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ABSTRACT

The results of two matching-to-sample experiments using color cues in Consonant Vowel Consonant (CVC) stimulus words with kindergarten through third grade subjects are included in this document. Color cues influenced subjects to match according to first letters. When the first letter of each stimulus word was underlined in red, kindergarten and first grade subjects' tendency to match according to first letters was increased, while second and third grade subjects' tendency to match according to rhyme was decreased. In the second experiment, when red letters were varied according to letter position, color cues appearing in the first letter position were utilized most frequently by all grades. Control subjects in all grades matched according to the first letter more frequently than according to the second or third letters, which did not differ. (Author/SW)

Children's Use of Color Cues in Words

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Abstract

Presents results of 2 matching-to-sample experiments using color cues in CVC stimulus words with kindergarten to third grade subjects. Color cues influenced Ss to match according to first letters. When the first letter of each stimulus word was underlined in red, kindergarten and first grade Ss' tendency to match according to first letters was increased; second and third grade Ss' tendency to match according to rhyme was decreased. In the second experiment, when red letters were varied according to letter position, color cues appearing in the first letter position were utilized most frequently by all grades. Control Ss in all grades matched according to the first letter more frequently than the second or third letters, which did not differ.

COLOR CUES IN WORD PERCEPTION[1]

June D. Knafle*

It is important to know the cues that children use in learning to read words so that ineffective methods may be discarded and more efficient methods utilized. Although there has been little research with children as subjects in word perception experiments, evidence for the importance of the initial letter as a cue, as compared with the final and middle letters, is provided by Levin, Watson, and Feldman (1964), Marchbanks and Levin (1965), and Williams, Blumberg, and Williams (1970), and is found in the analysis of confusion errors of Levin and Watson (1963). Knafle (1973) reported a tendency for children who could read to match according to rhyme, rather than first letters. This tendency was increased with the appropriate use of color and underlining cues. Word shape or configuration has generally been found to be an ineffective cue for children, especially when compared with specific letter differences (Muehl, 1961; Marchbanks & Levin, 1965; Williams, Blumberg, & Williams, 1970; Knafle, 1973).

The research using undergraduates has been more extensive

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[1] Gwendolyn Willett assisted with the data collection and Suzanne George assisted with the statistical analyses. The author thanks principals Robert Dolph, Arthur Fontaine, and Paul A. White for permitting the study to be carried out at their schools.

and may prove applicable to some extent. Additionally, a comparison of findings obtained using undergraduates with findings using children is valuable for its contribution to knowledge concerning the reading process.

Studies using undergraduates in paired-associate learning experiments have demonstrated the importance of the first letter in low meaningful trigrams for learning efficiency (Richardson & Chisholm, 1969) and recall (Jenkins, 1963; Postman & Greenbloom, 1967). Next in importance were final letters, then middle letters. Nelson, Bercov, and Leslie (1970), however, found acquisition easiest for first letters, middle letters, then final letters, but suggested that the concept-formation aspect of their paired-associate task was responsible for the left to right processing. Lovelace and Greenberg (1969) found that a 6-sec. study rate did not decrease first letter cue selection when compared with a 2-sec. study rate. They reported that the 6-sec. study rate elicited the greatest probability of correct digit responses to first letter cues, followed by final letter cues, then middle letter cues; the 2-sec. study rate, however, elicited correct digit responses in the following order: first letter cues, middle letter cues, and final letter cues. Nodine and Hardt (1968) analyzed CVC trigrams and concluded that initial letters were more important determiners of meaningfulness than final letters.

The research most relevant to the present study is that of Marchbanks and Levin (1965), Williams, Blumberg, and Williams (1970), and Knafle (1973). Marchbanks and Levin (1965) and

Williams, Blumberg, and Williams (1970) used delayed matching-to-sample tasks with nonsense trigrams and quingrams. For trigrams, individual letter position matching preferences were first, last, and middle letters, in that order, for first grade subjects. Marchbanks and Levin's middle class kindergarten subjects also demonstrated letter position preferences for first, last, and then middle letters, but Williams, Blumberg, and Williams' less advantaged kindergarten subjects, who knew less than 16 letters of the alphabet, did not show consistent preferences.

In two experimental tasks, Knafle (1973) found that color and underlining cues in CVC stimulus words aided kindergarten to third grade subjects in detecting structure in words. In a visual matching-to-sample task, when the pattern letters of each stimulus word were in red or underlined (e.g., <u>at</u> in mat, <u>ip</u> in sip), first, second, and third grade subjects' tendency to match according to rhyme was increased, and kindergarten subjects' tendency to match according to first letters was decreased. In a visual and oral task with kindergarten subjects only, the enhancement of pattern similarities in stimulus words with color or underlining (e.g., h<u>ip</u>, l<u>ip</u>, t<u>ip</u>) facilitated correct response choices.

Research studies concerning color as a cue have not provided definitive answers, and the use of color in instructional methods and materials seems to be based primarily upon intuition. A review of the literature is provided by Otto and Askov (1968). The present study attempts to investigate the use of color as a

cue in single letter positions, therefore extending the findings of Marchbanks and Levin (1965), Williams, Blumberg, and Williams (1970), and Knafle (1973).

Children's reactions to meaningful words, as opposed to nonsense syllables, also need exploration. Would children given meaningful words match according to letter position cues as they did when given Marchbanks and Levin's (1965) and Williams, Blumberg, and Williams' (1970) nonsense syllables? Postman and Greenbloom (1967) found that undergraduates used first letters more often when given hard to pronounce low meaningful trigram stimuli than when given easy to pronounce trigram stimuli. If the children given meaningful words in this study performed in accordance with Postman and Greenbloom's results, they would choose words according to the first letter less frequently than the children in Marchbanks and Levin's and Williams, Blumberg, and Williams' studies, since those two studies used nonsense syllables, not meaningful words.

The main questions to be answered in this study were as follows: Will color cues influence the response choices of subjects? Will color cues be strong enough to decrease the previously observed tendency of children who are able to read to match according to rhyming words? Will color cues be utilized differently according to letter positions? Will grade level differences in the response choices of subjects occur?

Method

Subjects

Subjects were kindergarten to third grade pupils from

three public schools in the eastern Connecticut towns of Willimantic, Marlborough, and Hebron. There were 211 subjects (M = 103, F = 108) in Task 1 and 213 subjects (M = 105, F = 108) in Task 2.

Procedure

The subjects were individually tested during the spring semester, 1972. Task 1 testing varied from 10 to 12 minutes for kindergarten subjects to three to five minutes for second and third grade subjects. Task 2 testing time varied from 10 to 15 minutes for kindergarten subjects to five to eight minutes for second and third grade subjects. The experimenter did not say whether the responses were correct or incorrect.

There were 10 items in Task 1 and 15 items in Task 2. (see Table 1) The procedure was the same for both tasks. For each

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Insert Table 1 about here

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item, a single stimulus word on a card was placed before the subject for a few seconds and then removed. The response card was then placed before the subject who was asked to point to the response choice which he thought was most similar to the stimulus word. Each response card in Task 1 contained two response choices, and each response card in Task 2 contained three response choices. All stimulus and response words were printed in lower case 60 pt. Futura Bold type.

In Task 1, there was one experimental group (Color) and one control group. In the Color group, the initial consonants

of the black stimulus words (e.g., b in bun) were underlined in red; in the Control group, the same stimulus words were presented without underlining. Response cards, containing the response choices printed in black, and instructions were the same for both groups. The experimenter did not say anything about the underlined letters.

In Task 2, there was one experimental group (Color) and one control group. In the Color group, each of the stimulus words contained one letter printed in red; the other two letters were printed in black. The red letter was varied so that for the 15 stimulus words, the red letter appeared five times in the initial position, five times in the middle position, and five times in the final position. No letter of the alphabet appeared in color more than once. In the Control group, the same stimulus words were printed in black. As in Task 1, response cards and instructions were the same for both groups. The experimenter did not say anything about the colored letters.

Experimental Instructions

The experimental instructions were the same for both tasks, as follows: "This is a word game. Look at this word." (E placed the first stimulus card in front of the subject for a few seconds and then removed it.) E: "Now point to the word which is most like this word." (E placed the first answer card in front of S; after S pointed to his choice, E removed the answer card and recorded S's choice. This procedure, beginning with the instructions, "Look at this word," was repeated for all items. After the task was completed, E gave S a card containing

the randomly arranged alphabet letters and two cards containing the 30 words of Task 1 and asked S to read the letters and words he knew.)

Random Assignment and Exclusion

For both tasks, assignment of subjects to experimental and control groups was random within grade and sex categories. The scores of subjects who showed positional preferences were discarded. In Task 1, if a subject made 9 or 10 left or right responses, that subject's score was discarded; in Task 2, if a subject made 13 to 15 left, center, or right responses, that subject's score was discarded. The scores of 11 subjects were discarded in Task 1, and the score of one subject was discarded in Task 2.

The Experiments

Task 1. As described in the original experiment (Knafle, 1973). the 30 CVC trigrams were taken from Readers 1, 2, and 3 of Fries et al.'s Merrill Linguistic Readers. The 10 stimulus words were selected so that the initial consonants were different. (see Table 1) One type of response choice consisted of words with the same medial vowels and final consonants as the stimulus words; consequently those responses rhymed with the stimulus words. Those responses were also selected so that no two initial consonants were identical. For each item, the other response consisted of a word with the same initial consonant and medial vowel as the stimulus word, but with a different final consonant. Items were arranged in accord with randomization procedures.

Task 2. The 60 CVC trigrams were also taken from Fries,

et al.'s Merrill Linguistic Readers. The 15 stimulus words were selected so that the initial consonants were different. (see Table 1) The medial vowels of the stimulus words consisted of three a's, e's, i's, o's, and u's. For each vowel group, the final consonants of the stimulus words were different (e.g., wag, can, tap; peg, den, led). Each of the three response choices for each item contained one letter of the stimulus word. The other letters of the words were different from each other; that is, no letter appeared more than once among each three word group of response choices. Although word shape was not a variable in this study, word shape was controlled in each item by making the word shape of each response choice different from that of the stimulus word. Items were arranged in accord with randomization procedures. Within each item, the three response choices were arranged so that the first letter response did not appear in the first position, the second letter response did not appear in the second position, and the third letter response did not appear in the third position. Therefore, the two possible arrangements for the response choices were: third letter, first letter, second letter; second letter, third letter, first letter.

Statistical Treatment

Task 1. Analysis of variance was computed for (a) first letter responses for the experimental and control groups for males and females combined at each grade level, (b) first letter responses to obtain F values of males versus females within each group and grade level (Winer, 1971, pp. 447-449), and (c) first letter responses to compare differences in responses according

to grade level within each group. Specific comparisons of grade level means were made with the Newman-Keuls test (Winer, 1971).

Task 2: Color vs. control. Analysis of variance was computed for (a) color cue responses for the experimental and control groups for males and females combined at each grade level, (b) color cue responses to obtain F values of males versus females within each group and grade level (Winer, 1971, pp. 447-449), and (c) color cue responses to compare differences in responses according to grade level within the Color group; the Newman-Keuls test was subsequently applied.

Task 2: Letter position cues. A Friedman two-way analysis of variance by ranks was computed for the control group of males and females combined at each grade level, to determine whether there was significant variation among the use of the three letter position cues. The Friedman test was also applied to the color group of males and females combined at each grade level, to determine whether there was significant variation among color cue utilization for the three letter position cues. Specific corparisons were made with Nemenyi's test (Kirk, 1968).

Generalization to other CVC words. Analyses of variance, as described by Coleman (1972-73) and adapted from Winer (1971), were computed for both tasks.

Findings

Color vs. Control

The results of Task 1 indicate that the color cue was effective in influencing the responses of subjects in kindergarten ($F = 10.88$, $df = 1, 58$, $p < .005$) and grade 2 ($F = 7.71$, $df = 1, 43$, $p < .01$). (see Figure 1 and Table 2) Differences

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Insert Figure 1 and Table 2 about here

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between the color and control groups were not significant for grade 1 or grade 3; however, for grade 3, when analysis of variance was applied only to males, the difference between the color and control groups was significant at the .05 level ($F = 5.27$, $df = 1, 28$, color mean = 4.33, control mean = 1.40).

The results of Task 2 indicate that the color cue was effective in influencing the responses of subjects in kindergarten ($F = 21.50$, $df = 1, 58$, $p < .001$), grade 2 ($F = 7.19$, $df = 1, 43$, $p < .05$), and grade 3 ($F = 19.13$, $df = 1, 58$, $p < .001$); however, differences between the color and control groups were not significant in grade 1. (see Table 3)

Insert Table 3 about here

When males were compared with females within each grade and group in both tasks, the differences were not significant, except for the Task 2 kindergarten color group ($F = 4.06$, $df = 1, 56$, $p < .05$, male mean = 7.27, female mean = 6.00). None of the eight interactions between sex and treatments was significant.

Grade Level Comparisons

The grade level comparisons in the color group of Task 1 revealed overall significant differences ($F = 11.61$, $df = 3, 101$, $p < .001$). Application of the Newman-Keuls test showed the following relationship: K 1 2 3. (Grades underlined by a common line did not differ significantly from each other; grades not underlined by a common line did differ significantly.) (K vs. 3: $p < .001$; 1 vs. 3: $p < .001$; 2 vs. 3: $p < .01$) (see Figure 1 and Table 2)

The grade level comparisons in the control group of Task 1 revealed overall significant differences ($F = 23.63$, $df = 3, 102$, $p < .001$). Application of the Newman-Keuls test showed the following relationship: 1 K 2 3. (1 vs. 2, 1 vs. 3, K vs. 2, K vs. 3: $p < .001$) (see Figure 1 and Table 2)

The grade level comparisons in the color group of Task 2 revealed overall significant differences ($F = 3.81$, $df = 3, 102$, $p < .05$). Application of the Newman-Keuls test showed the following relationship: 3 2 K 1. (3 vs. 1, 2 vs. 1: $p < .05$) (see Table 3)

Task 2: Letter Position Cues

Color cue utilization. Differences among color cue utilization according to letter position were significant for kindergarten ($\chi^2 = 31.32$, $df = 2$, $p < .001$) and first grade ($\chi^2 = 33.65$, $df = 2$, $p < .001$), but not for second or third grade. (see Figure 2 and Table 4) Application of Nemenyi's test revealed that

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Insert Figure 2 and Table 4 about here

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color cues were utilized significantly more often when they appeared in the first letter position than when they appeared in the middle letter or last letter positions for kindergarten ($p < .001$) and first grade ($p < .001$). Middle letter and last letter positions did not differ for kindergarten; however, for first grade, color cues were utilized significantly more often when they appeared in the last letter position than when they appeared in the middle letter position ($p < .05$). Although an

overall significant difference was not found for second grade, the Nemenyi test revealed that color cues were utilized significantly more often when they appeared in the first and last letter positions whan when they appeared in the middle letter position ($p < .05$).

As shown in Figure 2, there was a very noticeable difference in the way the children at different grade levels responded to the color cue. Subjects at all grade levels utilized the color cue most frequently when that cue appeared in the first letter of the stimulus trigram; kindergarten subjects showed the highest percentage of color cue utilization for the first letter (78%), followed by grade 1 subjects (71%), grade 3 subjects (59%), and grade 2 subjects (57%). As expected, the second most frequently utilized color cue was that of the last letter of the stimulus trigram for grade 2 (55%), kindergarten (30%), and grade 1 (26%). However, Figure 2 shows that grade 3 subjects did not respond in a similar pattern to the subjects in the other grades. Color cue utilization for grade 3 subjects was most frequent for first letters, followed by middle letters, and then last letters. The differences were slight for grade 2 for first letters (57%) and last letters (55%), showing that the last letter appeared to be almost as salient as the first letter in color cue utilization. Differences were also slight for kindergarten color cue utilization for last letters (30%) and middle letters (27%). The largest differences in favor of first letter color cue utilization appeared in kindergarten and grade 1.

Control group. Differences among the letter position choices were significant for kindergarten (χ^2= 17.02, df = 2, p<.001), first grade (χ^2= 25.34, df = 2, p<.001), and second grade (χ^2= 6.16, df = 2, p<.05), but not for third grade. Application of Nemenyi's test revealed that first letters were chosen significantly more often for kindergarten (p<.001), first grade (p<.001), and second grade (p<.005) than both middle letters and last letters, which did not differ in any of the three grades. (see Figure 3 and Table 4)

Insert Figure 3 about here

For subjects who correctly named less than 16 alphabet letters (N = 22: K = 16, 1st = 6), the percentage of choices was as follows: first letter: 51%; middle letter: 19%; last letter: 30%. Differences were significant at the .005 level (χ^2= 11.00, df = 2). Application of Nemenyi's test revealed that first letters were chosen significantly more often than middle letters (p<.001) and last letters (p<.05), and last letters were chosen significantly more often (p<.05) than middle letters.

For subjects who correctly named less than 10 alphabet letters (N = 17: K = 13, 1st = 4), the percentage of choices was as follows: first letter: 44%; middle letter: 22%; last letter: 34%. Although differences were not significant, they did approach significance at the .05 level (χ^2= 5.56; 5.991 required). Application of Nemenyi's test revealed that first letters were chosen significantly more often than middle letters

($p < .005$), and last letters were chosen significantly more often than middle letters ($p < .05$). First letters and last letters did not differ.

As shown in Figure 3, subjects at all grade levels matched according to the first letter more often than they matched according to the middle or last letters. First grade subjects showed the highest percentage of first letter matching (71%), followed by second grade subjects (62%), kindergarten subjects (58%), and third grade subjects (43%). Differences among letter position matching responses were least noticeable for third grade subjects.

Generalization to Other CVC Words

For Task 1, the application of the treatments x sex x grades x words design showed that the observed differences could be generalized to other CVC words. The results of those analyses corresponded to the results of the other analyses of variance. ($F = MS_{Treat}/MS_{Treat\text{-}by\text{-}Words} = 182.92$, df = 1, 9, $p < .001$; $F = MS_{Sex}/MS_{Sex\text{-}by\text{-}Words} = .01$, df = 1, 9, n.s.; $F = MS_{Grade}/MS_{Grade\text{-}by\text{-}Words} = 116.83$, df = 3, 27, $p < .001$)

For Task 2, the application of the treatments x sex x grades x words design also showed that observed differences could be generalized to other CVC words. ($F = MS_{Treat}/MS_{Treat\text{-}by\text{-}Words} = 28.89$, df = 1, 14, $p < .001$; $F = MS_{Sex}/MS_{Sex\text{-}by\text{-}Words} = .03$, df = 1, 14, n.s.; $F = MS_{Grade}/MS_{Grade\text{-}by\text{-}Words} = 1.37$, df = 3, 42, n.s.)

Discussion

While previous data (Knafle, 1973) showed that enhancement of pattern similarities with color or underlining

cues was effective in facilitating structure detection (e.g., an in can, it in hit), the present Task 2 data revealed that, so far as single letters were concerned, enhancement with color cues was effective with first letters. (see Figure 2) However, for Grade 2, color cues in the last letter position were utilized almost as much as cues which appeared in the first letter position. It would appear that color cues would be most effectively used when they are placed in the first letter position, and, to a lesser degree in the last letter position, especially when we consider that trigram relationships are typically taught in the beginning stages of reading development. Color cue use in the middle letter position does not appear to be warranted for kindergarten, first, and second graders when a single letter cue is used, at least in the context of these data. However, it should be remembered that the children were not told to pay attention to the color cues. The fact that their responses were influenced by the color cues demonstrates the effectiveness of those cues under that condition.

A comparison of the Task 2 letter position data obtained in the control group of this study with the data obtained by Marchbanks and Levin (1965) and by Williams, Blumberg, and Williams (1970) shows that the choices made by subjects in this study were definitely more biased toward the first letter than were the choices made by subjects in the other studies. Choices made by Marchbanks and Levin's first graders were more in accord with the results of this study, but Marchbanks and Levin's subjects chose the first letter approximately 2.6 times as

frequently as the last letter, and 3.1 times as the middle letter. First grade subjects in the present study chose the first letter approximately 4.2 times as frequently as the last letter and 5.9 times as the middle letter.

Bias toward first letter choices was found even for subjects who had little knowledge of the alphabet. Although Williams, Blumberg, and Williams (1970) found no significant differences in the proportion of times kindergarten and first grade subjects (N = 21) who knew less than 16 alphabet letters made specific letter position choices, the present study did reveal significant differences. However, for the 17 control group subjects in the present study who knew less than 10 alphabet letters, differences in letter position choices were more similar to the findings of Williams, Blumberg, and Williams (1970).

Postman and Greenbloom's (1967) position that "single-letter cue selection should decrease as the stimuli become more pronounceable [p. 92]," supported with data from undergraduate students, was not in agreement with the present Task 2 data. To the contrary, Task 2 control subjects showed more first letter cue selection than subjects given nonsense syllables in studies by Marchbanks and Levin (1965) and Williams, Blumberg, and Williams (1970).

The tendency to select rhyming words as being similar to given stimulus words was demonstrated by the second and third grade control groups of Task 1. This finding agrees with previous data that children who can read words tend to use a

rhyming strategy rather than a first letter strategy when choosing similar words (Knafle, 1973). Second grade subjects who were given the color cue in the first letter position gave twice as many first letter responses as subjects not given the color cue; third grade subjects given the first letter color cue gave 1.9 times as many first letter responses as their control subjects. (see Figure 1) Therefore, the color cue appeared to be strong enough to decrease the rhyming tendency. The tendency of kindergarten control subjects in Task 1 to match according to the first letter (also in agreement with previous data) was strengthened when subjects were given the first letter color cue. (see Figure 1)

The main difference between the control group of Task 1 in this study and the analogous control group of the previous study (Knafle, 1973) occurred in grade 1. Grade 1 subjects in this study responded similarly to kindergarten subjects in the previous study. Population differences in developmental stage of reading were probably responsible for the observed differences. The 46 first grade subjects in Task 1 of this study correctly identified a mean of 4.93 CVC words; the 22 first grade subjects in the analogous control group of the previous study correctly identified a mean of 13.64 CVC words, and the 20 kindergarten subjects in the analogous control group of the previous study correctly identified a mean of .85 CVC words.

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Table 1

Words Used in Tasks 1 and 2

Stimulus	Response Choice		
Task 1			
1. can	cap	ran	
2. hit	hid	kit	
3. sip	six	zip	
4. rug	rub	mug	
5. let	led	bet	
6. bun	bus	fun	
7. pot	pop	got	
8. tap	tag	lap	
9. fig	fix	dig	
10. mat	mad	sat	
Task 2			
1. peg	pat	hen	mug
2. job	jig	lot	cub
3. wag	win	pad	fog
4. den	dot	beg	van
5. fig	fan	sit	rag
6. can	cot	lap	bun
7. hit	hog	rid	jet
8. box	but	mop	six
9. mud	men	cup	had
10. gum	get	bus	him
11. led	lip	wet	mad
12. rug	rim	fun	leg
13. sip	set	lid	hop
14. not	nap	log	kit
15. tap	tub	man	rip

Table 2

Task 1: Means and Standard Deviations of First Letter Responses For Each Group and Grade Level

Grade	Color			Control		
	N	Mean (n = 10)	S.D.	N	Mean (n = 10)	S.D.
K	30	8.40	1.94	30	6.53	2.35
1	23	8.13	2.72	23	7.52	1.77
2	22	6.36	3.64	23	3.13	1.00
3	30	3.77	4.01	30	2.03	3.04

Table 3

Task 2: Means and Standard Deviations of Color Cued Responses For Each Group and Grade Level

Grade	Color			Control		
	N	Mean (n = 15)	S.D.	N	Mean (n = 15)	S.D.
K	30	6.63	1.91	30	4.53	1.52
1	23	5.34	1.76	25	5.00	1.52
2	23	7.43	4.12	22	5.23	3.50
3	30	7.87	3.34	30	4.93	1.36

Table 4

Task 2: Proportion of Choices Utilizing Color Cues (Color Group) and Letter Cues (Control Group) at Each Grade Level

Grade & Sex	Color Cue Utilization[a]				Control Matching[b]			
		Letter Position				Letter Position		
	N	1	2	3	N	1	2	3
Kinder.								
M	15	.76	.35	.36	15	.50	.21	.29
F	15	.80	.19	.24	15	.66	.14	.20
Grade 1								
M	10	.70	.10	.22	12	.64	.15	.21
F	13	.72	.12	.29	13	.77	.10	.13
Grade 2								
M	12	.53	.38	.57	11	.66	.21	.13
F	11	.60	.38	.53	11	.58	.19	.22[b]
Grade 3								
M	15	.68	.51	.40	15	.43	.23	.35[b]
F	15	.51	.59	.47	15	.44	.34	.23[b]

[a] Each of the three letter position proportions could equal 1.00 for color cue utilization.

[b] Numbers in the Control Matching group do not equal 1.00 because of rounding error.

Figure Captions

Fig. 1. Task 1: Proportion of first letter matching responses for color and control groups at each grade level

Fig. 2. Task 2, Color group: Proportion of choices utilizing color cues at each letter position for each grade level.

Fig. 3. Task 2, Control group: Proportion of choices of each letter position cue at each grade level.

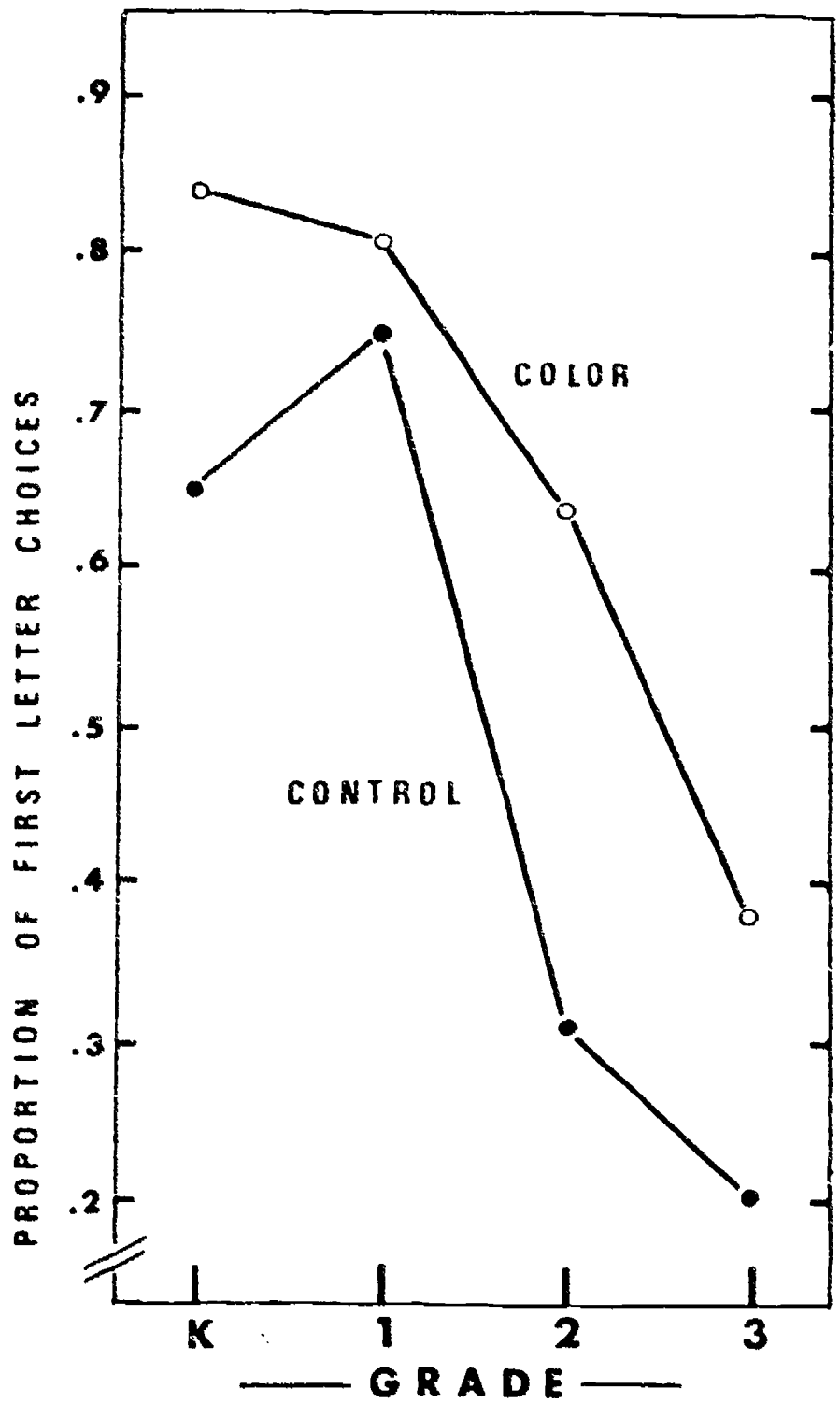
PROPORTION OF FIRST LETTER CHOICES
.9
.8
.7
.6
.5
.4
.3
.2
COLOR
CONTROL
K
1
2
3
GRADE

Figure 1

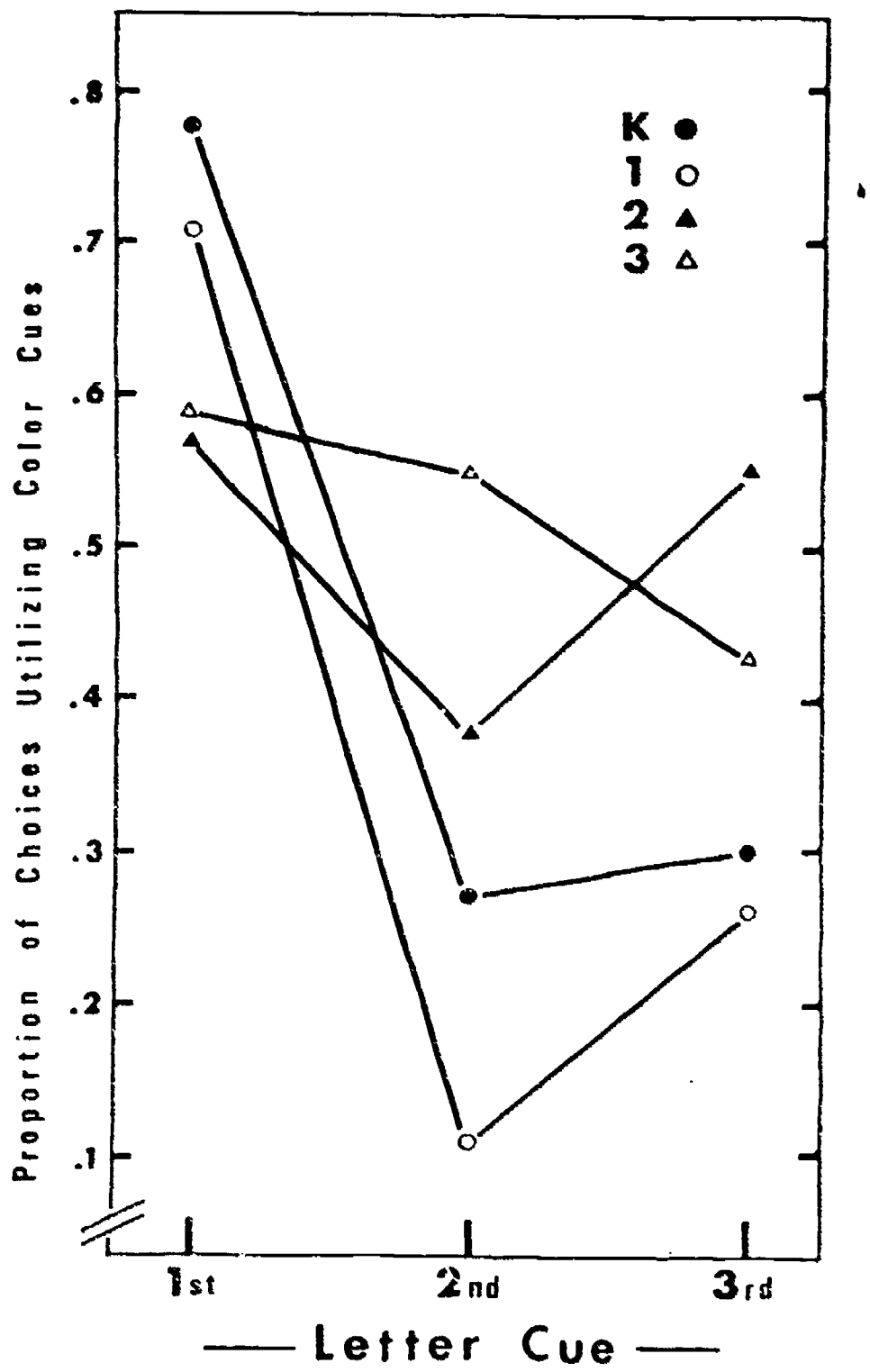

Figure 2

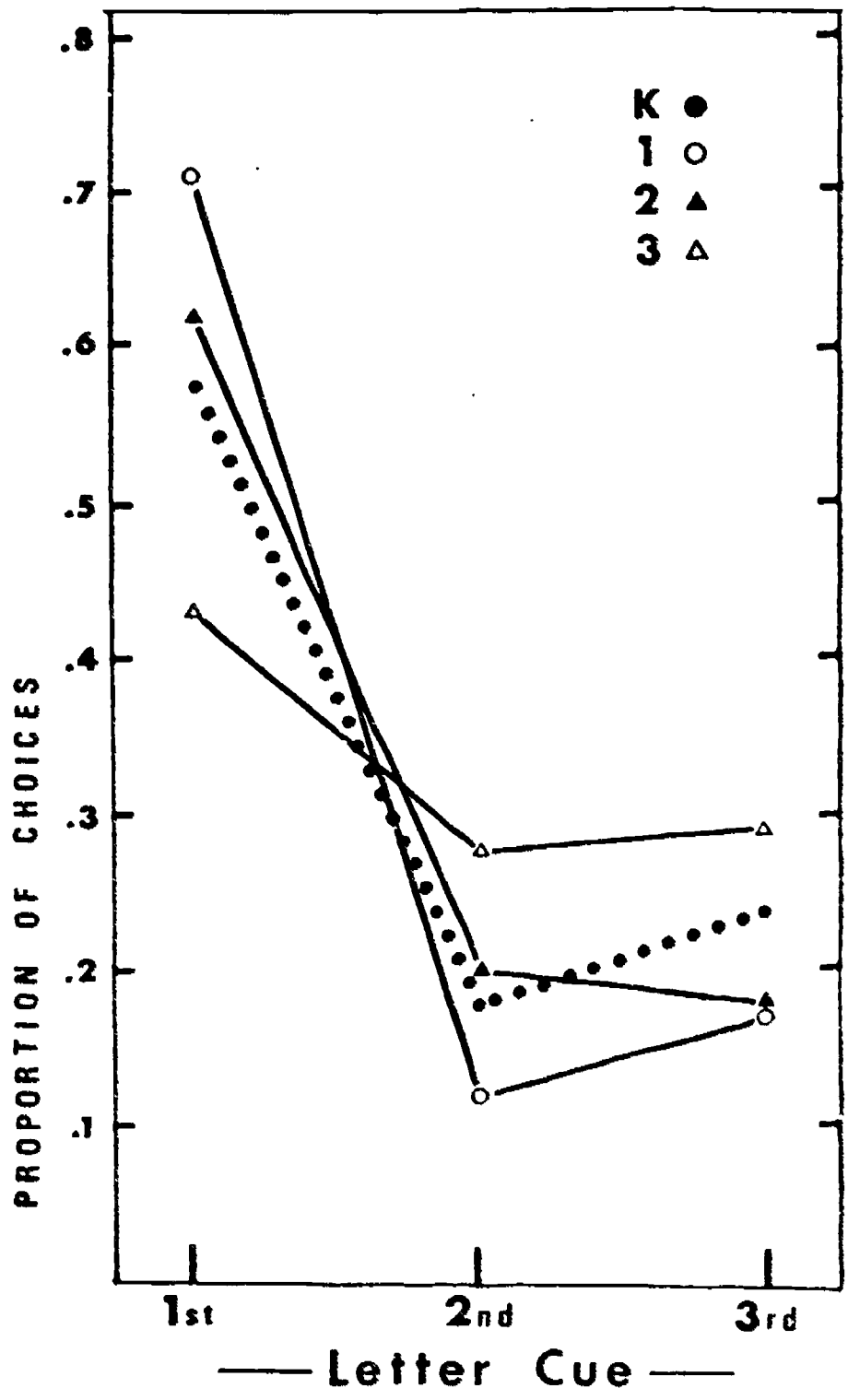

Figure 3