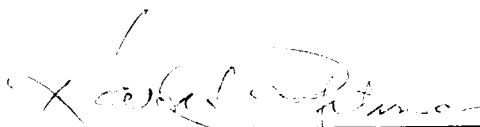
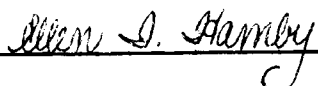


To the Graduate Council:

I am submitting herewith a thesis written by Sharon Elizabeth Blodgett entitled "The Understanding of Before and After as Locational and Temporal Terms in Five, Six, Seven, and Eight Year Old Children." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Speech Pathology.


Harold A. Peterson, Major Professor

We have read this thesis
and recommend its acceptance:




Accepted for the Council:


The Graduate School

THE UNDERSTANDING OF BEFORE AND AFTER AS
LOCATIONAL AND TEMPORAL TERMS IN
FIVE, SIX, SEVEN, AND EIGHT YEAR
OLD CHILDREN

A Thesis

Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Sharon Elizabeth Blodgett

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ABSTRACT

The purpose of this study was to compare the performance of five, six, seven, and eight year old children on their interpretation of "before" and "after" used as locational terms and as temporal terms.

In the locational task, subjects followed a series of instructions to place a toy either before or after another toy. In the temporal task, subjects followed a series of commands to perform two actions with "before" and "after" used as conjunctions.

Statistical analysis indicated that there were no differences among the age groups on either the locational task or the temporal task. However, on the temporal task the children demonstrated significantly better understanding of "before" as contrasted to "after," and better understanding of sentences in which the order of mention corresponded with the order of occurrence of the two actions.

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CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

I. INTRODUCTION

Some of the research in semantic development has focused on the child's acquisition of locational and temporal word meanings. For example, French and Brown (1976) have investigated children's comprehension of sentences containing "before" and "after." Some researchers (Clark, 1971; Hatch, 1971; Amidon & Carey, 1972; Johnson, 1975; French & Brown, 1976; Amidon, 1976; Trosborg, 1981) have looked at the temporal meanings of these two words used as conjunctions. Friedman and Seely (1976) also examined the comprehension of the locational meaning of these terms.

Most investigations have included children from the ages of three to five years old. However, both Coker (1977) and Trosborg (1981) reported that children after age five still have difficulty comprehending these terms used as subordinating conjunctions.

There is also disagreement concerning the strategy for acquisition of "before" and "after" as temporal terms. Some investigators have proposed that children use an "order of mention" strategy in comprehending "before" and "after" (Clark, 1971; Trosborg, 1981) while others support a strategy in which children focus on information presented in the main clause of the sentence (Amidon & Carey, 1972; Johnson, 1975; Amidon, 1976).

Because further investigation is needed to understand the

child's acquisition of the terms "before" and "after," the purpose of this study is to assess the understanding of "before" and "after" as locational and temporal terms in five, six, seven, and eight year old children.

II. REVIEW OF THE LITERATURE

Investigators hold different views concerning the child's strategy in comprehending the meaning of "before" and "after" as temporal conjunctions. Clark (1971) proposed that "the order of acquisition will be related to a linguistic analysis of the semantic components that characterize before and after" (p.267). Clark proposed that children acquire word meanings by adding "features" or smaller units of meaning to the word until the combination of features corresponds to the adult's meaning (Clark, 1973). She found three stages in the acquisition of the meaning of "before" and "after" in her study of 40 children between the ages of three and five. The investigation consisted of a production task to assess the child's ability to use the terms spontaneously and a comprehension task designed to assess the child's understanding of the two words. In the production task, the children watched a series of two actions performed by toys and were asked "when" questions concerning one of the actions such as "When did the boy kick the rock?" In the comprehension task, the children were asked to carry out instructions in 32 complex sentences containing "before" and "after" in these four different constructions.

- a. Before he patted the dog, he jumped the gate.
- b. He jumped the gate before he patted the dog.
- c. After he jumped the gate, he patted the dog.
- d. He patted the dog after he jumped the gate.

The children were told to "make the toys do what I say"

(p.268). The results of the study revealed an increase in the children's knowledge of the meanings of "before" and "after" from age three to five. According to Clark, at the earliest stage, the children appeared to use an order of mention strategy when acting out sentences containing these conjunctions; they assumed the first clause described the first event and the second clause described the second event. At the second stage, children interpreted "before" correctly regardless of its position, but few understood the meaning of "after." Some children seemed to interpret "after" as meaning the same thing as "before." Finally the children interpreted "before" and "after" in the same way adults do. Clark related these stages to the addition of semantic components to these words. She stated that the first component is (+Time) and the second is (+Simultaneous) followed by (-Simultaneous). Finally, the component (+Prior) is added to words which are (-Simultaneous). She described "before" as (+Time), (-Simultaneous), (+Prior), and "after" as (+Time), (-Simultaneous), (-Prior). Clark stated that the results of this study supported the notion that children learn certain semantic components of "before" and "after" in a particular order (Clark, 1971).

Amidon and Carey (1972) disagreed with Clark's (1971) conclusion concerning children's comprehension of "before" and "after" as

temporal conjunctions. They reported that "greater attention to main clauses occurred regardless of clause order within the sentence, which suggests that order of mention was not a dominant strategy for our five year olds" (p.422). Their study included 50 kindergarten children between five years, four months and six years, three months who were assigned to five experimental groups. One group received feedback after each response, one received intonational emphasis on the temporal marker, and another group received feedback and emphasis. One control group received neither feedback nor emphasis and another control group was trained with "first" and "last." Each subject responded to commands to move colored airplanes during a game situation ("Before you move a red plane, move a blue plane"). The same four sentence types were used as in Clark's (1971) study with the subordinating clause in the initial position in half of the sentences and in the final position in the other half. A posttest was conducted during which neither emphasis nor feedback was used with the subjects. The authors divided errors into reversals (the order of the commands was inverted), omissions of the subordinate clause, and omission of the main clause. They found that few of their subjects understood these two terms at the beginning of the study. The first control group's errors consisted primarily of omission of the subordinate clause. They pointed out that clause order did not affect the omission errors, but more reversal errors did occur when clause order conflicted with the order of events. They found a "slight overall trend for fewer errors to occur in before sentences than in after sentences" (p.421), however they pointed out that this was primarily

due to the feedback and feedback plus emphasis groups. They found that the sentences with "first" and "last" were much easier than the "before" and "after" sentences. Because sentences with first and last do not contain subordinate clauses, but two main clauses, the authors hypothesized that, "the young child's difficulty with before and after is with subordinating syntax and the lack of redundancy" (p.422). Because the children's performance improved quickly with feedback, the authors stated that they must "already have possessed the concept of temporal precedence" (p.422). They noted that the discrepancy between their results and Clark's (1971) may have been due to developmental differences between three and five year olds. They stated that strategies may change with age and that order of mention may be an earlier strategy used by children. They found that the five year olds in their study employed the strategy of ignoring subordinate clauses (Amidon & Carey, 1972).

Johnson (1975) conducted a study with ten girls and eight boys ranging in age from four years, two months to five years, two months in an attempt to examine the use of these two strategies (order of mention and main clause) in processing temporal order information. Johnson suggested that the differences found in previous studies may have been due to the nature of the tasks. She stated that,

Each of the Clark (1971) sentences described two different actions performed by a third person agent. In contrast, the Amidon-Carey (1972) sentences instructed the child (second-person agent) to perform two identical actions in sequence (p.90).

Johnson's tasks included a comprehension procedure (replication of

Clark's (1971) procedure), a picture-command task during which children responded to commands during a picture making activity, and a command task (replication of Amidon and Carey's (1972) procedure which involved moving colored toy cars. On the comprehension task, Johnson found that 86 percent of the errors were reversals; while on the command task, 61 percent of the errors were omissions. She pointed out that a reversal error indicated an understanding of a two-event sequence but a confusion concerning the order between the events specified by "before" or "after," while an omission response indicated an absence of sequential ordering. Because the same children who made reversal errors on the comprehension task made omission errors on the command task, Johnson suggested that there was some qualitative difference between the two tasks. In the comprehension task, the children were instructed to act out the two actions; however, in the command task only the main clause action was directly instructed. In the sentence "Before you move the pink car, move the green car," the child may follow the command and move the green car and wait for "Now move the pink car." Johnson stated that, "omissions on the command task, then, may mean not that the child has failed to extract a two-action sequence, but simply that he is responding only to direct commands" (p.99). Overall, the order of mention strategy emerged as the main strategy used to process the temporal order information. The author suggested that the main-subordinate sentence strategy should be further investigated (Johnson, 1975).

Amidon (1976) conducted a study with 48 elementary school

children ages five, seven, and nine to test their understanding of sentences containing the connectives "when," "as soon as," "before," "after," "if," "if-not," "unless," and "unless-not." Two tasks were used. In the first task, the experimenter read sentences with the various connectives in these two sentence types: "You move the car (before) the light comes on" and "(Before) the light comes on, you move the car" (p.425). The children responded by moving a car along a game board. In the second task, the subjects listened to tape recorded sentences (for example- "The elephant will eat the peanuts before the monkey climbs the rope.") and answered "when" questions referring to the relation between the main and subordinate clause ("When will the elephant eat the peanuts?") or "what" questions referring only to the main clause ("What will the elephant do?") Task one errors were divided into commission errors (subject carried out the action of the main clause but in inappropriate situations) and omission errors (subject did not carry out the action of the main clause). Amidon (1976) reported that five year olds made significantly more commission errors with each of the connectives and that the frequency of errors declined with age. Task two errors for "when" questions were divided into content errors ("subject either failed to respond or provided incorrect information about the event contained in the subordinate clause" (p.431), and relation errors (incorrect relation between events). The results of this task revealed that content errors decreased with age while relation errors increased. Amidon (1976) stated that "the developmental decline in content errors suggests that the ability to retain and verbalize

information contained in subordinate clauses improved with age" (p.432). This study found that at all three age levels, the order of mention related to the order of occurrence did not affect sentence comprehension. The author proposed two factors which explained the difficulty children have in understanding sentences with connectives. These are the syntactic complexity of the subordinate clause construction and the semantic complexity of the connective. "Before" and "after" were found to be of intermediate difficulty when compared to the other connectives in the study (Amidon, 1976).

French and Brown (1976) noted that previous studies of the acquisition of "before" and "after" as temporal conjunctions had ignored the relationship between language acquisition and contextual support. Therefore, they conducted a study with 20 girls and 20 boys ranging in age from three years, five months to five years, one month and had children act out, with toys, "logical" and "arbitrary" sentences in four types of "before" and "after" sentences (p.250). In the logical sentences, "the first event would not cause the second event, but would be a reasonable prior event." An example of a logical sentence is "Raggedy Ann fills the bottle before she feeds the baby" and an arbitrary sentence is "Raggedy Ann fills the bottle before she washes her hands" (p.250). They found that errors were primarily omissions of the subordinate clause for arbitrary sentences and omissions of the second event for logical sentences. They found that the subjects had more correct responses on the logical sentences. The authors stated that, "our data do not support Clark's description of consistent developmental strategies for the

interpretation of before and after which are congruent with a semantic feature description" (p.255).

Trosborg (1981) studied the acquisition of the temporal conjunctions "before" and "after" by conducting a series of experiments involving mastery of these conjunctions and then compared these results with the children's performance on tasks of cognitive skills. Her subjects were 60 Danish children ranging in age from three years to seven years, five months. Two tasks were used to examine the understanding of "before" and "after": an acting out task (similar to previous studies), and a verbal judgement task (the children heard sentences describing two things that a pair of dolls had done and then told the experimenter which of the events took place first). The cognitive tasks included: four seriation tasks, a picture seriation task, and three conservation tasks. The authors found that, "before and after sentences present considerable difficulty to children between three and six years when they have to rely solely on these conjunctions for their interpretation of event order" (p.400). They found that the children performed better with logical than arbitrary sentences on the verbal judgement task. On the acting out task, they performed better on "before" than "after." They performed better on both of these terms when the order of mention corresponded to the order of occurrence of events. The authors also found that increased performance on the cognitive tasks with age was related to increased performance on the conjunction tasks (Trosborg, 1981).

While most investigators have looked at the comprehension and production of the terms "before" and "after" as temporal conjunctions,

other investigators have looked at the acquisition of both the locational and temporal meanings of these two terms (Friedman & Seely, 1976). Clark (1973) stated that,

Many temporal relations have a spatial model underlying them. This is the reason why "before" (parallel to in front of) may be called positive and "after" (parallel to behind or in back of) negative (p.106).

Friedman and Seely (1976) tested the comprehension of the words "before," "after," "first," "last," "ahead of," "behind," and "together" in two locational and two temporal tasks in 29 children ranging from three to five years old. In one locational task, the children placed a doll in the position described by a series of sentences ("The horse is before Mary," "Mary is after the horse") (p.1104). In the second locational task, the children were instructed to "put your doll on the merry-go-round the way I tell you" ("Mary is before John," "John is after Mary"). The first temporal task involved two doll beds and two dolls; the children were instructed to "make the dolls get up the way I tell you" ("Mary gets up before John") (p.1104). In the other temporal task, the children gave gold stars to the doll who answered questions the quickest. The results revealed that the younger subjects received higher comprehension scores for "before" and "after" on temporal tasks than on the locational tasks. It was also noted that at times the children changed the task to fit their understanding. In the case of "before" and "after," it usually involved spatial tasks being regarded as temporal. The authors found that some words were under-

stood first in their temporal sense, while others were understood first in their spatial sense (Friedman & Seely, 1976).

III. SUMMARY OF THE REVIEW

Investigators in the area of language acquisition have differing views concerning the acquisition of word meanings in children. Many investigators have studied children's understanding of the terms "before" and "after." Some have examined the temporal meanings of these words (Clark, 1970; Clark, 1971; Amidon & Carey, 1972; Johnson, 1975; French & Brown, 1976; Amidon, 1976; Trosborg, 1981). Others have examined the locational meanings of the terms (Friedman & Seely, 1976).

Different developmental strategies used in understanding "before" and "after" as temporal conjunctions have been proposed. The major strategies proposed are an order-of-mention strategy (Clark, 1971; Trosborg, 1981) and a main clause strategy (Amidon & Carey, 1972; Johnson, 1975; Amidon, 1976). Because proponents of these different strategies have employed different experimental tasks, the different strategies used by the children may have been due to the task variables in the experiments (Johnson, 1975).

Few studies have examined the acquisition of "before" and "after" as locational terms. It remains unclear whether "before" and "after" are understood first as locational terms, or as temporal terms.

Most of the investigators in this area have looked at children between the ages of three and five years old. However, five year

old children have been reported still having difficulty with these two terms. Research is needed concerning the understanding of "before" and "after" as temporal conjunctions and as locational terms in older children.

IV. PURPOSE OF THE STUDY

The acquisition of the terms "before" and "after" remains unclear. Investigators disagree concerning children's understanding of these terms as well as the strategies used by children to process temporal order information. Further investigation is needed in this area of normal semantic development in order to provide a basis for determining if children exhibit delayed or disordered development in this area.

The purpose of this study is to compare five, six, seven, and eight year old children's comprehension of the terms "before" and "after" used as locational terms and temporal conjunctions to determine if one term is understood earlier than the other in either of these tasks, and if any particular strategies of comprehension emerge within the different age groups.

V. EXPERIMENTAL QUESTIONS

Locational Task

1. Is there a significant difference in the mean number of correct responses to the locational task among the four age groups?
2. Is there a significant difference between the mean number of

correct responses to "before" and "after" as locational terms by the subject group?

Temporal Task

1. Is there a significant difference in the mean number of correct responses to the temporal task among the four age groups?
2. Is there a significant difference between the mean number of correct responses to "before" and "after" as temporal terms by the subject group?
3. Is there a significant difference between the mean number of correct responses to the order of mention construction and the reverse construction by the subject group?

CHAPTER II

METHODS AND PROCEDURES

I. SUBJECTS

The subjects were 40 children divided equally into four age ranges:

Group I - 4 years, 10 months to 5 years, 2 months

(mean age - 4 years, 11 months)

Group II - 5 years, 9 months to 6 years, 2 months

(mean age - 6 years)

Group III - 6 years, 9 months to 7 years, 3 months

(mean age - 7 years)

Group IV - 7 years, 9 months to 8 years, 2 months

(mean age - 8 years)

All subjects met the following criteria:

1. Each subject was a native speaker of English and enrolled in school in the Knoxville, Tennessee area.
2. Each subject passed a pure tone screening test for 500, 1000, and 2000 Hz. at 20 dB (ASHA, 1975).
3. Each subject exhibited normal speech and language development as determined by parental and/or teacher reports and an age appropriate score on the receptive portion of the Northwestern Syntax Screening Test (Lee, 1975).
4. Each subject exhibited manual dexterity adequate for the performance on the tasks as assessed by their ability to manipulate small objects.

II. EXPERIMENTAL PROCEDURES

Each subject participated individually in two tasks to investigate the understanding of "before" and "after" as locational and temporal terms.

Locational Task

Five small toys were placed in a row in front of the child. Each object had a definite "front" and "back." The children were given a series of 20 commands, and for each command, the child was handed a toy to place either "before" or "after" one of the toys in the row. To insure that the tested orientation was to the toys rather than the child's left or right, the toys were rearranged and all placed in the opposite direction, either facing to the right or to the left after each five commands. Responses to each of the instructions were recorded as correct or incorrect the the exact placement of the toy for each item was indicated on the score sheet. One point was awarded for each correct response and incorrect responses received no points. The maximum score possible was ten points for "before" and ten points for "after." A complete list of the locational items can be found in Appendix A.

Temporal Task

In this task, the children were given a series of 20 commands and told, "I'm going to tell you two things to do. Listen carefully and do what I tell you." There were five commands for each of the four sentence types:

- 1) Before (reverse construction)

Example: "Before you stand up, clap your hands."

- 2) Before (order of mention construction)

Example: "Pick up the car before you stand up."

- 3) After (reverse construction)

Example: "Touch your nose after you clap your hands."

- 4) After (order of mention construction)

Example: "After you stand up, touch your nose."

The responses were categorized as correct (both actions performed in the correct order), reversals (the two actions were performed, but in the incorrect order), or omissions (one or both of the actions was not performed). One point was awarded for each correct response and reversals or omissions received no points. The maximum score possible was five points for each of the four sentence types. A complete list of the temporal test items can be found in Appendix B.

CHAPTER III

RESULTS AND DISCUSSION

This study was designed to determine how five, six, seven, and eight year old children performed on tasks of "before" and "after" as locational and as temporal terms.

The locational task involved each child following instructions to place a toy either before or after another toy, and the temporal task involved each child following a series of commands to perform two actions in a particular order.

I. SUBJECT RELIABILITY

One subject was selected by chance from each of the four age groups and retested one week after the original testing. Reliability was computed using an item by item comparison procedure. Test-retest agreement for the five year old was 60 percent for the locational task and 65 percent for the temporal task. A comparison of the two tests revealed relatively similar results. For the locational task, the five year old was correct on eight of the twenty items on the first testing and ten of the twenty items were correct on retesting one week later. On the temporal task, he was correct on sixteen of twenty items and then fifteen of twenty correct one week later. The percent correct was similar for both administrations of the test items, but the lower number of agreements found when using the item by item comparison procedure indicated that this child showed little understanding of the two terms.

The six year old had 90 percent agreement for the locational task and 100 percent agreement for the temporal task. The seven year old had 100 percent agreement for the locational task and 65 percent for the temporal task. For this child, his two testings showed fourteen of the twenty items were correct at first then seventeen of twenty correct one week later. The poorer performance on the temporal task indicated a degree of uncertainty in his understanding of "before" and "after" when used as temporal terms. Test-retest agreement was 100 percent on both tasks for the eight year old.

Examiner reliability was not computed due to the simplicity of the scoring procedure.

II. RESULTS

Locational Task

Table I presents the means, standard deviations and ranges of scores on the locational task for the four age groups. The five year olds achieved a mean score of 6.7 correct out of a possible 10 (range of scores three to ten) for "before" and a mean score of 6.5 correct out of a possible 10 (range of scores four to ten) for "after." The six year olds achieved a mean score of 9.4 correct (range of scores eight to ten) for "before" and 8.9 (range of scores seven to ten) for "after." The seven year olds achieved a mean score of 8.3 correct for both terms; however, the range of scores was five to ten for "before" and six to ten for "after." The eight year olds received a mean score of 7.6 correct for "before" and 6.2

Table I
Means, standard deviations, and ranges of scores*
for before and after as locational terms

Age Group	Measure	Before	After
5 Years	$\bar{X}$	6.70	6.50
	SD	2.95	2.68
	Range	3-10	4-10
6 Years	$\bar{X}$	9.40	8.90
	SD	.70	1.66
	Range	8-10	7-10
7 Years	$\bar{X}$	8.30	8.30
	SD	2.06	1.95
	Range	5-10	6-10
8 Years	$\bar{X}$	7.60	6.20
	SD	4.06	4.44
	Range	0-10	0-10

*Maximum score = 10

for "after" with a range of scores from zero to ten for both terms. Raw data for individual subjects on the locational task are shown in Appendix C.

Figure I presents the mean percentages of correct responses for the locational task. From this graph, it can be seen that all age groups except for the seven year olds, who performed equally well on both terms, received a higher percentage correct for "before." For "before" the mean percentage correct increased from 67 percent for the five year olds to 94 percent for the six year olds then dropped to 83 percent for the seven year olds and 76 percent for the eight year olds. The same pattern of responses was seen for "after." The mean percentage correct increased from 65 percent for the five year olds to 89 percent for the six year olds then dropped to 83 percent for the seven year olds and 62 percent for the eight year olds. One factor which influenced the mean scores for the eight year old group was the fact that two subjects did not answer any of the locational items correctly; they consistently placed the toys in the wrong position for each test item.

Table II presents an analysis of variance based on the number of correct responses of the four groups for the locational task. The results of this analysis indicated that there were no significant differences in the mean number of correct responses to the locational task among the four age groups. The analysis also indicated that there was no significant difference between the number of correct responses to "before" and "after" as locational terms by the total group.

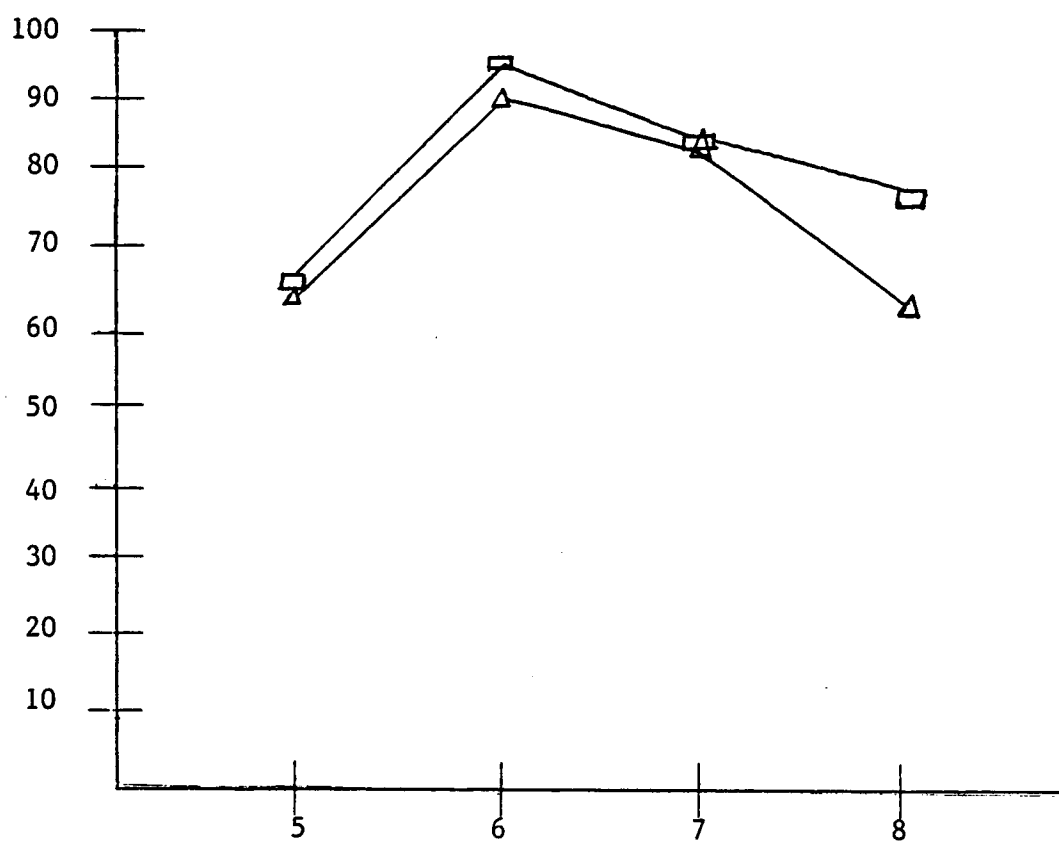


Figure I. Mean percentages of correct responses for 5, 6, 7, and 8 year olds on before (□) and after (△) as locational terms

Table II
Summary of a two-factor analysis of variance
between 5, 6, 7, and 8 year olds on before
and after as locational terms

Source of Variation	SS	df	MS	F	p
Total	667.49	79	--	--	--
Between subjects	555.99	39	--	--	--
¹ Groups	86.14	3	28.71	2.20	NS
Error _{between}	469.85	36	13.05	--	--
Within subjects	111.50	40	--	--	--
² Task	5.49	1	5.49	1.97	NS
Task x groups	5.76	3	1.92	.69	NS
Error _{within}	100.25	36	2.78	--	--

¹Groups = ages (5, 6, 7, 8)

²Task = before, after

Temporal Task

Table III presents the means, standard deviations and ranges of scores on the temporal task for the four age groups. The five year olds achieved a mean score of 4.5 correct out of a possible five (range of scores two to five) for "before"-order of mention construction and a mean score of 3.6 correct (range of scores one to five) for "before"-reverse construction. For "after," they achieved a mean of 4.1 (range of scores one to five) for the order of mention construction and 3.4 (range of scores one to five) for the reverse construction. The six year olds received mean scores of 4.7 for the order of mention construction and 4.3 for the reverse construction for "before" with a range of scores from three to five for both constructions, and mean scores of 4.3 (range of scores three to five) for the order of mention construction and 3.8 (range of scores one to five) for the reverse construction for "after." For "before," the seven year olds achieved mean scores of 4.9 (order of mention construction) and 4.8 (reverse construction) with scores ranging from four to five for both constructions. For "after," they achieved mean scores of 4.8 (range of scores four to five) for the order of mention construction and 4.2 (range of scores zero to five) for the reverse construction. The eight year olds received mean scores on "before" of 4.8 (range of scores four to five) for the order of mention construction and 4.5 (range of scores three to five) for the reverse construction. For "after," they received mean scores of 4.6 (range of scores one to five) for the order of mention construction and 3.8 (range of scores zero to five) for the reverse construction.

Table III

Means, standard deviations, and ranges of scores*
for before and after as temporal terms

Age Group	Measure	Before		After	
		Order of Mention	Reverse	Order of Mention	Reverse
5 Years	$\bar{X}$	4.50	3.60	4.10	3.40
	SD	.97	1.66	1.29	1.51
	Range	2-5	1-5	1-5	1-5
6 Years	$\bar{X}$	4.70	4.30	4.30	3.80
	SD	.67	1.06	.67	1.55
	Range	3-5	3-5	3-5	1-5
7 Years	$\bar{X}$	4.90	4.80	4.80	4.20
	SD	.32	.42	.42	1.62
	Range	4-5	4-5	4-5	0-5
8 Years	$\bar{X}$	4.80	4.50	4.60	3.80
	SD	.42	.71	1.26	1.62
	Range	4-5	3-5	1-5	0-5

*Maximum score = 5

Table IV presents an analysis of variance based on the number of correct responses of the four groups on the temporal task. The results of this analysis indicated that there was no significant difference in the number of correct responses on the temporal task among the four age groups. There was a significant difference ($F=4.29$, $p<.05$) between the number of correct responses to "before" and "after" as temporal terms by the subject group. The analysis also revealed that there was a significant difference ($F=17.16$, $p<.01$) between the number of correct responses to the order of mention construction and the reverse construction by the subject group. These results indicated that although there were no significant differences among the performance of the four age groups, there was a significant difference in performance between "before" and "after" and between the order of mention versus reverse construction by the subject group as a whole. Table V illustrates these differences by presenting the mean percentages of correct responses for each age group. The percentage of correct responses was greater for "before" versus "after" for all ages. For all age groups the percentage of correct responses was also greater for the order of mention construction, regardless of the specific term. For "before," the five year olds received a score of 90 percent correct for the order of mention construction and 72 percent correct for the reverse construction. For "after," they received scores of 82 percent correct for the order of mention construction and 68 percent for the reverse construction. The six year olds achieved scores of 94 percent correct (order of mention construction) and 86 percent

Table IV

Summary of a three-factor analysis of variance
between 5, 6, 7, and 8 year olds on before
and after as temporal terms

Source of Variation	SS	df	MS	F	p
Total	212.70	159	--	--	--
Between subjects	99.45	39	--	--	--
¹ Groups	12.50	3	4.17	1.72	NS
Error _{between}	86.95	36	2.42	--	--
Within subjects	113.25	120	--	--	--
² Task	6.00	1	6.00	4.29	<.05
³ Construction	11.50	1	11.50	17.16	<.01
Group x task	.25	3	.08	.06	NS
Group x construction	1.25	3	.42	.63	NS
Task x construction	.75	1	.75	1.47	NS
Group x task x construction	.55	3	.18	.35	NS
Error ₁	50.50	36	1.40	--	--
Error ₂	24.00	36	.67	--	--
Error ₃	18.45	36	.51	--	--

¹Groups = ages (5, 6, 7, 8)

²Task = before, after

³Construction = order of mention, reverse

Table V

Mean percentage of correct responses by construction for before and after as temporal terms (order of mention and reverse order) and the mean percentage of before and after scores

Age Group	Before			After		
	Order of Mention	Reverse	Total	Order of Mention	Reverse	Total
5 Years	90	72	81	82	68	75
6 Years	94	86	90	86	76	81
7 Years	98	96	97	96	84	90
8 Years	96	90	93	92	76	84

correct (reverse construction) for "before," and 86 percent correct (order of mention construction) and 76 percent correct (reverse construction) for "after." The seven year olds received scores of 98 percent correct (order of mention construction) and 96 percent correct (reverse construction) for "before," and 96 percent correct (order of mention construction) and 84 percent (reverse construction) for "after." For "before," the eight year olds achieved 96 percent correct for the order of mention construction and 90 percent correct for the reverse construction. For "after," they achieved 92 percent correct for the order of mention construction and only 76 percent for the reverse construction.

III. DISCUSSION

Locational Task

Results of the locational task were unexpected. Because previous studies have reported increases in performance between the ages of three and five years on similar tasks (Clark, 1971; Friedman & Seely, 1976), it was expected that an increase in the mean number of correct responses would have been seen for the four age groups in the present investigation. However, for both "before" and "after," an increase in the mean number of correct responses was seen from age five to six, then a decrease in the mean number correct was seen from age six to seven and from age seven to eight. If the two eight year old subjects who received scores of zero are removed from the analysis, a different pattern results. The eight year olds would have received the highest mean number correct for "before,"

and their mean score for "after" would have increased from the lowest score to the third highest score. Therefore, the performance of these two subjects affected the outcome and they may not have been representative of the eight year old population.

Another factor which may have contributed to the results was the task itself. It is possible that the locational task was not difficult enough to discriminate between the groups' understanding of "before" and "after." For example, in the five year old group, four of the ten children received perfect scores on "before" on the locational task.

Temporal Task

An unexpected finding was the fact that all four age groups performed similarly on the temporal task. It was expected that the mean number of correct responses would have increased with age, but they did not. However, the raw data reflect more consistency of understanding among the older children than among the younger. The difference within these age groups may have been demonstrated by speed rather than group accuracy of response. However, latency of response was not measured in this investigation.

The results of the temporal task suggested that sentences containing "before" were more easily understood than sentences containing "after" by all of the children regardless of the construction (order of mention or reverse). These findings agree with those of Clark (1971) and Trosborg (1981) and offer some support for Clark's (1973) semantic feature hypothesis. This would indicate that the

children had acquired the features (+Time) and (-Simultaneous), but still had some confusion about (+Prior).

The findings of the temporal task also suggested that an order of mention strategy was used by all of the age groups. For each age group, sentences appeared to be more easily understood when the order of mention of the two actions was the same as the order in which they should be acted out ("Clap your hands before you stand up"). Across age groups, this difference was significant ($p < .01$). These results offer more support for an order of mention strategy (Clark, 1971; Trosborg, 1981) than for a main clause strategy (Amidon & Carey, 1972; Johnson, 1975; Amidon, 1976) when interpreting the meaning of "before" and "after" as temporal conjunctions. Amidon and Carey (1972) stated that order of mention may be an earlier strategy and become subordinate to others at five years of age. However, in the present investigation, children from five to eight years performed significantly better for the "order of mention" construction for both "before" and "after."

All errors on the temporal task were reversals (both of the actions were performed, but in the incorrect order) rather than omissions of the subordinating clause. This finding suggested that a main clause strategy (Amidon & Carey, 1972; Johnson, 1975; Amidon, 1976) was not employed by the subjects in this investigation, and that errors were due to semantic complexity of the words rather than syntactic complexity of the subordinating clause construction. Johnson (1975) reported that the type of error may also be due to the particular task. She suggested that "command" procedures may elicit

more omission errors. However, in the present investigation a "command" procedure was employed and all errors were reversals of the two actions rather than omissions of the action described in the subordinate clause.

Amidon and Carey (1972) stated that very few of the five and six year olds understood the meanings of "before" and "after" at the beginning of their study. Amidon (1976) reported a significant improvement for all connectives (including "before" and "after") from the ages of five to seven. However, the results of the present investigation indicated that there were no significant differences for the temporal task among the five, six, seven, and eight year olds. A comparison of the mean percentage of correct responses for children in Johnson's (1975) study as compared with the five year olds in the present study indicated that the children in the present study had a higher percentage of correct responses for each construction. Johnson's five year old subjects had a mean percentage of 67 percent correct on "before" in the order of mention construction, while the present study's five year olds had 90 percent correct for that construction. The other comparisons for Johnson's data and for the present study, respectively, are 50 percent and 72 percent for "before" in the reverse construction, 53 percent and 82 percent for "after" in the order of mention construction, and 37 percent and 68 percent for "after" in the reverse construction. Although the general pattern is similar, five year olds in the present study scored consistently higher. The differences may have been due to slight differences in the tasks. Johnson's instructions involved the

children moving objects ("After you move the pink car, move the green car"), while the present investigation involved the children performing two actions ("After you stand up, clap your hands"). Also the subjects in Johnson's study ranged in age from 4:2 (years, months) to 5:2 with a mean age of 4:8, while the ages in the present study ranged from 4:10 to 5:2 with a mean of 4:11. Children in the present study were slightly older. Another factor could have been a difference in language skill between the two groups. The children in the present study were required to pass a syntax screening test, while Johnson's study had no language skill criteria.

CHAPTER IV

SUMMARY AND CONCLUSIONS

I. SUMMARY

The purpose of this study was to determine if differences existed in the performance of five, six, seven, and eight year old children on comprehension tasks of "before" and "after" used as locational and temporal terms.

The study included 40 children divided equally into four age groups (five, six, seven, and eight year olds). All subjects passed a pure tone audiometric screening test and exhibited normal speech and language development as determined by parent and/or teacher reports and age appropriate scores on the receptive portion of the Northwestern Syntax Screening Test (Lee, 1969). Each subject also demonstrated manual dexterity adequate for the performance of the tasks.

The number of correct responses were scored for each subject on a locational task involving the children placing a toy either "before" or "after" another toy and on a temporal task involving the children following directions to perform two actions in a specific order. Analysis of the data included a two-factor-mixed design: repeated measures on one factor analysis of variance on the locational task and a three-factor-mixed design: repeated measures on two factors analysis of variance on the temporal task.

Results of the study indicated that there were no significant

differences among the four age groups on either the locational task or the temporal task. However, across age groups the children performed significantly better with sentences containing "before" than "after" on the temporal task and on sentences in which the order of mention of events corresponded with the actual order of performance of the two actions.

II. CONCLUSIONS

Based on the results of this study and considering the relatively small subject population, the following conclusions can be tentatively drawn. No significant difference was demonstrated in the understanding of "before" and "after" used as locational terms among five, six, seven, and eight year old children. However, when used as temporal terms, "before" is more easily understood than "after" by children between the ages of five and eight. Finally, when processing commands with "before" and "after" indicating the temporal order of two events, children between the ages of five and eight performed better when the order the two events were mentioned corresponded with the order they were to be performed.

III. LIMITATIONS OF THE STUDY

This study was limited in the following ways:

1. The sample of subjects for each age group was small and may not have been representative of the entire population.
2. Screening criteria for the subjects included syntactic skill,

where a cognitive or semantic criteria may have defined more homogeneous groups.

3. The study included only males and therefore the results cannot be generalized to the female population.

IV. SUGGESTIONS FOR FURTHER STUDY

1. The experimental design of the temporal task could be used with the addition of a production task. This may differentiate between the age groups thus providing more information concerning children's understanding of temporal word meaning.
2. The same experimental design could be used with children selected on the basis of cognitive ability rather than syntactic skill in order to reflect possible differences between the age groups.

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APPENDICES

APPENDIX A

STIMULI SENTENCES FOR LOCATIONAL TASK

1. Put the car before the Smurf.
2. Put the car before E.T.
3. Put the car after the Smurf.
4. Put the car before the cowboy.
5. Put the car after the helicopter.
6. Put the car after the firetruck.
7. Put the car before the helicopter.
8. Put the car after E.T.
9. Put the car before the firetruck.
10. Put the car after the cowboy.
11. Put the Smurf before the cowboy.
12. Put the Smurf before E.T.
13. Put the Smurf after the cowboy.
14. Put the Smurf before the helicopter.
15. Put the Smurf after the car.
18. Put the Smurf after E.T.
19. Put the Smurf before the firetruck.
20. Put the Smurf after the helicopter.

APPENDIX B

STIMULI SENTENCES FOR TEMPORAL TASK

1. Clap your hands before you stand up.
2. Pick up the car after you stamp your foot.
3. After you touch your nose, clap your hands.
4. Raise your hand before you pick up the car.
5. Before you clap your hands, stand up.
6. Stamp your foot after you touch your nose.
7. Touch your nose after you clap your hands.
8. Pick up the car before you stamp your foot.
9. Before you touch your nose, clap your hands.
10. After you raise your hand, pick up the car.
11. Stamp your foot before you touch your nose.
12. Before you raise your hand, pick up the car.
13. Touch your nose before you clap your hands.
14. After you clap your hands, stand up.
15. Raise your hand after you pick up the car.
16. After you stamp your foot, touch your nose.
17. Clap your hands after you stand up.
18. Before you pick up the car, stamp your foot.
19. Before you stamp your foot, touch your nose.
20. After you pick up the car, stamp your foot.

APPENDIX C

RAW DATA

Listing of the subjects' correct responses to the locational task
out of a possible ten points

Subjects

<u>Group I</u>	<u>Before</u>	<u>After</u>
1	4	4
2	5	6
3	3	9
4	5	5
5	10	10
6	10	10
7	4	4
8	10	9
9	10	4
10	6	4
	<u>mean</u>	<u>6.5</u>
	6.7	

Group II

1	10	10
2	10	9
3	8	10
4	9	9
5	10	10
6	9	7
7	10	10
8	10	10
9	9	5
10	9	9
	<u>mean</u>	<u>8.9</u>
	9.4	

SubjectsGroup IIIBeforeAfter

1	7	8
2	10	10
3	10	10
4	10	10
5	6	6
6	10	10
7	6	6
8	9	9
9	5	9
10	10	5
	<u>8.3</u>	<u>8.3</u>
mean		

Group IV

1	0	0
2	0	0
3	10	10
4	10	10
5	9	2
6	9	7
7	8	3
8	10	10
9	10	10
10	10	10
	<u>7.6</u>	<u>6.2</u>
mean		

APPENDIX D

RAW DATA

Listing of the subjects' correct responses to the temporal task
out of a possible five points

<u>Subjects</u>	<u>Before</u>		<u>After</u>	
	<u>order of mention</u>	<u>reverse</u>	<u>order of mention</u>	<u>reverse</u>
<u>Group I</u>				
1	4	4	4	4
2	5	4	1	1
3	5	4	1	1
4	4	2	4	2
5	5	5	4	2
6	5	5	5	5
7	5	4	5	4
8	5	5	5	5
9	5	5	5	5
10	2	1	5	2
mean	<u>4.5</u>	<u>3.6</u>	<u>4.1</u>	<u>3.4</u>

<u>Group II</u>				
1	5	5	4	4
2	5	3	4	4
3	3	2	3	1
4	5	5	5	5
5	5	5	4	5
6	5	4	5	1
7	4	4	4	5
8	5	5	5	4
9	5	5	5	4
10	5	5	4	4
mean	<u>4.7</u>	<u>4.3</u>	<u>4.3</u>	<u>3.8</u>

<u>Subjects</u>	<u>Before</u>		<u>After</u>	
	order of mention	reverse	order of mention	reverse
<u>Group III</u>				
1	5	5	4	5
2	4	5	5	5
3	5	5	5	5
4	5	5	5	5
5	5	4	5	3
6	5	5	4	0
7	5	5	5	5
8	5	5	5	5
9	5	5	5	4
10	5	4	5	5
mean	<u>4.9</u>	<u>4.8</u>	<u>4.8</u>	<u>4.2</u>

<u>Group IV</u>				
1	5	5	5	5
2	5	4	5	4
3	5	5	5	4
4	5	5	5	5
5	5	5	1	0
6	5	5	5	5
7	4	3	5	2
8	5	4	5	4
9	4	4	5	4
10	5	5	5	5
mean	<u>4.8</u>	<u>4.5</u>	<u>4.6</u>	<u>3.8</u>

VITA

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