with the receiver of the action. The lack of contextual cues contributes significantly to the child's inability to adequately manage this sentence form.

As the child's grammatical competence improves and matures, the recall of the sentences improves as well. It is generally believed that a child cannot imitate forms with which he does not yet have linguistic competence. A child seems to impose his own structure upon what he hears. The child does not imitate adult speech, but seems to filter it through his own rule system according to Slobin (1971). This factor had been previously noted by McNeill (1966) and by Bellugi (1967) in her doctoral dissertation.

As stated above, linguistic competence is an internalized system of rules which relates semantic interpretation of sentences to their phonetic representations. Slobin (1971) goes on to suggest that since meanings of utterances are directly expressed in the sounds we hear, then psychology must develop a performance theory of the inner mental structures which make it possible to utter and comprehend sentences. In speaking of the need for such a theory Slobin says:

Such a theory cannot deal with observable "stimuli" and "responses" alone for processing speech, because all information is not present in observable behavior, nor can developmental psychologists speak for "imitation" and "reinforcement" alone, for a child learns not a set of utterances, but a set of rules for processing utterances.

The major or central questions are as follows: How are speech and language acquired? In what manner does the child develop this complex linguistic code?

The Acquisition of Language

All children appear to begin their speaking with one word or holophrastic utterances, proceeding on to two word utterances and finally on to many word utterances, using progressively more complex semantic and syntactic relationships. The direction of current theory and research in the field of language acquisition has proceeded along two major paths; one has been to emphasize linguistic universality and the existence of innate biological determinants of such universality (Lenneberg, 1967; Chomsky, 1968), and a second which has emphasized behaviorial descriptors which explain how children develop language. This latter view is based upon a blank slate or tabula rasa presumption which underlies the learning theory views espoused by behaviorists.

Learning theory model: Learning theory views of language acquisition have their philosophical roots in the thoughts of John Locke, the British empiricist, and are based on the theories of learning developed by Watson (1913), Osgood (1953), and Skinner (1957).

Are children like empty vessels, linguistically speaking, requiring a suitable environment providing adequate stimulation for learning language ? Behaviorists or empiricists insist that the child's mind is essentially blank at birth and that only experiences or stimuli are important to the developmental behavior of the child (Skinner, 1957). Proponents of this view state that the child's environment is of overriding importance in his learning to speak. Behaviorists stress the role of the language the child hears, which is the stimulus, and the pattern of responses or reinforcement the child receives from the adults with whom he has been speaking. Behaviorists argue that

the observable event or behavior of children is a consequence of the manner of stimulation and is contingent upon the reward of reinforcement practices. According to behaviorists, all human behavior can be directly related to neural representations developed passively as a consequence of the environmental impingement. Behaviorists believe that language response chains are represented in the human brain.

The factors which govern this language development are based upon external stimulus-response-reward conditions, are then internally elaborated during the acquisition of language from sounds to words to larger phrase units to longer sentences, and finally to varying and more complex sentence types. In this language acquisition model, early utterances in infancy are drive initiated. Stimulus-response-reward theorists hold the view that we learn to speak because speaking reduces a drive. The environment produces the environmental conditions which are necessary to the acquisition of language. A drive is set up within the individual as a consequence of some external or environmental stimuli. The appropriate speaking response by the individual reduces the drive. Reduction of the drive is the reward for speaking. Undesirable responses are generally not reinforced, and consequently are extinguished. Hence, speaking becomes autonomous in this drive (stimulus) - speaking (response) - reduction of drive (reward) paradigm, Stimulus-Response-Reward or S-R-R (Dollard and Miller, 1950).

According to Mowrer (1960), a drive which is present early in infancy is imitation. The behaviors of people in the environment, especially those of the family members, are imitated by the child.

Among these imitated behaviors are the imitation of the verbal behavior of the adults in the child's environment. Using the S-R-R paradigm, the child then tends to repeat or learn whatever responses are rewarded or reinforced. These rewards or reinforcements may be of a drive reducing variety or some secondary cue of an eventual reward. "Responses which are not so reinforced tend to drop out of the child's repertoire. The responses which are involved in these events may be direct responses which, like babbling, are somehow internally initiated" (Carroll, 1961). Carroll (1967) agrees that imitation is present but suggests that the infant child has no native instinct or drive to imitate, but learns to do so in the early stages of development when imitative behaviors are rewarded. Behavioral psychologists account for new and more complex responses in terms of shaping behaviors. Shaping is a process of achieving a series of responses in stages which bring one closer to the final and terminal behavior. Sentences are believed to be strings of response chains, beginning with phonetic elements which are later fused into words and then into word combinations. Language is achievement of sentence usage proficiency and is also considered to be the result of the shaping of behavior. Words in sentences do appear to some to be string-like chains of responses or associations. These sounds, words, and word units are the only language stimuli present in the child's environment, and the child is conditioned by the people in his environment to produce only those signals which have been rewarded. This kind of stimulus-response-reward paradigm continues in small steps until the adult-like stage

of language functioning is achieved (Staats and Staats, 1963).

This behaviorist explanation of language learning fails to account for the structure of language which is both abstract and complex even in the simplest of child utterances. This view also fails to account for how new language, never before heard, is processed and/or produced. The views also fail to account for the child's verbal behavior which is not an imitation of adult form, i.e. over-regularization of strong forms, or telegraphic speech, etc. (Brown, 1970). Another argument against imitation is presented by Bellugi-Klima (1968), who demonstrates that children cannot imitate structures which they are not capable of producing on their own. This view has been reinforced in the studies of Ervin (1964) and Slobin and Welsh (in press). A child would have to be exposed to all possible combinations of words in order to be able to produce ~~the~~ variety of language we hear demonstrated. Even if a child could successfully imitate all the utterances he hears he would be little more than a bright parrot. Like the parrot he would be unable to understand how to produce new utterances which he has not heard before.

The behaviorist claim that language acquisition is dependent upon a child's producing speech has not been fully explored. However, some counter-evidence is offered by Lenneberg (1962) and the anarthric eight year old child he writes about. This case is of a boy of eight who was unable to articulate speech, yet demonstrated the ability to understand complex utterances. Lenneberg (1962) suggests that linguistic competence must underlie the production and interpretation of speech. A speechless child could never have imitated speech,

nor could he be reinforced for speaking, yet this handicap did not interfere with his acquisition of linguistic competence.

A final argument is presented from the study of Brown, Cazden, and Bellugi (1969), which demonstrated that mothers are not very sensitive to their children's grammatical utterances. Mothers do not participate in the tuition or reinforcement of grammatical utterances, Where parental approval or disapproval is present it was shown to be contingent on truthfulness, rather than grammaticality.

Cognitive theories: Whereas behavioristic learning models view the child as an empty slate, the cognitive model rests upon the premise of an innate factor in language learning. Lenneberg (1967), Chomsky (1968) and Slobin (1971) are representative of the many researchers and authorities who postulate a theory which emphasizes the universality of language and the existence of biological factors which account for this universality. To many, a linguistic theory based upon a genetic factor has become a reasonable view. Cognitive theories initially attempt to deal with the complexities of the task facing a child in learning his language code. While learning model theories are concerned with the learning strategies and stimulus-response paradigms in relation to the child's linguistic environment, the child is busily acquiring a complex internal system of rules (Slobin, 1971). The child is never presented a set of rules for memorization, or even exposed to the rules themselves; rather he is exposed to the language, in the form of speech, and to situations containing language. The child learns his language because of an innate predisposition to acquire a

language, a predisposition to be able to induce (or "unconsciously figure out") the rules for language, any language.

Cognitivists, like behaviorists, agree that the environment and experience are important factors, for no child so deprived will learn or acquire his language code; but unlike the behaviorists, the cognitivist believes that the child brings a biological or inborn knowledge to the task of learning his language. The child is being acted upon in the learning model view. In the cognitive view the child is the actor and the processor of the language.

The universality of structure of language suggests that the child is born with a cognitive structure which is able to develop such linguistic universals. Exposure to appropriate environmental conditions allows the child to utilize his innate predisposition for language learning by analyzing the acoustic signals to which he is exposed. Many observers and researchers of children's linguistic development agree that the child understands the language of others considerably before he actually uses language himself (McCarthy, 1954). There seems to be little doubt that language acquisition is developmental. There seems to be little doubt that language is based on a system of rules. "Stimulus-response", "imitation", and learning theories do not seem able to account for this complex linguistic acquisition. A cognitive model which postulates some innate factor in the brain seems to deal with the complexities of how the child discovers underlying structure and meaning of sentences. The child seems to possess some linguistic competence and performance from the beginning of development. The linguistic rules as assessed in overt language behavior of children

appear to develop over a period of years. Beginning with his first utterances the child is already expressing an underlying competence with regard to linguistic rules. During this period of development the child is continually modifying, discarding, and refining the language until the linguistic product attains adult-like standards. Berko (1958) demonstrated that children as young as four apply morphological rules, and that most normal children by school age have learned the rules of morphology for regularized forms. There continues to be some evidence of over-regularization of strong forms throughout the developmental years. Slobin (1971) reports that by age three, children are monitoring their own speech performance and modifying this linguistic product in accordance with their linguistic rules as they go along. Slobin (1971) also reports how children of three are beginning to correct the speech of others. While rules for language acquisition are never stated explicitly, use of a set of implicit rules seem evident from children's linguistic behaviors. The child needs only to behave as if he knows the rules. If one can describe linguistic rules from the language behaviors of people, a strong case can be made that these rules exist as definitive entities.

It may seem, then, that the normally developing child is continually reacting to the speech and language of either himself or others. These reactions seemingly allow the child to utter language, then modify it, and then discard and refine the language utterances as a continuing process beginning with the first word and proceeding until adult competence is reached (Slobin, 1970).

Stages in Language Development

To many linguists, psycholinguists, psychologists, and observers of child development, there seems to be little doubt that the stages which children go through in acquiring language are universal. Predictably, like learning to walk, children appear to begin speaking in stages and continue to develop until they reach an adult-like functioning ability. Such observers would postulate a language learning universal based upon an innate factor, that developmental properties of the human brain must underlie human linguistic development (Cairns and Cairns). Regardless of the theoretical view one maintains regarding how children develop their system's linguistic code, observers of children's development agree that the course of development goes through several stages before arriving at a kind of social adult speech form. In the recent past, traditional researchers generally agreed upon four distinct developmental stages: a reflexive stage, a babbling stage, echolalic stage, and a true speech stage (Shiefelbusch, 1967). However, this turned out to be a somewhat limiting approach and most contemporary researchers view the following stages as the key stages in development (Cairns and Cairns):

1. First Babbling Stage
2. Second Babbling Stage
3. Stage I (Holophrastic Stage)
4. Stage II (Two-Word Utterances)
5. Stage III (Developing Grammar)
6. Stage IV (Near-Adult Grammar)
7. Stage V (Full Competence)

Although the specific numbering system may vary among writers and researchers, this contemporary view of the stages in child development allows for amore extensive andcomplete accounting for a child's development. In the traditional view, the final phase, the true speech stage, is the point at which some of the most interesting and complex linguistic occurrences are beginning. It would be somewhat short-sighted to limit the investigation of children's development at that point.

The stages should not be viewed as being constant, discrete, and independent, but rather as overlapping stages where old behaviors are seen to co-exist initially with new behaviors, and eventually drop out in favor of the new. This process appears to be repeated throughout the developmental stages.

The first babbling stage: The first babbling stage which occurs during the first half of the first year of life is characterized by two distinct periods. The first period, analogous to the stage of reflexive crying, is a period where the child is producing infant vocalizations which are largely responses to his reflexive needs of hunger, thirst, and discomfort. Cries during this period of life are mainly undifferentiated. During the middle and latter part of this stage the child begins to demonstrate his ability to interact with his environment through the smile (Ambrose, 1961). It has been suggested by learning theorists that, during the latter portion of this first stage, infant vocalizations may be stimulated by adult social responses. It has been demonstrated in several studies that, even in this early stage of infant life, children may become markedly more

quiet when they have not been socially reinforced by the adults in their environment, as compared to children who have been reinforced (Rheinhold, 1959 and Weisber, 1963). During the latter portion of this stage, children are becoming exceedingly more aware of their physical environment through observation with their eyes. They appear to be spending time on those objects in their immediate environment which seemingly excite or arouse them. According to Gesell and Ilg (1943), even at this early stage children are beginning to differentiate between brightness and darkness.

It is in the middle and latter portion of this stage that the child's behaviors become discernible from earlier reflexive behaviors, in that they begin to become intentional and environmentally oriented, according to Piaget (Flavell, 1963). In this early pre-lingual period Shiefelbusch (1967) suggests that it is essential for a child to be exposed to a rich experience of adult social interaction. During the latter period, social interactions are becoming increasingly more evident. Although at this stage social interactions are primarily visual they also include kinesthetic, tactile, and auditory experiences. The absence of stimulation by mother or other adults in the child's environment during the first six months may result in sensory deprivation according to many researchers (Thompson and Schafer, 1961). Shiefelbusch (1967) suggests that the child between 3 and 5 months of age becomes increasingly aware and selective of the person who is mediating the world to him through his sensorium. As a result of such experience the child begins to become aware of matters beyond his immediate sphere of direct contact.

He begins to reach out beyond the range of his crib and beyond the limitations imposed by his length of grasp. Consequently, he becomes more aware and alert and seemingly communicates with the people and objects which interest him.

One can only speculate about both the immediate and long term effects in children whose impairments have prevented such learning from taking place. Studies of children of this age who are deaf, mentally retarded, or brain injured are somewhat minimal. However, some studies on normal children with sensory and experiential deprivation suggest that there is marked difference in growth pattern, if not a permanent change (Rheinhold, 1959; Thompson and Schafer, 1961; Weisberg, 1963). According to learning theorists, if exposure to stimulation by the mother and environment is of importance to the normally developing child, then the absence of the same may have marked adverse effects on his development. It may follow that children whose deafness, mental retardation, or brain injury deprives them of normal sensory stimulation and experiences may then also be markedly impaired or different as a consequence of this deprivation. Retrospective reports concerning deaf children indicate that they have not been demonstrably different from normal children with regard to the quality and quantity of babbling.

The second babbling stage: During the second babbling stage of development the child's verbal utterances have increased in number and complexity. According to learning theorists, in this period of development normal linguistic development is dependent upon an active inter-response system between the child and the adults in his environment.

According to Piaget's model of development (Flavell, 1963), it is in this period of the child's cognitive development that the child moves toward more developed intentionality, prolonging satisfying experiences, and a new phase of duplicating experiences through repetition. Learning theorists contend that the effects of deprivation become considerably more severe at this stage of development. Yarrow (1961) studied the question of deprivation and concluded that children are severely effected as a result. He devised a three-area concept of types of deprivation most detrimental to children: sensory, social, and emotional, which he suggested were complexly related to one another. Yarrow (1961) also reports of studies of deprivation in animals in which perceptual experience was completely restricted during their formative development, resulting in serious impairment in function. Similar findings were made by Shiefelbusch (1967) in studying children in institutional environments, although in these cases the effects were less severe than those reported in the animal studies. Shiefelbusch concluded that developmental retardation is highly correlated with degree of deprivation.

The later period of the second babbling stage is followed by a period of active imitation by the child of the adults in his environment. Nonsense words are beginning to sound more like real word utterances, and are sometimes erroneously interpreted by interested adults as words. This is the stage in which Piaget believes the child's intentional behaviors have become well established (Flavell, 1963); that is, the child can deliberately pursue a goal by means of instrumental behaviors.

The child in the latter period begins to say and use his first true or real words. Often the child's first real or true words are not good phonetic duplications or facsimiles of the intended word. However, presumably for the first time the child has linked sound with meaning. The deaf child has become markedly quieter than hearing children. Toward the end of this period the deaf child may almost be silent by comparison to the normal.

The holophrastic stage - Stage I: The holophrastic stage or Stage I begins at about 12 months and frequently lasts about a year. This stage is marked by its one-word appearance used by the child in reference to names or association with actions, primarily. The age of onset of this stage and the length of its duration has considerable variability. There are children who begin this stage somewhat early and enter the next stage early, while others by comparison are markedly delayed in entering or fixed in terms of progressing to the next stage. Retarded children are frequently delayed in entering this stage, as they are in entering other motor developmental stages such as walking. In children within the normal intelligence range, intelligence does not seem to be correlated with speech development at this stage. In this stage the child is using single words as expressing the meaning of a phrase or sentence. The child may use the single word in combination with gestures of hand, head, or other non-verbal symbols. Frequently one needs to be in the presence of the child in order to determine what the child is saying.

Two word utterances - Stage II: This stage begins around the

24-month period in most children. However, again there is considerable variability as to its onset and/or duration. Toward the end of Stage I and the beginning of Stage II children begin to use two holophrases together with only a small pause between them, e.g., "mommy" (pause) "sock". The meaning of the two holophrases is not clear, as many meanings can be understood in the use of these words. Shortly after the appearances of the contiguous holophrases, the child begins to use two words without pause. During this stage the child's vocabulary is marked by the absence of prepositions, conjunctions, articles, and most pronouns, with the exception of "me". The child does not use morphological markers, such as tense, number, plural, etc. Utterances begin to sound like "mommy ball" or "play ball." One-word utterances continue throughout this period, but two-word utterances predominate, especially toward the end of this stage.

Developing grammar - Stage III: The age of onset of this stage is not so much linked to a specific age as it is to an inner readiness to deal with more complicated language structure. During this stage the child develops longer and more complex utterances or sentences and develops many grammatical devices as well. The child develops morphological markers including past tense and plurals. The development of negative and question forms appear. A new word class begins to take on a look or sound of the telegram. Consequently, these new utterances are referred to as telegraphic speech, e.g., "mommy table sit." This telegraphic form of utterance is not similar to adult type telegrams, which usually omit function words, but represents instead, a growth in sentence

length and complexity (Brown, 1970).

Near-adult grammar - Stage IV: In this stage the child begins to use complex structures of grammar which include dealing with more than the single sentence. All classes of words have been introduced, and the full use of auxiliary verbs have been implemented; however, frequent errors are made. The child has yet to learn all the exceptions to syntactic regularities, and frequently still over-regularizes strong forms. This stage is usually complete by the child's fifth year.

Full competence - Stage V: This final stage of language development takes place during the period from the beginning of school until late childhood. Although vocabulary expansion appears to continue on through life, grammatical development is usually complete by late childhood. During this period the child is refining grammatical usage, learning all exceptions to syntactic and phonological regularities and has learned all major constructions and formal devices of his language.

In the development described in the preceding pages the normally developing child has been seen as a being with a biological inheritance, which is seemingly disposed to language acquisition, and one who interacts with the linguistic environment.

Handicapped Children

The subject of typicality concerning the stages of language development and the normal child seems to be unquestionably that all normally developing children appear to go through these described developmental stages. However, whether this is true for handicapped children depends upon the studies used and the interpretations made. Lenneberg (1967)

and Menyuk (1971) contend that all children, regardless of type and degree of handicap, develop language sequentially, in an orderly manner; however, stretched out in time.

The physically handicapped and cerebral palsied: In the views thus far presented, the intact human needed continually to act and then react and then interact again with his linguistic environment during the developmental process. The child with cerebral palsy who is severely physically impaired from the very beginning of life is forced to react and relate to his environment in a less than normal manner. Because of his physical impairment, the cerebral palsied child often cannot explore his immediate environment with his hands and/or eyes, and frequently has additional involvement, e.g., sensory deficit (Cruikshank, 1955). The developing cerebral palsied child in general, and the athetoid with severe dysarthria in particular, often cannot engage in the prelinguistic play that normal children go through in their early development. The environment of the severely involved child is frequently less than ideal, including periods of institutionalization; prolonged and/or extended hospitalization for frequent surgical procedures related to the cerebral palsy; attendance at residential schools; frequent patterns of family rejection or excessive infantilizing; and disturbed family constellations. Lastly, the cerebral palsied child often has minimal opportunity for speaking and for imitative vocal and verbal behaviors during his critical periods of development. However, the effects of these variables have not been established.

The prospect of developing language with a less than normal

physiology and in an environment which may react negatively or indifferently to this less than normal physiology has not been well explored. That speech and language emerge in most humans is indeed self-evident, but do speech and language also develop in humans who are severely physically handicapped in the speech mechanism ? And if speech and language develop in severely physically handicapped beings, is it the same kind of language, following a similar developmental pattern ? And does this speech and language have similar usage characteristics as others who have developed normally ? Menyuk (1971), in summarizing the information known concerning language development among the handicapped says:

The findings of some studies of the linguistic performance of children who, because of known or suspected physiological conditions develop language in a deviant manner indicate that all these children, despite the difference in cause of deviancy, develop language in a normal sequence but stretched out in time. However, a closer look at these data indicates that differences, as well as delays, occur in the types of rules with especially marked difficulty, and in the rules they acquire and use. It appears that their linguistic behavior is deviant either because of their distorted experience, as in the case of the child who does have the capacity to analyze complete sentences in the way the normal speaking child does; or because the techniques for acquiring language are different, as in the case of the child who cannot spontaneously use the auditory-vocal channel.

Concerning the literature which Menyuk refers to pertaining to language development of children with known or suspected physiological conditions, many of these studies have investigated small numbers of children, others have investigated limited aspects of such children's functioning, and in some areas of physiological dysfunction only a few studies have been accomplished to date. The linguistic literature

concerning the cerebral palsied, brain injured child has been limited and mainly confined to investigating the articulatory aspects of this dysfunction.

The mentally retarded: The view that there has been little research in these areas with regard to the mentally retarded has been expressed by many, especially Carroll (1967), who stated:

I feel strongly that research in this area has not been plentiful and that little real progress has been made. Most of the published articles in the area seem to be reports of rather general surveys that do little more than repeat the oft confirmed finding that difficulties in language and communication constitute one of the major problem areas for mental retardates.

Writing about language research pertaining to the mentally retarded, Carroll (1967) suggested that in the 1960's we seemed to know little more about this problem than we did ten or even twenty years ago. Nevertheless, the literature pertaining to linguistic function is greater by comparison in the area of the retarded than for any other area of dysfunction. Concerning the retarded, the major research in speech and language has focused upon the incidence of impairment and their relationship to organicity and/or delays in intelligence (Shiefelbusch, 1967). Generally speaking, most studies of language problems and mental retardation distinctly demonstrate the high correlation between linguistic problems and mental retardation (Jordan, 1967). Mental retardation and language defects, although present together in the mentally retardate, may be independent entities which are connected by single or multiple causal relation(s). A

number of studies have shown that the quality of speech and language produced by the mentally retarded is consistently inferior to the language produced by non-retarded individuals. In the mentally retarded, syntax is below age level expectancies, sentences are shorter, and ability for abstraction is less apparent. The language of the mentally retarded has been shown to be and described as failing to develop beyond stereotyped patterns of speech. It seems, however, that a number of factors may influence the speech and language of the mentally retarded beyond his retardation. Among these influencers of speech and language development, Jordan (1967) speaks of the de-emphasis of the normal processes of family stimulation through fun, love, and companionship often missing in the relationships of the retarded. Lyle (1959) includes in this category the disruption of the usual or normal mother-child relationship as a factor to be considered. Siegel and Harkins (1963) concern themselves with adult expectations being different, and consequently influencing development.

In evaluating the grammatical development of the mentally retarded, Carroll (1967) and Shiefelbusch (1967) suggest that one may observe a kind of slow motion picture of grammatical development. Although there may be considerable retarded development in grammar among the retarded, there may be some parallels with the normal child which may co-exist. In studying the speech of mongoloid children, Lenneberg, Nichols, and Rosenberger (1964) concluded that the ability to produce certain morphological and syntactical structures is not necessary for understanding them. These researchers also reported that the acquisition of language

in mongoloid children is similar to normal children but stretched out in time. Shiefelbusch suggests that marked differences in language development between the mentally retarded and the normally developing children are present. It would be of value to understand what these differences are, when they become apparent, and whether they remain permanent. Carroll (1967) suggests more careful analysis of mental operations, requiring considerable subtlety, as in the case of differentiating between singular and plural which requires considerable abstractive ability. When and how those processes develop in normal children has been of considerable interest to many for a long time. How these phenomena develop in the deviant, developing child is perhaps even more interesting and not yet understood.

Milgram (1973) discusses the linguist's preference for speaking about competence versus performance and suggests that the competence among the mentally retarded may be closer to normal than heretofore suspected. Milgram states that the retarded child does not necessarily have a permanent deficit in language, but does suffer a developmental lag in language acquisition. The current view held by most linguists and psycholinguists (Chomsky, 1969; Menyuk, 1971) is that the normal child has actually acquired much of his language by school age. Milgram (1973), Carroll (1967), Shiefelbusch (1967), and others support the view that the retardate will have fully developed language when his mental age (M.A.) reaches this same school age level. This will, of course, be nearer adulthood in the mentally retarded individual. There may be a point beyond which the mentally retarded child will not develop

linguistically, representing the mentally retarded's upper limits. Luria (1961) expresses the view that the mentally retarded usually acquires the ability to control the first signal system of language, primarily motor controls, but fails at some point in the second signal system. The second signal system includes that language which is dependent upon mature cognitive development. Many researchers, particularly those influenced by Piaget and his associates, suggest that language development for this group of children seldom advances beyond the concrete stage of cognitive development (Inhelder, 1963). Strict interpreters of Piagetian theories insist on linking the linguistic difficulties to the cognitive development (Piaget, 1973). Milgram (1973) views a linguistic competence model as developing separately from a cognitive competence mode. According to Milgram, the bulk of the retarded population is presumed to acquire a fundamental linguistic functioning which closely approximates that of the normal person.

The hearing impaired: Much of what has previously been said about language deficits and factors influencing language deficits in general, and that which has been said about the mentally retarded, frequently can also be said of other dysfunctions. Does a sensory deficit interfere with language development? There can be no question that the acquisition and usage of speech and language is severely affected by a sensory deficit, such as deafness. Most authorities would concur that the severity of the linguistic deficit is positively correlated with the nature and degree of auditory loss. That deaf children have

linguistic dysfunction is evident, even on cursory evaluation, to which any observer of children attending a school for the deaf can attest. Deaf children growing to adulthood frequently also have serious linguistic problems. However, it is in this growth from childhood to adulthood that researchers are not certain what actually occurs.

The dysarthric child: Of prime concern to this research is the question: What is the nature of the language acquisition of the severely handicapped? In discussing why deaf children's linguistic performance is poorer than normal hearing children, Templin (1966) suggests that deaf children are not without ability, but are handicapped by long periods without productive experience of the use of language. Is this also true for children with other defects? Clinical observation of children with marked impairment to the vocal channel, dysarthria, reinforces the contention that these children may have linguistic deficiencies. Such children's linguistic output often ranges from minimally impaired to complete absence of oral speech. There is widespread agreement by clinical observers of such children that the oral expressive product often is unintelligible and frequently suffering in grammatical completeness even when the linguistic expression of the child is presented in some form other than orally. However, to what extent this has been experimentally demonstrated is not at all clear, for it has not been well reported in the literature. Jordan (1967) has said that some types of linguistic disorder, for example dysarthria, are linked to mental immaturity fairly frequently.

The child with cerebral palsy who has a dysarthric overlay begins

life with a considerable disadvantage regarding the development of speech and language. The speech and language of children so involved has been generally referred to as delayed speech or delayed speech and language. Does such delay influence in any marked manner the language development of the cerebral palsied child? The speech and language delay in some of these children may lag behind all through the developmental period, eventually resulting in learning an alternate means of communication. How, if at all, is this alternate means of communication effected?

From onset of life, children with marked cerebral palsy meet the experiences to which all children are generally exposed with a defective mechanism. They cannot explore their immediate environments with their hands and eyes and must, at best, adapt to all new experiences differently than do normal children. A defective vocal mechanism limits their experience during all stages of linguistic development. They frequently do not have satisfactory practice opportunity, as do normal children. Finally, the people in their environment react differently toward them. Reactions to impaired children may range from rejection to overindulgence to the point of infantilizing them.

However, the literature with regard to the cerebral palsied has mostly been confined to incidence studies, particularly of articulatory development. Few studies have attempted to investigate the linguistic development of cerebral palsied children. Denhoff and Holden (1951) investigating developmental order in cerebral palsy concluded that acquisition of language and articulatory skills, although retarded,

follow the same sequential pattern observed in normal children. Byrne (1959), evaluating the speech and language development of athetoid and spastic children, concluded that speech and language develop slowly among this group, with spastics developing articulatory and 1, 2, and 3-word sentences before athetoids. Most other studies which investigated the performance of cerebral palsied children evaluated articulation and related matters.

Fuller (1966) evaluated the comprehension of some syntactic structures and morphological rules by two cerebral palsied children ages twenty and fourteen, who did not speak and were in the educable retarded range of intellectual functioning. Fuller's morphological test was taken from Berko's Test of English Morphology. Fuller's results indicated that the sentence comprehension of these children was comparable to normal speaking 3 to 7 year olds, and that the results of the morphological rules usage demonstrated that one of the two children paralleled the responses of normal speaking children. The other cerebral palsied child was not able to be tested using morphological rules. Fuller concluded from these limited results that the acquisition of the structures evaluated followed the same developmental sequence as that of normal speaking children except that the developmental period was stretched out over a longer period of time.

Lenneberg (1962) studied a single anarthric child of eight years of age. Although this child could not speak at all, he could comprehend linguistically complicated sentence structures. Menyuk (1971), in talking about syntax and cerebral palsied, has suggested that research

makes it clear that the ability to produce grammatical structures is not necessary for understanding them.

From the results of the few available studies or reports concerning the cerebral palsied, the interpretations made from them have been based on small samplings at best, and possibly not even truly representing this population. Of interest are interpretations which suggest that children whose mentation is sub-normal may be able to produce language with a parrot-like ability without a commensurate degree of understanding. One may also understand how the ability to understand language may not be diminished even when the ability to express language is absent. No studies or reports have been reviewed which demonstrate the functioning of the morphological and/or syntactic factors in such children. Although clinical observations support and reinforce the view that severely cerebral palsied children may have considerable linguistic dysfunction, controlled studies have not yet explored these dimensions. However, in no instance is there a study or report of children whose expressive linguistic ability has been impeded because of the vocal channel impairment of dysarthria. No study or report of children who have developed an expressive linguistic system through some alternate means exists. And finally, does such a cerebral palsied child require practice in expressive language in order to develop language? The following chapter presents the experimental study designed to explore these questions.

CHAPTER III

METHODS

Preliminary Design Considerations

It is generally agreed that the grammar of a language consists of a semantic component, a phonological component, and a syntactic component (Chomsky, 1967). In this study of the language capacities of cerebral palsied children varying in degree of dysarthria, these are the three parameters of language investigated. For each of these parameters both a receptive level as well as an expressive level of functioning were subjected to parallel evaluations.

Semantic Component: The semantic component of a language or grammar consists of a dictionary or lexicon and projective rules (Katz and Fodor, 1963). In the dictionary or lexicon each morpheme is described in terms of its semantic properties or an enumeration of its distinctive properties. The projective rules interpret the meaning of items or properties enumerated in the lexicon in terms of the underlying syntactic structure of the word string used and impose restrictions on the co-occurrence of items in a grammatical string of words. Every grammatical utterance has both the elements of syntactic rules and projective rules co-influencing its structural formation in terms of the restrictions they impose regarding the co-occurrence of words.

To evaluate the semantic language component in this study, lexical receptive and expressive aspects of semantics was considered rather than the totality of semantics. Lexical is defined in this context as relating to words, word formatives, and vocabulary-word understanding as suggested by Pei (1966).

Phonological Component: The phonology of a language consists of its phonetics as well as its morphology or phonological rules. According to Lenneberg (1967), morphology is the study of inflection and is treated separately from syntax. He also suggests that acquisition of these phonological rules concerning inflection follow a developmental order, so that by the time children enter the first grade the basic inflectional mechanisms appear to be very well established (Lenneberg, 1967).

Regarding the phonological components of a language or grammar, Menyuk (1971) writes:

In the lexicon of a language each morpheme is described not only in terms of its semantic properties but also in terms of a set of matrices of distinctive features. These matrices of features describe and distinguish from each other all the phonemes of a language. Phonological rules are then applied depending on the underlying structures of the sentence and of the morpheme. For example, in English, plural markers and tense markers are dependent on the speech sound component which ends the morpheme.

Menyuk further suggests that acquisition of phonological rules follow a sequential pattern ranging from simpler to more complex and is finally equal to an adult model of grammar.

Empirically, Berko (1958) has studied the process of over-generalization, evaluating children between 4 and 7 in the ability

spontaneously to change nonsense words into plural, past tense, third person singular, and possessive forms. Her results clearly demonstrate the orderly development of morphological rules skill in normal children. In the present study, following Berko's lead, the phonological component of language is assessed by receptive and expressive tests of morphological development.

Syntactic Component: Pei (1966) defines the syntactical component as the rules of the relation of words to one another as the expressions of ideas and parts of structures of sentences. In evaluating the subject of how a child acquires language, one is concerned with the general mechanism of language acquisition, production, and understanding. For this aspect of the present study, the task was to obtain some valid measure of the subject's ability to deal with the structure of his language.

It is generally accepted by speakers of a language that thoughts and ideas are expressed in the form of words which are generally strung together as sentences. Sentences are strings of words containing some kind of structure, although that structure is not always evident. The string of words can be identified by its component parts or constituents, analyzable in terms of both a surface structure and an underlying deep structure. According to Jacobs and Rosenbaum (1968), the surface structure of a sentence defines the form a string of words takes in communication; the deep structure contains most of the information required to determine the meaning of a sentence. Cazden (1971) states that "the deep structure represents the basic relationships in the meaning being

expressed - relationships of actor-action, action-object, and modifications."

The deep structure of a sentence is related to the surface structure through transformation. Generally, a number of transformations must be used in order to change a deep structure into a surface structure. The number and type of transformations used by a speaker is a matter related to the speaker's linguistic sophistication. In normal children of younger ages, i.e., children whose grammars are of recent emergence, one observes fewer transformations than in children who are older. According to many authorities there is an orderly developmental process in the acquisition of transformations (Brown and Hanlon, 1970).

The experimental population of this study presents the opportunity for evaluating transformations that are acquired late in normally developing children. Two of these were selected: the passive which becomes stable at about seven years of age, and the indirect-object inversion which is in development until about nine years of age. The present study asks whether this is also true for the children in the experimental groups, or whether their distorted expression of language has retarded the development of these transformations. Hence this study assesses the syntactic component of language through two domains of transformational usage, receptively and expressively.

As discussed thus far, the need for eight tests has been established; namely, expressive and receptive versions of lexical, morphological, passive, and indirect-object-inversion tasks. Beyond these, the need for a spontaneous speaking task was discerned, so that actually nine tests were selected or developed as detailed in the following sections.

Lexical Tasks

Receptive: For the evaluation of the receptive level, the Peabody Picture Vocabulary Test (PPVT) was selected. According to its author (Dunn, 1966), "The Peabody Picture Vocabulary Test is designed to provide a well standardized estimate of a subject's verbal intelligence through measuring his hearing vocabulary." This test has also been standardized for the mentally retarded and cerebral palsied.

The PPVT was selected because it appeared from the data provided by the designers of this test to be a valid measure. Their validity data relate to content and construct validity for the rational evidence, and item validity for the statistical evidence. The reliability coefficients, that is, the degree to which subjects' scores remain stable or consistent, were found to be very high, ranging from a low of 0.67 at the six year level to a high of 0.84 at the 17 and 18 year level, with a median of 0.77 (Dunn, 1959). Dunn and Brooks (1957), Dunn and Hottel (1959), and Dunn and Harley (1959) found comparable reliability coefficients for 371 educable mentally retarded subjects and for 20 cerebral palsied children. Dunn (1959), in discussing these studies, states: "These data suggest the PPVT is a reasonably stable instrument for average, mentally retarded, and cerebral palsied subjects."

In this test, a stimulus word is presented to the subject accompanied by a plate containing four pictures. The subject is instructed to select one picture out of the four. A vocal or non-vocal response is permitted. The words are presented in order of increasing difficulty.

The test continues until the subject misses six consecutive words. Usually the obtained scores are scaled and computed into age equivalents or mental ages, and standard score equivalents or intelligence quotients. In this study, however, the raw scores are used directly, indicating the total number of correct responses of a possible 150 correct responses. Since the mental age and intelligence quotient scores for each subject have already been established from previous psychometric data obtained during the screening of each subject, it was considered unnecessary to use the derived scores of the PPVT to establish similar information.

It likewise appeared unnecessary to give this test to a control group since the designers have standardized the instrument for normal children of all ages up to 18. Hereafter this phase of the study will be referred to as Lexical Receptive.

Expressive: The vocabulary sub-test of the Wechsler Intelligence Scale for Children (WISC) was selected as the measure to evaluate lexical expressive performance. The WISC is a well-known psychological instrument for evaluating children over a wide range of intellectual functioning. Specifically, vocabulary sub-tests appear to be valid predictors of lexical ability. Terman and Merrill (1937) asserted this for predecessors of the WISC, and Wechsler (1949) found his Vocabulary Sub-test to correlate higher with full scale scores than any other sub-test. Several additional studies have demonstrated an association between vocabulary knowledge and school success, no doubt because both depend in some degree upon linguistic and cognitive maturation.

Wechsler presents validity and standardization data demonstrating the WISC's ability to predict intelligence for normal and mentally retarded populations. Therefore, it was unnecessary to present this test to a normal control group as such standardization had already been established.

No special adaptation of the Vocabulary Sub-test was required for administering or responding to stimulus words. In standard fashion, stimulus words are presented in order of increasing difficulty, the subjects responding by giving a definition of the word either vocally or through use of the letterboard. In either response mode, responses were recorded by an aide for later evaluations. In accordance with the Test Manual instructions, each response was retrospectively given a score of zero, one, or two, depending upon the quality of the response. There are 40 items on the test allowing for a maximum score of 80. This phase of the study will hereafter be referred to as Lexical Expressive.

Morphological Tasks

Receptive: A morphological receptive test was developed modeled upon tests like the PPVT which present a plate of four pictures to a subject along with a stimulus which appropriately matches one of the four pictures on the plate. This type of test requires only that the subject have adequate audition. There is no penalty for oral ineptitude, as responses may be oral or non-oral. This type of test is ideally suited to the experimental population used in this study.

Explicitly, two forms of a 20-item task were developed which assess

a subject's capacity to discriminate among five dimensions of morphological markers: singular vs. plural, present vs. past, third person singular vs. plural, singular vs. plural possessives, and comparatives vs. superlatives. In each form of the test each dimension was sampled with four items, two from each extreme. The two forms are presented in Appendices A and B where it is observed that parallel items sample the same dimension so that a single picture plate may serve for both forms. For example, Appendix C displays a plate which in Form A calls for the plural possessive as a correct response but in Form B calls for the singular possessive as a correct response. As administered, each form of the test is preceded by four practice sentences taken from the alternate form.

As initially developed it was not certain whether the administration of one or both forms would be required to obtain a stable measure of receptive morphological development. When both forms were presented to a normal control group, however, it was established not only that the task was within their normal competences, but also that either form yielded essentially the same result as the other. In application to the experimental group therefore, either Form A or Form B was given to any subject. Hereafter this phase of the study will be referred to as Morphological Receptive.

Expressive: The search for a suitable test to evaluate morphological expressive functioning was complicated by the nature of oral dysfunction of one group of the experimental population. The most severely handicapped with regard to oral functioning were anarthric and consequently,

could not be tested with any instrument requiring an oral response. No existing test met this requirement, but the Berko Test of English Morphology (Berko, 1958) seemed adaptable to a non-oral response format.

The Berko test uses nonsense words to test the child's ability to apply the appropriate morphological rules for plural, past tense, third person singular, possessive, comparative, and superlative forms. According to Berko, the use of nonsense words obviates the possibility of being cued by extraneous factors such as memorization. It is presumed that if a child understands the phonological rule applicable to a particular linguistic situation, he can generate this rule to nonsense words as well. This was well demonstrated in Berko's test population of children between the ages of 4 and 7 who were capable of oral responses (Berko, 1958). In order to make this test appropriate for the entire experimental population used in this study, Berko's oral response demand was converted to a multiple choice task.

Appendix D illustrates one of Berko's plates and its modification for this study. Below each picture five choices were provided, one of them correct, the remaining four being the most common errors made by Berko's subjects. This treatment was applied to each of the 33 test items, yielding a maximum score of 33 correct responses.

When applied to a normal control group, this test was found to be well within the functioning level of children above the age of nine, albeit somewhat difficult for younger children. This phase of the study will hereafter be referred to as Morphological Expressive.

Passive Tasks

Numerous researchers, including Menyuk (1971) and Chomsky (1969), suggest that it is in the later stages of development of syntactic rules that the ability for generating passives occurs. Difficulty with the passive has been noted in young children by many researchers (Fraser, Bellugi, and Brown, 1963; Slobin, 1966; Turner and Rommevetveit, 1967). These authors agree that the passive is one of the later developing sentence types over which a child gains mastery.

An example of the passive sentence and its active analog is contained in the following:

Active: The man punished the dog.
 Passive: The dog was punished by the man.

The active voice is a grammatical form understood very early in development. In the active form of the above sentences one may see that the first noun, the subject (the actor or performer), followed by a verb (action word) is followed by a second noun, the object, which takes the position of being acted upon. This active voice is considered to be in the normal or expected subject-verb-object (SVO) relationship. The passive voice is a grammatical form which does not become stable in most children until considerably later in development. In the passive form of the above sentence one may see that the strategy in changing an active to a passive requires that the first noun exchange position with the second noun, and the function word "by" is added. Thus the acted-upon object noun is now the first element in the sentence. The usual SVO word order has been altered and, consequently, made more

difficult to understand, especially for the developing child. However, because of his ability to comprehend the subject matter of the sentence, the developing child may be able to understand the above passive-voice sentence despite the lack of knowledge or grammatical competence with the particular form.

The task of developing competence and subsequent production of the passive voice is made more difficult if contextual cues are eliminated. In the above sentence examples, there is an obvious contextual cue. Although a man can punish a dog, a dog cannot, in the usual sense, punish a man. The child's comprehension abilities aid him in understanding this complicated grammatical form. The passive task becomes more difficult for all speakers, especially young speakers, in the following examples

Active: The boy hit the girl.

Passive: The girl was hit by the boy.

In this set of examples, there is no absurdity presented in the context: a boy may hit a girl and/or a girl may hit a boy. The listener in this instance must understand the passive in terms of the structure without the assistance of a contextual cue. Comprehension abilities do not, in this instance, suffice to make this difficult sentence type understandable.

According to Bever (1968) the comprehension of the passive sentence type or transformation may begin to appear as early as age two in some children, but does not become stable in most children until considerably later, at about seven years of age. It appears as if children begin to understand and then use the passive as early as age two. They thereafter over-generalize its use, but upon finding the passive not always applicable,

cease to employ it until a later period of language development. Menyuk (1971) suggests that this transformation is generally present and stable in normal children by the age of ten.

Receptive: A search of existing tests revealed no test which evaluated the receptive attainment of the passive. Consequently, a test was developed which evaluates a subject's ability to understand the active form and its passive transformation analog.

The passive test, which in reality was an "active/passive" test, was developed as a series of paired reversible sentences stated in the active voice form and/or the passive voice transformation, e.g., "The man helped the fireman", and "The fireman helped the man", expressed in the active form; and "The fireman was helped by the man", and "The man was helped by the fireman" expressed in the passive transformation.

Each pair of sentences was accompanied by a clearly drawn pair of pictures on one plate which depicted the actions implied in the sentences presented (Appendix G). Fourteen pairs of actively stated reversible sentences were composed, as were fourteen pairs of passively stated reversible sentences, and fourteen pairs of decoy reversible sentences in the active voice, each with appropriate picture accompaniment. Consequently, a total of forty-two sentences, fourteen examples of each of the three types, were prepared and divided into two parts, Form A and Form B. Each form contained twenty-one sentences in which all three types were equally counterbalanced (Appendix E & F).

The subject was shown two pictures as the evaluator read aloud a sentence. The subject was asked to select which of the two pictures

best matched the sentence. In presenting the Active-Passive Receptive test to subjects, half of the subjects in each experimental group received the Form A and the other half received the Form B. The scoring in this test gave one point for each correct active transformation sentence. There was a possible twenty-one point maximum.

This test was presented to a normal control group. The results of this control group demonstrated that both the sentences and the pictures were readily intelligible and appropriate for this age range.

The Active-Passive Receptive test will hereafter be referred to as Passive Receptive.

Expressive: The Passive-Expressive task was developed from the Passive Receptive test designed and described in the preceding section. In this task, each subject was given either Form A or Form B, depending upon which form the subject was given in the Passive-Receptive Task. The pattern of test taking for each subject followed either a Form A for Receptive and Form B for Expressive pattern, or a Form B for Receptive and Form A for Expressive pattern. In this manner, no subject could take the same test form in both the receptive and expressive portions (Appendix H and I).

In the expressive portion, the subject was presented a plate with two pictures (Appendix G) as the evaluator read aloud the appropriate sentence accompanying each picture. The evaluator then pointed to one of the two pictures and asked the subject "What does this picture say?". The pictures pointed to were preselected and starred on the evaluator's sheet, beyond the view of the subjects. All responses, oral or non-oral,

were recorded by an aide for retrospective analysis.

The scoring in the expressive portion of the test differs somewhat from the receptive portion. Each correct response is given one point for each active transformation sentence, two points for each passive transformation sentence, or one point for each passive transformation sentence incorrectly repeated but converted into its active analog. This scoring scheme does not completely penalize subjects who have not yet achieved full competence with this transformation. At the same time, this scoring scheme allows for some descriptive qualitative comments concerning syntactical development in this experimental population. A maximum score of twenty-one is possible using this scoring method.

This test was given to a normal control group. The test results of this group indicated that both sentences and pictures were readily intelligible and within the ability of children in this age range.

The Active-Passive-Expressive test will hereafter be referred to as Passive Expressive.

Indirect Object Tasks

The indirect object transformation and the indirect object inversion transformation are interesting to look at developmentally, although they emerge at different ages.

The use of the indirect object is considered to be among the later developing sentence types that young children acquire. This is particularly evident in children of younger years whose grammars have recently emerged (Fraser, Bellugi, and Brown, 1963). An example of the indirect object and the indirect object inversion sentence types may be seen in

the following:

Indirect Object: The man gave the rat to the snake.

Indirect Object

Inversion: The man gave the snake the rat.

In the sentences used in the above examples, the indirect object, a somewhat difficult construction, has been made considerably more difficult by modifying it into the indirect object inversion. This complex sentence type is considered among the last to develop in the child. Because of its complexity, Lee (1969) has included this sentence construction as among the last test items in her Northwestern Syntax Screening Test. The task of dealing with word orders which are strung out in somewhat unusual manner create difficulty for many speakers.

Menyuk (1971), writing on this subject, says:

It seems clear, then, that in analyzing sentences, children, and probably adults as well, interpret some sentences as the actor + action + acted upon, or interpret the subject in sentences as the actor, the verb as the action, and the object as acted upon. When the situation is not congruent with this interpretation of sentences, time is needed to reverse the subject and object in the sentence to fit the situation.

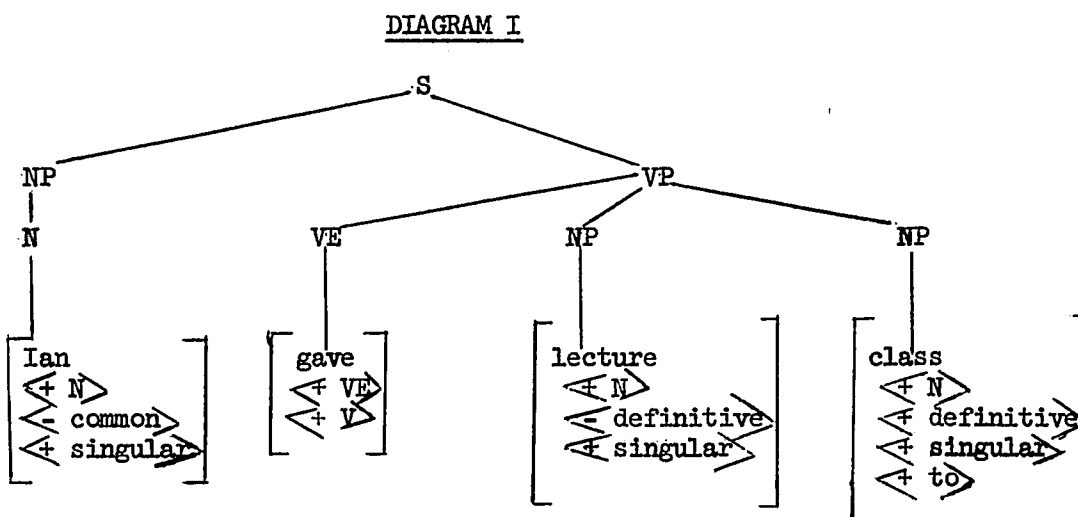
The grammatical complexity of the indirect object inversion is not easily understood even among adult speakers, and speakers below nine demonstrate little competence with this transformation.

In sentences containing these transformations, each sentence contains an object noun phrase and, in addition, a second noun phrase which usually contains a preposition.

An example of this type of sentence may be observed in the following sentence.

"Ian gave the class a lecture."

The deep structure for the above sentence, in a somewhat abbreviated form, may be observed in Diagram I, as suggested by Jacobs and Rosenbaum (1968).



If a prepositional transformation were now applied to create a preposition segment to the left of the second noun phrase, and other transformations as the article and the agreement transformations are carried out, the surface structure for the sentence following is generated:

"Ian gave a lecture to the class."

Reviewing the above tree diagram, Diagram I, it becomes evident that in verb phrases one may find not only an object noun phrase, but also a second noun phrase which sometimes contains a preposition. After a preposition transformation is applied to a verb phrase, a second transformation, the indirect object transformation may be applied. The later transformation reverses the order of the object and indirect object noun phrases and deletes the preposition segment of the indirect object, e.g. "The man gave the rat to the snake." will become "The man

gave the snake the rat." This application of transformations results in a syntactic structure which is grammatical, but requires more time to deal with on the part of the listener. In addition, it is not present in the syntactic repertoire of young children, but is generally developed by age nine.

Receptive: A search of existing tests revealed that no test existed which would appropriately evaluate the subjects' ability in this language domain. Consequently, a suitable test was developed.

The indirect object test developed for this study was, in reality, a test demonstrating understanding and usage of both the indirect object transformation and the indirect object inversion transformation. The test was developed in such a manner that each sentence composed was part of a pair of reversible sentences stated in the indirect object transformation and/or the indirect object inversion transformation.

In this task, in which the ability to understand the indirect object and the indirect object inversion transformations is to be measured, fourteen pairs of reversible sentences stated in the indirect object transformation were composed as well as fourteen pairs of reversible sentences stated in the indirect object inversion transformation. Fourteen additional pairs of reversible sentences were decoys. Each pair of sentences was accompanied by a clearly drawn pair of pictures which depicted the actions implied in the sentences presented (Appendix L). Consequently, a total of forty-two sentences, fourteen examples of each of the three types were prepared and divided into two parts, Form A and Form B. Each Form contained twenty-one sentences in which

all three types were equally counterbalanced (Appendices J and K).

The subject was shown two pictures as the evaluator read aloud a sentence. The subject was asked to select which of the two pictures best matched the sentence. In presenting the Indirect Object Receptive test to subjects, half of the subjects in each experimental group received Form A, and the other half received Form B. The scoring in this test gave one point for each correct indirect object transformation sentence, and two points for each correct indirect object inversion transformation sentence. There was a possible twenty-one points maximum score.

This test was presented to a normal control group. The results of this control group demonstrated that both sentences and pictures were readily intelligible and appropriate for this age range.

The Indirect-Object-Receptive test will hereafter be referred to as Indirect Receptive.

Expressive: The indirect-object expressive task was developed from the Indirect-Object Receptive test designed and described in the preceding section. In this task each subject was given either Form A or Form B, depending upon which form the subject was given in the Indirect-Object Receptive task. The pattern of test taking for each subject followed either a Form A for Receptive and Form B for Expressive pattern or a Form B for Receptive and Form A for Expressive pattern. In this manner, no subject could take the same form in both the Receptive and Expressive portions (Appendices M and N).

In the expressive portion the subject was presented a plate with

two pictures (Appendix L) as the evaluator read aloud the appropriate sentences accompanying each picture. The evaluator then pointed to one of the two pictures and asked the subject, "What does this picture say ?" The pictures pointed to were preselected and starred on the evaluator's sheet, beyond the view of the subject. All responses, oral or non-oral, were recorded by an aide for retrospective analysis.

The scoring in the expressive portion of the test differs somewhat from the receptive portion. Each correct response is given one point for each indirect object transformation sentence, two points for each indirect object inversion transformation sentence, or one point for each indirect object inversion transformation sentence incorrectly repeated but converted into its indirect object paraphrase. This scoring scheme does not completely penalize subjects who have not yet achieved full competence with this advanced transformation. At the same time, this scoring scheme allows for some descriptive qualitative comments concerning syntactical development in this experimental population. A maximum score of twenty-one is possible using this scoring method.

This test was given to a normal control group. The results of this test indicated that both the sentences and pictures were readily intelligible and within the ability level for children in this age range.

The Indirect-Object-Expressive test will hereafter be referred to as Indirect-Object Expressive.

Spontaneous Connected Speech Task

Measures of connected speech have long been considered an effective index of language development in children (Brown, 1970). Connected speech samples present an opportunity to look at a child's utterances as he puts component parts together. These speech samples cut across all language domains.

For this study, it was considered desirable to obtain some measure of spontaneous connected speech so that some comparison could be made among these speech samples and the responses obtained for the linguistic tasks previously evaluated. In order to obtain a sample of spontaneous connected speech, subjects were to be asked questions which were designed to elicit a flow of spontaneous connected speech. To accomplish this task, the Sentence Comprehension Sub-test of the Wechsler Intelligence Scale for Children (WISC) was utilized. According to the Manual of Instructions for this test, children are asked fourteen questions to which they must provide an oral response. These questions are presented in increasing order of difficulty. The WISC Sentence Comprehension test was modified to include five questions selected from the 14 questions (6,8,10,12, and 14) (Appendix O). This modification allowed a representation from each level of difficulty ranging from easier to more difficult. The response mode needed to be modified in order to accommodate the special needs of this test population. Oral responses were permitted and tape-recorded for oral speaking subjects, and pointing to the letter-board responses were permitted for non-oral speaking subjects. These non-oral responses were recorded on paper by an aide.

All responses were retrospectively analyzed. Scoring for this task simply totaled the number of words used in the total speech sample. No need was discerned to administer the Spontaneously Connected Speech test to normal subjects since the WISC Handbook supplied normal expectations.

The Spontaneously Connected Speech test will hereafter be referred to as Expressive Connected Speech.

Pretesting with Normals

The PPVT and the WISC, used to evaluate lexical ability, are tests which had been tested and standardized with normal and special populations. Similarly, norms existed for performance on the Spontaneous Connected Speech test. There appeared to be no need to replicate the suitability of these instruments for the population used in the study's experimental groups. However, in the remaining tests, the Morphological-Receptive, the Morphological-Expressive, the Passive-Receptive, the Passive-Expressive, the Indirect-Object Receptive, and the Indirect-Object Expressive, it was desirable to demonstrate that the tests were appropriate for the population to be evaluated.

Consequently, a normal control group hereafter referred to as Normal Control Pilot Group, was established. A random selection of 16 non-neurologically impaired children ranging in age between 9 and 15 composed the Normal Control Pilot Group. These children were considered to be normal in physical, mental, and social development and function. They were all at an appropriate grade level in school for their chronological age, normal in hearing and vision, and with no debilitating

physical symptoms.

Their results demonstrated that the materials, sentences, and pictures for each test were readily understood and well within the levels of functioning for children in this age range. These results have been summarized in Appendix P.

Subjects:

Sixty-four cerebral palsied children ranging in age between nine and twenty-one were used as subjects in this study. These children were selected as a result of the screening of children in cerebral palsy centers and schools in the New York and New Jersey areas. Although nearly 2,000 cerebral palsied children were screened for their possible use as subjects, several subsequent evaluations reduced the number to sixty-four children. These children were all of school age, and were in attendance at one of the following schools and/or centers:

The Matheny School, Peapack, New Jersey
The United Cerebral Palsy Center, Inc. of Rochester,
the Al Siegel Center, Rochester, New York
The Cerebral Palsy School, Nassau County Board of
Cooperative Educational Services, Roosevelt,
New York
The United Cerebral Palsy Association, Rockland
County, New York, New York

All children used in this study as subjects were medically diagnosed as having athetosis by a Board-Certified Pediatric Neurologist whose specialty was in cerebral palsy. Any child with a mixed type of cerebral palsy was excluded. Since diagnoses are occasionally changed as the child matures and his clinical picture becomes apparent, the length of time the diagnoses remained stable was also checked, and no

child was included whose diagnosis of athetosis had not been constant for the two years prior to this study. In addition, every child was required to have, at least, two previous medical evaluations prior to the onset of this study. In this manner it was possible to exclude all non-athetoid or mixed types of cerebral palsy.

The children used as subjects in this study were beyond both the CA and MA age of nine, and were able to demonstrate some mastery in communication. Such children could not be evaluated in an identical manner to children whose grammars are just emerging or even recently emerged. because in this instance one is evaluating the developed language. The most recent literature with regard to language acquisition tends to evaluate children at the earliest stages of linguistic functioning. Not nearly as much is known about children who are beyond this stage. In this regard Broen (1972) states:

Ultimately the child must learn the language practices of his linguistic community, and so one approach to language acquisition has been to concentrate on the terminal behavior, the linguistic competence of mature speakers of the language. Efforts to provide a comprehensive and formal account of adult language are, therefore, highly relevant to the task of describing linguistic development.

The subjects evaluated in this study were children above the mental age of nine. Presumably, children above the age of nine who have a developed system of communication have also developed the necessary linguistic skills which will allow them to understand and produce language similar to all mature speakers of the language. However, as stated earlier, it appears as if some dysarthric speakers in this test population

do not function in such a linguistically mature manner. These dysarthrics produce a linguistic product which, from several aspects, is both different and possibly less mature than that which is produced by children with similar intellectual ability. This appears to be especially so in morphological and syntactic parameters of language functioning. Consequently, in order to evaluate linguistic functioning, measures were sought which would be able to evaluate more advanced levels of understanding and usage in a somewhat mature population.

Each subject, then, was selected on the basis that he be between the chronological ages of nine and twenty-one. Age nine was selected as a baseline because some of the functions tested for are not always attained by an earlier age. Although some of the tests used, such as the vocabulary tests, required a mental age of 3 years, the morphological tests required a mental age of 4 or more years and the syntax tasks required a competence generally thought to be late in development and questionably present in normal children below the ages of seven and nine.

As the extent of the ability to communicate orally is the major concern of this study, it was necessary to select subjects with a wide range of oral communicative ability. Thus, dysarthric subjects were selected whose communicative abilities ranged from complete freedom from any impediment in their use of expressive language to those whose expressive language was completely impaired, anarthric, which required some alternative means of expressive communication.

Dysarthrias, say Berry and Eisenson (1956), are defects of articula-

tion which are caused by either central or peripheral nerve damage. Impaired nerve stimulation or control may result in misarticulations which, when severe, may make word recognition difficult. Ingram and Barn (1961), in their study of 258 cerebral palsy children, found that about 70% of those children with dyskinesia (athetosis, tremors, rigidity) showed evidence of dysarthria. Mysak (1971), writing of cerebral palsy dysarthrias, suggests that there is great variability in cerebral palsied children, ranging from near normal articulation to severe dysarthria. On the continuum of dysarthria, severe dysarthria may be extreme enough to include anarthria. Subjects, then, were selected for inclusion in this study on the basis of their degree of dysarthric involvement. The term "communication" as presently used was defined simply as the product of speaker's oral expression as evaluated by a listener in terms of intelligibility. The degree of impediment to the expressive communicative process is directly related to the dysarthric involvement.

To evaluate the degree of dysarthria, a two-step procedure was arranged. In step one at every center, each potential subject was evaluated by a professional Speech Pathologist, who held a Certificate of Clinical Competence in Speech Pathology conferred by the American Speech and Hearing Association, and who had had professional experience with the cerebral palsied. The criteria for evaluating dysarthria was determined by clinical practice procedures used in the centers and schools where the subjects were obtained. The criteria used in placing these children into a group were as follows:

1. Group 1 were those children whose dysarthria was so severe that they were anarthric, without oral ability.
2. Group 2 were those children with moderately severe to severe dysarthria whose oral speech was difficult to understand more than 50% of any given segment of speaking time.
3. Group 3 included those children with mild to moderate dysarthria whose oral speech intelligibility presented minimal difficulty in terms of listener understanding.
4. Group 4 were children who had no observable dysarthria and whose speech intelligibility was good.

In step two, a two-minute sample of each oral subject's speech was recorded on magnetic tape. Each subject was asked a series of questions designed to elicit some identifying information of a biographical nature. These magnetic tape speech samples were played for a panel of three unprofessional listeners who were asked to listen to each tape and make a judgment concerning the group to which the speech sample belonged. The criteria given the three unprofessional listeners almost paralleled the instructions and criteria given the speech pathologists and were as follows:

Group 1 speakers were not taped because they had no functional expressive output and have already been placed into group 1.

Group 2 are speakers whom you do not understand most of the time, most, meaning that more than half the time they are unintelligible.

Group 3 are speakers whom you readily understand, meaning that in less than 50% of the speaking segment they are unintelligible..

Group 4 are speakers for whom you find no difficulty with speech intelligibility.

Using these criteria the unprofessional listener-judges placed children into the above-enumerated four groups. Judgments of listeners required no less than 2 out of 3 agreement in order for a child to be placed into a group; most decisions were unanimous.

Each subject for Group 1 was evaluated for the ability to communicate in some alternative system. Potential subjects for this group were required to demonstrate an ability in communicating words and phrases or sentences on a letterboard, which was composed of a basic word list comprising all grammatical classes coupled with an alphabet display for composing new words or words not included on the board.

All subjects were screened to assure that the following criteria were present:

1. The ability to read above a primer level.
2. No visual perceptual defect.
3. Normal visual acuity with or without correction.
4. Absence of aphasia, as reported by teachers, speech therapists, and/or psychologists.
5. Normal hearing.
6. A mental age of nine years or above.
7. A chronological age of more than nine but less than twenty-one.
8. Moderately severe to severe physical involvement.

The above information was derived from the educational charts of each child. These charts contain the child's history with regard to

diagnostic evaluation, progress reports, and summaries relating to the educational process during the years the child has been in attendance in the school. These reports are confidential and official records. No child was included whose record did not correspond with the eight screening criteria above.

Regarding the matter of language usage of the two sexes, no strong case can be made for a difference based upon sex. McCarthy (1963), in his studies concerning performance on the ITPA, indicates that his data suggest that scores of males and females were in close agreement in each test by age levels. No significant statistical difference existed in terms of sex. Despite these findings, an effort was made to obtain as many female subjects as male subjects for each experimental group.

Although each subject had a history of normal hearing, prior to final acceptance as a subject a pure-tone audiometric test was given each child. A bilateral response to 20 decibels at each octave between 250Hz and 8,000Hz was required.

Concerning the matter of intelligence among the cerebral palsied, there is general agreement that there is considerable mental retardation present. However, reports from studies of mental retardation in cerebral palsy range from a low of 30 percent, as reported in the often quoted study by Phelps (1948), to a high of 70%, as reported by Crothers and Paine (1959). Most studies seem to agree that at least 50 percent of this population is mentally retarded (Asher and Shonell, 1950; Miller and Rosenfeld, 1952; Bice, Hopkins and Colton, 1954; Hood and Perlstein, 1956; and Henderson, 1961). Although there are some cerebral palsied

individuals of superior intelligence, the majority of those not mentally retarded tend to be skewed toward the low or dull normal levels of intelligence (Crothers and Paine, 1959). In the initial selection of such subjects, no attempt was made to control the variable of intelligence in this study. However, the intelligence quotient for each subject was obtained and later statistically considered as a factor possibly affecting function.

The children used as subjects in this study demonstrated I.Q.'s which clustered about the mid-point of the educable retarded range. The mean I.Q. for the experimental groups was 75.88, ranging from a low of 71.36 to a high of 78.28.

Beyond the I.Q., the mental age and chronological age also varied somewhat among the experimental groups. These variations were considered of secondary importance compared to the dysarthria dimension defining the groups. Nonetheless, the M.A.'s and C.A.'s for each subject were also held available for retrospective statistical analysis.

The children who were evaluated for inclusion in this study shared several additional commonalities. From the onset of life, they shared gross physical impairment and the limitations such physical impairment imposes upon learning experiences. They had similar histories of protracted periods of separation from home environment and family because of periods of extended hospitalization and/or attendance at a residential school. They shared the experience of attendance in a special school for severely handicapped away from their neighborhood schools, consequently resulting in limited normal social experiences. Each child came from a white, middle-class environment.

In summary, the results of the screening using the eight previously enumerated criteria resulted in obtaining one hundred subjects. This number was further reduced by illnesses, conflicting schedules, inability to obtain parental permission, and by the refusal of a few subjects to participate. Ultimately, sixty-four cerebral palsied, athetoid children were selected as subjects. The identifying data concerning group composition has been summarized according to the specifications of the formation of the experimental groups in Table 1.

Administration of Tests

Sixty-four cerebral palsied athetoid subjects ranging in age from nine through twenty-one were brought into the testing centers on pre-selected days. Each subject was scheduled for two ninety-minute testing sessions, with an additional ninety minutes between sessions allowed for rest and relaxation. During this rest and relaxation interval, subjects were permitted to eat, sleep, or play in a nearby recreation room.

Prior to the initiation of the first session, each subject was informed that he had been selected to participate in a language study of cerebral palsied children. Each subject was then asked if he would like to participate in a study that would evaluate his level of functioning in several areas of language understanding and usage. It was further explained that the results of this study would be used to further the knowledge of teachers and therapists who are working with cerebral palsied children. After each subject agreed to participate, he was told the objectives of each of the two sessions he would be

TABLE 1
SPECIFICATIONS OF THE FORMATION
OF THE EXPERIMENTAL GROUPS

Degree of Dysarthria	Group I	Group II	Group III	Group IV	Total Sample
	Severe	Moderate	Mild	None	
Number of Cases	14	19	17	14	64
Sex	8M 6F	9M 10F	9M 8F	7M 7F	33M 31F
$\bar{X}$ C.A. in Months	189.43	169.79	174.29	205.29	183.05
S.D.	27.70	40.31	41.07	37.92	39.24
$\bar{X}$ M.A. in Months	134.57	130.21	134.76	149.64	136.62
S.D.	29.62	39.00	34.73	30.88	34.21
$\bar{X}$ I.Q.	71.36	78.28	78.00	74.57	75.88
S.D.	11.47	17.77	12.87	15.87	14.81

attending. Without exception, all subjects appeared eager to participate and ultimately cooperated fully throughout the two sessions.

The time needed to administer these tests was determined by the time required to test the Normal Control Pilot Group. In testing this group, the total time required was found to be an average of 95 minutes, with a range of 80 to 110 minutes. On the basis of clinical observation, it was determined that non-oral cerebral palsied children appear to need approximately 50% more time than normal speakers to express similar ideas using a letterboard for communication. Consequently the maximum time required to test normal children was taken as a base figure, and 60% was added as the time needed to use the letterboard mode of communication. This resulted in allocating 180 minutes as the time needed to administer these tests to severely limited cerebral palsied subjects. The 180 minutes was divided into two ninety-minute test sessions. Ultimately, a ninety-minute session was more than sufficient to administer the assigned tests during each session. This ninety-minute period also allowed for inter-test pauses in order to avoid subject or evaluator fatigue.

During the first session each subject was given four receptive language tests: the Lexical Receptive test, the Morphological Receptive test, the Passive Receptive test, and the Indirect-Object Receptive test.

During the second ninety-minute session each subject was given five expressive tests: the Lexical Expressive test, the Morphological Expressive test, the Passive Expressive test, the Indirect-Object Expressive test, and the Connected Speech test.

The testing environment presented an ambience of quietness, in a room well lighted and free of distraction. There were no interruptions during the entire testing sessions.

Before initiating each of the nine tests, every subject was given the same instructions pertaining to the test he was about to take. In addition, each subject was given ample practice opportunity before officially beginning a test. In no instance was a test initiated before the subject demonstrated that he understood the instructions and the task. All subject responses were recorded either on magnetic tape, as in the case of orally speaking subjects, or on paper, as in the case of subjects using a manual system of response.

The results of these tests are reported in the following chapter.

CHAPTER IV

RESULTS

Sixty-four cerebral palsied children, varying in degree of dysarthria, were evaluated along three parameters of language usage: semantic, morphological, and syntactical. A total of nine measurements were collected on each subject, yielding the summary statistics presented in Table 2.

As a first screening of the data, the group means for each task were compared through a one-way analysis of variance, yielding the F values shown in the last column of Table 2. It is observed that on only three measures, all of them expressive, were there significant differences among the groups. These were the Lexical Expressive task (WISC), the Indirect-Object Expressive task, and the Connected Speech task. Subsequent pairwise comparisons of the groups, employing the Tukey HSD test (Runyon and Haber, 1971), revealed varying patterns of significant differences at the .05 level. For the Lexical Expressive task, Group IV (no dysarthria) scored higher than Group II (moderate dysarthria). For the Indirect-Object Expressive task, Group IV and III (no dysarthria and mild dysarthria) scored higher than Group I (severe dysarthria). For the Connected Speech task Groups IV and III (no dysarthria and mild dysarthria) scored higher than Groups II and I (moderate dysarthria and severe dysarthria). Indeed on that task the

TABLE 2
MEANS AND STANDARD DEVIATIONS
FOR ALL GROUPS-FOR ALL TASKS

Group		I	II	III	IV	
Number of Cases		14	19	17	14	F
Degree of Dysarthria		Severe	Moderate	Mild	None	
TASKS (and source of scoring)	Lex.Receptive (PPVT)	$\bar{x}$ 81.36 S 13.48	$\bar{x}$ 79.11 S 14.46	$\bar{x}$ 82.18 S 15.20	$\bar{x}$ 87.93 S 15.61	.98
	Lex.Expressive (WISC)	$\bar{x}$ 25.43 S 10.25	$\bar{x}$ 22.11 S 9.91	$\bar{x}$ 28.88 S 8.46	$\bar{x}$ 32.86 S 8.25	3.92*
	Morph.Receptive (App. A and B)	$\bar{x}$ 15.00 S 4.45	$\bar{x}$ 14.53 S 2.09	$\bar{x}$ 14.06 S 2.49	$\bar{x}$ 13.93 S 1.64	.60
	Morph.Expressive (App. D)	$\bar{x}$ 18.21 S 6.91	$\bar{x}$ 16.32 S 8.59	$\bar{x}$ 18.53 S 8.01	$\bar{x}$ 17.21 S 7.78	.27
	Passive Recept. (App. E and F)	$\bar{x}$ 17.79 S 3.83	$\bar{x}$ 17.95 S 2.95	$\bar{x}$ 18.59 S 2.79	$\bar{x}$ 17.64 S 2.73	.29
	Passive Express. (App. H and I)	$\bar{x}$ 15.64 S 2.53	$\bar{x}$ 16.58 S 3.88	$\bar{x}$ 18.41 S 2.92	$\bar{x}$ 16.00 S 3.74	2.12
	Ind.Obj.Recept. (App. J and K)	$\bar{x}$ 12.14 S 3.23	$\bar{x}$ 12.74 S 3.11	$\bar{x}$ 13.06 S 2.75	$\bar{x}$ 12.29 S 3.29	.28
	Ind.Obj.Express. (App. M and N)	$\bar{x}$ 9.64 S 3.18	$\bar{x}$ 11.68 S 3.02	$\bar{x}$ 12.47 S 3.11	$\bar{x}$ 12.64 S 1.50	3.35*
	Expressive Connected Sp. (App. O)	$\bar{x}$ 31.14 S 14.00	$\bar{x}$ 32.00 S 17.29	$\bar{x}$ 48.24 S 16.45	$\bar{x}$ 57.71 S 14.55	9.97**

* $p \leq .05$
 ** $p \leq .01$

difference between Group IV and Groups II and I was significant at the .01 level.

Summarizing thus far, the experimental groups are not discriminated by any of the receptive tasks, and on the three expressive tasks which do discriminate, it is never the case that all four experimental groups are distinguished from one another.

It would appear at this point that the degree of dysarthria is a potentially useful predictor of expressive language performances. That conclusion would be premature, however, when it is recognized that features other than dysarthria may have served to distinguish among the four experimental groups. As previously noted in Table 1, the groups also differed among themselves with respect to chronological age, mental age, and I.Q. Could it not be the case that these factors, as well as degree of dysarthria, influenced such performance? A suggestion of this possibility is observed in Table 3, where correlations are shown among all the measures from Tables 1 and 2 combined. When the three significant measures from Table 2 are examined, it is observed that age correlates significantly with one of them, I.Q. with two of them, and M.A. with all three of the tasks. From this result there emerges the possibility not only that demographic features are in part accounting for group differences but also that they may have served to suppress valid differences in the original measurements.

In the event that true differences had previously been suppressed, it was necessary to determine which kind of information best discriminated the four experimental groups: a knowledge of the characteristics relating

TABLE 3

MATRIX OF CORRELATIONS AMONG GROUP SPECIFICATIONS AND ALL TASKS

Age	M.A.	I.Q.	Sex	Lexical Rec.	Lexical Exp.	Morphological Rec.	Morphological Exp.	Ind.Obj.-Inv. Rec.	Ind.Obj.-Inv. Exp.	Active-Passive Rec.	Active-Passive Exp.	Sum Words	
.146	.157	.063	.029	.169	.327**	-.143	-.002	.027	.347**	.012	.100	.552**	Group
	.629**	-.292	.053	.476**	.388**	-.010	.244	-.041	-.225	.025	.047	.186	Age
		.541**	-.023	.936**	.738**	.278*	.567**	.264*	.210	.340**	.273*	.320*	M.A.
			-.056	.619**	.492**	.371**	.483**	.376**	.532**	.417**	.250*	.207	I.Q.
				-.081	-.227	.118	.113	-.129	.070	-.026	-.200	-.007	Sex
					.784**	.285*	.538**	.263*	.239	.350**	.291*	.313*	Lex.Rec.
						.249	.641**	.213	.268*	.360**	.464**	.498**	Lex.Exp.
							.316*	-.118	.207	.605**	.196	.066	Morph.Rec.
								.201	.140	.488**	.450**	.286*	Morph.Exp.
									.225	.149	.143	.178	I.O.-I.Rec.
										.284*	.081	.274*	I.O.-I.Exp.
											.409**	.239	A.P. Rec.
												.204	A.P. Exp.

* $p < .05$ ** $p < .01$

to chronological age, mental age, and intelligence quotient; a knowledge of the expressive test performances; or a knowledge of the receptive test performances. To this end, Multiple Regression analyses were initiated, employing library computer programs developed for this purpose (Dixon, 1973). To enter these programs, all the raw scores for each subject summarized in Tables 1 and 2 were keypunched.

A total of four predictions of group membership were programmed and run. The first of these employed the three defining variables of age, M.A., and I.Q. The second employed the data from the four receptive tasks. The third employed the data from the four expressive tasks which paralleled the receptive tasks. The final run employed all the expressive measures, allowing the data from the elicited speech task to join the variables in the third run.

The results of the four multiple regression runs are shown in Table 4. Describing them in turn, it is observed that when put to the test, the groups are not distinguished by knowledge of age, M.A., or I.Q. Likewise, from run 2, it is seen that no combination of receptive performances distinguishes among the four groups. Run 3 demonstrates substantial discriminability among the groups achieved from a knowledge of three of the four parallel expressive tests. Run 4 demonstrates that the single best discriminator is the elicited speech task. With that predictor in the equation, three additional measurements continue to improve the discrimination in a statistically significant fashion.

Summarizing the results of these runs, there is no true discrimination afforded by a knowledge of any group defining attribute other than

TABLE 4

PREDICTION OF GROUP MEMBERSHIP (DEGREE OF DYSARTHRIA)
FROM VARIOUS COMBINATIONS OF VARIABLES

Run	Variable in Order of Entry	R	Significance
1	Age	.157	---
	M.A.	.168	---
	I.Q.	.211	---
2	Lexical Receptive	.169	---
	Morphological Receptive	.261	---
	Passive Receptive	.272	---
	Indirect Object Receptive	.283	---
3	Indirect Object Expressive	.347	.01
	Lexical Expressive	.424	.05
	Morphological Expressive	.499	.05
	Passive Expressive	.500	---
4	Connected Speech	.552	.01
	Indirect Object Expressive	.589	.05
	Morphological Expressive	.616	.05
	Lexical Expressive	.659	.05
	Passive Expressive	.660	---

degree of dysarthria. Further, the original conclusion regarding the receptive tasks is affirmed. The groups do not perform them differently. Only in the expressive tasks are there differences among the four groups, the foremost discrimination afforded by the spontaneous elicited speech task.

Comparisons Between Experimental and Control Subjects

Seven of the nine experimental tasks were also performed by the Normal Control Pilot Group, as reported in Appendix P. When those data are compared with Table 2 it is observed that the normal group achieves scores substantially higher than the cerebral palsied group on all of the variables. This is, of course, not surprising when one considers the high correlations that obtain between intelligence and the various experimental test results.

The differences between normal control subjects and the four experimental groups, however, vary considerably among the various tasks. This can best be discerned from a further consideration of the three expressive tasks which successfully discriminated among dysarthric groups in Table 2. Figure 1 has been constructed to display the scores for each group as percentages of normal expectations. In the case of the indirect object task, normal performance is inferred from the normal control mean in Appendix P. In the case of the lexical and elicited speech tasks for which data do not exist in the normal control group, normal performance is inferred from WISC norms of 48 words and 60 words, respectively.

It is observed that the anarthric Group I is performing at about half the level of the normals on all these tasks, whereas the non-dysarthric Group IV is performing almost as well as normals on the elicited word tasks, but at about 70 percent of normal on the lexical and indirect object tasks. These differing spreads among the four groups suggests that dysarthria imposes differing degrees of penalty upon performance in the varying domains of expressive language.

The following chapter deals with a discussion of these findings and their conclusions.

Figure 1. Scores of four experimental groups on three tasks expressed as percentages of normal expectations.

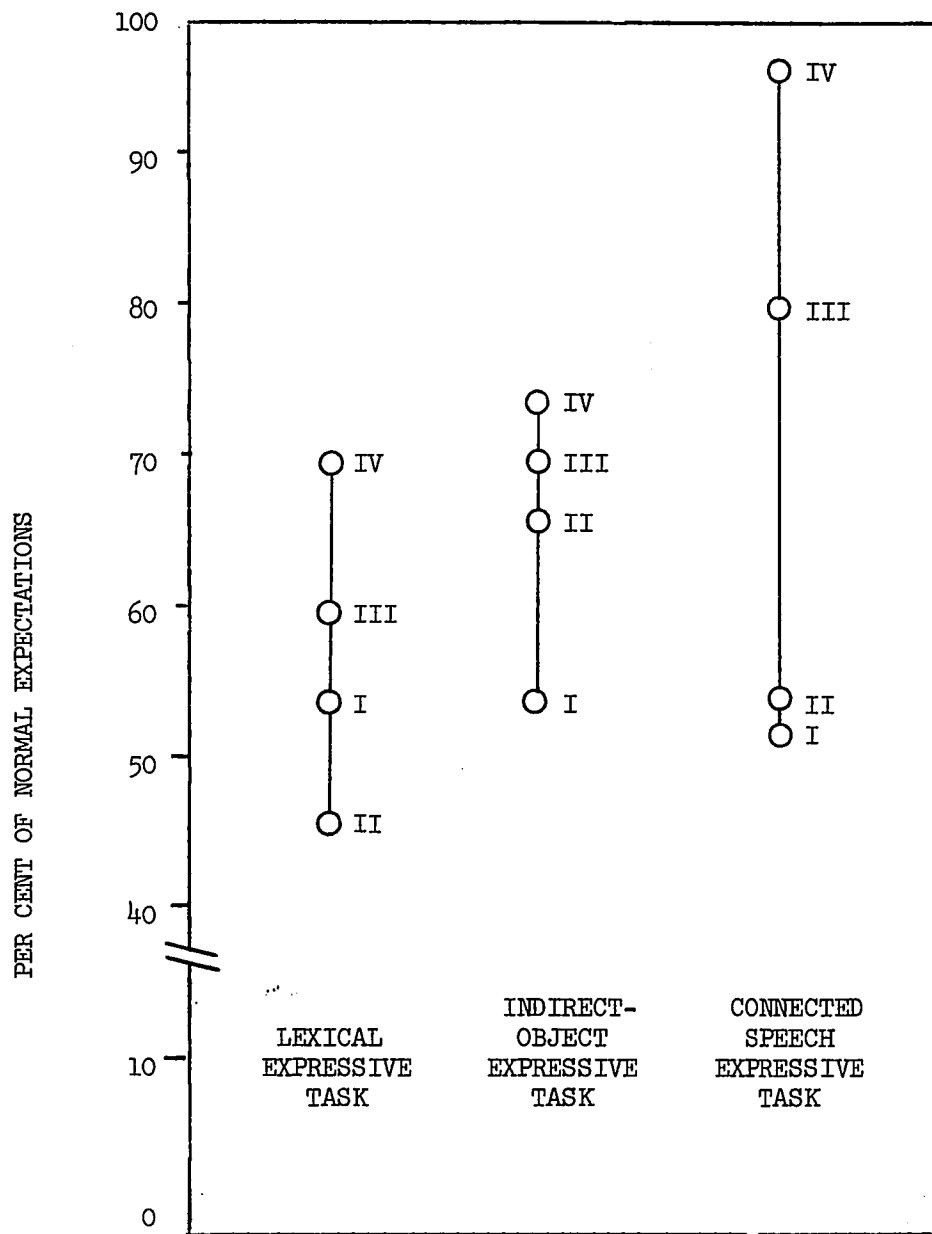


FIGURE 1

CHAPTER V

DISCUSSION

Major Findings

The results of the nine language measures, four receptive tasks, and five expressive tasks clearly demonstrated that there were marked similarities and differences among the groups with regard to their receptive and expressive capacities. These language measures were capable of distinguishing the groups in such a manner that clearly demonstrated that overall comprehension of language did not vary with dysarthria, but language expression did.

Receptive Capacities

Receptive functioning measured the degree of understanding each subject possessed with regard to the specific language task under consideration. Understanding of language along with language usage ability are measures of linguistic performance; linguistic competence may be inferred from performance ability. There is substantial agreement that comprehension is probably a better indicator of linguistic competence than is speech production.

The receptive capacities among all experimental subjects regardless of group membership were not significantly different. No distinction could be made among the groups on the basis of their functioning on receptive tasks for each of the three linguistic parameters evaluated.

The Group means for all tasks, as summarized in Table 2, were similar. Measures of multiple regression correlation, as summarized in Table 4, failed to provide a single instance where performance on receptive tasks contributed to group membership identification.

There were, however, considerable and significant differences between the receptive scores for all of the Experimental Groups on the one hand and the Normal Control Pilot Group on the other. The Experimental Groups, although similar in functioning despite differences in dysarthria, were significantly lower in functioning than the Normal Control Pilot Group. Cerebral Palsied athetoid subjects, in all factors alike except with regard to dysarthria, do function in a significantly inferior manner to normal children of similar age regardless of dysarthria. This difference in functioning between the Normal Control Pilot Group and all Experimental Groups may be accounted for on the basis of the limited intelligence of the experimental groups. Although the M.A. means for the Normal Control Pilot Group and the Experimental groups were similar (Normals were deliberately so chosen), the I.Q. means were considerably different, with the Experimental Group demonstrating a group mean of 75.88. However, differences of dysarthria among the Experimental Groups did not bring about any difference in receptive task functioning among the Experimental Groups despite the limited practice opportunity and deviant language styles among the more severely impaired Group I and Group II. Based upon receptive task functioning, it may be concluded that an equal linguistic competence existed among all four Experimental Groups.

Expressive Capacities

Expressive functioning measured the degree of language usage each subject possessed with regard to the specific language task under consideration. Language usage is one measure of performance. It is in the expressive language tasks that the degree of dysarthria may be seen to be influencing the performances of the Experimental Groups.

The expressive capacities among the four experimental groups differed significantly on three of the five expressive tasks: Lexical Expressive (WISC), Indirect-Object Expressive, and the Connected Speech task. The statistical results of these expressive measurements demonstrate that a kind of ordinal pattern of dysfunction has emerged which is related to degree of dysarthria.

Indirect-Object Expressive Task: In the Indirect-Object task the ordinal progression of dysfunction may be seen in Group I (the most severely dysarthric) which is significantly different from Group III (mildly dysarthric) and Group IV (no dysarthria). Group II (moderately dysarthric) functioned better than Group I, but more like Group III and Group IV, although not at a level of significance. Clearly, the degree of dysarthria was correlated with the degree of linguistic functioning in this task. The syntactical complexity of a task involving the use of indirect-object structures and indirect-object inversion structures is significantly correlated with the ease of communication. It appears that the greater the dysarthric involvement, the more simplified and less grammatically complex the expressive language becomes. Experimental subjects demonstrating the greatest difficulties with these syntactical

forms were also the subjects who exhibit the greatest difficulties with communication in general, as demonstrated in their linguistic sophistication and ease in expressing ideas using a letterboard type of communication.

Concerning the complex syntactical structures of the Indirect-Object Expressive task, children who must use an alternate means of communication, such as a letterboard, frequently resort to using as few words as possible in making responses to questions raised to them in conversation. These children seldom initiate communication unless they need something, and are generally more effective as responders to language situations. Their responses to linguistically stimulating situations are to use single words as often as possible. These children, therefore, have had little experience, if any, in using the indirect-object transformation.

It would appear as if most normal adult people who speak with others whom they deem less able or inferior to themselves generally speak using a simplified language. This appears to be equally true when normal adult people speak with others who are limited in intelligence and expressive capacity. Normal speaking people appear to use the kind of language they can reasonably expect from the people they are talking to, and, in this instance of speaking with the severely expressively handicapped, limit their own language accordingly. The severely expressively handicapped seldom, if ever, hear indirect-object inversions because people who speak with them seldom, if ever, use such constructions.

Such children frequently display a delay in processing information in addition to impaired short-term memory span recall. It frequently

takes letterboard users at least twice as long to formulate the simplest grammatical constructions as compared to oral speakers. These letterboard speakers also tend to communicate without the use of conjunctions, articles, and prepositions. Their responses generally lack morphological markers of every type. Their speech is telegraphic for the most part and similar in style to the speech patterns described by Brown (1963), and noted in all young speakers.

It is not surprising that they seem to be unable to use so complex a grammatical structure as the indirect-object inversion. What is critical is that such children, despite their lack of practice with these structures, have the competence to deal with them, nevertheless. This competence is inferred from the Experimental Groups' similar receptive abilities. This leads to the conclusion that expression is not necessary for acquiring the ability to understand such complex structures.

Since the receptive functioning for all four experimental groups did not vary significantly in this same syntactic task, it may be inferred that the ability to comprehend this syntactic type is equivalent for all four groups. Only in the expression of this syntactic type is significant difference demonstrated, and degree of difference is correlated with the degree of dysarthric involvement.

Lexical: A similar, but not identical, pattern of ordinality of dysfunction can be distinguished in the Lexical Expressive task (WISC) performance of the groups, although in this expressive task, only Group II (moderate dysarthria) was significantly different from Group IV (no dysarthria). However, Group III (mild dysarthria) functioned more like Group IV than like Group II. Although Group I

(severe dysarthria) functioned somewhat better than Group II, the difference was not significant and Group I functioned more like Group II than Group III or Group IV. It may be seen that the ability to express definitions, as demanded in the Lexical Expressive task measured through the WISC test, is a task closely linked with the ability to express oneself. The only non-ordinal progression in this expressive task was that Group I, the most severely impaired, functioned somewhat minimally, but insignificantly better than Group II, who are less severely involved. This non-ordinal result may be accounted for in the manner of expressive communicative functioning of the two groups. Although Group I is the most severely impaired, they have found a non-oral means of expression, the letterboard, which does not penalize them for the lack of oral ability. At the same time, Group I means of expression is well suited for usage in single word definition tasks and, unlike Indirect-Object Expressive performance, does not require full sentence usage. On the other hand, Group II subjects, who are moderately dysarthric, make all their responses orally with considerable difficulty. This impaired oral response pattern is less suitable for success in word definition tasks than is letterboard functioning. Although Group III does not function significantly better than Group I, it functions more like Group IV. Hence, Group II and Group I function more like each other and poorer than Group III and Group IV. The ordinality of progression may be seen in looking at all the oral functioning groups together, (omitting the non-oral, letterboard functioning Group I) where Group II is the poorest, Group III is next best, and Group IV is func-

tioning best of the three oral groups. The ordinal pattern of correlation of degree of dysarthria with ease of expressive functioning becomes evident. The most severely dysarthric suffer the most penalty and the least dysarthric have the least penalty.

The preceding points are made vivid in a refined analysis of the Lexical Expressive test. Table 5 displays the proportions of one-point and two-point responses made by the four experimental groups. It is observed that Group I and Group II subjects made a greater proportion of one-point responses than did Group III and Group IV subjects. Two-point responses are longer, more complex, and generally require more phrases than one-point responses. Children who use letterboards consistently reduce the quantity of words used to express themselves in almost all communicative situations. Likewise, it appears that severely impaired oral children also reduce the number of words used to express themselves. Both Group I and Group II are alike in their minuscule vocabularies as a consequence of their reticence or reluctance to participate, and not because of a cognitive deficit. Consequently, they are penalized more on a task where longer, more complex responses are necessary.

Connected Speech: In the Elicited Connected Speech task, measured through the sum of the words used, the ordinal progression correlated again with the degree of dysarthria. Although both Group I and Group II are significantly poorer than either Group III or Group IV, Group I is not significantly different from Group II. Nevertheless, the degree of dysfunction follows an ordinal pattern from the poorest to the best,

TABLE 5PATTERN OF ONE AND TWO POINT RESPONSESFOR WISC TESTBY EXPERIMENTAL GROUPS

	Percent of One Point Responses	Percent of Two Point Responses	Total Correct Responses	$\bar{X}$ Correct Responses
Group I (N=14)	.324	.676	216	15.4
Group II (N=19)	.278	.732	244	12.8
Group III (N=17)	.229	.781	283	16.5
Group IV (N=14)	.239	.761	259	18.5

going from Group I to Group IV. The Elicited Connected Speech task, unlike the Lexical Expressive task which evaluated the semantic domain only, and the Indirect-Object Expressive task in which complex syntactic structures were evaluated, crossed all language parameters and reflected an overall expressive language ability. The general parsimony of words noted earlier in both Group I and Group II subjects is reflected in the Elicited Connected Speech task as well. Interestingly, the ordinal pattern is maintained in this expressive measure and reinforces the view that degree of expressive functioning is correlated with the degree of dysarthric involvement.

Non-Significant Expressive Tasks

The two expressive tasks which failed to reveal a correlation between degree of dysarthria and expressive ability were the Morphological Expressive task, measured through the Modified Berko Test of English Morphology, and the Passive Expressive task. It could be assumed that for both these tasks the ability for usage as well as for understanding were already fully developed; consequently, the task was not differentiating among the groups. (Not knowing at what exact level expression would be impaired, a range of expressive tasks was therefore employed, e.g., morphology skills attained by 4-6 years; passive ability by 7 years; and indirect-object inversion by 9 years.) Although in both tasks the Experimental Groups did not perform significantly better than each other, they did perform significantly poorer than the Normal Control Pilot Group. These capabilities are attained at an earlier developing age (Berko, 1958; Brown, 1963).

Implications of This Study

Implications for Models of Language Acquisition: In Chapter II, reference was made to the questions related to how language is acquired. Current theory and research has proceeded along two major paths, one which emphasized linguistic universals and existence of innate biological determinants of such universality (Lenneberg, 1967 and Chomsky, 1968), and the other which explains language acquisition based upon learning theories which assume the reward of units of speech behaviors (Staats, 1957 and Staats, 1963).

According to the latter view, one would predict that an individual's linguistic development is directly related to his ability to produce speech. Language ability in this model is also predicted to be inversely related to the degree of impediment. The greater the impediment, the greater the linguistic dysfunction.

In the former view which emphasizes linguistic universals based upon the existence of innate biological determinants, one would predict that an individual's language development is dependent upon exposure to his language code, and that the opportunity for practice or the lack of practice does not necessarily interfere with the capability of learning one's language (Lenneberg, 1962). Using such a model with application to individuals who have serious oral dysfunction, one may expect differences to exist between the expressive language and receptive language; although both are measures of language performance, receptive functioning would be better than expressive functioning. Linguistic competence is more readily inferred from comprehension abilities than from expressive

abilities.

Although no direct attempt was made to specifically evaluate at what age lexical, morphological, and syntactic abilities are obtained among this experimental population, it was demonstrated that the experimental population did attain comprehension ability in all tasks of the lexical, morphological, and syntactic domains. Thus, by the mental age of nine, competence with the tasks measured in this study has been attained by these experimental groups, despite their retardation.

The results of the language measures used in this study, which individually probed the semantic, morphological, and syntactic parameters and, in one measure, cut across all three linguistic parameters, support the view that language development is not dependent upon practice in speaking. Despite the distinct differences in the language practice capabilities, language developed in a similar manner in all Experimental Groups.

Implications for Language Therapy Programs: Even among the most severely impaired Group I anarthrics, it was evident through receptive functioning tasks that comprehension abilities were as intact and well functioning as were the same abilities of members of any of the other three groups. Their expressive dysfunction was not a handicap for language acquisition. Despite the significantly poorer use in the performance of complicated transformations such as the indirect-object inversion and, to a less extent, in the use of the passive transformation, the potential for such expressive ability is nonetheless present. Although

anarthric children who use letterboards tend to simplify their language, expanded use of grammatical constructions and improved use of morphology appear to be within their potential.

Implications for Additional Study: While the present study has established, with a sample significantly in excess of his single case, the validity of Lenneberg's claim that speech practice is unnecessary for acquisition of language, it has not answered the next reasonable question: Is the course of language development in the dysarthric cerebral palsied child the same as the course of development in the normally developing child? Further research on that question must surely await the outcome of sophisticated longitudinal studies in which a large sample of dysarthric children are followed over a lengthy period of time during their developmental years.

APPENDIX ARECEPTIVE ENGLISH MORPHOLOGY SENTENCE TEST-FORM AInstructions for Tester:

1. Read each sentence slowly, carefully, and somewhat neutrally giving no emphasis to any word as you read.
2. You may only repeat the practice sentences.
3. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

Scoring:

One point for each correct pointing response. Maximum score = 20

Demonstration/Practice Sentences

1. The boys ate the pie.
2. The smaller child hits the punching bag.
3. This is a mother cat.
4. The girl owns the toy in the box.

Test Sentences

5. These are the animal's crackers.
6. The football player kicked the ball.
7. The boy is looking for his shoes.
8. This is his dog.
9. This is their house.
10. The baby drank the milk.
11. The woman puts the coats on the rack.
12. The youngest man sits down.
13. The boy's cap flew off.
14. This is the girl doll.
15. The oldest girl plays with dolls.

APPENDIX A

(continued)

16. The woman smells the flowers.
17. The boy played the game.
18. The fattest man eats the most.
19. This is baby's doll.
20. The horses are going along quickly.
21. The boys eat the pie.
22. The biggest child hits the punching bag.
23. This is mother's cat.
24. The girl owns the toys in the box.

APPENDIX BRECEPTIVE ENGLISH MORPHOLOGY SENTENCES TEST-FORM BInstructions for Tester:

1. Read each sentence slowly, carefully, and somewhat neutrally giving no emphasis to any word as you read.
2. You may repeat the practice sentences.
3. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

Scoring:

One point for each correct pointing response. Maximum score = 20

Demonstration/Practice Sentences

1. The boys eat the pie.
2. The bigger child hits the punching bag.
3. This is mother's cat.
4. The girl owns the toys in the box.

Test Sentences

5. These are the animal crackers.
6. The football player kicks the ball.
7. The boy is looking for his shoe.
8. This is their dog.
9. This is her house.
10. The baby drinks the milk.
11. The woman puts the coat on the rack.
12. The older man sits down.
13. The boys' caps flew off.
14. This is the girl's doll.

APPENDIX B

(continued)

15. The younger girl plays with dolls.
16. The woman smelled the flowers.
17. The boy plays the game.
18. The skinnier man ate the most.
19. This is a baby doll.
20. The horse went along quickly.
21. The boys ate the pie.
22. The smaller child hits the punching bag.
23. This is a mother cat.
24. The girl owns the toy in the box.

APPENDIX C

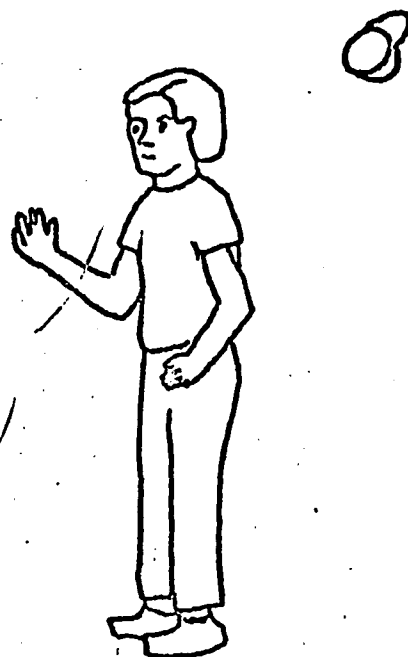
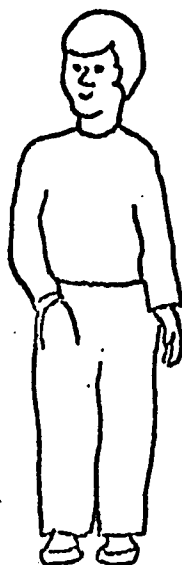
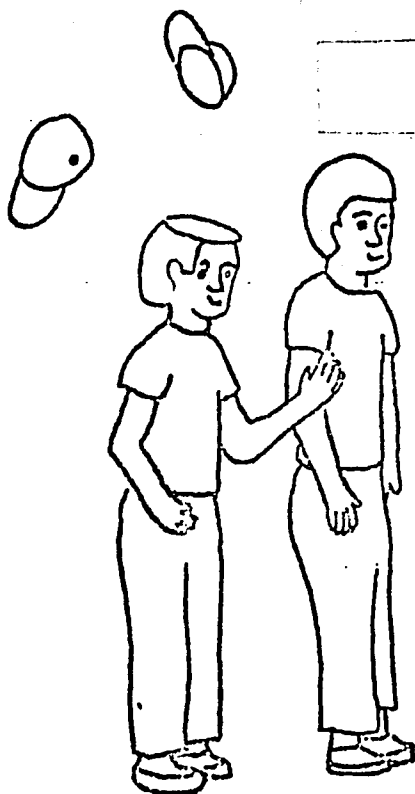
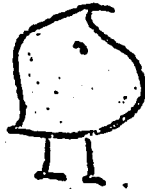


Plate for Item 13
English Morphology Test
Form A and Form B

1.



This is a Wug.



Now there is another one.
There are two of them.
There are two _____.

1 2 3 4 5
wug wugged wugs wugger wuggers

Plate 1 Modified Berko English Morphology Test

Scoring: There are 27 plates containing 33 test items.

Score one point for each correct choice. Maximum score = 33

APPENDIX ERECEPTIVE REVERSIBLE ACTIVE/PASSIVE SENTENCES TEST
FORM AInstructions for Tester:

1. Read each sentence slowly, carefully, and somewhat neutrally giving no emphasis to any word as you read.
2. You may only repeat the practice sentences.
3. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

Demonstration/Practice Sentences

1. The girl makes a pie.
2. The boy throws the ball.
3. The man mails the letter.
4. The man is painting the truck.
5. The child drinks the milk.
6. The woman dresses the baby.
7. The woman is buying food.

Test Sentences

8. The baby is in the house.
9. The man is on the chair.
- + 10. The baby touched the dog.
- ++ 11. The fireman was helped by the man.
12. The woman is eating food.
- + 13. The child kissed the grandmother.
- ++ 14. The mother was fed by the child.
- + 15. The boy pushed the girl.
16. The man is driving the car.
- ++ 17. The man was pulled by the child.
18. The child is on the swing.
- + 19. The mother covered the child.

APPENDIX E

(continued)

- ++ 20. The boy was washed by the girl.
- + 21. The boy sprayed the girl.
- 22. The girl stands at the table.
- ++ 23. The man was kicked by the horse.
- + 24. The boy tickled the father.
- 25. The mother is feeding the baby.
- ++ 26. The mother was read to by the child.
- + 27. The boy hit the child.
- ++ 28. The dog was chased by the cat.

Scoring: One point for each correct response to a critical
item (+).

Two points for each correct response to a critical
item (++) . Maximum score = 21

APPENDIX FRECEPTIVE REVERSIBLE ACTIVE/PASSIVE SENTENCES TEST
FORM BInstruction for Tester:

1. Read each sentence slowly, carefully, and somewhat neutrally giving no emphasis to any word as you read.
2. You may only repeat the practice sentences.
3. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

Demonstration/Practice Sentences

1. The girl cuts a pie.
2. The boy kicks the ball.
3. The man writes the letter.
4. The man is gassing the truck.
5. The child spills the milk.
6. The woman feeds the baby.
7. The woman is eating food.

Test Sentences

8. The baby is out of the house.
9. The man is off the chair.
- ++ 10. The baby is touched by the dog.
- + 11. The fireman helped the man.
12. The woman is cooking food.
- ++ 13. The child was kissed by the grandmother.
- + 14. The mother fed the child.
- ++ 15. The boy was pushed by the girl.
16. The man is fixing the car.
- + 17. The man pulled the child.
18. The child is near the swing.
- ++ 19. The mother was covered by the child.

APPENDIX F

(continued)

- + 20. The boy washed the girl.
- ++ 21. The boy was sprayed by the girl.
- 22. The girl sits at the table.
- + 23. The man kicked the horse.
- ++ 24. The boy was tickled by the father.
- 25. The girl stands at the table.
- + 26. The mother read to the child.
- ++ 27. The boy was hit by the child.
- + 28. The dog chased the cat.

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++). Maximum score = 21

APPENDIX G

Plate for Item 10
Active/Passive Test
Form A and Form B



APPENDIX HEXPRESSIVE REVERSIBLE ACTIVE/PASSIVE SENTENCES TEST
FORM AInstructions for Tester:

1. Read each sentence slowly, carefully and somewhat neutrally giving no emphasis to any word as you read.
2. Allow a 20-second pause before asking the subject to repeat the sentence of the starred picture being pointed to.
3. You may only repeat the practice sentences.
4. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

*

Demonstration/Practice Sentences

1. The girl makes a pie.*
The girl cuts a pie.
2. The boy kicks the ball.
The boy throws the ball.*
3. The man mails the letter.*
The man writes the letter.
4. The man is gassing the truck.
The man is painting the truck.*
5. The child drinks the milk.*
The child spills the milk.
6. The woman feeds the baby.*
The woman dresses the baby.
7. The woman is buying food.*
The woman is eating food.

Test Sentences

8. The baby is out of the house.
The baby is in the house.*
9. The man is on the chair.*
The man is off the chair.

APPENDIX H

(continued)

- + 10. The baby touched the dog.*
The dog touched the baby.
- ++ 11. The fireman was helped by the man.*
The man was helped by the fireman.
- 12. The woman is cooking food.
The woman is eating food.*
- + 13. The grandmother kissed the child.
The child kissed the grandmother.*
- ++ 14. The child was fed by the mother.
The mother was fed by the child.*
- + 15. The girl pushed the boy.
The boy pushed the girl.*
- 16. The man is driving the car.*
The man is fixing the car.
- ++ 17. The girl was pulled by the man.
The man was pulled by the girl.*
- 18. The child is on the swing.*
The child is near the swing.
- + 19. The mother covered the child.*
The child covered the mother.
- ++ 20. The boy was washed by the girl.*
The girl was washed by the boy.
- + 21. The boy sprayed the girl.*
The girl sprayed the boy.
- 22. The girl sits at the table.
The girl stands at the table.*
- ++ 23. The man was kicked by the horse.*
The horse was kicked by the man.
- + 24. The father tickled the boy.
The boy tickled the father.*
- 25. The mother is feeding the baby.*
The mother is washing the baby.

APPENDIX H

(continued)

- ++ 26. The child was read to by the mother.
The mother was read to by the child.*
- + 27. The boy hit the child.*
The child hit the boy.
- ++ 28. The dog was chased by the cat.*
The cat was chased by the dog.

* (picture to be pointed to)

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++), or one point for each (++) critical item converted into a (+) critical item. Maximum score = 21

APPENDIX IEXPRESSIVE REVERSIBLE ACTIVE/PASSIVE SENTENCES TEST
FORM BInstructions for Tester:

1. Read each sentence slowly, carefully and somewhat neutrally giving no emphasis to any word as you read.
2. Allow a 20-second pause before asking the subject to repeat the sentence of the starred picture pointed to.
3. You may only repeat the practice sentences.
4. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

*

Demonstration/Practice Sentences

1. The girl makes a pie.
The girl cuts a pie.*
2. The boy kicks the ball.*
The boy throws the ball.
3. The man mails the letter.
The man writes the letter.*
4. The man is gassing the truck.*
The man is painting the truck.
5. The child drinks the milk.
The child spills the milk.*
6. The woman feeds the baby.
The woman dresses the baby.*
7. The woman is buying food.
The woman is eating food.*

Test Sentences

8. The baby is out of the house.*
The baby is in the house.
9. The man is on the chair.
The man is off the chair.

APPENDIX I

(continued)

- ++ 10. The dog was touched by the baby.
The baby was touched by the dog.*
- + 11. The man helped the fireman.
The fireman helped the man.*
- 12. The woman is cooking food.*
The woman is eating food.
- ++ 13. The child was kissed by the grandmother.*
The grandmother was kissed by the child.
- + 14. The mother fed the child.*
The child fed the mother.
- ++ 15. The boy was pushed by the girl.*
The girl was pushed by the boy.
- 16. The man is driving the car.
The man is fixing the car.*
- + 17. The man pulled the child.*
The child pulled the man.
- 18. The child is on the swing.
The child is near the swing.*
- ++ 19. The child was covered by the mother.
The mother was covered by the child.*
- + 20. The girl washed the boy.
The boy washed the girl.*
- ++ 21. The girl was sprayed by the boy.
The boy was sprayed by the girl.*
- 22. The girl sits at the table.*
The girl stands at the table.
- + 23. The horse kicked the man.
The man kicked the horse.*
- ++ 24. The boy was tickled by the father.*
The father was tickled by the boy.
- 25. The mother is feeding the baby.
The mother is washing the baby.*

APPENDIX I

(continued)

- + 26. The mother read to the child.*
The child read to the mother.
- ++ 27. The child was hit by the boy.*
The boy was hit by the child.*
- + 28. The cat chased the dog.
The dog chased the cat.

* (picture to be pointed to)

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++) , or one point for each (++) critical item converted into a (+) critical item. Maximum score = 21

APPENDIX JRECEPTIVE REVERSIBLE INDIRECT-OBJECT SENTENCES TESTFORM AInstructions for Tester:

1. Read each sentence slowly, carefully, and somewhat neutrally giving no emphasis to any word as you read.
2. You may only repeat the practice sentences.
3. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

Demonstration/Practice Sentences

1. The mother washes her hands.
2. The man swims in the lake.
3. The bird flew away.
4. The woman touches her hat.
5. The girl rides the horse.
6. The child walks.
7. The policeman helps the child.

Test Sentences

8. The boy kisses the girl.
9. The girl washes her hair.
- ++ 10. The man carries the rat the snake.
- + 11. The boy brought the girl to the man.
12. The woman breaks the window.
- ++ 13. The zookeeper feeds the elephant the lion.
- + 14. The teacher showed the policeman to the child.
- ++ 15. The boy takes the cat the mouse.
16. The man fixes the door.
- ++ 17. The man throws the bird the fish.
18. The child hammers the carriage.
- + 19. The man gives the fly to the spider.

APPENDIX J

(continued)

- + 20. The child shows the man to the woman.
- ++ 21. The dog took the hunter the rabbit.
- 22. The baby throws the bottle of milk.
- + 23. The boy gave the cat to the dog.
- ++ 24. The zookeeper fed the tiger the leopard.
- 25. The father spansks the child.
- + 26. The father carries the boy to the bicycle.
- ++ 27. The father brings the baby the dog.
- + 28. The woman threw the fish to the frog.

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++) . Maximum score = 21

APPENDIX KRECEPTIVE REVERSIBLE INDIRECT-OBJECT SENTENCES TEST
FORM BInstructions for Tester:

1. Read each sentence slowly, carefully and somewhat neutrally giving no emphasis to any word as you read.
2. You may only repeat the practice sentences.
3. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

Demonstration/Practice Sentences

1. The mother brushes her hair.
2. The man fishes in the lake.
3. The airplane flew away.
4. The woman touches her shoes.
5. The girl rides the bicycle.
6. The child runs.
7. The policeman helps the man.

Test Sentences

8. The boy hits the girl.
9. The girl combs her hair.
- + 10. The man carries the rat to the snake.
- ++ 11. The boy brought the girl the man.
12. The woman cleans the window.
- + 13. The zookeeper feeds the elephant to the lion.
- ++ 14. The teacher showed the policeman the child.
- + 15. The boy takes the cat to the mouse.
16. The man cuts the door.
- + 17. The man throws the bird to the fish.
18. The child pushes the carriage.
- ++ 19. The man gives the fly the spider.

APPENDIX K

(continued)

- ++ 20. The child shows the man the woman.
- + 21. The dog took the hunter to the rabbit.
- 22. The baby drinks the bottle of milk.
- ++ 23. The boy gave the cat the dog.
- + 24. The zookeeper fed the tiger to the leopard.
- 25. The father carries the child.
- ++ 26. The father carries the boy the bicycle.
- + 27. The father brings the baby to the dog.
- ++ 28. The woman threw the fish the frog.

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++) . Maximum score = 21

APPENDIX L

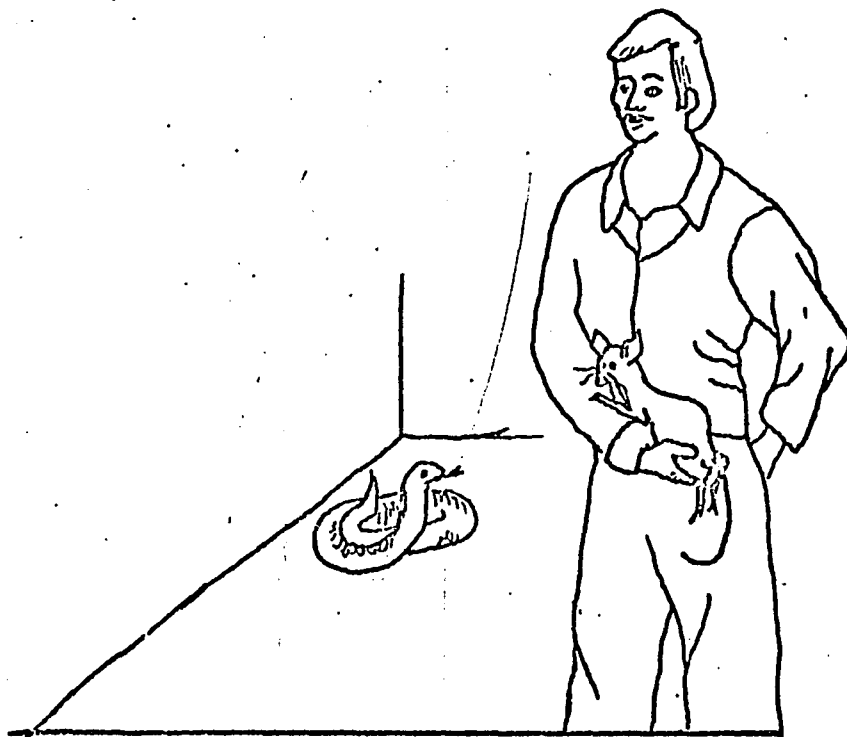
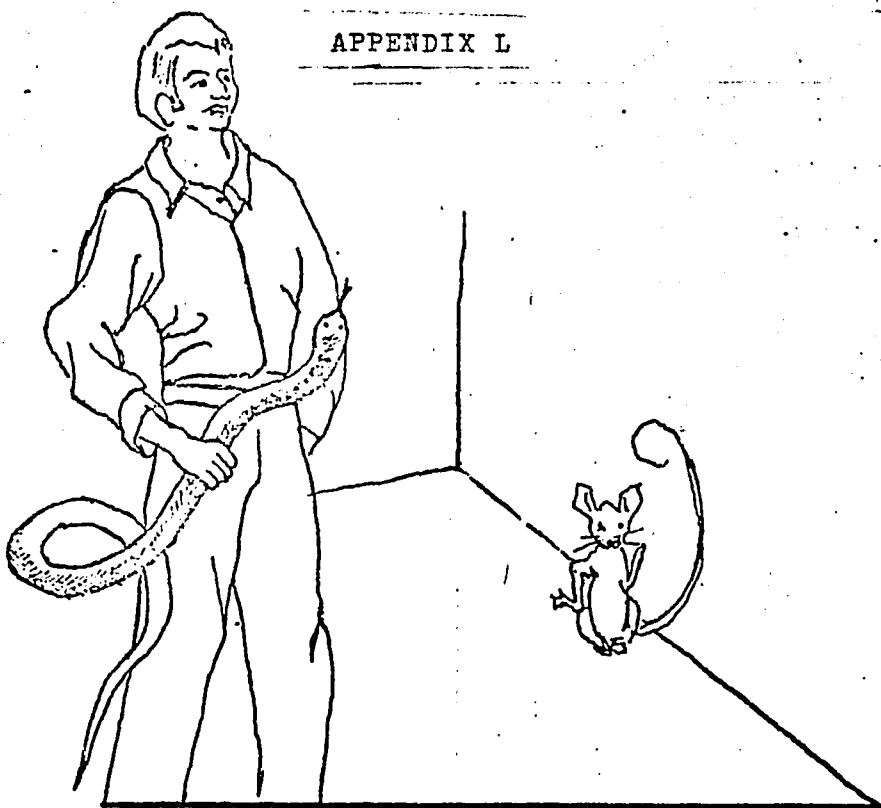


Plate for Item 10
Indirect Object Test
Form A and Form B

APPENDIX MEXPRESSIVE REVERSIBLE INDIRECT-OBJECT SENTENCES TESTFORM AInstructions for Tester:

1. Read each sentence slowly, carefully and somewhat neutrally giving no emphasis to any word as you read.
2. Allow a 20-second pause before asking the subject to repeat the sentence of the starred picture being pointed to.
3. You may only repeat the practice sentences.
4. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

*

Demonstration/Practice Sentences

1. The mother washes her hands.*
The mother brushes her hair.
2. The man fishes in the lake.
The man swims in the lake.*
3. The bird flew away.*
The airplane flew away.
4. The woman touches her shoes.
The woman touches her hat.*
5. The girl rides the horse.*
The girl rides the bicycle.
6. The child runs home.
The child walks home.*
7. The policeman helps the child.*
The policeman helps the man.

Test Sentences

8. The boy hits the girl.
The boy kisses the girl.*
9. The girl washes her hair.*
The girl combs her hair.

APPENDIX M

(continued)

- ++ 10. The man carries the rat the snake.*
The man carries the snake the rat.
- + 11. The boy brought the girl to the man.*
The boy brought the man to the girl.
- 12. The woman cleans the window.
The woman breaks the window.*
- ++ 13. The zookeeper feeds the lion the elephant.
The zookeeper feeds the elephant the lion.*
- + 14. The teacher showed the child to the policeman.
The teacher showed the policeman to the child.*
- ++ 15. The boy takes the mouse the cat.
The boy takes the cat the mouse.
- 16. The man fixes the door.*
The man cuts the door.
- ++ 17. The man throws the bird the fish.*
The man throws the fish the bird.
- 18. The child hammers the carriage.*
The child pushes the carriage.
- + 19. The man gives the spider to the fly.
The man gives the fly to the spider.*
- + 20. The child shows the man to the woman.*
The child shows the woman to the man.
- ++ 21. The dog took the hunter the rabbit.*
The dog took the rabbit the hunter.
- 22. The baby drinks the bottle of milk.
The baby throws the bottle of milk.*
- + 23. The boy gave the cat to the dog.*
The boy gave the dog to the cat.
- ++ 24. The zookeeper fed the leopard the tiger.
The zookeeper fed the tiger the leopard.*
- 25. The father spans the child.*
The father carries the child.

APPENDIX M

(continued)

- + 26. The father carries the bicycle to the boy.
The father carries the boy to the bicycle.*
- ++ 27. The father brings the baby the dog.*
The father brings the dog the baby.
- + 28. The woman threw the fish to the frog.*
The woman threw the frog to the fish.

* (picture to be pointed to)

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++), or one point for each (++) critical item converted into a (+) critical item. Maximum score = 21

APPENDIX NEXPRESSIVE REVERSIBLE INDIRECT-OBJECT SENTENCE TEST
FORM BInstructions for Tester:

1. Read each sentence slowly, carefully and somewhat neutrally giving no emphasis to any word as you read.
2. Allow a 20-second pause before asking the subject to repeat the sentence of the starred picture being pointed to.
3. You may only repeat the practice sentences.
4. Do not proceed to the test sentences until the subject has had at least three successes with the practice sentences.

*

Demonstration/Practice Sentences

1. The mother washes her hands.
The mother brushes her hair.*
2. The man fishes in the lake.*
The man swims in the lake.
3. The bird flew away.
The airplane flew away.*
4. The woman touches her shoes.*
The woman touches her hat.
5. The girl rides the horse.
The girl rides the bicycle.*
6. The child runs home.*
The child walks home.
7. The policeman helps the child.
The policeman helps the man.*

Test Sentences

8. The boy hits the girl.*
The boy kisses the girl.
9. The girl washes her hair.
The girl combs her hair.*

APPENDIX N

(continued)

- + 10. The man carries the snake to the rat.
The man carries the rat to the snake.*
- ++ 11. The boy brought the man the girl.
The boy brought the girl the man.*
- 12. The woman cleans the window.*
The woman breaks the window.
- + 13. The zookeeper feeds the elephant to the lion.*
The zookeeper feeds the lion to the elephant.
- ++ 14. The teacher showed the policeman the child.*
The teacher showed the child the policeman.
- + 15. The boy takes the cat to the mouse.*
The boy takes the mouse to the cat.
- 16. The man fixes the door.
The man cuts the door.*
- + 17. The man throws the fish to the bird.
The man throws the bird to the fish.*
- 18. The child hammers the carriage.
The child pushes the carriage.*
- ++ 19. The man gives the fly the spider.*
The man gives the spider the fly.
- ++ 20. The child shows the woman the man.
The child shows the man the woman.*
- + 21. The dog took the rabbit to the hunter.
The dog took the hunter to the rabbit.*
- 22. The baby drinks the bottle of milk.*
The baby throws the bottle of milk.
- ++ 23. The boy gave the dog the cat.
The boy gave the cat the dog.*
- + 24. The zookeeper fed the tiger to the leopard.
The zookeeper fed the leopard to the tiger.*
- 25. The father spans the child.
The father carries the child.*

APPENDIX N

(continued)

- ++ 26. The father carries the boy the bicycle.*
The father carries the bicycle the boy.
- + 27. The father brings the dog to the baby.
The father brings the baby to the dog.*
- ++ 28. The woman threw the frog the fish.
The woman threw the fish the frog.*

* (picture to be pointed to)

Scoring: One point for each correct response to a critical item (+).

Two points for each correct response to a critical item (++), or one point for each (++) critical item converted into a (+) critical item. Maximum score = 21

APPENDIX OELICITED SPONTANEOUS CONNECTED SPEECH TEST

(5 Questions from WISC - Comprehension Sub-Test)

Instructions for the Tester:

1. Read the question to the subject slowly and carefully. You may repeat the question an additional time before responses begin.
2. Record all vocal responses on tape recorder. Aide will record subject's non-vocal responses on scoring paper.

Scoring:

Note total number of words elicited and mean sentence length.
There is no maximum score.

Demonstration/Practice Questions:

1. What is the thing to do when you cut your finger ?
2. What is the thing to do if you lose one of your friend's balls (dolls) ?
3. What would you do if you were sent to buy a loaf of bread and the grocer said he did not have any more ?

Test Questions:

6. Why is it better to build a house of brick than of wood ?
8. Why should women and children be saved first in a shipwreck ?
10. Why is it generally better to give money to an organized charity than to a street beggar ?
12. Why is cotton fiber used in making cloth ?
14. Why should a promise be kept ?

APPENDIX P TEST SCORES FOR THE NORMAL CONTROL PILOT GROUP (N=16)

	Age		Morph.Rec.			Passive		I-O	
	Sex	in Mos.	Lex. Rec.	Form A	Form B	Morph. Exp.	Rec.	Exp.	Rec. Exp.
1	F	118	100	20	20	32	21	21	16 19
2	M	119	102	20	20	30	21	21	19 21
3	M	122	99	20	20	26	19	21	07 12
4	M	124	86	15	18	29	18	21	11 11
5	F	125	98	20	20	20	19	21	12 13
6	M	136	104	20	20	31	21	21	13 17
7	F	139	105	20	20	30	21	21	10 15
8	F	145	116	14	18	30	19	19	10 15
9	M	147	120	20	20	31	21	21	15 17
10	F	150	128	20	20	32	21	21	17 19
11	F	157	124	20	20	33	21	21	21 21
12	M	159	120	20	20	32	21	21	19 21
13	M	162	118	20	20	33	21	21	21 21
14	F	170	130	20	20	33	21	21	21 21
15	M	172	129	20	20	33	21	21	21 21
16	F	172	134	20	20	33	21	21	21 21
$\bar{X}$		144.8	113.3	19.3	19.7	31.1	20.4	20.9	15.9 17.8
S.D.		19.4	14.3	1.9	0.7	2.0	1.0	0.5	4.8 3.6

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