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AN ABSTRACT OF THE THESIS OF Ronald Michael Dohr for the
Master of Science in Speech presented May 16, 1975.

Title: Effects of Color, Noun Position, and Verb Proximity
on the Acquisition of Direct Objects.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

Theodore Grove, Chairman

Gerald Murch, Committee Advisor

Lara Barna

Larry Steward

The purpose of this study is to determine if colors can differentially be applied as teaching tools for pre-school children. Previous studies have shown that pre-school children are easily distracted in language development by external stimulation. Studies have also shown that brighter color hues can arouse and facilitate performance of subjects on given tasks. This experiment is an attempt

to measure performance of word manipulation by usage of colors. Three independent variables have been selected as stimuli to measure direct object acquisition. Measurement of color, noun position, and verb proximity will be assessed in connection with subject performance on given tasks.

Twenty preschool children were randomly selected from Towne Carouselle Day School in Portland, Oregon. Subjects were divided in half, each group exposed to one level of verb proximity, two levels of noun position, and three levels of color.

It was found that warm colors facilitate the acquisition of direct objects. Brighter color hues produced significantly greater efficiency in achieving correct responses on test-questions and less time-elapse for those responses. Noun position also proved to be significant. First position nouns produced more correct responses than third position nouns. Verb proximity created no statistical significance and there was no difference between performances of subjects exposed to level one of verb proximity and performances of subjects exposed to level two of verb proximity. Because of the trend of color influences for correct responses (warm color > neutral color > cold color) and the trend of color influences for time-elapse of responses (warm color < neutral color < cold color); more research is needed in the area of testing color hues as teaching tools for preschool children.

Further study was suggested for the following:

- (a) exploration into the concepts of noun and verb relationships,
- (b) assessment of child's level of awareness of his own speech, and
- (c) determining what extent color hues can combat external stimulation.

The present study may be of most value if applied as a teaching tool for studying relationships between nouns and verbs in preschool children.

EFFECTS OF COLORS, NOUN POSITION, AND VERB PROXIMITY,
ON THE ACQUISITION OF DIRECT OBJECTS

by

RONALD M. DOHR

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE
in

SPEECH: EMPHASIS ON COMMUNICATION THEORIES

Portland State University
1975

TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

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May 23, 1975

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CHAPTER 1

INTRODUCTION AND THEORETICAL BACKGROUND

The purpose of this study is to determine if colors can differentially be applied as teaching tools for pre-school children. This experiment focused on a small point of grammar--the direct objects of verbs. Our concern with the direct object is one of acquisition. That is to say, can a child select the main noun of a sentence more times in his performance, if the physical referent of that noun is presented in a warm color hue?

The performance/competence dichotomy could be studied in three major ways: 1) direct objects could be considered from a syntax point of view; 2) direct objects could be considered from a semantic point of view; 3) the sound or phonological aspect of direct objects could be considered.

This study will be limited in the performance/competence dichotomy to how well a preschool child can perform on given tasks in regards to instructions. The instructions will assess the child's ability to select direct objects. It will be determined in this experiment whether the variables of color, noun position, and verb proximity have any influence on the child's performance in manipulation of objects referred to in oral instructions.

The preschool child perceives many of the same things as the adult, but in a different way.¹ Most of the research by Vygotsky suggests that children form complexes in which individual objects are united in the child's mind by creatively produced bonds that exist between objects. In various experiments of complex building and thinking where the child combines objects into collections, there is some evidence that the child does so on the basis of some one trait which either differs or compliments one another.²

According to Vygotsky, pseudo-complex is a generalization in the child's mind when he associates two objects because of some perceptual likeness. These pseudo-complexes make up the majority of complexes formed in the preschool child's mind. The direction of which a complex will develop is dependent upon the meanings already given to words in the adult language system. Research suggests that the child at the complex stage is highly capable of arriving at the same word meanings as an adult, however, his grammatical set of rules for arriving at those meanings is entirely different than of the adult.³

In young children, objects and situations that have

¹L. S. Vygotsky, Thought and Language (Cambridge: M.I.T. Press, 1962), p. 66.

²Ibid.

³Ibid.

similar features result in common responses.⁴ Once a child has associated a word with an object he applies it to new objects that have similar attributes. Associations between words and objects can become stronger or weaker depending on what levels words are associated with the new objects. According to Piaget, the meanings of words are considered as individual grammatical units after a meaningful complex has been formed.⁵

There is a large amount of data suggesting that the rules governing the relationships between nouns and verbs for preschool children is often times different than for adults.⁶ The child's speech may be characterized as telegraphic speech, in that it lacks articles, adjectives, and prepositions. The typical preschool child's speech is at this level.⁷

McNeill has demonstrated that preschool children have preferences for nouns to be in the first position of sentences.⁸ In the same study McNeill also found children

⁴Ibid.

⁵Jean Piaget, The Language and Thought of the Child (New York: Humanities Press, Inc., 1952), p. 125.

⁶David McNeill, "The acquisition of direct objects in Japanese," Child Development, 1971, 42, 248.

⁷Colleen McElroy, Speech and Language Development of the Preschool Child (Springfield: Charles C. Thomas Publishing Co., 1972), p. 50.

⁸McNeill, "The acquisition of direct objects in Japanese," p. 244.

acquiring direct objects more efficiently when they were next to verbs. These results were especially applicable to children four years of age. Because of these findings, the variables of noun position and verb proximity were selected as potential variables for facilitating direct object acquisition.

This investigation was designed to see if color can facilitate the acquisition of direct objects. That is to say, will a child select a main noun more if it is of a certain color? Color affects behavior in our environment. Color as an arousal stimulus influences a child's behavioral preferences in performance.⁹ The effects of different colors on one's susceptibility to acquisition could be demonstrated by testing color hues with performance efficiency. Studies show that certain color hues affect behavior in different ways.¹⁰ Young children prefer yellow and as age increases there is a reduction in this preference and a gaining susceptibility to the color blue. In 1930, Goldstein maintained that,

The longer light wavelengths such as red, have an "Expansive Effect" in the sense that it causes an increase of susceptibility to external stimuli. Further, red induces a state of excitation and stimulation on both the emotional and motor level. In contrast, green has a shorter light wavelength, and has a "Contractive Effect" in that it causes a

⁹R. D. Norman, "Color and affect, a review and semantic evaluation," Journal of General Psychology, 1952, 46, 187.

¹⁰Ibid., p. 188.

withdrawal from the external world and a decreased susceptibility to its influences. Green promotes tranquility on both a motor and emotional level.¹¹

Longer light wavelengths have become known as "warm" colors and shorter light wavelengths have become known as "cold" colors. Warm colors have arousal tendencies on one's behavior and cold colors have an opposite effect.¹²

Most of the studies on warm/cold colors focus on the emotional attributes of color on human personality. To the author's knowledge there is no research in the area of how warm/cold colors affect the performance efficiency of acquiring direct objects. The present investigation assesses the influences of color hues, noun positions, and verb proximity on direct objects.

Hypotheses

Summary of color studies suggest that brighter color hues (warm colors) will have an "Expansive Effect" on subjects and facilitate their performance in selecting direct objects. Cold colors will have the opposite effect of influence on the direct object acquisition. The influences of neutral colors should fall between warm and cold. These findings lead the author to predict: 1) warm colors will facilitate the acquisition of direct objects more than cold

¹¹Jacob S. Nakshian, "The effects of red and green surroundings on behavior," Journal of General Psychology, 1964, 70, 146.

¹²Ibid., p. 143.

colors; 2) warm colors should interact favorably with the two variables of noun position and verb proximity; 3) there will be a three-variable interaction effect of warm color, first position nouns, and near verbs.

Summary of studies on noun and verb relationships have shown that preschool children prefer main nouns (direct objects) to occupy the first positions of sentences. There is also evidence suggesting that children will acquire these nouns more readily if the verb is next to the direct object in sentence position. Because of the previous findings the author predicts: 1) there will be a main effect of noun position in which first position nouns facilitate subjects in their tasks of selecting direct objects more than third position nouns; 2) there will be a main effect of verb proximity in which verbs next to the main noun will facilitate selection of that direct object more than nouns in a far verb proximity.

CHAPTER II

METHODS

Subjects

The group of subjects for this study were drawn from a number of preschool children from the ages of three years and five months to four years and five months. Subjects were selected from Towne Carouselle Day School in Beaverton, Oregon. Twenty subjects, eleven females and nine males, were selected at random from the fifty-nine children who were born between July, 1970 and June, 1971. In the random selection, numbers "1" through "59" were assigned to each one of the group population. Selection of twenty subjects proceeded with the aid of a random numbers table.¹³ Upon checking with the director of the Towne Carouselle, it was found that none of the subjects selected for the study had any deviant language problems, any color-blindness, or any severe intellectual or emotional deficit which might alter the subject's performance.

Subjects were chosen at the age of four because they are capable of perceiving objects and distinguishing between them. Their level of language is developed to connecting

¹³W. Mendenhall, Introduction of Probability and Statistics (Belmont: Duxbury Press, 1971), p. 448.

two or three words together and maintaining some type of grammatical relationship between word meaning and position in a sentence.

The Towne Carouselle Day School was chosen as the source of study because of its wide range of children to be used as subjects. There are twenty-two major Day Cares in the Portland area with over fifty children, however, there are only four with populations over one hundred and sixty children. Towne Carouselle is one of those large schools and it draws clientele from a large middle class area.

Independent Variables

The three independent variables used in this study were color (C), noun position (NP), and verb proximity (VP). The design was a 3x2x2 three-factor experiment with repeated measures. The three levels of color were warm (C_w), cold (C_c), and neutral (C_n). There were two levels of noun position, consisting of 1) the direct object in the first position (NP_f), and 2) the direct object in the third position of the sentence (NP_t). The third independent variable was verb proximity. Ten of the subjects were assigned at random to group one and the other half assigned to group two. Group one subjects were exposed to near verb proximity (VP_n), and group two subjects were exposed to far verb proximity (VP_f).

In this three-factor (CxNPxVP) experiment there are

repeated measure observations on factors (C) and (NP). Each of the subjects were observed under all combinations of these two factors and under a single level of VP (see Figure 1).

Figure 1. Treatment variables of color, noun position, and verb proximity.

According to the research surveyed in the introduction, the VP variable was least likely to have a significant effect upon direct object acquisition. Because of this finding it was determined that repeated measures would not be obtained on this variable, thereby keeping the testing period length for each S to one-half of the time it otherwise would have taken. Each subject was exposed to eight replications of test sentences for each of the CxNP (6) experimental conditions, a total of forty-eight different test-sentences. All sentences for Ss in group one were VP_n types; all sentences for Ss in group two were VP_f sentences.

Operational Definitions

Warm colors consisted of red and orange. Cold colors

consisted of blue and green. Neutral was designated as grey. The three qualities making up the colors used in the experiment can be located in Table I listed below.

TABLE I
MUNSELL REFERENCE CHART¹⁴

<u>Colors</u>	<u>Table No.</u>	<u>Location</u>	<u>Hue</u>	<u>Value</u>	<u>Chroma</u>
Blue	21	8D	5.5PB	3.3	10.7
Green	26	7B	4.5G	5.9	8.1
Red	12	8B	.5R	4.2	13.0
Orange	7	8B	1.5YR	5.8	13.1
Grey	24	2D	6.OPB	5.7	0.9

Noun position was defined by manipulation of the position of the direct object within the sentence. In the test sentences the direct object was placed in the first position (NP_f) or in the third position (NP_t). There was no way to test for far verb proximity with the direct object in the second position, so that condition was omitted.

Verb proximity was defined by manipulation of the distance of the verb from the main noun in the sentence. The test sentences where the direct object is in a position

¹⁴A. Kornerup, Methuen Handbook of Colour (London, 1961), p. 225.

A Munsell reference has three terms: Hue-position across the spectrum; Value-position of lightness-darkness scale; and Chroma-position on a neutral-colorfulness scale.

next to the verb comprised the near verb proximity condition (VP_n). Sentences where the direct object and the verb are separated comprised the far verb proximity condition (VP_f).

TESTING STIMULI

Test-Toy Stimuli

Small toys were the referents for the direct and indirect objects in the test sentences. The six referents for the direct objects were: two warm color objects (red balloon, orange block), two cold color objects (green crayon, blue comb), and two neutral color objects (grey house, grey key). Duplicates of these referents for the warm and cold colors were used, however, their colors were reversed. For example, if a referent was a red balloon then its duplicate was a cold color (blue or green balloon). Duplicates were used for the warm and cold colored referents to control for the effects of dimension and shape preferences for certain referents. Half the subjects were exposed to the original warm and cold colored referents and the other half exposed to the duplicates.

The ten referents that represented the indirect objects were as follows: pen, boat, chain, rubberband, telephone, ball, toothbrush, fork, spoon, and watch. These "neutral-grey" colored test-toys were combined with the toys representing the direct objects to form the test-sentences.

Test-Sentence Stimuli

Test sentences consisted of a direct object, indirect object, and a verb. The subjects were showed pairs of toys, one representing the direct object and one representing the indirect object and asked to move one toy next to the other in response to a command. Examples of the commands are: "Push the bottle to the toy soldier." "To the toy soldier the bottle push." "The bottle to the toy soldier push." The order of the direct object, indirect object, and verb varied, however, the specific performance requested remained the same. By noting which toy the child moved it could be determined which of the two objects the child took to be the main noun (direct object) in the sentence. The verbs in the test sentences always implied a sense of "movement" or "transport." Each sentence alternated across the verbs: push, move, or give and referred to a different pair of toys.

Test-Procedures¹⁵

The subjects were tested individually in the teacher's room at the Towne Carouselle in Beaverton, Oregon. Subjects

¹⁵On December 15, 1974, a "pilot-test" was administered to six four year old subjects at a day care in Tigard, Oregon. The purpose was to find out if subjects were familiar with the test-toys and test-sentences and capable of performing the tasks. Three males and three females were divided into (VP_n) and (VP_f) groups. Results showed that all subjects were capable of carrying out the test-tasks.

were exposed either to the forty-eight sentences for VP_n or to the forty-eight sentences for VP_f . Before hearing a test-sentence, the subjects were asked to name all of the test-toys for name familiarity. In two warm-up sentences subjects were instructed to move one C_n toy so that it touched another C_n toy. If for some reason a subject moved both of the C_n toys or refused to move either one, two replications of warm-up would have been presented. This was not necessary, because all subjects immediately acquired the procedure. Subsequently, subjects were tested with the forty-eight sentences. Testing for each S took sixteen minutes. During the period from January 14th through January 17th five subjects were tested daily.

Dependent Measures

Raw scores consisted of the number of times the subject correctly moved the appropriate toy. Scores were totaled for each subject in each of the treatments. Two types of data were totaled. Dichotamous data consisted of the number of correctly moved toys and continuous data consisted of the time-elapsd from sentence exposure to toy manipulation.

Hypotheses

$$(1) C_w > C_n, C_c$$

$$(2) NP_f > NP_t$$

- (3) $VP_n > VP_f$
- (4) $C_w \times NP_f > C_w \times NP_t$
- (5) $C_w \times VP_n > C_w \times VP_f$
- (6) Three-variable interaction for the $C_w \times NP_f \times VP_n$ condition.

CHAPTER III

RESULTS AND DISCUSSION

Raw scores for the total numbers of correct responses for each of the subjects in each of the treatments and total times in seconds for each of the subjects in each of the treatments were assessed as performance data. Statistical analysis was by means of Winer's version of analysis of variance for a three-factor experiment with repeated measures.

Data ranged from 0-8 in the treatment cells for correct responses. Data ranged from 11-35.6 seconds in the treatment cells for time-elapse. The raw data for correct responses and time-elapse can be found on Tables II and III.

The total performance for subjects in the VP_n and VP_f groups ranged from 19-42 for correct responses and the average total of correct responses for all of the subjects was 29.45. Total time-elapse for each of the subjects varied from 122.2-182.5 seconds and the average total time in seconds for all of the subjects was 142.1 seconds.

A Pearson product-moment correlation coefficient between correct responses data and time-elapse data produced a product of $-.15$. This correlation failed to reach statistical significance at the $.05$ level ($t = .67$, $df = 18$).

TABLE II
RAW SCORE TABLE FOR CORRECT RESPONSES

	Subjects	C_w		C_c		C_n		Totals
		NP_f	NP_t	NP_f	NP_t	NP_f	NP_t	
VP_n	1	7	7	8	1	8	5	36
	2	6	4	4	2	7	1	24
	3	6	5	2	2	7	1	23
	4	4	3	4	1	7	0	19
	5	8	4	8	1	8	2	31
	6	8	7	6	1	8	2	32
	7	8	6	8	1	8	1	32
	8	8	8	5	8	7	6	42
	9	7	4	3	1	3	2	20
	10	8	3	7	3	8	3	32
VP_f	11	8	7	7	4	5	5	36
	12	8	8	7	1	8	1	33
	13	8	3	5	2	7	1	26
	14	7	7	4	0	7	1	26
	15	8	7	6	0	6	3	30
	16	8	6	6	2	4	1	27
	17	8	5	4	2	4	1	24
	18	6	6	6	3	4	5	30
	19	8	6	6	2	5	5	32
	20	8	7	7	0	8	4	34
Totals		T = 147	113	113	37	129	50	589
		$\bar{X}$ = 7.35	5.65	5.65	1.85	6.45	2.5	29.45

TABLE III
RAW SCORE TABLE FOR TIME-ELAPSE

	Subjects	C_w		C_c		C_n		Totals
		NP_f	NP_t	NP_f	NP_t	NP_f	NP_t	
VP_n	1	17.1	24	29.2	28.9	25.5	26.4	151.1
	2	17.9	20.8	27.7	27.5	24.8	25.5	144.2
	3	17.5	12.4	30.1	32	37.7	32	161.7
	4	17.4	21.7	27.1	31	25.2	26.7	149.1
	5	12	18.5	16.8	23.3	18.1	34.9	123.6
	6	20.2	31.2	34.5	35.6	32.8	28.2	182.5
	7	24.1	23.4	26.1	29.5	30.3	25.8	159.2
	8	15.7	23.1	28.7	24.3	24.5	24	140.3
	9	12.1	19.2	22.2	29.2	21.3	22.8	126.8
	10	11	19.6	21.5	25.8	21.8	22.5	122.2
VP_f	11	15.7	19	21.8	24	23.9	25.6	130
	12	22.8	19.3	18.9	26.7	34.6	21	143.3
	13	17.3	16.1	23.7	23.1	20.2	24.4	124.8
	14	16.1	16.0	25.2	27.8	30.9	31.8	147.8
	15	17.3	18.7	29.4	31.5	26.9	25.4	149.2
	16	19.1	18.9	24.2	27	32.9	24.7	146.8
	17	17.5	19	26.7	27.3	22.9	23.8	137.2
	18	19.6	19.7	26.8	26.7	26.5	25.4	144.7
	19	18.1	20.1	22.6	23.1	20.8	23	127.7
	20	11.6	11.8	26	26	26.5	26.8	128.7
Totals		T = 340.1	392.5	509.2	550.3	528.1	520.7	1380.2
		$\bar{X}$ = 17	19.6	25.5	27.5	26.4	26	142.05

Analysis of variances can be found on Tables IV and V. Results showed a significant main effect of color for correct responses. Warm color treatments produced more correct responses than did neutral and cold color treatments. Noun position also had a significant main effect. Treatments with first position nouns produced more correct responses than third position nouns. There was no statistical significance of verb proximity. There was no difference between subject performance in the VP_n group and subject performance in the VP_f group. There was an interaction between color and verb proximity, although a weak one. The summary table for color and verb proximity indicated more correct responses for treatments ($C_w \times VP_n$) and ($C_w \times VP_f$) than for other treatment combinations of these two variables. There was no significant interaction between noun position and verb proximity. A very significant interaction between color and noun position was found. Treatment cells with warm colors and first position nouns had more correct responses than did other treatment combinations of these two variables. There was no significant interaction between the variables of color, noun position, and verb proximity.

As indicated on Table V, analysis of variances for time-elapse were very similar to correct responses. There was a significant main effect of color. Warm color treatments had less time-elapse responses than did neutral or cold colored treatments. There was a weak significance of

TABLE IV
SUMMARY OF ANALYSIS OF VARIANCE
FOR CORRECT RESPONSES

Source of Variation	SS	df	MS	F
<u>Between Subjects</u>				
VP	.41	1	.41	.6967
Subj. w. groups [error (vp)]	105.41	18	5.86	
<u>Within Subjects</u>				
C	162.52	2	81.26	68.86*
(VP) (C)	9.81	2	4.91	4.16**
C x subj. w. groups [error (c)]	42.34	36	1.18	
NP	297.67	1	297.67	78.33*
(VP) (NP)	1.41	2	.71	.1842
NP x subj. w. groups [error (np)]	68.42	18	3.80	
(C) (NP)	31.65	2	15.83	7.647*
(VP) (C) (NP)	7.82	2	3.91	1.888
(C) (NP) subj. w. groups [error (c) (np)]	74.53	36	2.07	

*p < .01

**p < .05

TABLE V
SUMMARY OF ANALYSIS OF VARIANCE
FOR TIME-ELAPSE

Source of Variation	SS	df	MS	F
<u>Between Subjects</u>				
VP	54	1	54	1.435
Subj. w. groups [error (vp)]	677.41	18	37.63	
<u>Within Subjects</u>				
C	1724.67	2	862.34	54.099*
(VP) (C)	11.13	2	5.57	.3488
C x subj. w. groups [error (c)]	573.81	36	15.94	
NP	61.78	1	61.78	5.476**
(VP) (NP)	42.84	2	21.42	1.8989
NP x subj. w. groups [error (np)]	203.05	18	11.28	
(C) (NP)	50.46	2	25.23	.463
(VP) (C) (NP)	20.42	2	10.21	.0187
(C) (NP) x subj. w. groups [error (c) (np)]	1958.52	36	54.40	

*p < .01

**p < .05

noun position in time-elapse ($p < .05$). Treatments with nouns in the first position had less time-elapse of responses than did treatments with nouns in the third position of sentences. Verb proximity was found to be nonsignificant as well as interaction between color and verb proximity. Color was nonsignificant in interaction with noun position for time-elapse, suggesting that noun position facilitated efficiency in acquiring direct objects only for correct responses and not for time-elapse. Finally, there was no statistical significance in a three-way interaction between color, noun position, and verb proximity for time-elapse.

Analysis of variances for correct responses have thus far demonstrated main effects of color and noun position, and two-variable interactions between color X noun position and color X verb proximity. Analysis of variances for time-elapse of responses have indicated a main effect only for the variables of color and noun position. There were no two-variable interaction effects. Because of the tendency for reaction times in time-elapse of responses to be skewed, probability on a normal curve was plotted for time-elapse data, to determine if the data was normally distributed. Results determined that time-elapse data was indeed normally distributed.

A follow-up analysis was calculated to determine order rank of treatment variables. Edward's version of an

orthogonal comparison was used to determine whether warm color was significantly greater than neutral or cold color. Using ($df = 1,36$) an F-value was calculated at 91.52, indicating a level of significance of ($p < .01$). Warm colors did significantly produce more correct responses than neutral or cold colors ($C_w > C_n > C_c$). A similar comparison was used to determine the order of color treatments for time-elapse. Using ($df = 1,36$) an F-value was calculated at 108.11, indicating a significance of ($p < .01$). Warm colors did significantly decrease the time-elapse of performance more than neutral or cold color performance ($C_w < C_n < C_c$).

Interchangeability of direct object referents was necessary in the testing procedure. It was felt that these duplicate sets would not be a factor in the data. A two-tailed t-test for independent means was calculated to determine if there was any difference between the performance of subjects exposed to original referents for warm and cold colored toys and the performance of subjects exposed to duplicate referents for warm and cold colored toys. A critical t-value of 1.734 ($df = 18$) was established for a confidence level of $p < .01$. A t-value of .03 was calculated for time-elapse and .33 for correct responses. Since both values fell below the critical value, it can be concluded that there was no statistical difference between the original and duplicate referents

for correct responses and time-elapse of responses.

Orthogonal comparisons were used again to determine if color and noun position could be compared to other treatment conditions of these two variables in the following way: ($C_{wNP_f} > C_{wNP_t}, C_{nNP_f}, C_{nNP_t}, C_{cNP_f}, C_{cNP_t}$). It was found that using ($df = 1,36$) an F-value was 6.89 for correct response data, an F-value was 42.3 for time-elapse data. Correct responses were significant at the ($p < .05$) level and time-elapse of responses were significant at the ($p < .01$) level. These significances demonstrate that treatments for warm colors and first position nouns were selected more frequently by subjects and with less time-elapse for responses, than any other combination treatment of these two variables.

Trend analysis for linear and quadratic trends were calculated for color treatments as follows: (warm color > neutral color > cold color). An F-value of 128.16 was found in linear analysis using ($df = 1,36$). A level of significance ($p < .005$) was found indicating a significant linear order of treatment sums as follows: (warm color > neutral color > cold color). For time-elapse of responses an F-value of 83.8 was calculated at ($df = 1,36$). A level of significance ($p < .005$) was found for the linear order of treatment sums as follows: (warm color < neutral color < cold color).

Quadratic analysis was calculated for the same order

trends of color treatment sums. Using ($df = 1,36$) an F-value of 9.54 was found for correct responses. This quadratic trend was significant ($p < .005$) indicating order of quadratic trend for correct responses as follows: (warm color $>$ neutral color $>$ cold color). Quadratic analysis for time-elapse of responses indicated the same trend of treatment sums as for linear analysis. An F-value of 24.39 was found thus making a quadratic analysis significant ($p < .005$) for time-elapse of responses in the following order of treatment sums: (warm color $<$ neutral color $<$ cold color) (see Figures 2, 3, 4, 5).

Figure 2. Linear trend for correct responses.

Figure 3. Quadratic trend for correct responses.

Figure 4. Linear trend for time-elapse.

Figure 5. Quadratic trend for time-elapse.

CHAPTER IV

SUMMARY AND IMPLICATIONS

Summary

A study was made of twenty preschool children in a public day care school setting. Subjects were divided into (VP_n) and (VP_f) groups and tested for performance on a forty-eight test-sentence schema to determine efficiency to achieve responses from instructions. The three independent measures of color, noun position, and verb proximity were used to determine what influences these variables might have on the performance efficiency in correctly selecting direct objects. As dependent measures two types of data were assessed. Correct responses (dichotomous) and time-elapse of responses (continuous) were used to measure significances that independent variables might have on the acquisition of direct objects.

It was found that there was no significant difference in the performances of subjects exposed to original referents for warm and cold colored toys and subjects exposed to duplicate referents for warm and cold colored toys. This indicates that subjects reacted to the color hues and not to the dimension or shape of the referents for colored toys.

Analysis of variances demonstrated that colors did have a significant main effect ($p < .01$) for correct responses and time-elapse of responses. Trend analysis proved that order of color influence was (warm color $>$ neutral color $>$ cold color) for correct responses and order of color influence for time-elapse was (warm color $<$ neutral color $<$ cold color). It was also found that noun position produced a main effect at a level of significance ($p < .01$) for correct responses and $p < .05$ for time-elapse of responses. Orthogonal comparisons demonstrated that first position nouns were significantly greater in facilitating direct object acquisition than third position nouns. There was a nonsignificant effect of verb proximity. There was no statistical difference between (VP_n) and (VP_f) groups.

Whether the relationships of color to the emotional and motor level are due to inherent factors or the result of cultural associations is questionable. However, warm colors did demonstrate in this experiment that children will select the main noun in a sentence more when warm colors are used than when neutral or cold colors are used. Further research is needed to determine the direction and magnitude of colors as teaching tools for preschool children.

Implications

This study has demonstrated that color and noun

position can facilitate performance efficiency on tasks utilizing oral instructions. A major implication is the impact these variables may have for further assessment of language acquisition. A major factor in assessing performance and language competency in young preschool children is the understanding of how much a child's performance is altered by external stimulation. Smith (1970) tried to measure how much of a child's performance is altered by external stimulation, and how much of what the child receives is incorporated into his speech. From her results, it was determined that she could not, in her study arrive at such a measurement. Children apply some type of selectivity in determining what is grammatical and what they will use. The Smith study demonstrated that as a child develops his speech, he can be easily distracted. Until an appropriate methodology is developed in assessing performance competence, more efficient teaching tools are needed to combat against external stimulation. Color, in this study, has been shown to be highly significant in achieving correct performance on given tasks using words and direct objects. More research is needed in assessing warm color hues as teaching tools for preschool children.

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APPENDIX I

DISTRIBUTION OF SUBJECT'S AGES

4 yrs.			
3 yr.-11 mo.		4 yr.-1 mo.	
3 yr.-10 mo.	2	4 yr.-2 mo.	
3 yr.-9 mo.	0	4 yr.-3 mo.	0
3 yr.-8 mo.	1	4 yr.-4 mo.	3
3 yr.-7 mo.	1	4 yr.-5 mo.	0
3 yr.-6 mo.	2	4 yr.-6 mo.	0
	2		4
	4		1

APPENDIX II

TEST QUESTIONS FOR VF_n SUBJECTS

1. The block push to the chain.
2. To the pen move the house.
3. The comb push to the spoon.
4. To the toothbrush give the balloon.
5. To the airplane push the crayon.
6. The key push to the watch.
7. The comb move to the ship.
8. To the ball push the house.
9. The key give to the telephone.
10. The block move to the rubberband.
11. To the fork push the crayon.
12. To the bell push the balloon.
13. The block give to the toothbrush.
14. To the pen move the balloon.
15. The comb give to the chain.
16. To the spoon push the crayon.
17. To the watch move the house.
18. The key push to the airplane.
19. To the rubberband push the house.
20. The block give to the ball.
21. The comb move to the telephone.

22. The key give to the ship.
23. To the fork push the balloon.
24. To the bell give the crayon.
25. To the pen move the comb.
26. The house give to the toothbrush.
27. To the airplane push the block.
28. To the chain move the key.
29. The balloon push to the spoon.
30. The crayon give to the watch.
31. To the fork push the block.
32. The house move to the telephone.
33. The balloon give to the rubberband.
34. To the ball push the comb.
35. To the ball move the key.
36. The crayon push to the ship.
37. The house give to the chain.
38. To the toothbrush move the comb.
39. The crayon push to the pen.
40. To the watch give the block.
41. To the spoon push the key.
42. The balloon give to the airplane.
43. To the bell push the block.
44. To the rubberband give the comb.
45. The balloon give to the telephone.
46. The house push to the ship.
47. The crayon give to the ball.
48. To the fork push the key.

APPENDIX III

TEST QUESTIONS FOR VP_f SUBJECTS

1. The block to the chain push.
2. Move to the pen the house.
3. The comb to the spoon give.
4. Push to the toothbrush the balloon.
5. Give to the airplane the crayon.
6. The key to the watch push.
7. The comb to the ship move.
8. Push to the ball the house.
9. The key to the telephone give.
10. The block to the rubberband push.
11. Move to the fork the crayon.
12. Give to the ball the balloon.
13. The block to the toothbrush move.
14. Push to the pen the balloon.
15. The comb to the chain give.
16. Move to the spoon the crayon.
17. Push to the watch the house.
18. The key to the airplane give.
19. Push to the rubberband the house.
20. The block to the ball push.
21. The comb to the telephone give.

22. The key to the ship move.
23. Give to the fork the balloon.
24. Push to the bell the crayon.
25. Move to the pen the comb.
26. The house to the toothbrush give.
27. Give to the airplane the block.
28. Push to the chain the key.
29. The balloon to the spoon give.
30. The crayon to the watch move.
31. Push to the fork the block.
32. The house to the telephone move.
33. The balloon to the rubberband push.
34. Give to the ball the key. Give to the ball the comb.
35. Move to the bell the key.
36. The crayon to the ship push.
37. The house to the chain give.
38. Give to the toothbrush the comb.
39. The crayon to the pen move.
40. Push to the watch the block.
41. Move to the spoon the key.
42. The balloon to the airplane push.
43. Give to the bell the block.
44. Move to the rubberband the comb.
45. The balloon to the telephone push.
46. The house to the ship give.
47. The crayon to the ball move.
48. Push to the fork the key.