CHILDREN'S UNDERSTANDING OF RELATIONAL TERMS

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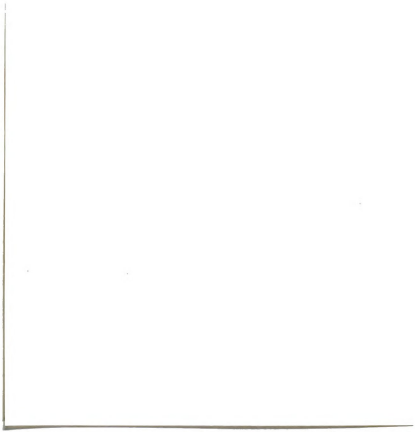

ABSTRACT

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By

Elissa Lynn Gatlin

The focus of this investigation was to study the development of children's understanding of the relational terms classified as spatial terms. Additionally, this study sought to identify the terms that children produce to express the relationships implied by the relational terms and to identify nonlinguistic strategies that children use in early language acquisition.

Relational terms is a broad category which indicates particular ways in which objects, events, and actions relate to each other. Spatial terms are a special subset of this broad category which more specifically indicate the ways in which, under the conditions of this study, objects relate to each other. E. Clark (1973) proposed a theory that applies to spatial terms. According to her, children's apparent comprehension of certain words is at first combination of their linguistic knowledge about a word's meaning and certain nonlinguistic strategies which are based on their perceptual knowledge of objects and events and conceptual knowledge about relations.

The terms studied were: *in, on, under, ahead of, beside, behind, into, onto, underneath, in front of, along side of,* and *in back of*. The subjects were sixty Black and sixty White girls ages 2.5-4.11. There were two experimental tasks. In the first experimental situation--labeled the comprehension task--the child was asked to manipulate six reference point objects and six toy animals with respect to instructions given by the experimenter for a total of thirty-six instructions. In the second experimental situation--labeled the production task--the child was asked to verbally describe the researcher's object manipulations for a total of twelve instructions. Each response was tape recorded.

The results of Task I were analyzed by the variables of race, age, spatial terms, and reference point objects. The results showed that the variable of age was the significant effect. The developmental pattern of the terms was *under, underneath, in front of, in back of, behind, along side of, beside,* and *ahead of* from early to later developing terms. *In, into, on* and *onto* appeared to develop earliest.

The terms were divided into two groups--primary set and secondary set. The primary set was the terms which were thought to be less complex--semantically and perceptually--than the terms in the secondary set, which was composed of terms similar in meaning. The results showed the primary set to be *in front of, along side of,* and *in back of* and the secondary set to be *ahead of, beside,* and *behind*. *In, into, on* and *onto* were all

comprehended equally. *Under* and *underneath* were responded to as the same term with only a small difference in means.

The results of Task II showed that the children used terms in the primary set to describe the object relationships demonstrated. In this study, once the children comprehended a term tested, they had a term to express the relationship indicated.

Analyses of data revealed the kinds of errors children made relative to the reference point objects with respect to *in* and *on*. Additional nonlinguistic strategies, for the terms studied, were also suggested from the analyses.

Suggestions were made for language assessment and therapy. In therapy, it was suggested that the least complex terms be used. Implications for further research were also indicated. Among them were that more spatial terms be tested to determine if the developmental pattern suggested would hold true and that the influence of birth order be researched for possible influence on the development of comprehension of spatial terms.

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By

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To Mother. Thanks.

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INTRODUCTION

Children's Understanding of Relational Terms

Language is symbolic behavior and, consequently, requires concepts, abstractions, logic and other internal representations for meaning. Chomsky (1965) used the terms "deep structure of language" and "the competence for language performance" to identify the internal representations of language. Psychologists used the term conceptual formation to refer to events inside the language user which enable, control and specify language.

In the process of language acquisition, semantic and syntactic information about relationships between words must be learned. Until recently, most studies of language acquisition dealt with children's language output (speech production). The primary focus of these studies was centered on the child's syntactic knowledge as reflected in the production of defined categories and relationships (Brown and Bellugi, 1964; Bloom, 1970). Greater interest has been focused on the child's comprehension of language. Comprehension is defined as an operational process whereby the child actively attends to verbal language not only to acquire the meaning of what is heard, but also to become acquainted with aspects of language that he will eventually

use. For example, the child hears the upward voice inflection which comes to indicate a question. MacNamara (1972) and others have proposed that infants learn their language by first determining, independent of language, the meaning which a speaker intends to convey and then by working out the relationship between meaning and what is heard.

Of increasing interest is the idea of the cognitive basis for the development of language, in general, and of comprehension, in particular (Schlesinger, 1973; Slobin, 1973). According to Slobin (1973), "the pacesetter in linguistic growth is the child's cognitive growth as opposed to an autonomous linguistic development which can reflect back on cognition." There is considerable evidence that the child's productive language development is closely related to the mastery of certain conceptual relationships. These relationships are encoded in the child's syntax as language develops (Huttenlocher, 1971).

From the research of Vygotsky (1963) and Piaget (1962), it has been proposed that infants' thoughts are more developed than their language and, consequently, that they use meaning as a key to the linguistic code. These researchers emphasized that when the infant begins to understand language, he has already made observations about the world around him, including himself and his activities. These observations are based on the infant's interactions with the environment and himself. Therein is the connection between cognition and language.

The interaction of cognition and linguistic development is constant in the process of language development. In E. Clark's view (1973), much of the cognitive basis for early language acquisition consists of perceptual information which the child has "successfully interpreted and organized by the time he starts to work on language." Of particular interest is word meanings. Clark (1973) proposed that, in acquiring the adult meanings of words, children employ strategies based on their perceptual understanding of the world.

This study will focus on the acquisition of meaning of relational terms. The terms used in E. Clark's (1973) study will be included, as well as other similar terms. The terms used are those designated as relational terms and are further classified as spatial terms. Relational terms is defined as a broad category of words that indicated the particular manner in which objects, events, and actions relate to each other. The spatial terms in this study are prepositions that serve to show the relationship between objects.

CHAPTER I

THEORIES OF THE RELATIONSHIP OF COGNITION AND LANGUAGE

There has been much research in an attempt to determine the relationship between language and the better understood aspects of cognition. Along a Paigetian sensorimotor line, Sinclair (1973a) reports that during the first two years of life, children establish "very general cognitive structures composed of systems of action." These systems constitute the basis for many different types of specific cognitive structures. Sinclair proposed that certain abilities, which are achieved by the end of the sensorimotor period, are reflected in Chomskian deep structures. One example is the ability to comprehend relations among objects and actions. This ability parallels the comprehension of basic subject-verb grammatical relations. Another example is the ability to embed action patterns into each other and this parallels the rules for sentence embedding in deep structure. Along that line, the research of Greenfield, Nelson, and Saltzman (1972) showed that certain strategies children used with manipulations of cups and strategies used in the acquisition of some grammatical structures appeared to be ordered--developmentally--in the same manner. For example, the

children treated a cup as an acted-upon object and then as an actor in the same structure. This strategy developed later than the strategy of the child making multi-cup constructions in which each cup played a single role. This pattern is similar to the ability to form relative clauses in which a single noun phrase functions in two grammatical roles--object and subject. This follows the ability to use and coordinate noun phrases within sentences.

Nelson's (1974) research stressed the importance of an action strategy in language acquisition; however, she and others (Benedict, 1976) go one step further by incorporating the object into the strategy proposed. Nelson's model emphasized that first an object is identified by its functional relations. These relate the object to the child's self and to other people through a set of acts. The perceptual analysis, then, is derived from the functional concept. For example, the total picture of the concept "ball" developed from interactions over time with the child's self and others might be as follows:

BALL	Functional core relationships: rolls, bounces Non-core implicit relationships: actor, action, location Optional relationships: possessor Descriptive features: shape (round), rigidity (....), color (....) Names: "ball", "baseball"

The research of Benedict (1976) supports Nelson's action-object thesis. Benedict states that "in many senses,

comprehension is an action-dominated mode, in the sense that the child's words trigger an action response."

Answers to questions about the specific ways in which cognition and language are related have led to applications, with respect to "prerequisites to the teaching of language", which could help in the learning of language--particularly for the language disordered child. Inhelder (1966) reported on the operational assessment method in which the development of some cognitive functions, as outlined by Piaget (1954), were incorporated into a diagnostic method for some mental disorders. It was shown, for example with the "pre-psychotic child" (Inhelder, 1966), that in some cases impairment in reality testing showed an impairment of operational activity.

As cognitively based diagnostic methods have been proposed, so have methods of therapy. Miller and Yoder (1972) have developed a cognitively based syntax teaching program. Their program emphasizes that 1) before the child becomes a language user, he needs something to say (concepts), a reason for saying it (semantic intent), and a way to say it (linguistic structure); 2) there are four critical developmental stages--single words, word strings, syntactic constructions, and three word sentences; 3) throughout the program the clinician works from comprehension to production; 4) new words and syntactic relationships are established by supplying the underlying concepts through environmental manipulations and experiences. Manipulation

of the child's environment allows him to experience the underlying concepts necessary for the comprehension and expression of words and syntactic relationships.

Relational Terms

Relational terms are a specialized subset of language with specialized properties. As defined, they are a broad set of terms that indicate particular manners in which objects, events, and actions relate to each other. The previous theories reviewed established the importance of underlying cognitive structures. E. Clark and H. Clark (1973) begin with this basis to propose a theory that applies specifically to relational terms. H. Clark (1973) has argued that there is a parallel between linguistic and cognitive structures in another domain for these terms. According to him, the properties of spatial terms, in English and probably in all languages, correspond directly to man's nonlinguistic structuring of the space around him. He theorizes that the child acquires spatial terms by learning how to apply them to prior understanding of perceptual space. More specifically, man's biological endowment, including in particular his perceptual apparatus, leads him to develop a particular kind of "perceptual space" which is characterized by--among other things--a concept of man's canonical or normal position, three reference places and several associated directions which have naturally defined positive and negative values. These planes are 1) a plane at ground level with upward positive; 2) a vertical left

to right plane through the body with forward from the body positive; 3) a vertical front-to-back plane with leftward and rightward both positive. He proposed that the properties of nonlinguistic structuring of perceptual space coincides with the properties of English spatial terms. He hypothesized that the child acquires spatial terms by learning how to apply them to his prior understanding of perceptual space.

E. Clark (1973) has incorporated H. Clark's basic hypothesis into investigations of how children use cognitively based strategies in acquiring the meaning of relational terms. According to E. Clark, children's apparent comprehension of certain words is at first dependent on a combination of their linguistic knowledge about a word's meaning and certain nonlinguistic strategies which are based on their perceptual knowledge of objects and events and conceptual knowledge about relations. From her research with the spatial prepositions *in, on* and *under,* she identified two nonlinguistic rules that the children appeared to use in tasks involving manipulations of objects with respect to each other. For example, the child was asked to place object X (a small toy animal) *in* a reference point object Y (a crib). The rules identified were as follows: Rule 1--if the reference point object is a container, the child must put the object to be placed *in* the reference point object; Rule 2--if the reference point object has a horizontal surface, the child must put the

object to be placed *on* the reference point object. Rule 2 is to be used when Rule 1 does not fit.

E. Clark's (1973) theory also applies to children's overextensions. The child first acquires the very broad, general features in learning word meanings. These perceptually based features, for example size and shape, are coupled with the child's linguistic hypothesis that "a word refers to some identifiable (perceptual) attribute of the object pointed to" (Clark, 1974). These linguistic hypotheses then lead the child to act on the assumption that the feature he has selected *is* what that particular word designates. For example, the child may call all objects that are round--door knobs, light bulbs, paperweights--"ball" because of the feature of roundness (Clark, 1974).

The child also acquires a notion of dimensionality. The dimension acquired may appear through direct encoding of a spatial dimension (high-low on the dimension of height) or through an abstraction of perceptual space (like-dislike on the dimension of like). The dimensions have two ends with the name of the dimension coming from the positive end. The positive end of the dimension is the more extended one and the opposite end is termed the negative or less extended end of the dimension.

In learning language, the child typically learns to use and understand the positive, or more extended, end of a dimension. Donaldson and Wales (1970) reported on the over-extensions children make to the relative terms "more

and less." Wales and Campbell (1970) also reported over-extensions in children's responses to terms like "tall-short" and "thick-thin." E. Clark (1973) explained the children's behavior by saying that, since children do not have complete meanings for the words, they rely on partial meanings in combination with certain nonlinguistic strategies. Thus, the children responded with their knowledge that, for example with more and less, these terms both refer to amounts (+AMOUNT). The strategies that children use not only provide information about particular words but also form the basis for their hypotheses about the meanings of new words. As children acquire more features of a word, they exhibit full semantic knowledge of the word.

Though Clark's theory has been accepted by some, there are those who offer alternative suggestions to perceptually based strategies. As reported in Bowerman's (1973) summary of the development of concepts underlying language, Menyuk (1973) suggested that the perceptual cues children use in classifying are hierarchially organized such that children may initially tend to use color or shape cues as a basis for responding. Mehler and Bever (1967) suggested that motivation or reinforcement of the children's responses may influence the way they respond. Another alternative suggested was that children have no such strategies and will manipulate objects based on personal preferences. Responses will actually reflect a shift in preference rather than acquisition or comprehension of word meanings.

Summary of Review of Literature and Implications for Research

As summarized by Bowerman (1973), research has suggested that the following kinds of nonlinguistic knowledge and skills are necessary for language acquisition: the general ability to represent or symbolize experiences which may not be perceptually present; the ability to use consistent and rule-governed strategies in processing language to arrive at the relationships between meanings and the linguistic structures by which meanings are expressed. These rule-governed strategies, in many instances, derive from the child's nonlinguistic interactions and understanding of the world. Also needed is the ability to derive appropriate concepts and categories which are functional in the child's early language rule system. The child must have, in addition to control of cognitive structures or basic meanings, methods of determining the relationships between meanings and linguistic structures by which meanings are encoded in language. As stated by Huttenlocher and Higgins (1972), the child must have first stored a particular type of perceptual relation between objects--e.g., above/verticality--termed perceptual relation schema. There must also be stored an ordered relation among words in a sentence (termed syntactic schema) and then the child must have stored a mapping of the ordered relation among words into the ordered relation among objects.

Relational terms, especially spatio-temporal terms, are used in language diagnostic and intervention methods with, particularly, the language disordered child who is beyond the prelanguage age but who does not have the same ability as the normal language developer. In assessment and in therapy, children are often asked to perform a variety of relational manipulations. Children are asked to demonstrate that they understand the relationships stated. For example, a child might be asked to place a ball *in* a cup, *in* a box, and *in* a truck. Children are also asked to identify objects by responding to statements with spatio-temporal terms in a stimulus function. A child might be asked to put a block *in* a crib where the child's task is to identify the crib from an array of objects. Incorrect or inappropriate responses are considered evidence that the child either did not understand the task or, more commonly, that the child did not understand the relationship stated or did not have the names for the objects used. The research of E. Clark (1973) and Huttenlocher (1968) suggested that the relational terms used may not be consistent with respect to the development of the meaning of these terms. That is, the child does not have the linguistic strategy to make assumptions as to the meanings of the terms responded to incorrectly.

There is a small amount of information available about the development of spatio-temporal terms. Children learn spatio-temporal terms in a highly ordered fashion based on complexity of meaning of the terms, and it appears that

the terms relating to space are acquired before those relating to time (Wood, 1976). According to Wood (1976), the development of some of the more frequently used spatio-temporal terms is as follows: *up-down, in-out, on-off, above-below, over-under, in front of-in back of, ahead of-behind, first-last, early-late, before-after.* The simplest relationship understood would be *up-down,* a relationship which relates an object's position on a vertical axis and does not involve reference points. As relationships become more complex, with respect to additional dimensions of space and time, the relational terms become more difficult to understand. For example, when reference points are included, relations like *in* and *on* come into play.

Diagnosticians and clinicians frequently interchange similar relational terms which might be well understood by the mature language user but which, with the language learner and disordered child, might be less well understood and, consequently, could result in incorrect or inappropriate responses to directions for manipulations of objects. It is not uncommon, for example, that *in/into* or *on/onto* would be used interchangeably. H. Clark (1973) suggested that these terms develop at different times with *in* having meaning before *into.* This order is determined by the cumulative complexity of the incoming spatial information and, to some extent, by the order in which the child learns the properties of perceptual space. From E. Clark's investigations with antonyms (1972), it has been shown that the order of acquisition of relational terms will be from

the semantically less complex to the more complex where complexity relates to added dimensions of time and space.

Purpose of Investigation and Research Questions

The purpose of this investigation was to study the development of meanings of the spatial terms *in, on, under, ahead of, beside,* and *behind*; to study the development of meaning of similar terms--*into, onto, underneath, in front of, along side of,* and *in back of*; to identify the terms that children have in their productive vocabularies to express the relationships implied by the relational terms used; to identify additional strategies that children use in early language acquisition of relational terms and, consequently, to expand the understanding of how the strategies might work with a broad range of terms.

The following questions were posed for investigation:

1. Can children, ages 2.5-4.11, relate objects with respect to the prepositional relationships of *in, on, under, ahead of, beside,* and *behind* better than chance?

2. Can children, ages 2.5-4.11, relate objects with respect to prepositions similar to the terms previously listed--termed the primary set--better than chance? These terms--*into, onto, underneath, in front of, along side of,* and *in back of*--are designated the secondary set. The primary set of terms is considered to be less complex and would be acquired first by children. The secondary set of terms is considered to be more complex and would be acquired later.

3. Is there a difference, in responding to these terms, as a function of race?

4. What is the developmental pattern of the relational terms labeled the primary set?

5. What is the developmental pattern of the relational terms labeled the secondary set?

6. Is there a difference in the children's production of the primary and secondary sets of relational terms?

Null hypotheses are stated as follows:

1. The children will not be able to relate objects with respect to the prepositional relationships of *in, on, under, ahead of, beside,* and *behind* better than chance.

2. The children will not be able to relate objects with respect to the prepositional relationships of *into, onto, underneath, in front of, along side of,* and *in back of* better than chance.

3. It is not expected that there will be a difference in response patterns as a function of race.

4. There will not be a developmental pattern of the primary set *in, on, under, ahead of, beside,* and *behind.*

5. There will not be a developmental pattern of the secondary set *into, onto, underneath, in front of, along side of,* and *in back of.* It is not expected that these terms will develop later than the terms in the primary set.

6. There will not be a production difference between the terms in the primary set and the secondary set of

relational terms. Children will use the terms in the primary and secondary sets equally.

Definitions

There are terms which have specific meaning as they relate to this study:

Perceptual cognition refers to the way in which the child perceptually organizes the world and develops responses based on that organization.

Relational terms is a broad category of terms which indicates a particular manner in which objects, events, and actions relate to each other. The child's understanding of the terms and relationships specified will be demonstrated by correct manipulations of objects by the child and by the child's description of manipulations by the experimenter.

Primary set is a designation of those relational terms which are--semantically and perceptually--not as complex as the *secondary set* of terms which here are designated as terms whose meanings are similar to the primary set but which are more complex.

Pattern refers to the order of development, of the terms used in the study, as a function of age and/or race.

Factors to be Considered

With respect to individual differences among children, there is research evidence showing that babbling--as a predictor of future indices for higher levels of cognitive development--is more stable in female children than in male

children (Bayley and Schaefer, 1964). Bayley and Schaefer's data showed that vocalizations and facial fixation time were more stable in girls than in boys and that these findings paralleled data indicating greater long term stability for girls on a variety of cognitive dimensions. McCarthy's (1954) research also indicated, though not strongly, that with rate of language acquisition females outpaced males. Nelson's (1973) research showed that when specific types of language were considered, there were no sex differences. Gillum (1976) also reported that, in judgments of grammaticality, there were no sex differences. In view of inclusive research data, the decision was made to include only girls in this study of cognition and language.

Numerous researchers have shown differences in the production patterns of Black and White children (Baratz, 1969; Williams, 1970). Some, like Engelman (1970) and Bernstein (1970), have suggested that this difference is indicative of deficiency in the development of language and cognitive skills. If Bernstein is correct, then the White children would be expected to comprehend the relational terms studied before the Black children; there would also be a difference in the productive vocabularies, and the Black children would lag behind the White children. Other researchers, while acknowledging a difference in Black and White language patterns, have shown that Black language has as much communicative value as White language (Labov, 1970; Baratz, 1970) and that the difference is not

an indication of deficiency in the development of language and cognitive skills. For example, Gillum's (1976) study showed that there was no difference between races in judgments of grammaticality. In the acquisition of meaning of relational terms, it is expected that there will be no effect of race on the response patterns of the children.

It has been proposed and recently researched that birth order is an important component of the child's environment and that it affects personality behavior (Toman, 1971; Zajonc, 1975). McCarthy's (1954) research showed a relative slowness of language learning among younger siblings. When type of language was considered, a small difference was found in Nelson's (1973) research. It is possible, then, that birth order might have an effect on the development of meaning of the relational terms in this study.

It had been accepted that comprehension preceded production at every step of language development. McNeill (1970) suggested that "children probably add new information to their linguistic competence by comprehending speech." There has been a growing interest in comprehension, and questions are being raised that challenge the once widely held viewpoint. Bloom (1974) proposed that a likely hypothesis about the developmental relation between comprehension and speech is that "both speaking and understanding depend upon the same underlying

information but each manifests a different performance mode."

One generative grammar theory is that both comprehension and production involve learning the same words and linguistic structures with the difference being that different performance capabilities emerge at different times. It has also been suggested that comprehension and production are mutually dependent but have different underlying processes, with a resulting shift of influence between them in the course of language development. This view suggests that there will be a gap between comprehension and production that varies among different children and at different times.

Though there has been no clear resolution of the controversy, Bloom (1974) emphasized that the relationship between comprehension and production is almost certainly not a static one but shifts and varies according to the experience of the individual child and the developing linguistic and cognitive capabilities.

The focus of this investigation will be to study the development of children's understanding of the relational terms classified as spatial terms which are prepositions that specify the ways that objects can relate to each other. Additionally, this study will seek to identify the terms that children produce to express the relationships implied by the relational terms and to identify nonlinguistic strategies that children use in early language acquisition.

CHAPTER II

EXPERIMENTAL PROCEDURES

Subjects

The subjects for this study were 120 preschool girls. They were selected from the various Lansing area nursery schools, day care centers, and Head Start programs. Each center director was contacted, first by telephone, then by personal visit, to explain the research purpose and design. With approval from the center directors and governing boards, parent permission letters were sent to the parents of all the girls aged 2.5-4.11. The children included in the study were those for whom parent permissions were obtained in writing. All of the children selected were native speakers of English with no other language contact according to reports from the teachers. All of the children were of normal intelligence as determined by information in the school records and reported by the children's teachers. The children were divided into five age groups with twenty-four children (twelve Black and twelve White) in each group. The following information was collected on each child: age, race, birth order, and receptive vocabulary level as measured by the Peabody Picture Vocabulary Test (1959).

Prior to conducting the study, the experimenter visited the programs from which the children were selected in order to become acquainted with the children and in order for the children to become acquainted with the experimenter. A pilot study was conducted with ten children, ages 2.5-4.11, to insure that the relational terms and objects were appropriate. These children were not included in the actual test population.

Equipment

The objects used in the study were toy animals and common objects. The test objects (reference point objects) were made of wood and plastic. All were approximately the same size (2-1/2 x 5-1/2 inches) and were painted brown to neutralize possible effects of color preference. These objects were a box, truck, table, crib, bridge, and tunnel. The toy animals used were a pig, cat, bird, horse, cow and dog. All were approximately the same size (1-1/2 x 1 inch) and were naturally colored. The children's responses, for Task I, were recorded on data sheets which specified the relational term stimulus item; the placement of toy animal and reference point objects (RP's) with respect to stimulus item; the correct/incorrect response as indicated by animal placement and comment section. For Task II, the children's verbal responses were recorded on data sheets indicating the animal and the RP combination used; the relational term tested; and the child's verbal response. Each child's verbal responses were tape recorded on Scotch C-90 cassette

tapes using a portable General Electric cassette recorder model 3-5010 with encased condenser microphone. The tape recorder was situated approximately one foot in front of the child during taping. The experimenter was a Black female native speaker of Standard American English.

Procedures with Children

Each child was interviewed separately by the experimenter. All of the children went through a two stage screening procedure. The Peabody Picture Vocabulary Test (1959) was administered first. The children who did not meet the receptive vocabulary level criterion set by the established test norms, for their respective ages, were excluded from further testing. The experimenter next administered a screening task to insure that the child would follow the test instructions. The child was given four instructions. They were as follows: "Show me the ball *in* the cup (the doll *on* the chair; the ball *on* the chair and the doll *in* the cup)." The two relational terms were selected from E. Clark's (1973) study and, from her research, it was assumed that all of the children in this study would comprehend those two terms. If the child did not follow the instructions or missed both of the instructions with either term, she was excluded from further testing. The child was asked to name each of six reference objects (RP's--box, truck, table, crib, bridge, and tunnel) and each of six toy animals (cow, dog, horse, pig, bird, and cat). When the child's names for the test objects

differed from the experimenter's, the child's names were used throughout the testing.

In the first experimental situation, the child was asked to manipulate the RP's and the toy animals with respect to the instructions given by the experimenter. The instructions contained the relational terms *in, on, under, ahead of, beside, behind, into, onto, underneath, in front of, along side of,* and *in back of.* There were thirty-six instructions given to the child with each of the twelve relational terms tested three times. The relational terms were presented in randomized order with randomized object sets. The instruction form was "Show me the X *in (on, under, ahead of, beside, behind, into, onto, underneath, in front of, in back of)* the Y" where X was one of the six toy animals and Y was one of the six reference point objects. The researcher placed the reference point object and, after the instruction was given, the child was given the toy animal to place. The child's task was to locate correctly the object X with RP Y.

The child was then asked to describe the object manipulations of the researcher. Twelve instructions were prepared for testing and an additional twelve were prepared for presentation to retest incorrect responses. The instruction form was "I'm going to put the X and the Y like this. What did I do?" The child's task was to describe the manipulations. For this task no relational terms were used in the directions as the task was designed

to identify the terms that the child used to describe the relationship displayed. Each description was tape recorded. The order of presentation, of the relational terms and the objects and animal pairs, was randomized and presented once to the child. The individual stimulus items were repeated twice, if needed, for the child to make a response. After two times the relational term was tested by using new object and animal pairs. The items for retest were presented after the original twelve test items had been presented. All responses were tape recorded and recorded on data sheets.

Examples of the experimental situations were as follows: "Show me the cow *in* the truck." The child's task was to place the cow *in* the truck if the term *in* was understood. The second situation was "I'm going to put the cow and the truck like this (for example, the cow was placed *in* the truck). What did I do?" The child's task was to describe the manipulation as "You put the cow *in* the truck" or a similar response. Total testing time was approximately 30 minutes per child. Some of the younger children took a short break halfway through Task I.

Analysis of Data

The data from Task I were analyzed in terms of how the children carried out the instructions. Two of three correct responses indicated that the child had acquired the meaning of a given relational term. Raw correct scores

were compiled by age and race of the children. These were converted to mean scores. An analysis of variance was done for age and race to determine the effects of those factors on the acquisition of the meanings of the terms used in the study. Mean responses were also computed by birth order, age and race to determine whether there were effects of the birth order factor, in combination with age and race, on the acquisition of the terms where age and race did not appear to have effect. In addition, mean incorrect responses by reference point objects were computed to determine patterns of responses as indicated by the kinds of responses children made when they did not have an understanding of a relational term. Varimax rotational analysis was also conducted to identify the factors in the relational terms. The tapes were analyzed to determine by age and race which of the terms used were part of the children's productive vocabulary; what terms the children used that were socially acceptable where the relational terms specified were not used by the children; and what terms were used when the children did not understand the relational term used and had no socially acceptable terms in their vocabularies.

CHAPTER III

RESULTS AND DISCUSSION

The purpose of this investigation was to study the development of meanings of the spatial terms *in, on, under, ahead of, beside,* and *behind*; to study the development of meaning of terms that are similar--*into, onto, underneath, in front of, along side of,* and *in back of*; to identify the terms that children have in their productive vocabularies to express the relationships implied by the relational terms used; and to identify additional strategies that children use in early language acquisition of relational terms.

The following questions were suggested for investigation:

1. Can children, ages 2.5-4.11, relate objects with respect to the prepositional relationships of *in, on, under, ahead of, beside,* and *behind* better than chance?

2. Can children, ages 2.5-4.11, relate objects with respect to prepositions similar to the terms previously listed--termed the primary set--better than chance? These terms--*into, onto, underneath, in front of, along side of,* and *in back of*--are designated the secondary set. The

primary set of terms is considered to be less complex and would be acquired later.

3. Is there a difference, in responding to these terms, as a function of race?

4. What is the developmental pattern of the relational terms labeled the primary set?

5. What is the developmental pattern of the relational terms labeled the secondary set?

6. Is there a difference in the children's production of the primary and secondary sets of relational terms?

The analysis of the means from this investigation indicated that girls, ages 2.5-4.11, were able to relate objects with respect to the spatial relationships of *in, on, under, into, onto,* and *underneath* better than chance. The analysis for the mean percentage of correct responses to each instruction is shown for all ages in Table 1. For the terms *behind, in front of, along side of,* and *in back of,* the girls ages 3.6-4.11 related the objects better than chance. For the terms *ahead of* and *beside*, only the girls ages 4.6-4.11 could relate objects with respect to those terms better than chance.

Each 2 x 5 analysis of variance was performed, for the factor of age, for all of the terms except *in, into, on,* and *onto*. These four terms were excluded because all of the children responded with the maximum number of three correct for each term. The analyses indicated that the groups differed from each other significantly overall (Table 2). Age was shown to be the significant factor in

Table 1

Mean percentages of correct responses to the relational terms

Instructions	Age Groups I 2.5-2.11	II 3.0-3.5	III 3.6-3.11	IV 4.0-4.5	V 4.6-4.11
1. In	100	100	100	100	100
2. On	100	100	100	100	100
3. Under	98	100	100	100	100
4. Ahead of	0	0	21	32	87
5. Beside	0	16	40	55	96
6. Behind	1	16	65	72	100
7. Into	100	100	100	100	100
8. Onto	100	100	100	100	100
9. Underneath	86	93	94	96	100
10. In front of	1	18	79	98	100
11. Along side of	3	5	65	79	98
12. In back of	6	18	77	86	98

Table 2

Analysis of variance by age

Instruction	Source	Sums of Squares	Degrees of Freedom	Mean Squares	F Values
3. Under	Between groups	2.70	4	.67	6.68
	Within groups	11.62	115	.10	
	Total	14.32	119		
4. Ahead of	Between groups	111.78	4	27.94	66.66
	Within groups	48.20	115	.42	
	Total	160.98	119		
5. Beside	Between groups	125.21	4	31.30	64.00
	Within groups	56.25	115	.49	
	Total	181.46	119		
6. Behind	Between groups	144.62	4	36.15	125.04
	Within groups	33.25	115	.29	
	Total	177.87	119		

Table 2 (continued)

Instruction	Source	Sums of Squares	Degrees of Freedom	Mean Squares	F Values
9. Underneath	Between groups	2.58	4	.64	3.70
	Within groups	20.08	115	.17	
	Total	22.66	119		
10. In front of	Between groups	164.42	4	41.10	231.99
	Within groups	20.37	115	.17	
	Total	184.79	119		
11. Along side of	Between groups	165.28	4	41.32	192.32
	Within groups	24.71	115		
	Total	189.99	119		
12. In back of	Between groups	140.72	4	35.18	132.28
	Within groups	30.58	115	.27	
	Total	171.30	119		

$F_{(4,115)}$ $p<.05$

the development of comprehension of the terms studied. The influence of age reflected the children's increased experiences with language and increased cognitive development which stimulated the development of comprehension of the terms tested.

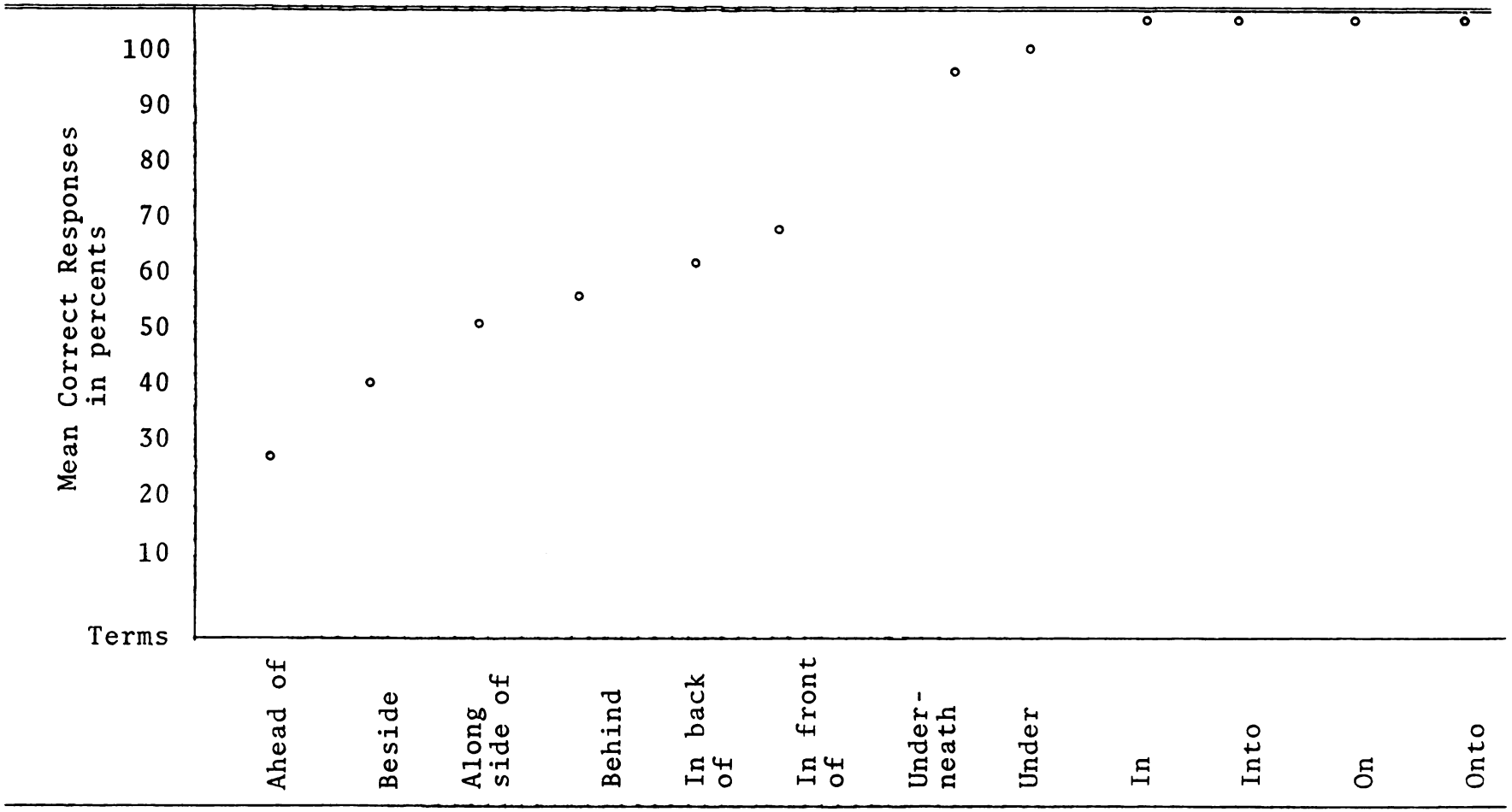
Analysis of mean correct responses, by age, indicated the primary set of relational terms to be--excluding *in, on, into,* and *onto--under, in front of, along side of,* and *in back of.* The secondary set was identified to be *underneath, ahead of, beside,* and *behind.* For the terms *in, into, on,* and *onto,* the children responded with the maximum number of correct responses of three, indicating that by age 2.5 the children in this study had acquired the meaning of those terms. The terms *under* and *underneath* were responded to, also, as similar terms with small differences in mean responses at all age groups except 4.6-4.11.

Figure 1 shows the developmental pattern of comprehension of the relational terms studied as a function of age. The pattern, from most complex to least complex, as indicated by mean percentages, was *ahead of, beside, along side of, behind, in back of, in front of, underneath,* and *under. In, into, on,* and *onto* were equally least complex and, therefore, the most easily comprehended.

Duncan and Tukey post hoc tests were applied to the means to identify age groups that might differ significantly from all age groups. The results of the post hoc tests showed that there were no groups that differed significantly from all age groups at the 0.05 level. The results showed

Figure 1

Developmental pattern of comprehension of relational terms across all subjects by mean percentage of correct responses



a linear relationship between age and correct responding to the relational terms studied.

Eight 2 x 5 analyses of variance were also performed for the variable of race (Table 3). The results showed that there was no significant effect of race on the development of comprehension of the relational terms studied.

As expected, the younger children made more errors than the older children. An an analysis was made of the types of error that all the children made relative to the reference point objects used in the study. That is, if the child made an incorrect response in the placement of a toy animal with a reference point object, what response did the child make? Table 4 shows the types of errors made by reference point object and age group. For example, with the object truck, of the total errors made by age group I, 60% were the relationship *in*. This meant that when the child did not understand the relational term used or did not understand the relationship indicated, she placed the toy animal *in* the truck.

Table 5 shows the children's patterns of comprehension and production. It shows the percentage of children who comprehended the relational term presented and the percentage of those children who used that term or a socially acceptable equivalent in their productive vocabularies. For example, 21% of the children in age group III comprehended the term *ahead of* and all of them used that term or a socially acceptable equivalent to express that relationship. Social acceptability of verbal responses

Table 3

Analysis of variance by race

Instruction	Source	Sums of Squares	Degrees of Freedom	Mean Squares	F Values
3. Under	Between groups	.008	1	.008	.079
	Within groups	11.953	118	.101	
	Total	11.961	119		
4. Ahead of	Between groups	.008	1	.008	.019
	Within groups	49.684	118	.421	
	Total	49.692	119		
5. Beside	Between groups	.133	1	.133	.267
	Within groups	58.779	118		
	Total	58.912	119		
6. Behind	Between groups	.033	1	.033	.113
	Within groups	34.460	118		
	Total	34.493	119		

Table 3 (continued)

Instruction	Source	Sums of Squares	Degrees of Freedom	Mean Squares	F Values
9. Underneath	Between groups	.033	1	.033	.183
	Within groups	21.279	118	.180	
	Total	21.312	119		
10. In front of	Between groups	.008	1	.008	.049
	Within groups	19.265	118	.163	
	Total	19.273	119		
11. Along side of	Between groups	.075	1	.075	.338
	Within groups	26.183	118	.222	
	Total	26.258	119		
12. In back of	Between groups	.133	1	.133	.518
	Within groups	30.299	118	.257	
	Total	30.430	119		

$F_{(1,118)}$ $p<.05$

Table 4

Errors made relative to reference point objects: indicated by percentage and type of error response

	In	*On*	*Under*	*Other*
Age I				
truck	60			6
tunnel	41	27		
table		22	13	
crib	9			
box	48			
bridge		16	35	
Age II				
truck	51			2
tunnel	47	20	14	1
table		17		1
crib				2
box	42			3
bridge		8	32	1
Age III				
truck	24			2
tunnel	26	3		2
table		6	3	
crib	6			1
box	25			2
bridge		3	12	2
Age IV				
truck	24			2
tunnel	21	4		1
table		8	3	
crib	1			
box	17			
bridge		2	2	
Age V				
truck	5			1
tunnel				
table			1	
crib				
box	1			
bridge				

Table 5

Comprehension and production of relational terms by children: reported by age groups and percentages

Terms:	Age Groups I	II	III	IV	V
1. In	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
2. On	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
3. Under	87 (50)	100 (100)	100 (100)	100 (100)	100 (100)
4. Ahead of	0	0	21 (100)	30 (100)	100 (100)
5. Beside	0	12 (100)	33 (100)	50 (100)	100 (100)
6. Behind	0	8 (100)	79 (100)	92 (100)	100 (100)
7. Into	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
8. Onto	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
9. Underneath	87 (50)	100 (100)	100 (100)	100 (100)	100 (100)
10. In front of	0	4 (92)	100 (92)	100 (88)	100 (100)
11. Along side of	0	0	83 (100)	96 (100)	100 (100)
12. In back of	4 (100)	4 (92)	96 (100)	96 (100)	100 (100)

*Number in parentheses indicates number of children who comprehended and produced relational term or a socially acceptable equivalent.

**Comprehension was determined as two of three correct responses per child per age group.

refers to the terms, in the child's productive vocabulary, which imply the same relationship expressed by the relational terms used in the study. For example, some of the children verbally responded to the relationship *in* as *inside* where the terms are somewhat different but the relationship expressed is the same.

There were some children who did not comprehend the terms tested or have them in their productive vocabularies, but they did have an understanding of the relationship demonstrated and used an appropriate term to express that relationship. For example, 62% of the children in age group III responded incorrectly to *beside* in the comprehension task, but they verbally responded with "by" and "side of it" when the relationship *beside* was demonstrated in the production task.

Between the ages of 3.5-4.5, most of the meanings of the terms seemed to develop. The children in this age range, more than others, used other terms to identify the relationships tested as indicated by taped responses. These terms were considered to be socially acceptable words to identify the relationship implied because, though they were different terms, the relationship indicated was the same. For example, for the term *along side of*, the children frequently verbalized the words "by", "next to", and "on the side."

Those children who neither understood the term presented nor had a socially acceptable word in their vocabularies to express the relationship responded with "put it

there", "put it like that" and the like to the stimulus "I'm going to put the X and the Y like that. What did I do?" The children in the younger age range, 2.5-3.5, were the ones who most often gave those kinds of responses. The children committed very few errors in the production task. That is, if the child did not have a term for the relationship demonstrated, for example cow *behind* truck, they rarely verbalized an incorrect description of the relationship. They would not say cow *in* the truck or cow *on* the truck.

Generally, once the child had an understanding of the terms tested, she also had a term to express the relationship indicated. The terms usually verbalized were those from the primary set. For example, the children in age group V (4.6-4.11) comprehended *ahead of* but most often used *in front of* to express the relationship indicated by *ahead of*.

The data, from the error analysis (Table 4), gave support to E. Clark's (1973) rules for relating objects with respect to *in* and *on*. Rule 1 stated that if the reference point object was a container the relationship indicated was *in*. Rule 2 stated that if the reference point object was a flat surface, the relationship indicated was *on*. It appeared that when the children, in this study, did not comprehend the term stated they relied on these rules to make a response.

A factor analysis was performed to group the twelve relational terms. A Varimax rotation, the final computation

of the factor analysis, appears in Table 6. As suggested by Guttman and adapted by Kaiser,[1] all groupings with latent roots of one or more were accepted as factors. Two groupings or factors with latent roots of one or more resulted from the analysis. As pointed out by Child (1975), "'significant' refers to the size a loading must attain before we have confidence that it exists at all and the interpreter of a factor matrix should look for 'conspicuous patterns' formed by the highest correlations."

The first grouping portrayed was *ahead of, beside, behind, in front of, along side of,* and *in back of.* The terms in Factor I seemed to reflect a laterality or side space dimension. The terms in Factor 2, *under* and *underneath,* seemed to reflect an above/below ground space dimension.

With the terms *under* and *underneath*, strategies appeared to develop along an above/below ground dimension. That is, the children in this study already comprehended *in/into* and *on/onto* establishing above ground. The next progression then was to establish its opposite or below ground space. Most of the children, in the youngest age group (2.5-2.11), comprehended *under/underneath.* For those who did not yet comprehend the terms, according to the factor analysis, the strategy would be to extend perception of the above ground dimension to establish the below ground

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[1]Child, D., *The Essentials of Factor Analysis.* London: Holt, Rinehart and Winston (1975), p. 43.

Table 6

Varimax rotation of factors associated with relational terms

Terms:	Factors 1	2	
1. In	0.00	0.00	0.00
2. On	0.00	0.00	0.00
3. Under	0.15	0.91	0.86
4. Ahead of	0.84	0.01	0.70
5. Beside	0.90	0.10	0.81
6. Behind	0.94	0.16	0.90
7. Into	0.00	0.00	0.00
8. Onto	0.00	0.00	0.00
9. Underneath	0.21	0.90	0.85
10. In front of	0.92	0.19	0.88
11. Along side of	0.93	0.10	0.88
12. In back of	0.90	0.15	0.82
	4.96	1.74	

dimension. Once below ground is established, the child should begin to comprehend *under* and *underneath*.

With the remaining six relational terms, strategies appeared to develop along a lateral continuum. That is, the children responded to the dimension of sidedness. With *in front of*, in the canonical space, an object "faces" the child. That is, front space usually contains the characterizing information about the object. If the placement of the object showed characterizing features of that object, the relationship called for was *in front of*. For example, if that part of the truck with the windows, headlights, and cab faced the child, then that space was *in front of*. If those characterizing features could not be seen, and cab faced the child, then that space was *in front of*. If those characterizing features could not be seen, that space was *in back of*. *In back of* was also indicated as the space away from the child. The mean correct responses were very similar for these terms; however, *in front of* appeared to be comprehended before *in back of*. *Along side of* corresponded to space between and to the sides of front and back. Here the child had two choices--two sides. With the dimension of laterality, the strategies seemed to generate from establishing the various sides--side with characterizing features and sides without characterizing features--and sides between them. Clark (1974) hypothesized that nonlinguistic rules last until the child has developed full meanings of the terms. For this study that appeared to be age 4.6-4.11

when the children responded to most of the terms with maximum correct scores of three.

For the terms in the primary set, the developmental pattern was *in front of, in back of,* and *along side of.* The developmental pattern of the secondary set of terms did not mirror that of the primary set. The pattern was *behind, beside,* and *ahead of.* The reason for this difference was shown to be that *ahead of* was the most difficult for all the children and consequently comprehension of that term was later than for all the others. As shown in the data, the terms *in/into, on/onto* and--to some extent--*under/underneath* could be interchanged with no difference in responses from the children. There was, however, a difference in the children's responses to the other terms both in comprehension and production.

To further demonstrate the research hypotheses, the response pattern of a typical Black subject in the 3.0-3.5 age range is described. As with the other subjects, she responded with maximum number of correct responses (three) for the terms *in, into, on, onto.* She also responded with maximum number correct responses for *under* and *underneath.* This was consistent with the other subjects in her age group. Her responses to the other relational terms showed emergence of understanding of *in front of.* She made one correct response to the terms *in back of* and *behind* which may have indicated that these terms were beginning to develop. There was no comprehension of the terms *ahead of, beside* or *along side of.*

In the production task, she verbalized from the primary set for the terms she had an understanding of. That kind of verbal responding was shown by most of those in her age group and across age groups. Contrary to the others in her group, she demonstrated understanding of the term *in front of*, but it did not appear in her productive vocabulary. It is possible that there was a lag between the comprehension of this term and the emergence of that term in her productive vocabulary. A kind of reverse lag was seen in the comprehension and productive responses of the next oldest group. That is, a number of children had no comprehension of the term *ahead of*, but in the production task the relationship indicated by that term appeared in the productive vocabulary as *in front of*. Her response and that of some of the subjects in the next age group gives some support for Bloom's view (1974) that the relation between comprehension and production is not a static one. This subject's responses were, overall, consistent with her age group and with the rest of the subjects as well as the crisscrossing of comprehension and production evident in other subjects in her age group and in other age groups.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The focus of this study centered on the development of children's understanding of relational terms. There was also a comparison made of the comprehension of the spatial terms tested and their appearance in the children's productive vocabularies.

Age was shown to be the significant factor in the development of the comprehension of the terms *in, on, under, ahead of, beside, behind, into, onto, underneath, in front of, along side of,* and *in back of.* The influence of age reflects the children's increasing experiences with language and increasing cognitive development. Race was not shown to be a significant factor. The developmental pattern shown for the comprehension of the terms was *under, underneath, in front of, in back of, along side of, behind, beside,* and *ahead of. In, into, on,* and *onto* were all comprehended by the children at the time this study was conducted. *Under* and *underneath* were comprehended by most of the children at the time of testing. These two terms were responded to as the same term with only small differences in mean scores. The resulting primary set was *under, in front of, along side of,* and *in back of.* The

secondary set was identified as *underneath, ahead of, beside,* and *behind.*

In the comparison of the production and comprehension tasks, for most of the children, once they understood a given term, they had a corresponding term in their productive vocabularies to express it. With some terms, most notably *ahead of*, few of the children had an understanding of that term, but some understood the relationship indicated and used *in front of* to express the relationship. There were instances where comprehension appeared to precede production. For example, some of the children in age group II (3.0-3.5) demonstrated that they understood the terms *beside* and *along side of* but had no term to express the relationship.

Analysis of the types of errors that the children made gave support for the strategies identified by E. Clark (1973). When the children had no clear understanding of a given spatial term or relationship indicated, they appeared to apply Clark's rules (1973) for placement of the animal objects with respect to the reference point objects. For example, the children in age group I (2.5-2.11) did not comprehend *ahead of*. When a truck was used as a reference point object, the animals were placed *in* the truck. The rules proposed by Clark were as follows: Rule 1--if the reference point object was a container, the relationship called for was *in*; Rule 2--if the reference point object had a horizontal surface, the relationship called for was *on* if Rule 1 did not apply.

Additional strategies were suggested for the other terms studied. With *under* and *underneath*, the strategy appeared to be generated from the development of perception of above/below ground spaces. *In, into, on,* and *onto* served to establish above ground (positive end) and the extension (negative end) from that would be below ground. With *ahead of, beside, behind, in front of, along side of,* and *in back of*, the strategy appeared to be generated from the development of perception of lateral or side spaces. For example, *in front of* was the space containing the characterizing information pertaining to a particular object.

Implications for Therapy

It is important that diagnosticians and clinicians have information as to how children normally respond in order to have some basis for comparison with those children who have delayed or disordered development of language. As stated previously, relational terms are used frequently in diagnostics and therapy. From the research, it has been shown that as a function of age--related to increased language experience and cognitive development--there was a developmental pattern to the terms studied. While this was less evident for the older children, it was very evident for the younger children and did persist across age levels to some degree. The younger children made very differentiated responses to the primary and secondary sets of terms. Again, the older children responded to the terms

in a similar manner though the terms in the primary set were responded to overall more correctly.

With respect to comprehension and production, it was shown that the relationship between them was not a simple one, nor was it a one to one relationship. For some of the terms, comprehension seemed to precede production and for others the reverse appeared to be true. Children showed preferences in the production task and used the terms (primary set) that were more common everyday terms. These are probably also the terms that parents and others in the child's environment first use to specify relationships for the child. Brown (1958) discussed the behavior of parents in selecting the simplest words when talking to children. In diagnostics and therapy, the least complex terms would best be used; for example, *in back of* rather than *behind*. If relational terms are being taught, teaching first in a framework of perceptual awareness, beginning with the least complex terms and building to the more complex terms would, in all probability, result in some measure of success. As indicated by the factor analysis, there were two common threads that ran through a number of the terms and revealed two factor groupings. A number of these terms are used in language assessment and therapy. In this study, the dimensions of laterality and above/below ground space were shown in the terms. In therapy, then, it might be necessary to build awareness of these dimensions if teaching these terms and possibly others that are similar. The developmental pattern shown

by the children's responses also gives indications of what terms might be selected for therapy--which terms seem to be important as dictated by the order that the child learns them.

Questions Related to Perceptually Based Strategies

Questions have been raised relating to the validity of the concept of perceptually based strategies in language acquisition (Menyuk, 1973). To answer some of the questions, one of the primary factors generated from this study was the developmental pattern of the terms studied. The development was consistent over the various ages--that is, as the children were older in age, they comprehended more of the terms. This, as stated previously, is related to the children's increasing cognitive development and increasing experiences with language. There was also consistent responding in the production task where the terms in the primary set were the ones verbalized most often by the children. Additional support came from the factor analysis, which highlighted the two perceptual dimensions that related the terms together in groups--one based on above/below ground space and the other based on lateral space dimension.

Implications for Future Research

The purpose of this study was to investigate the development of understanding of relational terms in children. Additionally, it was to compare their comprehension and production vocabularies as these pertained to the

acquisition of the meanings of the spatial terms studied. The data suggested that there was a developmental pattern in the acquisition of meaning of these terms and that a primary set (more easily understood set) and secondary set (less well understood set) of terms could be identified. A question is raised as to whether this pattern would hold true for other spatial terms and other types of relational terms such as adverbs. All of the children in this study were native speakers of English with no other language contact. It is possible, then, that children from a bilingual background would acquire meanings of spatial terms in a different developmental pattern as influenced by possible perceptual organization differences. The children, too, were all in pre-school programs where they are encouraged to be verbal and are given many opportunities to talk and to listen, not only to peers but to adults as well. It could be expected, then, that the levels and types of responses given were influenced by the verbal behavior shown in the pre-school settings. It is possible that children who are not in pre-school programs would show differences, perhaps in rate of acquisition of meanings according to age.

The birth order data were not analyzed because of unequal sample sizes within age groups; however, birth order has been suggested as a possible influence in overall development as well as language development (Nelson, 1973). This, also, is an area that might be studied further as it

pertains to the development of comprehension of relational terms.

A final area of suggested research is the area of experimenter influence. Rosenthal's (1966) research indicated that experimenter bias might influence the responses of the subjects. According to Williams' (1970) research, with Black children, the interviewer's expectations of the child is one of nonstandardness, reticence and uncertainty. The child's expectations of the interviewer is one of dominance, confidence, and verbosity. It is not unusual that so often they have fulfilled their joint prophecies. With same race researcher, Gillum (1976) reported that there was no difference in the Black children's ability to make judgments of grammaticality from the White children though the experimenter was Black. There did not appear to be an unusual influence of the Black experimenter, in this study, on the responses of the Black children. This is, however, an additional area to be studied more thoroughly relative to same race examiner and the influence that there might be on the children's responses.

APPENDICES

APPENDIX A

ANALYSIS OF VARIANCE, AGE BY RACE

ANALYSIS OF VARIANCE
AGE BY RACE

Instruction	Source	Sums of Squares	Degrees of Freedom	Mean Squares	F Values
3. Under	Age	2.700	4	.675	6.410
	Race	.008	1	.088	.079
	Age by Race	.033	4	.088	.079
	Residual	11.583	110	.105	
	Total	14.325	119		
4. Ahead of	Age	111.783	4	27.946	64.830
	Race	.008	1	.008	.019
	Age by Race	.783	4	.196	.454
	Residual	47.417	110	.431	
	Total	159.992	119		
5. Beside	Age	125.217	4	31.304	62.608
	Race	.133	1	.133	.267
	Age by Race	1.117	4	.279	.558
	Residual	55.000	110	.500	
	Total	181.467	119		
6. Behind	Age	144.617	4	36.154	122.368
	Race	.033	1	.033	.113
	Age by Race	.717	4	.179	.606
	Residual	32.500	110	.295	
	Total	177.867	119		

ANALYSIS OF VARIANCE
AGE BY RACE
(continued)

Instruction	Source	Sums of Squares	Degrees of Freedom	Mean Squares	F Values
9. Underneath	Age	2.583	4	.646	3.552
	Race	.033	1	.033	.183
	Age by Race	.050	4	.013	.069
	Residual	20.000	110	.182	
	Total	22.667	119		
10. In front of	Age	164.417	4	41.104	243.307
	Race	.008	1	.008	.049
	Age by Race	1.783	4	.446	2.639
	Residual	18.583	110	.169	
	Total	184.792	119		
11. Along side of	Age	165.283	4	41.321	186.155
	Race	.075	1	.075	.338
	Age by Race	.217	4	.054	.224
	Residual	24.417	110	.222	
	Total	189.982	119		
12. In back of	Age	140.717	4	35.179	136.578
	Race	.133	1	.133	.518
	Age by Race	2.117	4	.529	2.054
	Residual	28.333	110	.258	
	Total	171.300	119		

$F_{(4,110)}$ $p<.05$

APPENDIX B

CORRELATIONS OF RELATIONAL TERMS
PRINCIPAL COMPONENTS OF RELATIONAL TERMS

CORRELATIONS OF RELATIONAL TERMS

Relational Terms	In	On	Under	Ahead of	Beside	Behind
1. In	0.00	0.00	0.00	0.00	0.00	0.00
2. On	0.00	0.00	0.00	0.00	0.00	0.00
3. Under	0.00	0.00	0.00	0.16	0.22	0.25
4. Ahead of	0.00	0.00	0.16	1.00	0.83	0.73
5. Beside	0.00	0.00	0.22	0.83	1.00	0.85
6. Behind	0.00	0.00	0.25	0.73	0.85	1.00
7. Into	0.00	0.00	0.00	0.00	0.00	0.00
8. Onto	0.00	0.00	0.00	0.00	0.00	0.00
9. Underneath	0.00	0.00	0.71	0.20	0.30	0.35
10. In front of	0.00	0.00	0.30	0.66	0.76	0.89
11. Along side of	0.00	0.00	0.26	0.72	0.79	0.85
12. In back of	0.00	0.00	0.26	0.63	0.71	0.86

CORRELATIONS OF RELATIONAL TERMS (continued)

Relational Terms	Into	Onto	Underneath	In front of	Along side of	In back of
1. In	0.00	0.00	0.00	0.00	0.00	0.00
2. On	0.00	0.00	0.00	0.00	0.00	0.00
3. Under	0.00	0.00	0.71	0.30	0.26	0.26
4. Ahead of	0.00	0.00	0.20	0.66	0.72	0.63
5. Beside	0.00	0.00	0.30	0.76	0.79	0.71
6. Behind	0.00	0.00	0.35	0.89	0.85	0.86
7. Into	0.00	0.00	0.00	0.00	0.00	0.00
8. Onto	0.00	0.00	0.00	0.00	0.00	0.00
9. Underneath	0.00	0.00	1.00	0.34	0.25	0.30
10. In front of	0.00	0.00	0.34	1.00	0.89	0.90
11. Along side of	0.00	0.00	0.25	0.89	1.00	0.85
12. In back of	0.00	0.00	0.30	0.90	0.85	1.00
r=.254	p<.05					

PRINCIPAL COMPONENTS OF RELATIONAL TERMS

Relational Terms	Principal Components 1	2	
1. In	0.00	0.00	0.00
2. On	0.00	0.00	0.00
3. Under	0.38	0.84	0.86
4. Ahead of	0.81	-0.22	0.70
5. Beside	0.89	-0.14	0.81
6. Behind	0.95	-0.10	0.90
7. Into	0.00	0.00	0.00
8. Onto	0.00	0.00	0.00
9. Underneath	0.44	0.81	0.85
10. In front of	0.94	-0.07	0.88
11. Along side of	0.93	-0.15	0.88
12. In back of	0.90	-0.10	0.82
	5.23	1.48	

APPENDIX C

TASK I, TASK II

TASK I

Child's Name _____

Stimulus Items and Child's Names

box	_____	pig	_____
bridge	_____	horse	_____
table	_____	cow	_____
crib	_____	dog	_____
tunnel	_____	cat	_____
truck	_____	bird	_____

Instruction: Show me the X _____ the Y.

Test Item	Placement	Correct/Incorrect	Comments
1. bird *in back of* bridge			
2. dog *beside* tunnel			
3. cow *in* box			
4. cat *ahead of* truck			

Test Item	Placement	Correct/Incorrect	Comments
5. pig *behind* bridge			
6. cat *onto* table			
7. cow *into* box			
8. bird *onto* bridge			
9. horse *underneath* crib			
10. pig *behind* tunnel			
11. cat *under* crib			
12. cat *on* tunnel			
13. cow *in back of* truck			

Test Item	Placement	Correct/Incorrect	Comments
14. bird *onto* tunnel			
15. dog *into* truck			
16. horse *underneath* table			
17. dog *into* crib			
18. pig *in back of* tunnel			
19. bird *under* bridge			
20. cow *in front of* truck			
21. horse *along side of* box			
22. dog *under* table			

Test Item	Placement	Correct/Incorrect	Comments
23. pig *in front of* tunnel			
24. cat *on* table			
25. pig *in front of* tunnel			
26. bird *ahead of* tunnel			
27. pig *behind* tunnel			
28. cow *beside* box			
29. bird *underneath* bridge			
30. horse *on* bridge			
31. dog *into* crib			

Test Item	Placement	Correct/Incorrect	Comments
32. dog *in* truck			
33. horse *beside* table			
34. horse *along side of* box			
35. cat *ahead of* bridge			
36. cow *along side of* table			

TASK II

Instructions: I'm going to put the X and Y like this. What did I do?

Test Item	Child's Response(s)	Comments
1. cow *in* box (pig *in* crib)		
2. cat *behind* truck (bird *behind* tunnel)		
3. pig *in front of* bridge (dog *in front of* truck)		
4. horse *under* table (cow *under* bridge)		
5. bird *onto* bridge (pig *onto* table)		
6. bird *underneath* crib (cat *underneath* crib)		
7. dog *beside* tunnel (horse *beside* box)		
8. cat *in back of* tunnel (bird *in back of* tunnel)		
9. cow *into* crib (pig *into* box)		

Test Item	Child's Response(s)	Comments
10. horse *along side of* box (cow *along side of* table)		
11. dog *on* table (dog *on* bridge)		
12. cow *ahead of* truck (pig *ahead of* truck)		

*Items in parentheses are for retest of relational terms.

APPENDIX D

OUTLINE OF RESEARCH STUDY
PARENT INFORMATION AND PERMISSION LETTERS

May 4, 1976

OUTLINE OF RESEARCH STUDY

Elissa L. Gatlin
Doctoral Candidate-MSU
Department of Audiology
and Speech Sciences

Title: CHILDREN'S UNDERSTANDING OF RELATIONAL TERMS

Purpose of the study:
1. To study the ways in which children normally develop meanings of the relational terms in/into, on/onto, under/underneath, ahead of/in front of, behind/in back of, beside/along side of
2. To study children's comprehension and productive uses of the relational terms

Method:
1. Each child will be asked to place toy objects in different arrangements according to directions from the researcher. For example, the child will be asked to "Put the horse in the truck."
2. Each child will be asked to describe the toy object arrangements of the researcher. For example, the horse will be placed in the truck by the researcher and the child will be asked to describe what the researcher did - "You put the horse in the truck" or something similar would be the expected response.

Information to be obtained on each child:
1. age, by year and month - as determined by birthdate
2. race
3. birth order - as determined by ages of brothers and sisters
4. vocabulary level - as indicated by the Peabody Picture Vocabulary scale

Total needed for study: 120 girls ages 2.5-4.11

Results: Results of the study will be reported in general research form with no mention of specific children. All information will be strictly confidential as it relates to the individual child. Results of the study will be available to parents and teachers of the children who participated in the study

Questions and concerns: Questions and concerns may be directed to Elissa L. Gatlin (home) 351-9129 or (campus) 353-8780 and to Dr. Linda H. Gillum, director of the research study, 353-8780

May 4, 1976

Dear Parent:

This letter is to ask permission for your daughter, who attends , to participate in a child language development study that I am conducting at various nursery schools in the Lansing/East Lansing area. To introduce myself, I am a doctoral candidate in speech pathology at Michigan State University. I have worked with children in a variety of settings including speech therapy and classroom teaching.

The purpose of the study is to determine the ways in which children normally develop understanding of relational terms-like *in, on, under, behind, beside, ahead of* and related terms. There are two tasks. The first is that the child will be asked to put toy objects in various arrangements that I will specify. For example, I will say "Put the horse in the truck." The second task is for the child to describe object arrangements that I will make. For example, I will put the horse in the truck and ask the child to tell me what I did. The verbal responses will be tape recorded. From the children's responses, I hope to tell the developmental patterns of the relational terms used and to investigate the difference in comprehension and productive uses that children have of these terms. The time of the study will be approximately 25 minutes per child and will be conducted during free play and free activities times. All information about the children will be strictly confidential and results of the study will be reported in general terms.

Please indicate on the attached form if I have your permission to include your daughter in the study. If you have any questions or concerns, please contact me at one of these two numbers-(home) 351-9129 or (MSU) 353-8780. You may also put questions on the attached form and I will contact you. Thank you for your consideration.

Sincerely,

Elissa L. Gatlin, M.A.
Doctoral Candidate

Linda H. Gillum, Ph.D.
Director of Research

_____ I give my permission for my daughter to participate in the study

_____ I do not give permission for my daughter to participate in the study

_____ I need more information before making a decision

Please fill out information if your daughter will be in the study

Daughter's name: _____

Birthdate: _____ Age: _____

Address: _____ Phone: _____

Brothers and Sisters and their ages: (list below)

_____
Signature of Parent

Please return this form to the school and I will collect them by _____. THANK YOU.

(signed) Elissa L. Gatlin

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