CONTEXT, CUE SELECTION, AND TRANSFER OF TRAINING

APPROVED:

Kevin J. Kennelly
Major Professor

Earl W. Kroeker
Minor Professor

Harold A. Hamann
Chairman of the Psychology Department

Robert B. Toulouse
Dean of the Graduate School
Framer, Edward M., Context, Cue Selection, and Transfer of Training. Master of Arts (Clinical Psychology), August, 1972, 23 pp., 1 table, 1 illustration, 17 references.

The investigation examines the effects of three contexts (strong easily discriminable colors, shifting strong to weak colors, and a homogeneous white background) on cue selection in a paired associate study. Stimuli employed were high similarity consonant-consonant-consonant trigrams, and the responses were high imagery value nouns. Each S learned two lists.

Fifteen anticipation trials plus an initial exposure were given to each S on the first list. All Ss were then run to a criterion of one perfect trial on a second list which contained a mixture of A-B,A-B, A-B,A-C, and A-B,C-D pairs. Results indicated that Ss who learned the first list with distinctly different colors as contexts for each pair acquired their list faster than Ss whose pairs were presented on a homogeneous white background. However, when all Ss were transferred to the second list in which all pairs for all conditions were presented on a homogeneous white background, predicted performance superiority for the group which had learned the first list on a homogeneous white background failed to materialize. Reasons for the failure to find the predicted differences among the groups were discussed.
CONTEXT, CUE SELECTION, AND TRANSFER OF TRAINING

THESIS

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

By

Edward M. Framer, B. A.
Denton, Texas
August, 1972
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. List Membership of the Items and Their Colors.</td>
<td>12</td>
</tr>
</tbody>
</table>
## LIST OF ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Second List; Mean Errors by Paradigm</td>
<td>20</td>
</tr>
</tbody>
</table>
CONTEXT, CUE SELECTION, AND TRANSFER OF TRAINING

Pan (1926) noted the importance of contextual stimuli in learning. He studied learning and recall under various conditions and stated "Our results thus indicate that the recall of any material is favored by the presence of an environmental factor which has some associative connection with that material [p. 490]." This implied that something besides the nominal stimulus (the stimulus as defined by the experimenter) may be learned to a response.

Dulsky (1935), in a paired associate learning study, made use of a condition in which each pair was presented on a different color background and then recalled and relearned on a gray background. This condition was contrasted with another which presented the pairs on a homogeneous chromatic background and then tested recall and relearning on a homogeneous achromatic background. He found the performance of the first group to be disrupted more than that of the second group by the change. Dulsky interpreted his results as supporting the hypothesis that it was the lack of context cues and not the novelty of the changed situation which led to a decrement in performance. He reasoned that if only novelty were involved, both groups should have been affected equally.
Weiss and Margolius (1954) sought to answer questions about the effects of color contexts on learning, retention, and relearning. Six groups were used in a study which systematically varied presence or absence of colors in all phases of acquisition and testing. The nonsense syllable components of the nominal stimulus were also manipulated so that they sometimes remained unchanged and at other times were altered or removed before recall or relearning.

The results indicated that those groups which learned under conditions in which each pair in the list was placed on a different color background learned significantly faster than the group which learned with all pairs placed on the same homogeneous gray background. Furthermore, groups whose color contexts were changed to gray for retention and relearning suffered a decrement in performance when compared with those groups who retained the color backgrounds. The color context group whose stimulus syllables were removed before the retention and relearning tests, and a color context group whose stimulus syllables were altered slightly before retesting were not significantly different from the color context group which retained the original nonsense syllable components in all phases. Weiss and Margolius saw their results as confirming and extending the earlier work of Dulsky (1935). The findings demonstrated that context stimuli are capable of becoming functioning cues in paired associate
learning and that distinct context stimuli facilitate acquisition of the stimulus - response associations.

Sunland and Wickens (1962) enlarged upon the work of Weiss and Margolius. Sunland and Wickens hypothesized that where the nominal stimuli were already highly discriminable, the addition of highly discriminable contexts would not facilitate learning. They further hypothesized that when the nominal stimuli were highly discriminable, the context stimuli would be utilized in recall less often than when the nominal stimuli were of low discriminability. To test these hypotheses Sunland and Wickens used words as the highly discriminable stimuli and consonant-vowel-consonant (CVC) tri-grams as the difficult to discriminate stimuli in a paired associate study. The response terms were three letter words. Highly discriminable contexts were created by the use of different color backgrounds for each stimulus in a list.

Sunland and Wickens reported that there was no evidence that the context cues facilitated learning, regardless of whether the nominal stimulus was a word or a nonsense syllable. This outcome is in apparent conflict with that obtained by Weiss and Margolius (1954); however, since different presentation procedures and materials were used in the two studies, direct comparisons may be out of order.

Sunland and Wickens (1962) presented evidence supportive of their second hypothesis. They found that context cues were almost useless as recall cues when they had been
previously combined with highly discriminable stimuli (words), but were relatively effective when they had been employed with the low discriminable stimuli (nonsense syllables). It was also noted that "...effectiveness of context cues will be a function of an interaction between the discriminability of the major cues among themselves and the discriminability of the context cues among themselves [p. 306]."

Underwood, Ham, and Ekstrand (1962) hypothesized that if a stimulus contains components of two different classes, then the more meaningful component will become the functional stimulus. Part of their research centered on what happens when the components of a stimulus are pulled apart and presented separately. The results indicate that while both cues may be learned (e.g. word and color) for a particular response, correct answers can often be obtained using either of the two; the percentage of the time that one, the other, or even both cues need to be present depends on what materials are used. (These observations preclude an interpretation which states that the functional stimulus must have a compound configuration when the nominal stimulus has two or more parts).

Underwood, Ham, and Ekstrand found that those subjects who received the trigram stimuli on color backgrounds used the colors more often than did those who were given word stimuli on color backgrounds. This, the authors suggest, was the result of higher "meaningfulness" values for the
words. Meaningfulness is considered to be akin to discriminability as used by Sunland and Wickens (1962); however, since Underwood, Ham, and Ekstrand did not explain their concept of meaningfulness, one can only speculate as to their intentions. The authors did indicate that a more "fruitful" view of context experiments would be to see them as studies on the variables influencing cue selection.

That meaningfulness, discriminability, and cue selection overlap one another at many points in a discussion of verbal learning should come as no surprise. The notions have been implicit even where not stated in the work of all of the authors discussed to this point. Perhaps a perspective will be gained if meaningfulness and discriminability are viewed as two sides of the same coin -- as measures of unity or disunity. Both have a bearing on how well a subset (the trigram or word) is recognizable as a unit, different from the set (all possible combinations of letters that are the same length) of which it is a part. This is somewhat like the old Gestalt adage that the whole is more than the sum of its parts, for not all the points upon which a discrimination is made appear to always exist in the letters presented. One author who has looked at meaningfulness, discriminability, and cue selection in his work is Edwin Martin (1968).

The results of the studies by Weiss and Margolius (1954), Sunland and Wickens (1962), Underwood, Ham, and Ekstrand (1962), and others, can be interpreted within the framework
of a hypothesis put forth by Martin (1968). His hypothesis is one of encoding variability. The more possible ways a nominal stimulus has of being perceived by the subject - the more functional configurations the nominal stimulus can take - the harder it is to learn. With respect to the previously cited studies, this means that if the context is less fragmentable or less difficult to reperceive in the same form than is the nominal stimulus, then the context will be learned either with all or part of the nominal stimulus or instead of it.

Martin notes that when words, trigrams, or letters are viewed from his perspective, the results of earlier studies are quite predictable. Words are perceived by most subjects as wholes or gestalts; three letter combinations without referents are more often perceived as individual letters. The nonsense trigrams may thus be variably encoded (given a particular perceptual response) from one of at least three and possibly as many as seven choices, if all possible pairings are considered. This leads to variability in subject performance and an attempt to choose the cue which will most reliably differentiate the different stimuli in a list from each other. If the discrimination between items on the basis of their structure is very difficult, then perhaps other available cues will be used; if the differentiation is relatively easy, other cues may not be emphasized. It is for this reason that Sunland and Wickens found words to suffer
less loss in recall when the color context was removed than did the nonsense syllables. The subjects who encoded the words made less use of the contexts as stimuli than did the subjects receiving nonsense syllables.

Newman and Taylor (1963) and Runquist (1968) indicate that data from their studies show increasing list learning difficulty as the formal similarity of the stimulus terms increases. Degree of formal similarity is indexed by the number of elements shared between terms in a list. The more overlap that occurs, the greater the formal similarity. The Newman and Taylor study reports that as formal similarity increases there is an increased tendency for the subjects to select context cues in addition to or instead of the nominal stimuli. This effect was not only demonstrated statistically, but was reported by the subjects who participated in the experiment.

These observations lend support to the Martin (1968) encoding variability hypothesis discussed earlier. The reasoning is as follows: when formal similarity increases, the number of encodings for different items in the list which can be confused also increases. For example, if the two stimulus terms are PQR and PRQ, there is no single letter or even pair of letters that are unique to either trigram. The subject must remember the added cue of letter position in order to reliably differentiate between the two. Certainly the encoding will need to be more selective than would be
necessary if ABC and XYZ were used. When the nominal stimuli are highly similar, the subject will be reinforced with correct answers for selecting any distinctive cues that differentiate between trigrams where such exist. If the context is unique and less fragmentable than the nominal stimulus, encoding of the context will reduce the variability associated with selecting an encoding which can reliably be reproduced; thus, the context should be selected.

In a study of the relationship between formal intralist similarity and the von Restorff effect (isolation of an item in a list in any way from the rest of the list, e.g. color, print class, or size), Samuels (1968) found that the magnitude of the effect was influenced by stimulus similarity. He discovered that correct responses were given to the isolated item during learning, but at the point of transfer to a list where the term was no longer isolated, fewer correct responses were given to the formerly isolated stimulus. This effect held for the high similarity lists but not for lists with medium or low similarity. It appears that only when there were a large number of possible encodings for the terms in a list, and only a few would help the subject differentiate among items, did the subjects use the isolation cue, a different color context. This work seems, then, to be in harmony with Martin's (1968) encoding variability hypothesis and the previously discussed research.
Fading is a procedure whereby stimulus control of a response is shifted from one stimulus dimension to another. This is usually accomplished by establishing response control along a dimension of extreme difference (e.g. distinctly different bright colors) and then reducing the differences until discriminative control is based solely on the difficult to discriminate nominal stimuli. Jung (1971) hypothesized that a fading procedure might reverse the decrement at transfer that Samuels (1968) found, thus making the use of the von Restorff effect in education an acceptable procedure. (For examples of the use of color prompting in education see Jones, 1965; Otto, 1967,1968). He found a significant difference at transfer in favor of the group that had not had isolated items during training, a difference which in the fading condition was only partially overcome.

Of the previously cited studies which looked at context effects (selection of contexts as cues) on learning, retention, and transfer of training, only two held the exposure to first list materials constant for all subjects; and these (Samuels, 1968; Jung, 1971) studied the von Restorff effect. The present investigation was concerned with the effects of different contexts (strong, easily discriminated colors as contexts for each stimulus - response pair, fading color contexts, and no color) on transfer of training in a paired associate study. Consonant trigrams with a high degree of letter overlap were used to assure the high formal similarity.
of the stimuli. The number of first list learning trials was identical for all conditions to equalize exposure to the materials.

Due to the high formal similarity (low discriminability) among the stimuli, it was assumed that easily discriminated context cues would be selected if they were available. They would be available in the strong color and fading conditions according to previous research (Underwood, Ham, and Ekstrand, 1962; Newman and Taylor, 1963; Samuels, 1968; Jung, 1971). Since the strong color group should be benefiting from the distinctive color cues, it should make fewer errors in acquisition than the no color group. Subjects in the fading condition should perform intermediately between the subjects in the strong color and no color conditions.

Due to non-selection of cues differentiating among the trigrams themselves, the strong color group should make significantly more errors on the transfer task; as in first list learning, the fading condition is predicted to produce scores which fall in between those obtained in the strong color and no color conditions.

Method

Design and Subjects

Subjects were 60 undergraduate students who participated to fulfill a course requirement in an introductory psychology course or who volunteered to earn extra credit in other
undergraduate psychology courses. Assignments to the three conditions of the experiment were made in blocks of three, with one S per experimental condition per block. The running order of conditions within each block was determined by a table of random numbers. Assignment to conditions was based on the S's order of appearance in the laboratory. There were 60 Ss in the experiment, 20 in each condition.

The design was a paired associate verbal learning study with three groups who received two lists to learn. The first list (6 pairs) contained the same nominal stimuli for all of the groups, but had different context stimuli depending upon the condition assigned. There were three possible sets of contexts; easily discriminated strong colors, the same strong colors shifted to lighter tones which were less easily discriminated, and no color. The second list (9 pairs) was identical in every respect for all subjects. No color context stimuli were present; the background was a homogeneous white. The nominal stimuli used were high similarity consonant-consonant-consonant (CCC) trigrams. The responses were nouns.

Lists

Nine CCC stimulus terms were constructed using the response frequency list in Underwood and Schulz (1968), Appendix F. The association value of all contiguous letters was kept at 10 or below. The 12 response nouns were chosen from a list of Pavio, Yuille, and Madigan (1968); all had
imagery values between 6.50 and 6.57. High formal similarity among the trigrams was obtained by using only 5 letters to fill 27 letter positions. Each letter therefore appeared from 4 to 8 times in the stimulus list. The pairing of nouns with stimuli was on a random basis. (For exact specification of the trigrams, their responses, and colors if any, see Table 1 below).

TABLE 1

LIST MEMBERSHIP OF THE ITEMS AND THEIR COLORS

<table>
<thead>
<tr>
<th>List</th>
<th>Stimulus Term</th>
<th>Response Term</th>
<th>Color</th>
<th>Gel Numbers Dark Colors</th>
<th>Gel Numbers Light Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HSG</td>
<td>FLASK</td>
<td>Yellow</td>
<td>R 807</td>
<td>C 49</td>
</tr>
<tr>
<td>1</td>
<td>BHG</td>
<td>ARMY</td>
<td>Blue</td>
<td>R 866</td>
<td>R 851</td>
</tr>
<tr>
<td>1</td>
<td>WSB</td>
<td>SALAD</td>
<td>Purple</td>
<td>R 839</td>
<td>R 828</td>
</tr>
<tr>
<td>1</td>
<td>BGS</td>
<td>WHALE</td>
<td>Orange</td>
<td>R 817</td>
<td>R 813</td>
</tr>
<tr>
<td>1</td>
<td>HGB</td>
<td>BOY</td>
<td>Green</td>
<td>R 874</td>
<td>C 22</td>
</tr>
<tr>
<td>1</td>
<td>WSG</td>
<td>NAIL</td>
<td>Red</td>
<td>R 823</td>
<td>R 819</td>
</tr>
<tr>
<td>2</td>
<td>HSG</td>
<td>FLASK</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>BHG</td>
<td>ARMY</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>WSB</td>
<td>SALAD</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>BGS</td>
<td>DOVE</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>HGB</td>
<td>TABLE</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>WSG</td>
<td>HOME</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>HGB</td>
<td>PLANT</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>BWG</td>
<td>GEESE</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>WGB</td>
<td>CLOCK</td>
<td>B &amp; W</td>
<td>-----</td>
<td>-----</td>
</tr>
</tbody>
</table>

R = Roscolene   C = Cinemoid   B & W = Black and White
The first list was constructed from six of the trigram and six of the response nouns. Four random orders of these six pairs were constructed (to avoid the possibility of serial learning) and given the contexts appropriate to the condition.

The transfer task, or the second list, was constructed as follows: three of the original pairs from the first list were retained; the CCC trigrams of the other three first list pairs were re-paired with three of the unused response nouns; the three remaining trigrams were paired with the last three response nouns.

This procedure resulted in a list which contained three A-B,A-B paradigm pairs (both stimuli and responses are the same on list one and list two), three A-B,A-C paradigm pairs (the second list retains the first list stimuli but takes new responses), and three A-B,C-D paradigm pairs (both stimuli and responses on the second list are new). (It was assumed that the A-B,A-B paradigm items would be easier than either the A-B,A-C or A-B,C-D paradigm items. It was also assumed that the items in the A-B,A-C paradigm would be learned faster than the items in the A-B,C-D paradigm due to the high intralist stimulus similarity of the lists [see Underwood and Ekstrand, 1968]). Three random orders of this list were used.
Apparatus

The apparatus consisted of a Kodak Carousel 750 slide projector, four 80-slide Carousel trays, and a 16 x 20 inch piece of matte mounting board which acted as the viewing surface. Duration of exposure was controlled by a Lehigh Valley Electronics (LVE) variable timer (Model 1309) which was connected to an LVE power supply (#215-01) and an LVE circuit board (#231-08). Connection of the timing mechanism to the projector was made by way of the projector's remote control socket. Distance from the slide projector to the screen was 7 feet. The subject's chair was placed 4 feet from the screen. Four groupings of slides were prepared and loaded into the trays, one set for each of the three first list context conditions and one set for the common transfer of training task.

The slides of stimulus and response terms were prepared by exposing Kodak High Contrast Copy film (HC-135-36) in a Honeywell Pentax Spotmatic camera to white capital letters (1 1/4 inches high) on a black background. The camera was attached to a copy stand and a cable release was used to avoid camera shake on the 1/8 second exposures. Light was provided by two 300 watt bulbs mounted in photoflood reflectors. The film was developed in Kodak D-11 developer for 10 minutes at 72 degrees Fahrenheit. The resulting negatives were cut and mounted in Lott plastic slide mounts. They were
either backed with the appropriate color at this time or left unbacked as the condition demanded. The colors for the slides were obtained by using Roscolene and Cinemoid stage lighting filters. (Colors used were red, green, purple, blue, yellow, and orange. See Table 1 for a listing of the colors with their stimuli and responses). The above process produced slides which cast black letters on either a white or colored background.

**Procedure**

Subjects were read a set of standard paired associate learning instructions which had been modified for presentation of the lists by slide projector. Presence or absence of context stimuli was never mentioned by the experimenter. Subjects in all three conditions received 15 anticipation trials on the first list plus an initial exposure trial. The strong color group received all of these trials with the context stimuli being the easily differentiated original colors. The fading condition Ss received their initial exposure and the first 7 trials in strong colors, but the last 8 trials in much lighter hues. The no color condition received all trials with the items on a homogeneous white background. Stimulus and stimulus - response slides were presented by the anticipation method at a 2.5:2.5 second rate with a 5 second intertrial interval.

Thirty seconds after completion of the first list learning trials, presentation of the second list was initiated.
The anticipation rate and intertrial interval were the same as for the first list. Subjects received as many trials as necessary for them to reach the criterion of one perfect trial.

Results and Discussion

First List

A one-way analysis of variance was performed on the total error scores of the Ss for the 15 first list anticipation trials. The three groups for the analysis were the three conditions (strong color, fading, no color). The results indicate that the three groups did differ in rate of acquisition ($F=14.52$, $df=2/57$, $p<.001$). A Newman-Keuls calculation on the cell totals showed that the clear group differed from both the strong color and the fading groups ($p<.01$ in both cases). Significant differences were in the predicted direction; color and fading Ss acquiring the list faster than those Ss in the clear condition. The strong color and fading groups did not differ from each other ($p>.05$). The nonsignificant difference between the strong color and fading groups indicates that there is a possibility that the Ss did not shift stimulus dimensions from color contexts to CCC's in the fading condition. This was most likely due to the failure of the single shift in context color intensity to be effective as a fading procedure. Also, the remaining colors after the shift may have been strong enough
for the Ss to still have been able to encode them in preference to the difficult to differentiate trigrams. Further research on the number of levels of stimulus intensity for effective fading is needed.

An Fmax test run on the variances of the above analysis yielded no significant difference (Fmax=1.1664, df=3/19, p>.05); the assumption of homogeneity of the variances was retained. The overall results obtained in the first analysis are in line with those reported by Pan (1926), Dulskey (1935), and Weiss and Margolius (1954). Context factors do appear to be capable of affecting the rate of acquisition in paired associate learning.

**Second List**

A 3x3 analysis of variance with repeated measures on the second factor was run on the errors to second list criterion. The first factor was context condition and the second factor was transfer paradigm. Items representing the transfer paradigms A-B, A-B, A-B, A-C, and A-B, C-D in their relationships with first list items, were present in the second list. Results indicated that acquisition condition had no effect (F=.8814, df=2/57, p>.05) on speed of second list learning. This was not as had been predicted.

Transfer paradigms produced a significant effect (F=16.95, df=2/114, p<.001). This study did not employ a design balanced for equal appearance of the trigrams in all
paradigms; as a consequence, item differences between paradigm groups, not paradigm differences, may be responsible for these results. However, since assignment of trigrams to paradigm type was made on a random basis, the significant differences are assumed real. A Newman-Keuls run on the paradigm types collapsed across conditions indicates that all paradigm types are significantly different from each other (p<.05). The A-B,A-B paradigm items accrued significantly fewer errors than the A-B,A-C or the A-B,C-D paradigm items, while the A-B,A-C paradigm items accrued significantly fewer errors than items in the A-B,C-D paradigm. These results extend the Underwood and Ekstrand (1968) study. Those authors found that less negative transfer occurred in high similarity lists than in low similarity lists for the A-B,A-C paradigm as compared to the A-B,C-D paradigm. The degree of formal similarity among the stimuli in the present study was, if anything, greater than in the Underwood and Ekstrand study, where they found reduced negative transfer, the present study found evidence of positive transfer for the A-B,A-C paradigm when it was compared to the A-B,C-D paradigm. There was no interaction between condition and paradigm (F=.4383, df=4/114, p>.05).

An Fmax test was run on the data from conditions collapsed across paradigms. The purpose of this test was to check for homogeneity of variance. The resulting value
(Fmax=3.4002, df=3/19, p<.05) was significant. This result indicates that the variances of the different conditions were different for the transfer test, while an Fmax on first list data found the variances of the different conditions equal. Apparently there is some effect produced by the different contexts during first list learning which influences the variances of the second list. The second list variances were quite large (Color = 3523.75, Fading = 3372.71, and No Color = 1036.33).

The results of the second list analysis are somewhat surprising in light of the Jung (1971) study. Jung found retention differences between a color isolated pair and other pairs in a paired associate list when on the recall test the color context was removed from the item which had previously had one. The differences were in favor of the non-isolated items (the possible equivalent of the clear condition in the present study). Even though Jung studied the von Restorff effect while the present study placed different color backgrounds on all the items in the color and fading conditions, similar results had been expected.

Since visual inspection indicated the existence of consistent differences between conditions (see Figure 1), and because of the finding of heterogeneity of variance, a transformation of the raw data was performed (x' =√(x+1)). This procedure is designed to reduce heterogeneity of variance,
restore normality to possibly skewed distributions, and return additivity of parts to the analysis. The analysis of variance was then rerun. Again no significant difference among conditions was found (F=.7612, df=2/57, p>.05).

The most likely explanation for the failure to find significant differences between the strong color and no color groups (which receives support from Figure 1 and the significant Fmax test) is that excessive variability among individual Ss obscured the effects of the independent variable color context, in the present study. It can be seen (Table 1) that
the CCC trigrams in this study had very high formal similarity. In order to learn the list, a S would first have had to make a "useful" discrimination among those trigrams. On the first list which was comprised of six pairs and was therefore easier than the nine pair second list, the three conditions were about equal so far as variability was concerned, although the no color condition Ss did not perform as well as the other two. When the nine item list was introduced, the differences among the Ss were even greater, produced perhaps by the greater difficulty of the second list. It is possible that the results may be due to the failure of the first list differences to transfer to second list learning, but the trends seen in Figure 1 and the large variances argue against such an interpretation.

A possible method for reducing the amount of individual variability would be to shorten the second list. Alternatively the formal similarity of the materials might be reduced. Although this would appear to be in opposition to the results of Samuels (1968) who detected the von Restorff effect only in his high similarity condition, his high similarity materials were not nearly as highly similar as those in the present study. Perhaps the context selection process is not a simple, linear function of the formal similarity of the nominal stimuli.
REFERENCES


Richardson, J., Cue Effectiveness and Abstraction In Paired-Associate Learning, Psychological Bulletin, 1971, 75, 73-91.


