THE EFFECT OF SYNTACTICAL STRUCTURE ON WORD IDENTIFICATION BY KINDERGARTEN CHILDREN

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ABSTRACT

THE EFFECT OF SYNTACTICAL STRUCTURE
ON WORD IDENTIFICATION BY
KINDERGARTEN CHILDREN

By

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This study began with the postulate that reading begins with the basic processes of speech and that these processes are carried over into reading through the use of phrase structure rules. This supposition was operationalized by hypothesizing that nonreading kindergarteners would learn to identify words as wholes if given an opportunity to attend to the syntactical structure of the sentence, preferably when representative of uncommon usage. Ideas for methodology were developed with E. J. Gibson's theory of perceptual learning in mind. An experimental descriptive study was designed. There were two groups of subjects, twenty in each group. One group had discrimination practice upon uncommon syntactical structure. The other group had discrimination practice upon the same sentences representative of common usage. Both groups were tested for word identification upon new sentences containing

previously presented words. Uncommon usage syntactical practice yielded superior word identification. Student's t, two-tailed test for mean difference, was significant at the .05 per cent level. Three additional hypotheses of a descriptive nature were also tested. Three unanticipated factors emerged. These were the sex of the subject, the age of the subject, and the sentence administered first in discrimination practice.

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By

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CHAPTER I

ANALYSIS OF THE PROBLEM

When a child starts to school he already has considerable command of language. Language exists in speech, and as a result, the proposition that reading begins in speech has been more or less taken for granted in reading readiness programs.[1] Only recently has this postulate been of concern. The reason for this state of affairs has been explained by Eleanor J. Gibson as follows:

> Despite decades of concern on the part of educators, parents, and proponents of homespun wisdom, we seem to know little more about how to teach reading than our great grandparents did. In fact we do not even know why it has to be taught. Why doesn't it just grow, like language? No one teaches a child to speak. We do not know much about how a child acquires speech either, but in recent years studies of the developmental process have been very instructive. I think the reason for this is that we have begun to look at the process as a piece of natural history somewhat as the ethologist looks at behavior. Observation followed by a careful

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[1]Marion Monroe, Growing into Reading (Chicago: Scott Foresman and Company, 1951), pp. 207-21.

> analysis may be the essential preliminary to a good theory. Perhaps we have not really tried it with reading.[2]

Eleanor J. Gibson is actively engaged in research on reading and the developmental process and has been so engaged for some time. As a result she has been able to lay out certain principles of perceptual learning and development.[3] Through her research experiences, she states what the relationship between reading and speech is in the following:

> The origin of reading in speech is obvious. Long before the child goes to school he has learned to segment a sequential stream of acoustical information; to divide it into valid units of structure; to discriminate these units by means of an economical set of distinctive features; to assign symbolic meanings to units of an appropriate size; to infer the rules that structure the units in permissible ways; and even to recombine units in these rulelike ways so as to produce original messages. Surely this massive achievement must transfer in some way to the perception of written speech, which is also processed sequentially. It, too, must be segmented, discriminated, assigned symbolic meaning, and its combination rules mastered. That there is a carry-over is clear from a comparison of hearing children, who must do without this headstart.[4]

In these remarks, Gibson gives the basic processes of speech that are pertinent for the origins of reading

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[2]Eleanor J. Gibson, "The Ontogeny of Reading," American Psychologist, XXV (1970), 136.

[3]Eleanor J. Gibson, Principles of Perceptual Learning and Development (New York: Appleton-Century-Crofts, Educational Division, Meredith Corporation, 1969), 537 pp.

[4]Ibid., p. 136.

in speech. She makes no mention of words whatsoever. In another source, she says words "are the constituents of higher order units defined by the rules of grammar."[5] With her reference to rules she means phrase structure rules.[6] These are the rules that demonstrate how the sentence divides into grammatical units--or basic sentence relations--such as the subject of the sentence, the predicate of the sentence, and the object of the verb.[7] Words, then, are the end products of a division of the sentence into its grammatical units.[8]

Need for Study

A major portion of the primary grades program of instruction is devoted to beginning reading. As Gibson has already indicated[9] no method of instruction has really taken into account how reading begins in speech. Gibson's analysis of the basic processes of speech for the origins of reading has never been put to test. The

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[5] Ibid., p. 428.

[6] Ibid., p. 441.

[7] Noam Chomsky, Syntactic Structures (The Hague: Mouton, 1957), pp. 26-27.

[8] Gibson, Principles of Perceptual Learning, p. 432.

[9] Gibson, "Ontogeny of Reading," p. 136.

usual method of instruction sees reading as "talk wrote down"[10] in such a way that a word, not the sentence or the grammatical unit, to which the word belongs, is taken as a unit:

> . . . he--the child--must understand how a printed word is related to a spoken word--that it has the same meaning as a spoken word, only we see the row of printed letters that make up a printed word and we hear the series of sounds that blend into a spoken word. Each printed word stands for only one spoken word and means just what the spoken word means.[11]

With the word as the unit, sentences in beginning reading materials may be too short to permit the use of grammatical units to induce words by way of the basic processes of speech. One consequence may be that efficient use of a child's basic processes of speech postulated by Gibson occurs too rarely for instruction to be really effective.

The purpose of this study is to show that kindergarten children learn to identify words as wholes by using phrase structure rules to segment the sentence into grammatical units, a feat that the child accomplishes through the use of basic sentence relations--the subject of the sentence, the predicate of the sentence, and the object of the verb. In other words, this

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[10] Monroe, Growing in Reading, p. 207.

[11] Ibid., p. 209.

study attempts to operationalize the relationship between speech and reading in terms of Gibson's analysis.

However, because of the interpretation of Monroe's analysis, operationalizing Gibson's analysis places such constraints upon the researcher that the procedures used may not be directly applied to the classroom without further research.

Problem Analysis

The ability to identify words as wholes seems to be predictive of success in beginning reading instruction. Chall investigated the research literature on "meaning" and "coding" approaches.[12] Apparently, she took for granted that the origins of reading in speech had been adequately described by Monroe.[13] As a consequence, she found "coding" approaches superior to "meaning" approaches. This conclusion leaves unexplained why the ability to identify words as wholes should be predictive of success in beginning reading in the first place.

Meaning

Monroe's remarks in regard to "reading is talk wrote down" fail to indicate what is meant by the term

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[12]Jeanne Chall, Learning to Read: The Great Debate (New York: McGraw-Hill, Inc., 1967), 362 pp.

[13]Monroe, Growing in Reading, p. 209.

"meaning." Since her analysis of the relationship between speech and reading hinges upon "meaning," this is a crucial omission. In the remaining portion of her chapter, she encourages teachers to elicit speech from children and to write down what they say.[14] In order to be able to elicit speech, a child must first have something to talk about, a circumstance that often makes it necessary for teachers to provide common experiences so that the class does, in fact, have something to say. Such a procedure appears to be a roundabout way of tapping the origins of reading in speech.

In her analysis of the origins of reading in speech, Gibson has enumerated the basic processes of speech involved. The children begin by segmenting a stream of acoustical information. Eventually, "symbolic" meaning is assigned to grammatical units.[15] "Symbolic" meaning is the kind of meaning that derives from the sentence taken as a whole. It is that which is assigned to grammatical units when a unit is perceived as a basic sentence relation, such as the subject of the sentence, predicate of the sentence, and object of the verb. Rules are used to rewrite the sentence into its grammatical components. This division into grammatical

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[14] Ibid., pp. 207-21.

[15] Gibson, "Ontogeny of Reading," p. 136.

units is accomplished without recourse to the thought of the sentence. A term like noun phrase or subject of the sentence carries symbolic meaning because either can apply to a very specific relation in all sentences--an economical way of perceiving units. It is clear that this is the explanation for meaning that Gibson has in mind. In the same article she says "The writing-to-speech code is not a simple matter of paired-associate learning."[16] "It is not obvious that the word if automatically a unit for the child."[17] "Simple segmentation of this sort . . . doesn't provide the rules for which we are looking."[18] "There is carry-over to reading of the unit-forming principles of speech."[19]

Universals of Language Structure

Eleanor J. Gibson has said that the question of how reading originates in speech should be seen as a piece of natural history.[20] In recent years a search has been made for uniformities among languages with respect to structure and native language learning. Forty languages representing fourteen different language

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[16] Ibid., p. 139.

[17] Ibid., p. 140.

[18] Ibid.

[19] Ibid.

[20] Ibid., p. 136.

families have been studied.[21] These studies have demonstrated the existence of certain uniformities among languages for structure and native language learning. These uniformities are called universals. For example, all of the languages studied had a way of expressing what is meant in English by terms such as noun phrases, verb phrases, subject of the sentence, predicate of the sentence, object of the verb. They all had a way of converting a declarative active-voice transitive verb sentence into other forms such as the interrogative, imperative, passive, or relative clauses.[22] For all of these languages, the syntactical structure organized itself into a hierarchy that operated from the top down--from the largest unit, sentences, to phrases, to subphrases, to words, to word parts--a hierarchy that together with its breakdown into grammatical units is called phrase structure grammar.[23] All of the children studied seemed to go through the same set of stages in acquiring their native language. They used word order even when word order was not pertinent in the grammar for the language

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[21]Dan I. Slobin, "Cognitive Prerequisites for the Development of Grammar," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, Inc., 1973), pp. 175-77.

[22]Dan I. Slobin, Psycholinguistics (Glenview, Ill.: Scott Foresman and Company, 1971), pp. 12-17.

[23]Ibid.

being learned. All of the children acquired a set of function classes and also a set of content classes that are needed to carry out syntactical relations. The classes, though, that young children use in speech belonged to child, not adult, grammars.[24] All of the children were capable of saying things that they had never heard. They were not learning their native language by imitating adults. They were imitating in keeping with their abilities to perform. Imitation has been found to be a useful research technique in that it permits control over adult input so that child output can be compared with it.[25]

The uniformities among languages for language structure and native language learning have indicated that syntax is a connected and organized system for the way words appear in sentences and are combined into grammatical units. In all of the languages there was a surface structure, a form of the language as it is normally represented in print or heard. In all of the languages syntax related the surface structure to phonology, and at the same time, it could also break up the

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[24] Ibid., p. 55.

[25] Dan I. Slobin and Charles A. Welsh, "Elicited Imitation as a Research Tool in Developmental Psycholinguistics," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, 1973), pp. 485-96.

surface structure into grammatical units so that the underlying meanings could be reached. Breaking the sentence into grammatical units is accomplished through the use of phrase structure rules, but these rules say nothing about the processes whereby children arrive at meaning.[26] Immediate memory processes seem to originate in the syntactical structure of sentences.[27]

In view of the uniformities reported for language structure and native language learning, it has been concluded that all languages have the same general definition for form and function and that young children grasp what this definition is about as soon as they learn to speak. Young children handle language in sentences, and because they do, an economy of effort exists through the use of the hierarchical organization of grammatical units that characterizes all sentences.[28]

Statement of the Problem

The uniformities of language structure and of native language learning have indicated that children have child, not adult, grammars. This being the case, it may not be possible to predict what children will do

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[26]Slobin, Psycholinguistics, pp. 12-17.

[27]Ibid., p. 32.

[28]Slobin, "Cognitive Prerequisites," pp. 179-80.

with the grammar of the writing system from their speaking habits. For example, words that are crucial in operating the phrase structure rules in English are frequently omitted in a child's speech. It may, however, be possible to predict the use of rules even though the output of these rules for children and adults may not be exactly the same. What is needed is the identification and an analysis of the basic processes of speech that pertain to the origins of reading in speech together with a theory for how perceptual learning takes place. Then a methodology for carrying out research and a way of explaining the results can be developed. A generalized set of rules that incorporates both adult and child grammars and the use of a task that permits control over adult input, so that child output can be compared with it as a child speaks and discriminates sentences in print are required also. This study meets these prerequisites by using a generalized diagram to define the phrase structure rules in keeping with both child and adult grammars and by using imitation-of-oral reading as a way of providing discrimination practice. This task permits the basic processes of speech to transfer while the child discriminates along the printed sentence. E. J. Gibson's principles of perceptual learning[29] were

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[29]Gibson, Principles of Perceptual Learning, 537 pp.

used as a theoretical base and her analysis of how reading begins in speech was used to specify the basic processes of speech that were pertinent for the transfer from speech to reading.[30]

A study of experimental, descriptive design was drawn up. The researcher prepared a pretest to eliminate children who might already be able to read, prepared a set of active-voice transitive verb sentences and manipulated these sentences by exchanging the subjects of the verbs with the objects of the verb so that the predicates would be marked off, a procedure that made it possible to assign a control group to discrimination practice upon sentences representative of common usage and an experimental group to discrimination practice upon sentences representative of uncommon usage.[31] For discrimination practice, an imitation-of-oral reading task was devised. Both groups were tested at the end for word identification upon a common set of new sentences containing words previously presented during discrimination practice.

It was hypothesized that kindergarten children would learn to identify words as a result of their ability to segment sentences into grammatical units,

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[30]Gibson, "Ontogeny of Reading," pp. 136-43.

[31]Slobin, "Cognitive Prerequisites," p. 201.

this ability being predicted to be superior for subjects receiving discrimination practice with sentences representative of uncommon usage. (In these sentences, a grammatical unit, the predicate, had been marked off by having the subject and the object of the verb exchange places.) Additional hypotheses were needed to explicate in further detail how reading begins in speech. These hypotheses were (1) that an economy of effort would be apparent from attending to the sentence in grammatical units; (2) that the particular words instrumental in using phrase structure rules would be the ones identified most often, and (3) that the perception that occurred during discrimination practice would reflect how the grammar had been attended to.

Summary

It was noted that beginning reading instruction could be made more efficient if it were known how reading begins with speech. The usual explanation that reading is "talk wrote down" was contrasted with the more sophisticated explanation of Eleanor J. Gibson. The origins of reading in speech were attributed to the use of unit-forming principles--the phrase structure rules that divide sentences into grammatical units. The source of these rules was found in the uniformities noted for language structure and of native language learning. They are arrived at through the use of basic sentence

relations such as the subject of the sentence, the predicate of the sentence, and the object of the verb. The fact that child and adult grammars are not the same was seen as the problem. The problem was handled by using a general diagram that incorporated both adult and child phrase structure rules for sentence structure, by using imitation-of-oral reading as a discrimination practice task, and by taking Gibson's principles of perceptual learning and her analysis of those basic processes of speech that were deemed pertinent into account. A description of the design for the study together with the hypotheses were given.

CHAPTER II

REVIEW OF RESEARCH, THEORETICAL FRAMEWORK, AND DEFINITIONS

The postulate is that reading originates with the basic processes of speech. The processes that are capable of transfer from speech to print are predicted to be the phrase structure rules that divide and rewrite sentences into grammatical units. This chapter is divided into three sections. The first deals with the research literature on the abilities of the young child to break sentences into smaller units. From this review, it should be apparent whether the sentence or the word is the appropriate unit with which to work. The second section presents theoretical formulations, and the third gives the formal definitions for the terms used in this study.

Linguistic Consciousness for Grammatical Units

Gibson's analysis of the relationship between speech and reading starts with the sentence as the unit.

Segmenting "a stream of acoustical information"[1] involves the ability to "localize a difference and to give explicit recognition" of boundaries for grammatical units and words.[2] This ability to localize a difference and to give explicit recognition of boundaries has been designated as "linguistic consciousness."[3] Even though studies dealing with linguistic consciousness are rare,[4] it is generally accepted that a young child has this consciousness for basic sentence relations--the subject of the sentence, the predicate, and the object of the verb. Children do not seem to undergo development in this respect. These relations seem to be uniformly present in native language learning.[5] Behavioral evidence as to how a child breaks up sentences is needed.

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[1]Gibson, "Ontogeny of Reading," p. 136.

[2]Charles A. Ferguson and Dan I. Slobin, "Segmentation," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, 1973), p. 138.

[3]Ibid.

[4]Ibid.

[5]Roger W. Brown, Courtney Cazden, and Ursula Bellugi, "The Child's Grammar from I to III," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, 1973), p. 307.

With such evidence, it should be possible to specify what is available for transfer from speech to print.

Karpova's Study

Using Russian children ranging in age from three to seven years, Karpova tried to find out how children break sentences into words.[6] He instructed children to repeat the sentence after him and then to tell him "How many words are here? Which is the first word? The second word? The third word, etc.?"

Most children, once they understood the instructions, had no difficulty repeating the sentence after him, but sometimes a child would summarize the meaning in one word instead of giving the exact repetition of the sentence as he had been asked to do: Karpova said, "Cold weather came." The child said, "Winter." Sometimes the child expanded the sentence by adding an interpretation: Karpova said, "Vanya went home." The child gave, "Because it was bad weather." Sometimes the child repeated a few important nouns from the sentence: Karpova stated, "They brought up a kitten and two puppies." The child gave, "Puppy and kitty."

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[6] S. N. Karpova, "Osoznaniye Slovesnogo Sostava Rechi Rebenkom Doshkol'nogo Vozrasta," Vopr Psikhol., I, No. 4 (1955), 43-55, abstracted in D. I. Slobin, "Abstracts of Soviet Studies of Child Language," in The Genesis of Language: A Psycholinguistic Approach, ed. by F. Smith and G. A. Miller (Cambridge, Mass.: M.I.T. Press, 1966), pp. 370-71.

Three stages were observed in breaking a sentence up into words. They were:

1. The youngest children took the sentence as a unit. Karpova gave the sentence, "Galya and Vova went walking." The child (four years, six months) repeated, "Gayla and Vova went walking." Karpova asked, "How many words are there?" Child, "Two." Karpova, "What's the first word?" Child, "Gayla went walking and Vova went walking." In another example, a seven-year-old child correctly repeated "The boy is laughing" and then reported that there was only one word because "only one boy was laughing."

2. At the next stage, older children began in this fashion, but with repeated questioning, their responses changed. For example, a child, after repeating "Gayla and Vova went walking" stated "There are two words. Vova is one word and Gayla is the other." Karpova interpreted this to be an isolation of nouns and as the first step in breaking the sentence into words. Upon further questioning, children at this level will break the sentence into the subject and the predicate. For example, "Misha ran quickly." "What is the first word?" Misha." "What is the second word?" "Ran quickly."

3. A few of the older children were able to break the sentence into all of its separate words, with the exception of prepositions and conjunctions. But some of these children also broke words into their component syllables at the same time.

Karpova took for granted that children had to be taught to break sentences into appropriate units. He presented the sentence orally and had the child move a plastic counter for each word in the sentence, a procedure that is not explained. He organized his data by age. Table 1 presents the percentage of children to be found in each stage.

TABLE 1.--Karpova's data: Three stages

	Percentage of Children in Each Stage		
Stage	3-6 to 5 years	5 to 6 years	6 to 7 years
1	74%	45%	20%
2	22%	32%	60%
3	4%	23%	20%

Karpova's study demonstrated how a child breaks a sentence that is heard and imitated into words. The process involved increased differentiation within the sentence. Studies on the acquisition of grammar show

that a child's utterances increase in length.[7] Despite this evidence for additive processes rather than differentiation, Huttenlocher showed that the acquisition of grammar could not proceed by placing separate words together to make phrases and sentences longer.

Huttenlocher's Study

Huttenlocher[8] assigned four- and five-year-old children to two groups: Those assigned to the first group were instructed to say the last word of a pair first and the first word of the pair last. Those assigned to the second group were told to say the last word of a pair, wait for a tap, and then to give the first word of the pair. Her word pairs fell into five categories:

(1) Digits and letters;

(2) Like parts of speech such as black-white;

(3) Commonly encountered two-word sequences that are not grammatical when reversed such as red apple;

(4) Commonly encountered sequences that are grammatical when reversed such as you are; and

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[7]Brown, Cazden, and Bellugi, "Child's Grammar," p. 295.

[8]Janellen Huttenlocher, "Children's Language Word-Phrase Relationships," Science, CXLIII (1964), 264.

(5) Anomalous pairs that are not encountered in everyday speech such as table goes.

Because her subjects did not know where one word member of the pair ended and the other began, having subjects learn to wait for a tap before giving the second member of the reversed pair facilitated performance. Both groups had extreme difficulty telling where one word ended and the other began for highly practiced and frequently heard sequences such as you are. Since her subjects could not differentiate between multiple word utterances and single words readily, single words could not serve as separate vocabulary items or as the appropriate unit for the acquisition of grammar.

The Baldwin and Baum Study

Baldwin and Baum wanted to delineate some of the underlying units in the language of nursery school children.[9] They assumed that the underlying units would be less vulnerable to being split in the middle of vocalization than nonunits, and therefore tried to locate a child's underlying units by interrupting a child's speech. Their subjects were instructed to repeat a number of sentences after the experimenter,

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[9]Alfred L. Baldwin and Esther Baum, "The Interruptability of Words in the Speech of Nursery School Children," in A Basic Research Program on Reading, ed. by Harry Levin, et al., CRP 639 (Ithaca, N.Y.: Cornell University, 1963).

and that when a lighted Santa Claus face went out, to stop speaking whatever they were saying, and to wait until Santa's face was lighted again before resuming the sentence from the precise point of interruption. Twenty-six sentences, consisting of word sequences known to be familiar to the children from previous observation of their daily speech were constructed. Points of interruption were designated to occur in the middle of the sentence in each case. The children tended to complete the entire phrase or sentence. As was true of Karpova's study, the younger children tended to treat the whole sentence as a unit.

Comments

These studies show that in making a transfer from basic processes of speech to print, the unit is not the word. A child does not seem able to perceive words in oral language unless he first perceives the larger unit, the sentence or phrase to which the words belong.

All three of these studies involved imitation. Baldwin and Baum found that children had difficulty localizing word boundaries even though the sentences had been formed from their own language.[10] Karpova's subjects were reported to have had some difficulty

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[10] Ibid.

grasping the instructions.[11] Sentences convey thought as well as grammar. Karpova's subjects may have confused the two. Huttenlocher's subjects did better with anomalous sequences like table goes than they did with meaningful ones like you are.[12] Anomalous sequences may rule out the possibility of confusing grammar with thought.

It is also possible that imitation, comprehension, and production of sentences represent three separate sets of task demands. Fraser, Bellugi, and Brown investigated the claim that an understanding of grammatical contrasts must precede production of them.[13] Ten pairs of sentences containing grammatical contrasts that could be pictured were constructed. Imitation was operationalized as the correct repetition of the contrasts; comprehension was operationalized as the correct identification of the picture named by a particular grammatical contrast; and production was operationalized as the ability to give contrasting features in sentences for the picture in question. Imitation was easier than comprehension and

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[11]Karpova, "Osoznaniye Slovesnogo," p. 370.

[12]Huttenlocher, "Word-Phrase Relationships," p. 264.

[13]Colin C. Fraser, Ursula Bellugi, and Roger W. Brown, "Control of Grammar in Imitation, Comprehension, and Production," Journal of Verbal Behavior and Verbal Learning, II (1963), 121-35.

comprehension was easier than production. Imitation was seen to be a perceptual-motor task that relied largely upon control over a highly systematic speech system. The task demands of imitation, comprehension, and production could be differentiated.

There are numerous examples that demonstrate how children imitate in keeping with their linguistic competence. "Syntactic structures take up space in memory, and frequently content will be sacrificed to the retention of form in immediate, rote imitation."[14]

In her analysis of the basic processes of speech that transfer from speech to print, Gibson mentioned the use of "symbolic meaning."[15] The fact that imitation tasks tap linguistic competence and that imitation demands can be differentiated from those of comprehension lends support to the view that symbolic meaning might consist of a linguistic consciousness for the basic sentence relations--the subject of the sentence, the predicate, and the object of the verb. On the other hand, in the studies cited, no support has been found for Monroe's account for the way that reading begins in

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[14]Dan I. Slobin and Charles A. Welsh, "Elicited Imitation as a Research Tool in Developmental Psycholinguistics," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, 1973), p. 496.

[15]Gibson, "Ontogeny of Reading," p. 136.

speech.[16] The children in these studies were not attending to individual words or to their individual vocabulary meanings.

Theoretical Formulations

E. J. Gibson's theory of perceptual learning states that environment is far richer in potential stimulation information than the organism is capable of registering. At first the organism's ability to extract information from environmental stimulation is very crude. With practice, the organism begins to respond to stimuli previously not responded to. The organism responds to differences, points where change can occur. A correspondence of increasing specificity between environmental stimulation and the organism's perception of it comes with practice. A change in what the organism is capable of responding to occurs. He uses the responses that he already has to do the extracting of information. There is no response shaping. Reinforcement or knowledge of results are not needed. Because information must be discovered in stimulation, ways of enhancing the stimulus so that the desired information can be picked up are needed. But because the information in stimulation is already structured, pick up of it does not depend upon

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[16]Marion Monroe, Growing Into Reading (Chicago: Scott Foresman and Company, 1951), p. 209.

complex thinking processes or the formation of associations. The basic task in perceptual learning is discrimination.[17]

Distinctive Features

Distinctive features are properties of objects and events that differentiate them from one another. A system of distinctive features for distinguishing minimal units of speech, the phonemes, has been worked out by Jakobson and Halle.[18] Gibson has used this system as a "model for attempts to specify distinguishing properties of other sets of objects and events."[19] A set of twelve distinctive features is sufficient to yield unique bundles of features for all of the phonemes in all languages. From this set of twelve, a language makes a selection. English, for example, uses only nine distinctive feature oppositions to define the twenty-eight phonemes listed by Jakobson, Fant, and Halle.[20] Each distinctive feature opposition represents

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[17]Gibson, Principles of Perceptual Learning, 537 pp.

[18]Roman Jakobson and Morris Halle, Fundamentals of Language (The Hague: Mouton and Company, 1956), 87 pp.

[19]Gibson, Principles of Perceptual Learning, p. 83.

[20]Roman Jakobson, C. Gunnar M. Fant, and Morris Halle, Preliminaries to Speech Analysis (Cambridge, Mass.: M.I.T. Press, sixth printing, 1965), p. 43.

two alternatives such as vocalic/nonvocalic; consonantal/nonconsonantal; continuant/interrupted. Each phoneme has a unique patterning for its bundle of distinctive feature oppositions. All the perceiver really needs to perceive in order to detect a difference capable of differentiation is "otherness," "contrast," or "different than."

Developmentally in the acquisition of these features, differentiation is progressively ordered in hierarchical fashion. There is a stratified splitting of categories. For example, it has been demonstrated that a child may begin with the consonant-vowel (open/closed) distinction. A distinctive feature opposition for the consonant and another for the vowel may then be chosen. Each of these will split in half in predictable fashion. If nasal/oral is chosen for the consonant, then continuant/interrupted will become the next division.[21]

Quite apart from speech perception, E. J. Gibson has discussed research evidence with controlled stimuli that shows that the perceptual strategy for discrimination is most efficient when the least frequent distinctive feature is selected, whereas the strategy for identification is best when the distinctive feature attended to

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[21]Ruth H. Weir, Language in the Crib (The Hague: Mouton, 1962), p. 43.

comes closest to splitting the set into a fifty-fifty distribution.[22] The demands of discrimination and identification tasks are not the same.

Invariants

An invariant is a relation, a contrast, that stays the same under many kinds of change such as size or color. A critical dimension must be discriminated. The discovery of critical dimensions is believed to be an abstraction.[23] A relation or contrast becomes abstract from being confronted with many different cases for the contrast in question. Conscious search is not necessarily involved. The most primitive demonstration of an invariant that is abstract is transposition; for example, if a pair of hens are trained to peck at grain on the darker of two gray squares, they will continue to peck at the darker even when a new stimulus pair is presented and the originally darker square is now the lighter.

Gibson felt that the research literature on transposition was relevant for phoneme discrimination.[24]

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[22]Gibson, Principles of Perceptual Learning, pp. 122-23.

[23]Ibid., pp. 108-11.

[24]Ibid., p. 110.

It may also be relevant for the perception of phrase structure rules. For an invariant to exist, a dimension must be abstracted. This study is concerned with grammatical syntax as a dimension of language. Phonology is another dimension, the one to which phoneme discrimination pertains. Abstracting a dimension in print cannot occur unless the difference between the two dimensions, grammar and phonology, is discriminated. In Gibson's model for the development of cognitive processes,[25] the abstraction of distinctive features and the abstraction of invariants follow parallel lines. Both lines of development feed into the formation of representations, sensory-motor, imaginal, and conceptual. Both arise from the same source--a differentiation of simple patterns and objects from background stimulation. It seems theoretically valid to assume that distinctive features and the grammar in syntax have the same origins also. In this study, it was assumed that the origins of discriminations for phonology and grammar would begin with the selection of a distinctive feature for the phoneme #. (Jakobson, Fant, and Halle have listed # as a phoneme.) It carries the distinctive features of

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[25] Ibid., pp. 160-61.

nonconsonantal, nonvocalic, and lax.[26] It has potential in grammar.[27] It occurs between grammatical units.[28]

Amodal Perception

A reader uses his senses to perceive grammatical units in sentences. The writing-to-speech code has evolved from linguistic characteristics of speech over time. Theoretically, there may be a kind of resonance in the nervous system, a tuning of the system to the organization of language sounds. It is known that the distinctive features of speech are such that they cannot be attributed to the domain of any one sensory modality.[29] They are representative of several modalities. There is no transfer from one modality to another. What is held in one is latent in another at the same time. The sensory representations in the nervous system become correlated so that they can take over for one another when one group drops out. Under appropriate stimulus

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[26]Jakobson, Fant, and Halle, Speech Analysis, p. 43.

[27]Noam Chomsky, Syntactic Structures (The Hague: Mouton, 1957), pp. 38-40.

[28]Norman C. Stageberg, An Introductory English Grammar (New York: Holt, Rinehart and Winston, 1965), pp. 48-67.

[29]Jakobson, Fant, and Halle, Speech Analysis, pp. 43-52.

enhancement, the nervous system gets itself attuned to the stimulus input of the writing-to-speech code. This attuning needs no construct for memory. The information needed is picked up. Perceptual functioning and perceptual content, in some sense, begin to mirror one another. The perception involved is amodal, abstract, and relational.[30]

Definitions

This study is experimental and descriptive. Three sets of definitions are given. These three sets are:

(1) Those that pertain to adult grammar;

(2) Those that demonstrate how adult and child grammars have been incorporated; and

(3) Those that pertain to the psychological tasks of discrimination and identification.

Adult Grammar

1. Surface structure is that form of language that is normally heard or read.

2. Syntactical and syntax refer to the combining of the subject of the sentence, the predicate

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[30]Gibson, Principles of Perceptual Learning, pp. 218-19.

of the sentence, and the object of the verb in such a way that a sentence results.

3. Structure in this study is limited to the subject-predicate-object of the verb sentence. Syntactical structure consists of a set of phrase structure rules for dividing the sentence into grammatical units such as Noun Phrase and Verb Phrase. Phrase structure is a set of rules that is used to rewrite the sentence into its constituents. The rules are:

Sentence as an axiom is given.

1. Sentence is rewritten as Noun Phrase and Verb Phrase.
2. Noun Phrase is rewritten as T (article) and Noun.
3. Verb Phrase is rewritten as Verb and Noun Phrase.
4. T is rewritten as the or a.
5. Noun is rewritten as boy, girl, ball, etc.
6. Verb is rewritten as hit, etc.[31]

4. Hierarchical organization of the sentence is that which puts these rules into tree diagram form. The tree for these rules is shown in Figure 1.

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[31]Chomsky, Syntactic Structures, pp. 26-27.

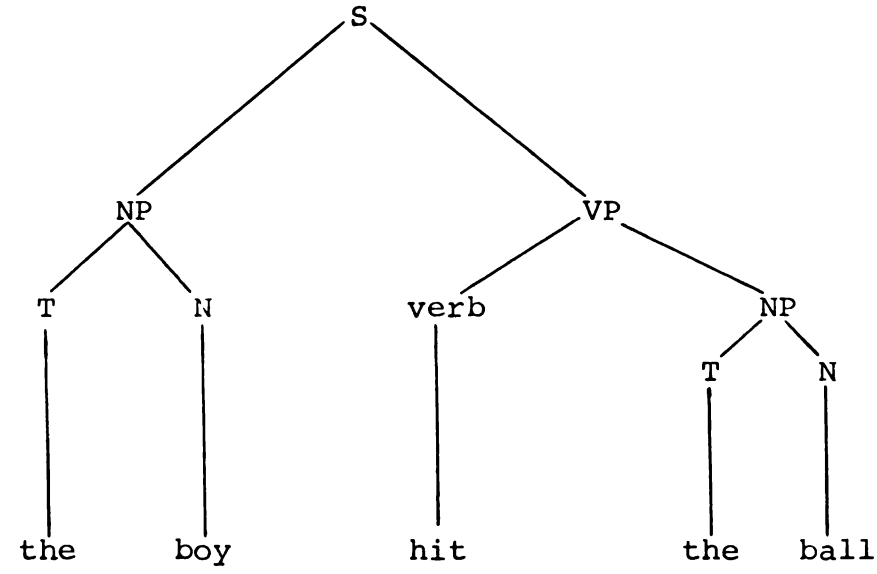

Fig. 1.--Hierarchical organization of the sentence

5. A constituent is a unit that can be replaced by a single word without changing the whole structure of the sentence: the boy can be replaced by he and the subject-predicate-object of the verb structure still remains.

6. Words are the end products of the hierarchy. They result from using the phrase structure rules.

Incorporating Adult and Child Grammars

The young child's grammar consists of basic sentence relations.[32] In this study, like the term

[32]Brown, Cazden, and Bellugi, "Child's Grammar," pp. 306-07.

structure, basic sentence relations refer to subject, the predicate, and the object of the verb. The phrase structure rules rewrite the sentence into Noun Phrase and Verb Phrase. In this study, the young child is to arrive at this rewriting by using his awareness of basic sentence relations. A new tree that includes his basic sentence relations was drawn. This tree was called a "generalized tree diagram." It gives the three major grammatical divisions of the sentence that are to be discriminated during discrimination practice as follows:

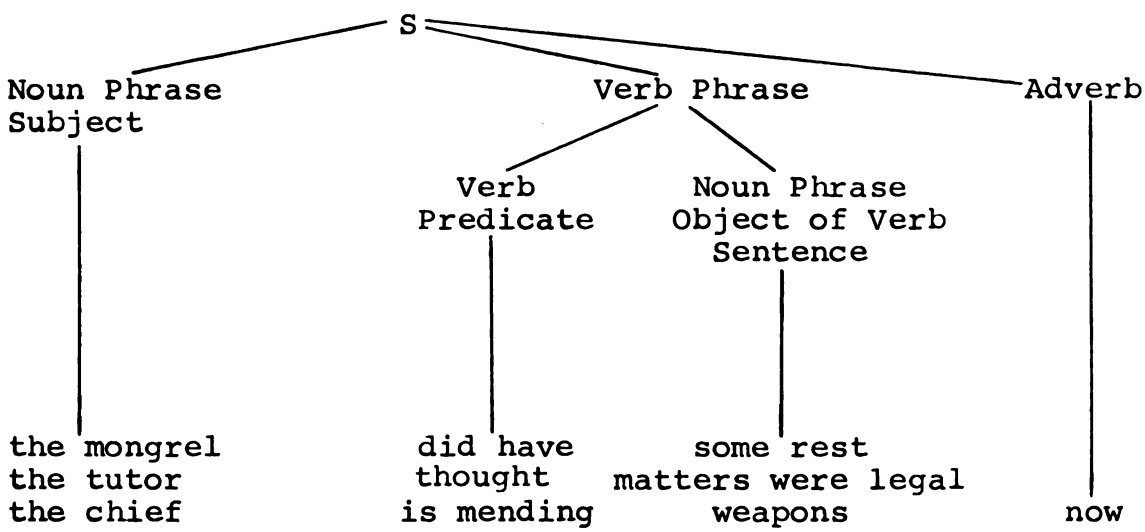

Fig. 2.--Generalized tree diagram

The sentences in Figure 2 represent common usage.[33] These were the sentences used during discrimination practice for the control group. Uncommon usage refers to the sentence that results when the words in the positions of the subject and the object of the verb exchange places. It was predicted that the child would put phrase structure rules to work during discrimination practice as a result of the pressure for preserving subject-verb-object of the verb sentence relations.[34] The experimental subjects were given discrimination practice on sentences of uncommon usage.

All sentences have syntactical structure. Because this is so, only an improvement in word identification can be expected as a result of discrimination practice. The control group had common usage sentences. The experimental group had uncommon usage sentences. The dichotomy in terms of usage is one that is external to both linguistic theory[35] and psychological theory.[36]

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[33]Dan I. Slobin, "Cognitive Prerequisites for the Development of Grammar," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, 1973), pp. 197-201.

[34]Ibid.

[35]Chomsky, Syntactic Structures, pp. 26-27.

[36]Gibson, Principles of Perceptual Learning, pp. 102-05.

(In psychological theory, uncommon usage should constitute enhancement because the switch of the subject with the object of the verb automatically marks off the verb so that this particular grammatical unit can be picked up.)[37]

In Figure 3 the sentences representative of uncommon usage which were used for discrimination practice with the experimental group are given.

The grammatical units designated by the two generalized tree diagrams begin with certain words that commonly begin noun phrases and verb phrases. These words were called phrase structure indicators. From these sentences two words were singled out for use in testing word identification. These two words were the and did.

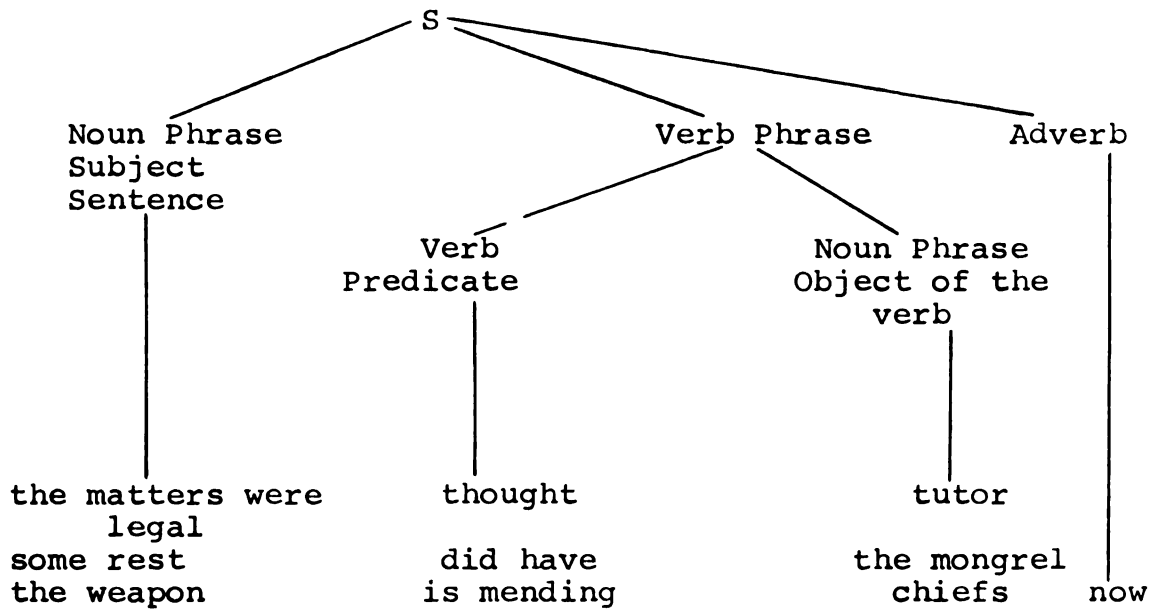

Fig. 3.--Uncommon usage

[37] Ibid.

Terms for Psychological Tasks

It may be recalled that the design of this study consists of pretest, discrimination practice, and a test for word identification, and that discrimination and identification tasks do not involve the same psychological processes.[38] This fact was taken into account by defining identification responses apart from discrimination responses. Word identification is the ability to select the word that has been previously presented and to give its correct name. Word recognition is the ability to select a word that has been previously presented without the ability to give its correct name. (In this study, these two response measures do not overlap. A word is either an identification or a recognition, not both.) Word identification and word recognition both pertain to the test phase of the design.

Three response measures were taken during discrimination practice, which was given by way of an imitation-of-oral reading task. The three response measures were naming, pointing, and omitting. Naming is the word said by the child when he imitates. Pointing is the word pointed to and that is to be pronounced for him by the researcher when he imitates. Omitting is a word that is neither named or pointed to. Amodal

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[38]Gibson, Principles of Perceptual Learning, pp. 122-23.

perception should occur.[39] Amodal perception refers to the pattern produced across the sentence by these three responses.

Summary

This chapter dealt with a review of research, theoretical formulations, and definitions for terms used in this study. The review of research indicated that young children perceive language in terms of sentences and grammatical units, but not words. The description of how speech transfers to print by Monroe[40] was not supported by the research evidence. The relationship of Gibson's theory of differentiation in perceptual learning to language was given in some detail. Definitions needed to carry out a study in keeping with research findings and theoretical framework were given.

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[39] Ibid., pp. 218-19.

[40] Monroe, Reading, p. 209.

CHAPTER III

HYPOTHESES

Eleanor J. Gibson thought that the "unit-forming principles of speech" were surrogates for grammatical syntax in the writing-to-speech code.[1] It has been suggested that the phrase structure rules of a child's speech might represent one such set of surrogates. The phrase structure rules are needed to segment the sentence and to rewrite the segments so that the hierarchical organization of the sentence is retained as the child perceives words. Because syntactical structure is always present in sentences, the child may be able to learn to identify words, even though he does not pick up syntactical structure in print very well. Many children have learned words even though they never had the opportunity for apprehending a grammatical unit through practice upon sentences representative of uncommon usage. The hypotheses must be capable of explaining what happens in both cases: when children receive

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[1]Gibson, "Ontogeny of Reading," pp. 139-40.

practice upon sentences representative of common usage and when children receive practice upon sentences representative of uncommon usage. Two different sorts of hypotheses are needed: a null hypothesis that demonstrates that either word identification does or does not occur and descriptive hypotheses that tell something about the responses being made and the subjects making them without confusing the two.

The Issues

It may be recalled that the acquisition of grammar had appeared to be additive whereas the perception of words in sentences appeared to result from a breakdown of the sentence as a whole into grammatical units. Because the child does not always use the words that are critical for identifying phrase structure rules, it was concluded that the child would have to avail himself of these rules by way of his knowledge of basic sentence relations--the subject of the sentence, the predicate of the sentence, and the object of the verb.[2] In other words it is easier to see how a young child operates with basic sentence relations than it is to see how he operates with units like Noun Phrase and Verb Phrase of the phrase structure rules. (Child grammars are not like adult grammars.) A generalized

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[2]Brown, Cazden, and Bellugi, "Child's Grammar," pp. 295-332.

tree was drawn so that the basic sentence relations would be included in the phrase structure rules, and so what the child was responding to during discrimination practice--the perceptual content--could be defined. Syntactical structure was made uncommon by marking off the predicate through an exchange in the words held in the positions for the subject and the object of the verb. The advantage of marking off the predicate lies in the economy of effort involved. Since the child has grammatical units for the subject, the predicate, and the object of the verb already available from speech, once the sentence is divided and some grammatical unit, like the predicate, is apprehended in print, phrase structure rules of speech can operate directly. The child should be able to pick out the predicate when it is automatically makred off by having the subject and the object of the verb change places. This being the case, improvement in discrimination should occur to the point where the child apprehends sentences in terms of their grammatical divisions even though the sentences are no longer representative of uncommon usage. This study gives practice upon uncommon syntactical structure for the experimental group and upon common syntactical structure for the control group. Word identification is then measured for both groups upon new sentences containing old words presented during

discrimination practice. In this way it should be possible to tell if word identification improves as a result of practice upon a manipulation of syntactical structure that draws attention to grammatical units even though it is also representative of uncommon usage.

In addition to the issue of improvement of word identification as a result of practice upon uncommon sentences, the theoretical framework of this study requires the researcher to show how economy of effort applies, whether phrase structure has been attended to, and how perceptual functioning and perceptual content correlate over discrimination practice.

Hypotheses

Three response measures were taken on the word identification sentences, the new sentences containing old words presented during discrimination practice. These response measures were:

(1) Word identification, which is the ability to give the word its name;

(2) Word recognition which is the ability to select a word as having been seen before; and

(3) Phrase structure indicators which are words that designate the beginning of Noun Phrase and Predicate on the generalized tree diagram;

for the sentences used in word identification test, these words are the words the and did.

The first hypothesis is concerned only with word identification. The second is concerned with both word identification and word recognition responses and the numbers of subjects giving these responses. The third hypothesis is concerned with phrase structure indicators and the number of subjects responding to these words. The fourth hypothesis is not concerned with word identification. It deals with the response measures taken on the discrimination practice sentences.

Hypothesis (1)

Because syntactical structure was manipulated so that divisions into grammatical units might be found by the experimental subjects, but not for the control subjects, the experimental subjects should give more identifications than subjects assigned to the control group.

Null hypothesis: There is no difference between the mean number of word identifications given by the experimental and control subjects. A t test for the significance of the difference between means applies. The statistic to be used is student's t. The level of significance to be reached is .05 per cent, two-tailed test.

Hypothesis (2)

Perceiving sentences in terms of their constituent grammatical units, and eventually words as parts of these units, represents an economy of effort. When a child uses his phrase structure rules by way of his knowledge of basic sentence relations, words ought to be identified because there is the whole sentence together with its grammar to help him. It is hypothesized that the experimental subjects will make more word identifications proportionately when the number of word identifications to word recognitions is taken into account and that when a count of the number of subjects making responses, word identifications and recognitions combined, and the mean number to responses per subject is found, that the experimental and control groups will not differ.

Separate counts for words identified and recognized will be taken for the experimental group and also for the control group. The proportion of word identifications to word recognitions will be computed for each group. The proportion of identifications is predicted to be higher for the experimental group.

A count of the subjects making word identifications and word recognition for the experimental and also for the control group will be made. The means for the number of word identifications and word recognitions together will be found for only those subjects capable of responding.

When this is done, it will be evident that there is no difference between these means. The higher proportion of word identifications to word recognitions for the experimental subjects will then be presumed to be due to the increased accuracy in "localizing a difference and giving explicit recognition of boundaries for grammatical units and words."[3] In order to avoid distorting the form that the data take or initiating confusions, the data will be tabulated and presented without further statistical analysis.

Hypothesis (3)

It is necessary to show that phrase structure rules were being used. Attention was drawn to the phrase structure indicators in defining phrase structure with a generalized tree diagram. These are those words that occur at the beginning of Noun Phrase and Predicate. Considering the fact that young children do not always utter these words in their daily speech, getting them to identify these words in reading ought to constitute evidence that rules must have been used. A list of the words identified by subjects in both the experimental and control groups together with the frequency with

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[3]Charles A. Ferguson and Dan I. Slobin, "Segmentation," in Studies of Child Language, ed. by Charles A. Ferguson and Dan Isaac Slobin (New York: Holt, Rinehart and Winston, 1973), p. 138.

which each of the different words was identified by each of the two groups will be made. Upon inspection of these frequencies, it will be evident that phrase structure indicators were identified more often by the experimental subjects.

When the subjects identifying phrase structure indicators are counted, it will be evident that a higher percentage of subjects in the experimental group identified these words. (The researcher might be expected to offer an explanation whenever experimental subjects identified words without also identifying a phrase structure indicator.) When subjects recognizing (as opposed to identifying) phrase structure indicators are counted, it will be found that the number of subjects locating these words is the same for both the experimental and control groups. This information will be presented in tabular form.

Hypothesis (4)

According to Gibson, the perception that accounts for word identification develops over discrimination practice. The processes of identification tasks and the processes of discrimination tasks are not the same.[4] This being the case, it is not possible to conclude what happened during discrimination practice from the findings

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[4]Gibson, Principles of Perceptual Learning, pp. 122-23.

on the word identification task alone. A separate analysis of what happened during discrimination practice is needed. This hypothesis deals with discrimination practice with Gibson's distinction between discrimination and identification in mind.

Theoretically, practice upon syntactical structure, preferably when it is easy to apprehend the sentence in terms of grammatical units, results in a sensitization of a child's perceptual functioning to the pattern for the hierarchical organization of the sentence provided by the generalized tree diagram. Naming, pointing, and omitting are not dependent upon sensations unique to a given sensory modality. Since they are the responses recorded during discrimination practice, they should illustrate what Gibson means when she says that perception is amodal.[5] The stimulus content being responded to is the hierarchical organization of the sentence described by the generalized tree diagram. Presumably, rules are applied by way of the child's knowledge of basic sentence relations--the subject of the sentence, the predicate, and the object of the verb. The use of rules in this way would make perception abstract. Because basic sentence relations are being seen in terms of the hierarchical organization for the

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[5] Ibid., pp. 218-19.

sentence as a whole, perception is relational. Gibson cited the research literature on transposition to explain the terms "abstract" and "relational."[6]

Only the experimental subjects receive discrimination practice upon uncommon sentences. For them, it should be easy to "localize a difference and to give explicit recognition of boundaries for grammatical units."[7] For these subjects, it is hypothesized that naming, pointing, and omitting will produce a figure that shows that these responses correlate at certain points in the sentence. Naming, pointing, and omitting responses for individual words across the sentence, all three discrimination practice sentences being taken together, will be summed to produce this figure. The correlations of these three separate response measures will be seen as a form of perceptual functioning. It is also hypothesized that a pattern that mirrors the grammar, child grammar though it may be, will result at points where naming, pointing, and omitting correlate. In order for a pattern for a grammatical unit to be seen, all three responses should be taken together as a single

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[6] Ibid., pp. 109-10.

[7] Ferguson and Slobin, "Segmentation," p. 138.

figure. In this way, the figure should display an "increase in specificity of responding to a set of stimuli."[8]

Summary

In demonstrating how children attend to syntactical structure when they learn to identify words, it is necessary to observe how many of them respond to words and also which words were given a response. So that these two different categories of response measures would not be confused or the data distorted, only one null hypothesis, needed to prove that word identification had in fact occurred, was used. The remaining hypotheses were descriptive. The relevant data were specified. These particular hypotheses must demonstrate that:

(1) Economy of effort occurs with practice upon uncommon sentences;

(2) That phrase structure rules were used; and

(3) That efficient perception is amodal, abstract, and relational.

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[8] Ibid., p. 77.

CHAPTER IV

METHODOLOGY AND PROCEDURES

This study intends to show that when kindergarten children learn to identify words, they do so by noting the syntactical organization of sentences. It was hypothesized:

(1) That word identification resulted from attending to syntactical structure and that identification of words would be even better syntactical structure was perceived in sentences representative of uncommon usage;

(2) That an economy of effort would account for the efficiency of identification with uncommon sentences;

(3) That words instrumental in using phrase structure rules would be identified; and

(4) That the kind of perception required would reflect the syntactical organization being responded to with respect to symbolic grammatical meaning.

These hypotheses assumed that phrase structure rules of the writing-to-speech code had for their surrogates the same rules in speech. In this way, it was being said that reading began with the basic processes of speech. In such a case, word identification becomes the outcome of a carefully managed discrimination process. Eleanor J. Gibson has given several suggestions for managing discrimination practice.[1]

Methodology

In promoting efficient discrimination, Gibson has stated that neither reinforcement nor knowledge of results are necessary. Neither is it necessary to call into play complex processes like thinking or imagination (a circumstance that suggests that the illogic of changing the order for the subject and the object of the verb in uncommon syntactical structure might not be an analogous illogic for the child). Further, for the greatest effectiveness, higher order studies must be designed so that they permit processing of the total pattern: the instructions, the materials, what the child and the researcher do must all be taken as a whole.[2] By exercising care in preparing sentences,

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[1] Gibson, Principles of Perceptual Learning, pp. 121-42.

[2] Ibid.

and by having an imiation-of-oral reading task, the conditions for the efficient management of discrimination practice should obtain.

Sentences

The design of this study necessitated a pretest to serve as a criterion for the acceptance of children as subjects, sentences for discrimination practice, and sentences for word identification. Since it is syntactical structure that must be discriminated, it was desirable to keep sentence length constant while varying the type of syntactical unit within the sentence. For discrimination practice, the sentences were limited to six words. The type of syntactical unit for the object of the verb was either a Noun Phrase or a Sentence in adult grammar. The transitive verb was seen in terms of a large comprehensive class rather than in terms of some subdivision within this particular class of verbs. The word thought was selected because it often takes a sentence as its object, and because it can also be a noun. The verb have was chosen because it can be either a helping or a main verb, and because it cannot take passive voice. The verb mend was selected because it takes both an inanimate object and passive voice and because of its nasal sounds. The verbs did and is were chosen because of a suspected need for vowel variety, and because these words may also serve as the main verb

as is the case for the verb were also. The researcher surmised that if children identifying words as wholes from their syntactical units during discrimination practice, that they would not notice the individual letters within words. As a consequence, they might say that they had seen words that had never been presented. The words think and by were chosen for the word identification sentences to check out this possibility. (It might be recalled that phrase structure rules divide sentences into their constituents, and that constituents are units replaceable by a single word without destroying the subject-predicate-object of the verb structure of the sentence.)

It was also assumed that the words used would present a comprehensive display of the distinctive features for phonemes, the minimal units of speech. The words legal, rest, matters, mongrel, tutor, weapons, and chief were selected partly for this reason, and partly because rather anomalous sounding sentences could be made from them. (Children may be unduly inclined to rely upon their highly systematic motor control over speech disadvantageously in an imitation-type task if sentences are not somewhat anomalous.) Now was included because it is a familiar adverb that fits into the sentence at several points: The chief is now mending weapons. Now the chief is mending weapons.

The chief now is mending weapons. Chief is mending now the weapons. If the child needs a word to use as a placeholder in segmenting the sentence, this word might serve such a purpose during discrimination practice. Both some and the were chosen to provide variety in forestalling the possible effects of fatigue that might develop during practice.

The surface structure of sentences contains not only grammatical syntax, but also thought and phonology as well. It may not be possible to attribute word identification to the effects of syntactical structure unless the effects of thought and phonology are also taken into account. The influence of thought was presumably controlled by using anomalous sentences. Providing variety for the distinctive features of phonemes may not control the influence of phonology. Young children may have a propensity for responding to sounds rather than to syntax. Gibson thought that efficient discrimination proceeded by the detection of the least frequent distinctive feature that also had the potential of becoming an invariant which later on figures into abstracting processes needed for higher order rules.[3] It was decided to take advantage of the child's propensity for some sound element, and to use it to make syntactical structure more obvious. In English, the

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[3] Ibid., pp. 122-23.

phoneme # carries the distinctive feature lax of the tense/lax distinctive feature opposition.[4] Presumably, if this feature is perceived in the right places, an invariant for the predicate can be detected potentially such that the child's basic sentence relations of speech--the subject of the sentence, predicate of the sentence, and object of the verb--become the subject of the verb, the predicate, and the object of the verb in print. Exchanging the words for the subject and the object of the verb might automatically create juncture points that mark off the beginning and the end of the predicate succinctly. It was believed that the child would select some least frequent distinctive feature (maybe lax) to help him gain control over his speech habits in such a way as to permit entry into syntactical structure when he looks at the sentence during the course of imitating the researcher's oral reading. This thinking explains the rationale behind the preparation of uncommon sentences--ones in which words held by the subject and the object of the verb switched places. It might be noted that it is the distinctive feature for a phoneme, not the phoneme itself necessarily, that gets the child from phonology into grammatical syntax.

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[4]Jakobson, Fant, and Halle, Speech Analysis, p. 43.

Design

Discriminating and identifying words are not alike.[5] In discrimination, the least frequent feature has the greatest utility for differentiation. In identification, confusion is least when stimuli differ by a feature with 50 per cent frequency in the set. It is the discrimination of differences for dimensions that transfers from discrimination processes to identification processes. In this study, the discrimination of differences for dimensions may be those that pertain to the differences between phonology and syntactical structure. It may take time for the transfer of differences to take place. Assuming this to be the case, activities that were the same for all subjects, and that kept the subjects task-oriented, intervened between discrimination practice and the presentation of the word identification sentences. The design consisted of pretesting, discrimination practice, intervening activities, and presentation of the word identification sentences.

Procedures

This section describes how subjects were obtained, how materials were made, and how the experimental session was conducted.

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[5]Gibson, Principles of Perceptual Learning, p. 123.

Subjects

The public school authorities of a school system in a metropolitan area in the Great Lakes region made kindergarten children available to the researcher. With the exception of one child, all were white and all were reported to be representative of middle-class socio-economic home backgrounds. All of the subjects had the same two classroom teachers in a team teaching arrangement. The researcher originally constructed sentences that were representative of common usage, uncommon usage, and of ungrammatical usage--all using the same words. A fourth set of materials was made by combining a common usage sentence, uncommon usage sentence, and an ungrammatical usage sentence to make an inconsistent discrimination practice treatment. There were originally four treatments: one for common usage, one for uncommon but grammatical usage; one for ungrammatical usage; and one for inconsistent practice. A total of eighty-seven subjects were made available. Six were dropped because they could read on the pretest. One was dropped because he had a severe speech problem and could not make himself understood. Without any identifying information with the exception of name and first initial of last name, children were arbitrarily assigned to four treatments so that there were twenty different children in each treatment. After the subjects were tested, the

data were examined. It became apparent that a problem common to all four treatments could not be found. A problem was identified for the common and uncommon usage treatments, and therefore these two groups were used for this study. The data for the remaining two treatments have been set aside for a separate problem analysis at another time. Testing of subjects began immediately after Christmas vacation. There was a morning and an afternoon kindergarten session. Because the experimental session lasted about an hour, only two subjects could be tested on a given school day. (The researcher was observed by the school principal and by each of the two classroom teachers once. The presence of these observers during the experimental session for three subjects is not believed to have influenced the results in any manner.)

This study has a control and an experimental group. The control group had discrimination practice upon sentences that were representative of common usage--subject-predicate-object of the verb. The experimental group differs in that they had discrimination practice upon sentences representative of uncommon usage--object of the verb-predicate-subject. These sentences were made by exchanging the subjects with the objects of the verb of the common usage sentences. It was assumed that the experimental subjects would perceive the object of

the verb as the subject and the subject as the object of the verb, but that in doing so the predicate would automatically be marked off for them.

Materials

The materials consisted of a packet of pretest cards, a set of discrimination sentence cards, and a set of word identification sentence cards. For the pretest packet, each word used in the sentences was printed on a small white index card in black manuscript with a felt pen. Each card was covered with laminated plastic to prevent soiling. For discrimination practice, each sentence was printed in black manuscript about one and one-half inches high on oak tag strips 18" x 6." Each strip had a hinged cover so that exposure could be controlled. The sentence was covered with laminated plastic. The word identification sentence cards were made in the same manner. The sentences as they appeared on the sentence cards are given in Table 2.

Experimental Session

Children had been informed by their classroom teachers that each of them would have an opportunity to play the "reading game" with the researcher. The researcher escorted the subject from the classroom to a small room in the school set aside by the school authorities for the purpose of testing subjects

individually in this study. The child's cooperation was secured by exchanging a few remarks on the way to the experimental room. A pretest, discrimination practice, intervening activities, and word identification were administered in this order.

TABLE 2.--Sentences: Discrimination and identification

Discrimination	
Experimental Group	
	some rest did have the mongrel
	the weapon is mending chiefs now
	the matters were legal thought tutor
Control Group	
	the mongrel did have some rest
	the chief is mending weapons now
	the tutor thought matters were legal
Identification	
Both Groups	
	the mongrel did mend legal matters
	the chiefs think the rest legal
	the weapons were mended by the tutor

Pretest

Only subjects incapable of identifying any of the words used in the sentences were accepted as subjects. The words were briefly exposed, one card at a time, and the child was asked if he knew what the word was. After exposure, each card was placed in a pile face down. Discrimination practice began immediately.

Discrimination Practice

The researcher and the subject sat on a 4' x 6' cotton throw rug. The researcher sat facing the child so that the subject could see the researcher's mouth, and said, "You and I will take turns being the teacher. First, it will be my turn; then it will be your turn. When your turn comes, you should look at the card and point the way I do. You should learn to say what I say when I point also. If you don't remember on your turn, you should look carefully when it is my turn again. Remember you must look, point, and say what I say, so that you learn the game. And you must keep on trying very hard. Now we'll practice." Then the child and the researcher positioned themselves so that they sat side by side, and so that the child could no longer see the researcher's mouth without turning his head deliberately to do so. The sentence card, cover closed, was placed in front of the child. The researcher said, "Ready?" She then looked to see if the child was looking at the card, opened the cover, and pointed to each word as she read the sentence without intonation and without letting her voice fall at the end of each word, at the rate of about one word per second. She closed the cover and said, "That was my turn." The cover was opened and she said, "You show me where you start to point. What does it say? You point while I say the

words so that you know how to look and point." The child and the researcher went through the sentence whereupon the researcher said, "You must put your finger under the one where you want help. We'll do this again." The child placed his finger under the words. (The researcher took the child's finger in hand to get him started when necessary.) The researcher read the sentence again while the child did his best to point. Then the researcher said, "You must put your finger under the one where you want help." She closed the cover and said, "This time, you must try to remember what I say." She then looked at the child to get attention, opened the cover, read the words, and left the cover open; the child tried to point and to say the words. The child was told, "Do that again." Whatever the child said and did by way of pointing was accepted. The cover was closed. The researcher looked at the child and said, "Now we are ready to start the game. You must keep on trying very hard. Try to remember what I say and put your finger under the one where you want help." Trials were counted from this point on.

Trials

A trial consisted of placing a sentence card in front of the child. The researcher said, "Ready?" She opened the cover, read the sentence, closed the cover, looked at the child to get his attention, opened the

cover, the child imitates, with the researcher recording his response to each word on a form prepared for this purpose. When the responses were recorded, the cover was closed. Discrimination practice consisted of nine trials for each of the three sentences. (A naming response was the word said. An omitted response was either a word skipped or something offered for which a place could not be located in the sentence. The pointing responses were words pointed to. Eagel and mongol were acceptable naming responses for legal and mongrel.)

Word Identification

The word identification sentence card was placed before the child with the cover closed. The researcher looked at the child to get attention, opened the cover, and said, "We have had all of these," while pointing to each word in turn. "Where are the ones that you know? Is it here? Here?" until every single word had been looked at by the child. The child's pointing responses were recorded. The researcher asked, "What is it?" Words correctly named were scored as word identifications. Words incorrectly named or simply pointed to were designated as word recognition responses. Six trials of imitation-of-oral reading were given for each of the three sentences in the same manner as used in discrimination practice. Three sentences were presented. Order of presenting sentences varied for both discrimination

practice and word identification. Materials were then put in order. The child was permitted to relax, and was then escorted back to the classroom.

Limitations

Without further research, the procedures used in this study should not be extended to classroom instruction. It may be recalled that this study purports to show how reading begins with the basic processes of speech as identified and analyzed by E. J. Gibson[6] and as opposed to the analysis suggested by Marion Monroe.[7] Gibson's analysis differed from Monroe's in two respects:

1. Gibson stated that the unit was the sentence and that it in turn was segmented into its grammatical constituents whereas Monroe stated that the unit was the word; and
2. Gibson talked of "symbolic meaning"--the kind that applies to units like Noun Phrase and Verb Phrase or basic sentence relations like the subject, the predicate, and the object of the verb--the kind that applies to sentences generally, whereas Monroe talked of meaning as a vocabulary item in which the child is called up to recount some experience.

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[6]Gibson, "Ontogeny of Reading," p. 136.

[7]Monroe, Reading, pp. 207-21.

In order to demonstrate what happens when speech transfers to print in terms of Gibson's analysis, it was necessary to use an imitation-of-oral reading task. In this way a comparison of adult grammar with child grammar could be made and it was also possible for the processes of speech and the discrimination processes on print to occur simultaneously. It was necessary to rule out the influence of the king of meaning that Monroe talked about. This was accomplished by administering both discrimination practice and identification test in the same experimental session and by constructing rather anomalous sounding sentences for discrimination practice and test. Learning to identify words may have rendered more difficult than is usually the case, and as a result, both the number of words identified and the numbers of subjects capable of identifying them appear rather small. Using anomalous sentences hardly seems advisable in classroom practice. This study should be replicated upon larger numbers of subjects and with transitive verb sentences that are more representative of those used in the classroom.

It would also be advisable to find out what the ramifications of imitation-of-oral reading may be. Four treatment groups of subjects were originally tested. The data for two groups were set aside because a problem common to all four could not be found. Analyzing the

problems for the data set aside and comparing them with the problem of this study might be one way of getting at the complexities of imitation-of-oral reading. The findings of this study together with the additional research suggested are needed before specific recommendations for improving classroom materials and instruction can be made.

When this study was conducted, it was not possible for the researcher to randomize the assigning of subjects to the four experimental groups. Instead with the barest minimum of information, the researcher arbitrarily assigned subjects to the four different treatments. There may be some undetected margin of error because randomization was not followed.

Concluding Remarks

Methodology and procedures were developed with Gibson's suggestions for efficient management of discrimination in mind. How the sentences had been constructed was explained. Attention was drawn to the fact that this study purports to show how reading begins in speech in keeping with Gibson's identification and analysis of those basic processes that are pertinent in reading. Using Gibson's analysis made it necessary to design a study that would not yield directly the information needed to improve classroom instruction and materials. Suggestions for additional research were given.

CHAPTER V

PRESENTATION AND ANALYSIS OF DATA

Word identification begins in speech. Because words are the end products of a hierarchical organization of the sentence, phrase structure rules must be used to effect a breakdown that starts with the sentence as a whole. It is the operations of these rules that accomplishes a transfer from speech to print. The child arrives at these rules by way of his knowledge of basic sentence relations--the subject of the sentence, the predicate of the sentence, and the object of the verb. The meaning that is involved is of a symbolic nature, the kind that is inherent in grammar, and therefore the kind that applies to all sentences. Several hypotheses were formulated to demonstrate how reading begins in speech in this manner. These hypotheses predicted that children would identify words in keeping with the opportunity to pick up syntactical structure; that efficient word identification would reflect an economy of effort; that phrase structure indicators would be identified; and that a pattern for efficient perceptual functioning

would emerge over discrimination practice. These predictions are restated and the evidence for them is presented herewith.

Hypothesis (1) Findings

This hypothesis predicted that there would be no difference between the mean number of word identifications given by the experimental and control groups. A *t* test for the significance of the difference between means was used to test this prediction. Table 3 gives the scores for subjects assigned to the experimental and control groups. The scores are the numbers of word identifications given.

The experimental group identified thirty-seven words for a mean of 1.85, and the control group identified six words for a mean of .30: student's *t*, two-tailed test is ±2.18. (For thirty-eight degrees of freedom, *t* must be at least ±2.025 for the .05 per cent level of significance.) The null hypothesis of no mean difference is rejected. The experimental subjects did identify more words than the control group did. Both groups had practice upon anomalous sentence with syntactical structure present. The superior performance was predicted to represent an improvement in discrimination due to practice upon uncommon sentences. (In these sentences, the predicate had been marked off by exchanging the subjects with the objects of the verbs.)

TABLE 3.--Scores and means for word identification

Experimental Group		Control Group	
subjects	score	subjects	score
1. Kathleen	3	Victor	0
2. Scott	0	Mary	2
3. Becky	0	Gary	0
4. Bobbi (female)	1	Chris (female)	0
5. Mike	2	Richard	0
6. Chuck	11	Mike	0
7. Annette	2	Scott	0
8. Joe	0	Roxanne	0
9. Steve	0	Kathryn	0
10. Donald	0	Eddie	0
11. Danny	1	Kate	2
12. Delores	0	Mike	0
13. Judy	0	Meredith (female)	0
14. Beth	0	James	0
15. Sue	1	Tom	0
16. Daphne	1	Linda	2
17. Crystal	3	Joe C.	0
18. Robert	10	Anne	0
19. Lisa	2	Joe	0
20. Kate	0	Julie	0
Total number of words	37		6
Mean number of words	1.85		.20

Because there were subjects in the control group who did identify words, improvement in discrimination appears to have occurred.

Sex

An examination of the scores suggested a possibility of an interaction of treatment with sex of the subject. Since the uniformities of native language learning had not suggested this interaction, this evidence was unexpected. The data are summarized in Figure 4.

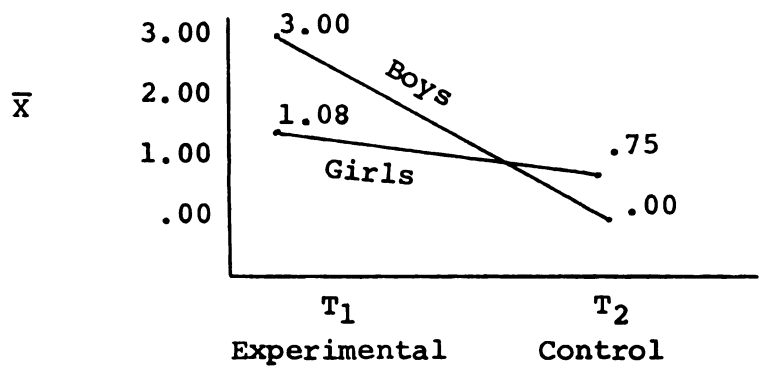

Fig. 4.--Interaction with sex

Age

If children are merely improving in discrimination when they identify words, age would not be expected to be a factor. By the time a child starts to school, his syntax in speech seems to be quite well

mastered.[1] The age range in this study is limited by the selection of only kindergarten subjects. Subjects in the experimental and control groups did not differ with respect to mean age. Their mean ages were 5.74 years and 5.78 years respectively. When the performance of the younger subjects, sixty-two through sixty-nine months, is compared with that of the older subjects, seventy through seventy-seven months, age seems to be of no consequence for the experimental subjects whereas only the older subjects identified words in the control group. The youngest control subject to identify words was seventy-four months. The youngest experimental subject to identify words was sixty-three months. The data are summarized in Table 4.

Hypothesis (2) Findings

A major limitation of this study derives from the fact that the meaning involved in a transfer from speech to reading is of a symbolic nature. When meaning is defined as being something specified by grammar, it is necessary to rule out the possible effects of extraneous experiences in order to show that this is so. Discrimination practice and test were confined to a single session and the sentences used were deliberately made anomalous.

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[1]Paula Menyuk, "A Descriptive Study of the Syntactic Structures in the Language of Children: Nursery School and First Grade" (unpublished Ph.D. dissertation, Boston University, 1961).

The transfer from speech to reading took place during imitation-of-oral reading. As a consequence of this approach to meaning, the number of words identified and the number of subjects capable of responding were expected to be rather small. This expectation was upheld: of a possible 380 word recognitions and identifications, only 73 were obtained for the better performing group. Of a possible 20 subjects, only 11 in the better performing group identified words.

TABLE 4.--Percentages of subjects identifying words by age

	Younger Subjects (62-69 months)		Older Subjects (70-77 months)	
	Experimental	Control	Experimental	Control
No word identified	40%	100%	50%	63%
One word identified	30%	0%	10%	0%
Two words identified	10%	0%	20%	37%
Three or more words	20%	0%	20%	0%
	100%	100%	100%	100%

Hypothesis (2) dealt with economy of effort. If a word is the end product of a breakdown for the hierarchical organization of the sentence, economy of effort should result from regarding words as parts of this type of organization. It was predicted that the

proportion of words identified to words recognized would be larger for the experimental subjects, that the number of subjects capable of responding meaningfully would be greater for the experimental group, but that the mean number of words recognized and identified per subject capable of responding meaningfully would be the same for the two groups. The relevant data are given in Tables 5, 6, and 7.

TABLE 5.--Word identifications and word recognitions

	Number of Words	
	Experimental	Control
Word Identifications	37	6
Word Recognitions	36	32
Total	73	38
Proportion of Identifications to Recognitions	37/36 = 100	6/32 = 19

Table 5 shows that the experimental subjects gave at least one word identification for every word recognition and that the control subjects gave only one word identification for every five recognitions. Table 6 shows that a larger percentage of subjects appeared to be responding meaningfully for discrimination practice with uncommon sentences: 85 per cent as opposed to 60 per cent. Table 7 shows that the mean number of

TABLE 6.--Responding by subjects

	Number of Subjects
Experimental Group	17 of 20 subjects gave word identifications and recognitions 17/20 = 85% responded meaningfully 11 of these 17 gave word identifications 6 of 17 gave word recognitions
Control Group	17 of 20 subjects responded 5 of 17 gave meaningless letter names 3 of 17 gave word identifications 9 of 17 gave word recognitions 12/20 = 60% responded meaningfully

TABLE 7.--Means for word responses

	Experimental	Control
Word Identifications	37	6
Word Recognitions	36	32
Total	73	38
Means	73/17 = 4.29	38/12 = 3.17

word identifications and word recognitions combined was 4.29 for the experimental subjects and 3.17 for the control subjects. The difference between these means hardly seems large enough to account for the fact that six times as many words (37 to 6) were identified by the experimental subjects and that nearly four times as many subjects (11 to 3) were capable of identifying words in the experimental group.

Two words not presented during discrimination practice were used in the word identification sentences. These words were think and by. This was done because it was thought that efficient attending to syntactical structure would preclude attending to letters within words. This may be the case: Chuck, the most efficient subject in word identification, was the only subject to report having seen the word by before. Four experimental and one control subject reported having seen think before. The word now appears in discrimination practice but not in word identification. It was used in discrimination practice because it was surmised that subjects might use this word as a placeholder, and therefore might learn to identify other words with it. One experimental subject, only, gave the word now as a word recognition in word identification. This same subject failed to identify words. In view of how the term "constituent"

was defined, there may be no need for a placeholder in segmenting the sentence during discrimination practice.

Hypothesis (3) Findings

This hypothesis predicted that if subjects were attending to syntactical structure of sentences, they would identify the particular words appearing as phrase structure indicators on the generalized tree diagram. The words so specified for the word identification sentences are the and did. The data for word identifications are given in Table 8 and the data for subjects giving these responses are given in Table 9.

TABLE 8.--Frequencies for word identifications

	Number of Word Identifications	
	Experimental	Control
1. the	16	2
2. did	5	0
3. chief	7	2
4. legal	3	2
5. mongrel	1	0
6. matters	1	0
7. weapons	1	0
8. rest	1	0
9. tutor	2	0
totals	37	6

TABLE 9. Frequencies for subjects

Subjects Identifying Phrase Structure Indicators	
Experimental Group	11 gave word identifications 8 of these gave 20 identifications for the words the and did 77% of these subjects identified these words
Control Group	3 subjects identified words 1 of these identified the twice 33% of these subjects identified these words
Subjects Recognizing Phrase Structure Indicators	
Experimental Group	6 subjects recognized words 3 of these located did and the 50% located did and the
Control Group	9 subjects recognized words 5 of these located did or the 55% located did or the

These data suggest that phrase structure indicators the and did tended to be identified more often by a higher percentage of subjects in the experimental group (77% versus 33%), and that once these words were identified that several other identifications might also occur. But this thinking does not hold entirely. It does not explain why, for example, Danny and Bobbi of the experimental group gave as their only identifications the words matters and mongrel respectively. An examination was made in terms of the sentence administered first during discrimination practice. In both groups,

subjects who had had the tutor sentence first, with but one exception, identified the or did or both. It may be that the sentence administered first exerts some influence upon the selection of the least frequent phoneme, and that this selection in turn enters into the abstracting processes of phrase structure rules. Interestingly, the list of words in Table 8 contains no words used as verbs with the exception of the word did. The frequencies with which individual words were identified do suggest the possibility that a distinctive feature of some sound might be selected and used.

Merely recognizing the and did did not seem to promote word identification in that the experimental and control subjects do not seem to differ in this respect.

Hypothesis (4) Findings

It was predicted that at the end of discrimination practice that patterns for perceptual functioning and for perceptual content will emerge for the experimental group. These patterns were to consist of naming, pointing, and omitting responses summed separately for each word across the sentence. A pattern for perceptual content, the grammatical units being responded to, was also predicted to emerge. This pattern was to be a composite for all three of these responses. The evidence for the experimental group is given in Figure 5 and for the control group in Figure 6.

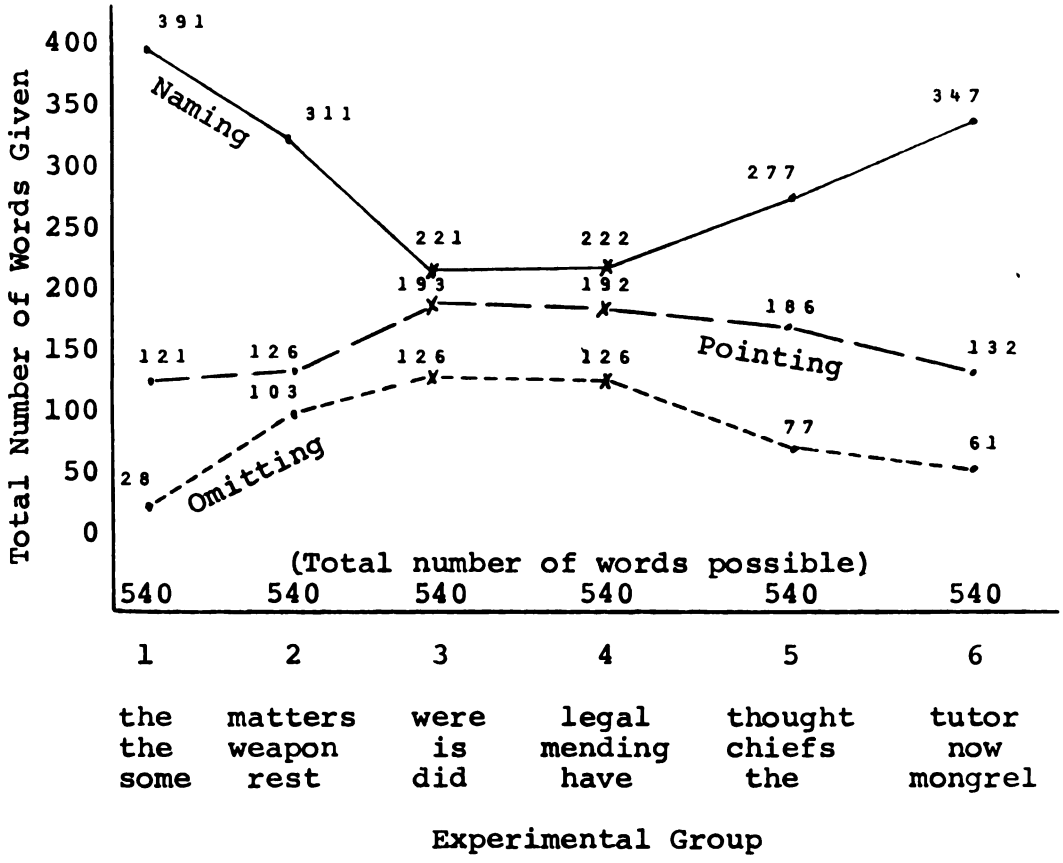

Fig. 5.--Amodal perception

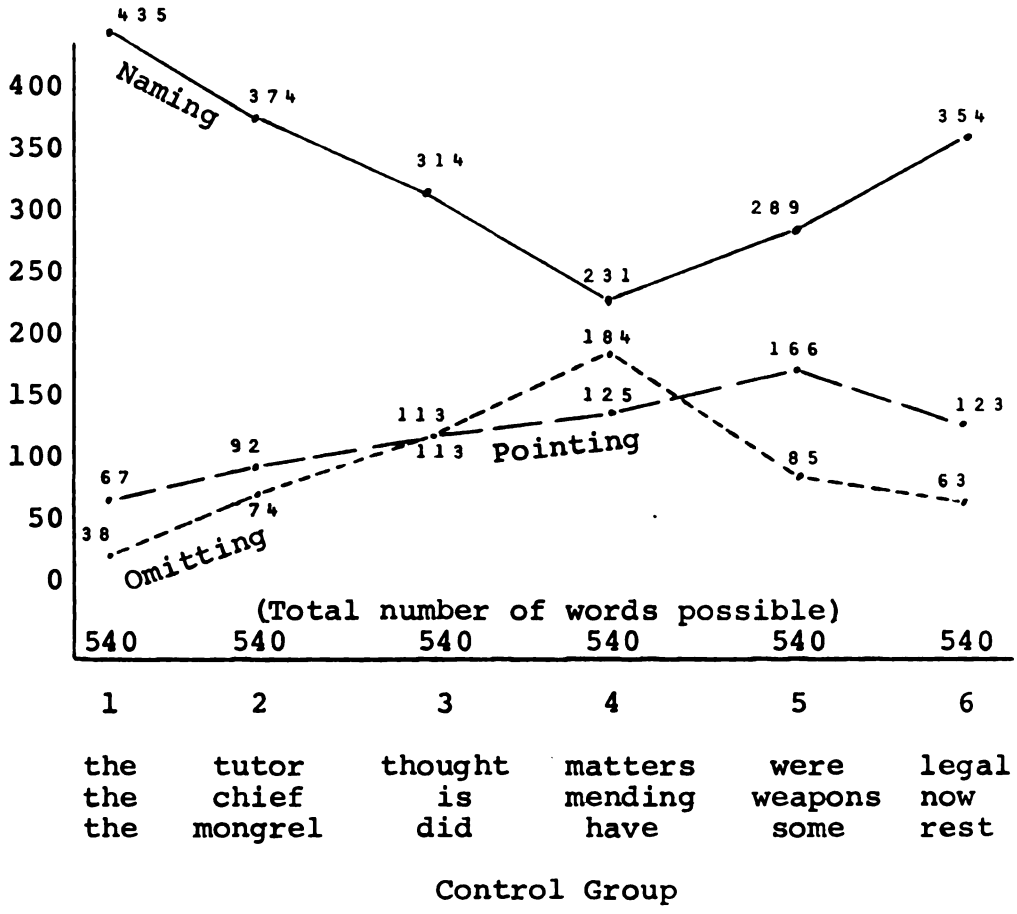

Fig. 6.--Amodal perception

Figure 5, for the experimental subjects, shows that the predicate tends to be marked off as syntactical unit and that naming, pointing, and omitting responses are correlated at these points, that is, where naming drops off, pointing and omitting responses pick up. Naming, pointing, and omitting are amodal in that they are not sensations that are unique to some particular sensory modality. They are forms of responding that take place separately. They do not correlate in Figure 6 for the control subjects.

In Figure 5, for the experimental subjects, if naming, pointing, and omitting are each taken separately, it is not necessarily obvious that a syntactical unit, such as the predicate, is being responded to consistently. All three must be taken together as a composite at their points of correlation before such a conclusion can be reached. Further, the tutor sentence was not divided as expected from the generalized tree diagram: thought was not perceived as the predicate. Legal was perceived in this way instead. Maybe this performance reflects an unexplainable peculiarity of child grammars. However, it does appear from the points of correlation that some kind of abstracting may have gone on.

In Figure 6, for the control subjects who had practice upon sentences representative of common usage, it is obvious that the control subjects actually did

more naming of phrase structure indicators the (435 to 391; 289 to 277) and did (314 to 221) than did the subjects receiving practice upon sentences representative of uncommon usage. An examination was made to see if the words named during discrimination practice were also the ones identified later on for experimental subjects. According to Gibson, discrimination and identification processes are not the same, and therefore the naming that occurs during discrimination practice need not be the same as the naming that occurs during word identification.[2] Examination revealed the possibility of little relationship between naming during discrimination practice and naming on word identification test. For example Lisa gave a total of eight naming responses of fifty-four possibilities for the tutor sentence during discrimination practice. All eight were given to the word legal. On word identification test, she selected the words did and chief and failed to identify the word legal. Perhaps some abstracting process accounts for the differences between discrimination and identification.

Gibson used the research literature on transposition to explain what was meant by the terms

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[2]Gibson, Principles of Perceptual Learning, pp. 122-23.

"relational" and "abstract."[3] Her interpretation of this literature may apply to Figures 5 and 6. Gibson observed that transposition dealt with the discrimination of structure in particular. She reported that organisms, both human and subhuman, could be trained to give relational responses like "darker than," "heavier than," "different than" whenever two adjacent contrasting stimuli were presented. The information extracted was "contrast." Once "contrast" was extracted, this information functioned as invariant and transferred to other stimuli possessing the same contrast dimensions. Stimuli for "contrast" do not in themselves exist. What exists are the conditions that give rise to this perception. Perhaps the correlations in Figure 5 represent a detection of the contrast "different than" in such a way that an abstraction can be made. If this interpretation is plausible for locating the boundaries of grammatical units, then practice upon sentences representative of uncommon usage possess the stimulus conditions that give rise to the abstraction "contrast" whereas practice upon sentences representative of common usage may not.

The control subjects, Figure 6, apparently did differentiate between words, and maybe parts of the sentence also. But there is no correlation among naming, pointing, and omitting; an abstraction may not have been

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[3] Ibid., pp. 217-38; 283-95.

made. The failure to abstract efficiently may, in turn, have made it difficult for these subjects to grasp the real point of the instructions. In other words, they saw differences but didn't know what to do with the differences seen. Because the sentences were anomalous, one consequence may have been a tendency to revert to classroom experience. All of the subjects in this study were receiving instruction in giving the letter names in their classroom. This bit of experience may have been put to use inappropriately with the result that five of these subjects gave meaningless letter names. Monroe[4] tried to accomplish a transfer from speech to print by capitalizing upon the experiences that children have had. The evidence in Figure 6 suggests that it is possible that such a procedure may not necessarily be useful.

Summary

The data for four hypotheses were presented. Hypothesis (1) demonstrated that the experimental subjects did identify more words than did the control subjects. The mean difference was significant at the .05 per cent level, two-tailed test. The three remaining hypotheses were descriptive in nature. Hypothesis (2) indicated that more experimental subjects were capable

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[4]Monroe, Reading, pp. 207-21.

of responding and that these subjects gave at least one word identification for every word recognition whereas the control subjects gave five recognitions for a single identification. Hypothesis (3) demonstrated that the experimental subjects identified the phrase structure indicators the and did more often than was the case for the control subjects. Hypothesis (4) demonstrated that for the experimental subjects, naming, pointing, and omitting responses correlated with the beginning and ending points for the predicate. The evidence also suggested that three unpredicted variables may have influenced word identification. These variables were (1) sex of the subject; (2) age of the subject; and (3) the sentence administered first during discrimination practice.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

This study started with the postulate that reading begins with the basic processes of speech, and that these processes are carried over into reading through the use of phrase structure rules. To demonstrate that this is the case, an experimental descriptive study was designed. The supposition was operationalized by hypothesizing that kindergarten children would learn to identify words as wholes if given an opportunity to attend to syntactical structure of sentences, preferably of sentences representative of uncommon usage. Ideas for methodology and for interpreting the results were developed from Eleanor J. Gibson's principles of perceptual learning.[1] Children were tested in an experimental session that lasted an hour. They were first pretested, and only those kindergarten children who could not already read the words in this study were

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[1]Gibson, Principles of Perceptual Learning, 537 pp.

accepted as subjects. For this study, there were two groups of subjects, twenty in each group. One group, the experimental group had discrimination practice upon sentences representative of uncommon usage. The other group, the control group, had discrimination practice upon the same sentence representative of common usage. Both groups were tested for word identification upon new sentences containing the same words previously presented. Subjects were given discrimination practice through the use of an imitation-of-oral reading task. The syntactical structure for the sentences used in this task was formally defined as consisting of subject of the sentence, predicate of the sentence, and the object of the verb. While it was difficult to get kindergarteners to learn to identify many words in a single experimental session, it was evident that children did identify words as wholes, that they did so by attending to the syntactical structure of the sentence, the uncommon sentences, those with the object of the verb, the predicate of the sentence, and the subject of the sentence yielding superior results as predicted. Student's t, two-tailed test, for no difference between means was significant at the .05 per cent level of significance.

Three additional hypotheses of a descriptive nature were tested. For these hypotheses, the data were

tabulated and presented. It was necessary to avoid distorting the form that the data took. Care was taken to avoid possible sources of confusion that might arise when both the words being identified and the numbers of subjects identifying them must be examined. The data presented demonstrated that there had been an economy of effort, that phrase structure indicators were being identified, and that the predicate of the sentence had been marked off by naming, pointing, and omitting during discrimination practice for subjects having discrimination practice upon uncommon sentences. Three unanticipated factors also emerged. These were the possibility of an influence for the sex of the subject, for age, depending upon whether the sentences were uncommon or not, and for the sentence administered first during discrimination practice.

Conclusions

The Problem

The problem identified was that adult and child grammars are not alike. Eleanor J. Gibson had identified and analyzed those particular processes of speech which were pertinent for a transfer from speech to print.[2]

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[2]Gibson, "Ontogeny of Reading," p. 136.

Unlike Marion Monroe[3] who saw the word as the unit and who interpreted the transfer from speech to print in terms of experiences and thoughts that words brought to mind, Gibson stated that the transfer took place through the use of rules that started with the sentence as a unit and then divided it up into grammatical units. The meaning that transfers in such a case is symbolic and abstract. It belongs to the grammar, and therefore applies to all sentences in general. In order to show that the transfer takes place as Gibson has stated, it was necessary to rule out extraneous influences. Discrimination practice and test for word identification took place in a single experimental session. Anomalous sentences were constructed. A generalized tree capable of incorporating the rules for both adult and child grammars was drawn up to describe the syntactical structure of sentences. An imitation-of-oral reading task was used to give discrimination practice. This task permitted control over adult input so that child output could be compared with it. It also permitted a transfer of basic speech processes while discriminations in sentences were being made. These procedures were probably necessary. It may not be possible to find out

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[3]Monroe, Reading, pp. 207-21.

how rules effect a transfer from speech to print without giving the procedures followed here much consideration.

Methodology and Hypotheses

Eleanor J. Gibson provided an identification of those speech processes pertinent in a transfer from speech to print; she also provided a theoretical framework for conducting the study and for interpreting the findings. As a result, during discrimination practice, reinforcement was not given, complex processes like thinking were not called into play, and the study was designed to permit processing of the total pattern.[4] Gibson's theory states that the transfer from speech to print represents only an improvement in discriminating syntactical structure from speech. Insofar as this study had been concerned, Gibson's theory has been borne out. It may not be necessary to exclude a child who can already read as was done in this study.

A null hypothesis was used to show that word identification occurred optimally with discrimination practice upon uncommon sentences--those in which the subjects and objects of the verbs had switched places, thereby marking off the predicates. The three remaining hypotheses were descriptive in terms of what might happen according to theory. Both the words--the stimuli

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[4]Gibson, Principles of Perceptual Learning, 537 pp.

to be responded to--and the responses to be made to the stimuli were identified and defined. It seems likely that researchers may need to work in similar fashion in the future. It is difficult to visualize how economy of effort and amodal perception might be operationalized in beginning reading. It is also difficult to specify what a child is doing when he is using abstract rules without a theory.

Implications

Gibson looked at the process of learning to read as a piece of natural history.[5] She assumes that children already have the appropriate responses from speech. They need to discover how and where their responses apply in printed materials. Gibson believes that it is necessary to manipulate the stimulus material so that the subject has an opportunity to discover what must be found. Confusions that have been attributed to the shortcomings of phrase structure (John is easy to please. and John is eager to please. being a case in point.)[6] are not to be assigned to the ineptness of the pupil, but rather to the ineptness of the professional in providing appropriate instruction. The findings of

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[5]Gibson, "Ontogeny of Reading," p. 136.

[6]Chomsky, Syntactic Structures.

this study suggest that the sentences used in beginning reading instruction should be those that allow the child to apply phrase structure rules by way of his knowledge of basic sentence relations--the subject of the sentence, the predicate of the sentence, and the object of the verb. But before guidelines can be given as to how sentences should be prepared, this study should be replicated. It was not possible to randomize the assigning of subjects to groups. Although the researcher was a stranger to the children and to the school, it is not known how much error may exist because the researcher arbitrarily assigned subjects to different treatment groups. Comparatively few subjects were involved in the analyses of data for some of the hypotheses. In the superior group, only eleven subjects succeeded in learning to identify words. Now that it has been demonstrated that the sentence and its grammatical subdivisions are the appropriate units, not words as Monroe thought, it is necessary to find out whether anomalous sentences are really crucial in effecting a transfer from speech to print. A child may use phrase structure rules with thought-provoking sentences also.

In this study, it was the uncommon sequence of object of the verb-predicate-subject that produced the superior results, apparently because the predicate may have been automatically marked off by switching the

subjects with the objects of the verb. Much more information is needed regarding the possibilities for manipulating the ordering of grammatical units in reading material so that some one unit can be perceived.

Imitation has been found to be a useful research tool in studies of child language development.[7] The uses of imitation in reading research or in the classroom seem to be unknown. This study originally started with four treatment groups. Data for two groups were laid aside because a problem common to all four treatments could not be found. One starting point in assessing the possible contributions of imitation in reading research would be to analyze these data.

Additional development of Gibson's theory would be desirable. She has cited evidence that indicates that discrimination and identification tasks do not involve the same processes. Discrimination is most efficient with the detection of a least frequent distinctive feature and that identification will be most efficient when stimuli differ by a feature with 50 per cent frequency in the set.[8] Some selection of a

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[7]Slobin and Welsh, "Elicited Imitation as a Research Tool in Developmental Psycholinguistics," in Studies of Child Language Development, ed. by Charles A. Ferguson and Dan I. Slobin (New York: Holt, Rinehart and Winston, 1973), pp. 485-96.

[8]Gibson, Principles of Perceptual Learning, pp. 122-23.

distinctive feature must take place during discrimination, and during the course of abstracting through the use of phrase structure rules by way of an ability to handle basic sentence relations, the requirements for identification are met. Discrimination and identification were kept dichotomous in this study. But some confusion may exist; naming occurs in both discrimination and in identification. Observation of individual performances revealed that the words named during discrimination were not necessarily the same words identified. The fact that the same term applies to both processes together with the fact that it is not known how distinctive features are discovered renders it impossible to specify the distinctive features that were used by subjects in this study. Keeping the order in which sentences are administered constant might help to clarify the different ways naming is being used.

Both age and sex appeared to be factors that need further study. In the control group, the data suggest that the subject had to be a girl at least seventy-four months old in order to identify words. In the experimental group, both older and younger subjects of both sexes identified and failed to identify words. Also there were two boys, one sixty-four months and the other, seventy-three months, who gave a substantial number of word identifications, ten in one case

and eleven in the other. Menyuk[9] has not found sex differences in the acquisition of syntactical structures in speech and she found age to be a factor when the age range was much greater than it is in this study. For Gibson, greater specificity of the correlation between stimulation and discrimination, increasing differentiation, and the pick up of invariant relations occur with increases in experiences that age provides.[10] Insofar as the experimental treatment is concerned, it would appear possible to use nursery school subjects as well as kindergarten children.

Chapter Summary

An abstract was provided in the opening summary. Conclusions were drawn with respect to the handling of the problem and contributions of Gibson's theory. Replication of the study upon a larger sample and with thought-provoking sentences was suggested. The need for information on ways of manipulating grammatical sequences in sentences, on the possible uses of imitation in reading research, and a need for further development of Gibson's theory were noted. Research

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[9]Menyuk, "Descriptive Study of Syntactic Structures."

[10]Gibson, Principles of Perceptual Learning, pp. 450-70.

investigating the effects of age, sex, and the sentence administered first was also mentioned.

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