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ABSTRACT

This study was concerned with the effect of situational frequency manipulations on subsequent discrimination learning. The subjects were 104 fourth-grade children attending two elementary schools located in middle-class residential areas. Twenty-six subjects were randomly assigned to each of two picture conditions. The other 52 subjects were randomly divided between two word conditions. The learning of the discrimination list consisted of picture pairs preceded by either relevant or irrelevant prefamiliarization training. In the relevant prefamiliarization condition, subjects were pre-exposed to the pictures which occurred in the discrimination task. In the irrelevant conditions, subjects were exposed to materials unrelated to the discrimination-task pictures. In the experiment utilizing verbal materials, subjects learned a discrimination list consisting of word pairs after they received either relevant or irrelevant prefamiliarization training. A significant negative effect of prefamiliarization was found in both experiments. It was concluded that the effect of stimulus prefamiliarization generalizes across stimulus materials (pictures and words) and across age levels. (WR)

Technical Report No. 285

THE EFFECT OF STIMULUS PREFAMILIARIZATION ON CHILDREN'S DISCRIMINATION LEARNING

by

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Statement of Focus

Individually Guided Education (IGE) is a new comprehensive system of elementary education. The following components of the IGE system are in varying stages of development and implementation: a new organization for instruction and related administrative arrangements; a model of instructional programing for the individual student; and curriculum components in prereading, reading, mathematics, motivation, and environmental education. The development of other curriculum components, of a system for managing instruction by computer, and of instructional strategies is needed to complete the system. Continuing programmatic research is required to provide a sound knowledge base for the components under development and for improved second generation components. Finally, systematic implementation is essential so that the products will function properly in the IGE schools.

The Center plans and carries out the research, development, and implementation components of its IGE program in this sequence: (1) identify the needs and delimit the component problem area; (2) assess the possible constraints—financial resources and availability of staff; (3) formulate general plans and specific procedures for solving the problems; (4) secure and allocate human and material resources to carry out the plans; (5) provide for effective communication among personnel and efficient management of activities and resources; and (6) evaluate the effectiveness of each activity and its contribution to the total program and correct any difficulties through feedback mechanisms and appropriate management techniques.

A self-renewing system of elementary education is projected in each participating elementary school, i.e., one which is less dependent on external sources for direction and is more responsive to the needs of the children attending each particular school. In the IGE schools, Center-developed and other curriculum products compatible with the Center's instructional programing model will lead to higher student achievement and self-direction in learning and in conduct and also to higher morale and job satisfaction among educational personnel. Each developmental product makes its unique contribution to IGE as it is implemented in the schools. The various research components add to the knowledge of Center practitioners, developers, and theorists.

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Abstract

Previous research has shown that stimulus prefamiliarization retards subsequent verbal discrimination learning in adults. In one experiment of the present study, children learned a discrimination list consisting of picture pairs following prefamiliarization with either the same or irrelevant materials. The same conditions were investigated in a second experiment using high-frequency words as materials. A significant negative effect of prefamiliarization was found in both experiments. It was concluded that the effect of stimulus prefamiliarization generalizes across stimulus materials (pictures and words) and across age levels (adults and elementary-school children). Suggestions for future research are offered.

I
Introduction

This study was concerned with the effect of situational frequency manipulations on subsequent discrimination learning. It has been demonstrated that discriminations between items with low situational frequencies are easier than between items with high situational frequencies when the absolute frequency difference between items is held constant (e.g., Ghatala & Levin, 1973; Underwood & Freund, 1970), a result which has been attributed to the operation of Weber's psychophysical law. For example, fewer errors in judging relative frequency are made when discriminating between an item presented twice and one presented only once than when discriminating between an item presented four times and one presented three times.

The same type of effect has been observed when Ss are pre-exposed to the experimental stimuli of a verbal discrimination task. That is, Ss who are prefamiliarized with discrimination learning materials tend to perform more poorly on the discrimination task than do Ss who are prefamiliarized with irrelevant materials (e.g., Berkowitz, 1968; Wallace & Nappe, 1970)--a presumed consequence of more difficult discriminations associated with items of higher situational frequency.

However, the research in which the latter effect has been demonstrated is based exclusively on discriminations between verbal items. A preliminary study by DeRose (1974), in which kindergarten children were prefamiliarized with either the same pictures that occurred in a subsequent discrimination task or with unrelated pictures, provided some evidence of negative effects of prefamiliarization with pictures. However, the effects were not strong and did not emerge until the second response trial.

The present study was conducted with older children, longer lists, and revised prefamiliarization procedures in order to determine unequivocally whether the prefamiliarization effect could be obtained with pictures. In addition, the present study also investigated prefamiliarization effects with verbal materials in order to ascertain whether the negative effect (previously found with adults) could be replicated with children.

II
Method

Subjects

The Ss were 104 fourth-grade children attending two elementary schools located in middle-class residential areas in Ogden, Utah. Twenty-six Ss were randomly assigned to each of two picture conditions. The other 52 Ss were randomly divided between two word conditions. Thus, two experiments were conducted simultaneously.[1]

Materials

The learning of the discrimination list consisting of picture pairs was preceded by either relevant or irrelevant prefamiliarization training. In the relevant prefamiliarization condition, Ss were pre-exposed to the pictures which occurred in the discrimination task. In the irrelevant conditions, Ss were exposed to materials unrelated to the discrimination-task pictures.

The pictures were 36 line drawings of common objects. In the prefamiliarization stage, the pictures were 3 x 3 inches in size and mounted in clear plastic folders. The pictures were randomly paired to form an 18-pair discrimination list. In discrimination learning the pictures were mounted side by side on 8-1/2 x 11 inch sheets of white paper, covered by plastic folders and placed in 3-ring notebooks. One member of each pair was randomly selected as correct and starred. In a second version of the list, received by half of the Ss, the other member of each pair was correct. The list of 18 pairs was presented for five trials such that: (a) within a trial the correct members occurred equally often in the right and left positions; (b) across trials the correct member of a pair never occured in the same position more than three times; and (c) the serial order of the pairs was random for each trial.

In the experiment utilizing verbal materials, Ss learned a discrimination list consisting of word pairs after they received either relevant or irrelevant prefamiliarization training. The words were 36 concrete nouns from the A and AA range of the Thorndike and Lorge (1944) norms. The words were labels for the stimuli in the picture experiment. In the relevant prefamiliarization condition, these words were typed in primary type on 3 x 3 inch cards and mounted in plastic. The discrimination list for words was constructed to parallel the list in the picture experiment.

In both experiments, the irrelevant materials consisted of 36 two- and three-digit numbers, which were prepared for the prefamiliarization stage in the same way as the relevant materials.

Procedure

The procedure was comparable for the picture and word experiments. Each S was run individually in a private room in the school building. During the prefamiliarization phase, the Ss were first given a visual study trial in which the appropriate 36 stimuli were

[1] Originally it was planned to compare word and picture effects within the confines of a single experiment. However, due to the differing difficulties associated with the two types of task, this was later deemed unreasonable.

presented one at a time at a 5-second rate. The Ss were told to pay close attention to the stimuli because it would help them in a game that was to be played. The second part of the prefamiliarization activity consisted of a matching task in which two identical sets of stimuli were used, with one set laid out in a six-by-six array for S to inspect for 30 seconds. Then E randomly selected a stimulus from the second set and handed it to S who in turn placed it on its duplicate in the array until all 36 stimuli were paired. In the irrelevant (number) conditions, a five-by-five array was used so that the average time spent on this task equaled that spent by the Ss in the relevant conditions, which for both picture and word stimuli was between 2.5 and 3 minutes.

Following the matching task a 2-minute rest period was given during which S was engaged in casual conversation. The final part of the prefamiliarization phase consisted of a second visual study trial with instructions and procedures identical to the first. At no time during the prefamiliarization activities did E label any of the stimuli.

All Ss were administered the discrimination learning task immediately following the second visual study trial. A single study trial was followed by four anticipation trials on which Ss indicated their choice by pointing or labeling. A 5-second presentation rate was used.

III
Results and Discussion

Considering first the results for the picture experiment, relevant prefamiliarization produced poorer discrimination performance than did irrelevant prefamiliarization ($t = 2.73$, $df = 50$, $p < .01$). The mean number of errors across four trials was 8.62 (S.D. = 7.15) for the relevant condition and 4.46 (S.D. = 3.04) for the irrelevant condition. Prefamiliarization also produced a negative effect in the word experiment ($t = 4.11$, $df = 50$, $p < .001$). The mean number of errors across trials for the relevant and irrelevant conditions was 22.58 (S.D. = 11.60) and 11.00 (S.D. = 9.49) respectively. While there was improvement across trials in all conditions, in neither experiment did the prefamiliarization effect interact with trials.

The result of primary interest is that the negative effect of prefamiliarization previously found with words was demonstrated here with pictures. The result from the word experiment replicates the verbal prefamiliarization effect found with adults (e.g., Berkowitz, 1968; Wallace & Nappe, 1970) and indicates that the result for pictures is not peculiar to our young sample. That is, the results of the present word experiment along with other evidence (cf. Ghatala & Levin, 1973 and Underwood & Freund, 1970) suggest that the same variables influence frequency discriminations in both children and adults.

It should be noted that while the effect of prefamiliarization with pictures was statistically significant, its magnitude is probably underestimated because performance in the irrelevant prefamiliarization condition approached ceiling. While the ceiling effect in the picture experiment in no way obviates the present inference concerning the existence of the prefamiliarization effect with pictures, it does prevent our gaining any information concerning the comparative magnitudes of the effect for pictures and words (at least based on the same list of 18 pairs).

Previous research indicates that the effect of prefamiliarization (under conditions where both members of subsequent discrimination pairs are pre-exposed) varies with characteristics of the verbal materials: With relatively common words, as used in the present study, the effect is negative (e.g., Berkowitz, 1968; Lovelace & Pulley, 1972; Wallace & Nappe, 1970); with nonsense materials the effect is absent (Runquist & Freeman, 1960), and with low-frequency words the effect is either absent (Lovelace & Pulley, 1972) or reversed such that relevant prefamiliarization facilitates subsequent verbal discrimination learning (Lovelace, 1969). And now that the negative effect of prefamiliarization has been established with pictures corresponding to high-frequency words, further research might utilize picture analogs of nonsense and low-frequency verbal materials to determine whether corresponding variations in the picture prefamiliarization effect are found. In our own published (Ghatala & Levin, 1973; Ghatala & Levin, 1974; Ghatala, Levin, & Makoid, in press) and unpublished research we have found that such variables as the pre-experimental frequency and meaningfulness of stimuli have comparable influences on pictorial and verbal materials in discrimination learning and in frequency judgment tasks. Further research utilizing pictures and words in the prefamiliarization paradigm may be helpful in elucidating these and additional effects.

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