Effects of mode of presentation on paired-associate transfer in children

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Transfer under the A-Br and A-C paradigms was compared under four conditions of mode of presentation resulting from the factorial combination of aural and visual modes in Task 1 with Task 2. Second graders learned lists of four pairs of two-digit numbers, with transfer evaluated against a C-D control condition. Neither mode of presentation in the training or transfer task exerted a significant main effect, although both were found to interact with the other variables. Significant positive transfer occurred under the A-C paradigm, and while the direction of transfer under the A-Br paradigm was negative, this trend was not significant. The comparability of these results with the findings of other studies was discussed.

Recently, Schulz & Hopkins (1968) compared aural and visual modes of presentation in combination with several variables frequently investigated in one-stage verbal-learning situations. On the basis of their systematic investigation, they concluded that mode of presentation influenced learning only in interaction with other variables and not as a main effect. The question then arises as to the possible interaction of mode with transfer paradigms in two-stage learning tasks.

With little exception, the major transfer paradigms have been investigated only with visual presentation of the stimulus materials. It was the purpose of the present investigation to compare transfer effects in the A-Br and A-C paradigms, using a D-C control, under the four conditions of mode of presentation resulting from the factorial combination of aural and visual modes in Task 1 with Task 2. It was also possible to assess whether or not mode of presentation interacted with the sequence of tasks that are presented in either mode.

In an effort to provide developmental data on the effects of mode of presentation and its possible interaction with transfer paradigm, second graders served as Ss in this experiment.

SUBJECTS

The Ss were 40 children, aged 8 and 9 years, from a public school in Albuquerque, New Mexico.

DESIGN

The design represented a 2 by 2 by 2 by 2 factorial, with visual vs

aural modes of presentation in Tasks 1 and 2 and in experimental paradigms, A-Br vs A-C, comprising the three between-Ss variables. Transfer, the comparison of each experimental paradigm with a C-D control, constituted a within-Ss comparison. Five Ss served under each of the eight conditions defined by the factorial combination of the between-Ss variables.

STIMULI AND APPARATUS

Both stimuli and responses consisted of two-digit numbers, ranging from 13 to 95. Numbers, rather than words, were used in an attempt to better equate the stimuli for meaningfulness under visual and aural presentation. Also, the use of highly integrated responses was expected to minimize the contribution of response learning in the A-Br paradigm and thereby allow a less complicated comparison of associative interference under the two experimental paradigms. A Hunter Card Master, Model 340, was used for visual presentation of stimuli. The numbers were recorded on magnetic tape for aural presentation.

Each S learned two successive four-pair lists. In Task 2, two pairs represented the C-D paradigm (new stimuli and new responses), and two pairs represented the experimental paradigm (A-Br with old stimuli and responses re-paired or A-C with old stimuli and new responses). Presentation order of the pairs within a list was varied to prevent serial learning of the responses.

PROCEDURE

Ss were given paired-associate instructions for the anticipation method that were appropriate for the condition of mode of presentation to which they had been assigned. Following instructions, the task was illustrated with two pairs. All Ss were run individually to a criterion of two successive correct trials in Task 1 and were given 10 trials in Task 2.

The anticipation interval and joint-presentation interval were 6 and 5 sec, respectively. Two seconds separated successive pairs, and approximately 1 min separated successive tasks.

RESULTS

First-Task Learning

An analysis of variance was performed on the number of trials to a criterion of two successive correct responses for each of the pairs representing any paradigm. Mode of presentation in Tasks 1 and 2 and in paradigms were the between-S factors. This analysis revealed no significant main

effects or interactions ($p > .05$). The only variable which would be expected to be a possible significant source of variance was Task 1 mode of presentation. Thus, the failure of the other two variables or of any interaction to reach significance indicates that the groups did not differ initially.

Initial Transfer Effects

Trial 2. Since the anticipation procedure was used in presenting stimuli, Trial 2 was the first trial on which second-task learning could be observed. The number of correct responses on Trial 2 of Task 2 was subjected to an analysis of variance, with mode of presentation in Task 1, in Task 2, and in paradigms as the between-Ss variables and with transfer as a within-Ss comparison. The main effect for paradigms was significant [$F(1,32) = 7.6562$, $p < .01$], with more correct responses given under the A-Br paradigm. No other main effects reached significance ($p > .05$).

The interaction of transfer with paradigms and mode of presentation in Task 1 was significant [$F(1,32) = 8.6486$, $p < .01$]. Following visual presentation of stimuli in Task 1, a trend toward negative transfer was evident under the A-C paradigm, while the direction of transfer was positive under the A-Br paradigm. Following aural presentation, a trend toward positive transfer occurred in the A-C paradigm, while under the A-Br paradigm, it was negative. No other interactions reached significance ($p > .05$).

Trials 1-3. An analysis was performed on the correct responses given on the first three trials of the transfer task as a more stable measure of initial transfer effects than in the second trial alone. Mode of presentation in Tasks 1 and 2 and in paradigms were between-Ss variables, and transfer was a within-Ss comparison. Paradigms was shown to be a significant source of variance [$F(1,32) = 5.0562$, $p < .05$]. A trend toward positive transfer occurred under all conditions except for aural presentation of the A-Br paradigm. Neither the main effect for transfer nor any of the other interactions were significant ($p > .05$).

A chi square showed a significant difference in the frequency of interlist intrusions, responses which were correct in Task 1, given to the experimental and control pairs for the two paradigms ($\chi^2 = 5.01$, $p < .05$). More of these errors were made to the experimental pairs representing the A-Br paradigm than to those representing the A-C. A difference in the frequency of errors made to the control pairs occurred as well, with more being made to the control pairs presented with the A-C paradigm.

Second-Task Learning

The numbers of correct responses on the

10 trials of the transfer task were subjected to an analysis of variance, with trial blocks, Trials 1-5 and 6-10, as an additional within-Ss factor. The effect for paradigms was again significant [$F(1,32) = 5.0276$, $p < .05$], with more correct responses being given under the A-Br condition. The interaction of modes of presentation in Tasks 1 and 2 with paradigms was significant [$F(1,32) = 5.2287$, $p < .05$]. Following visual presentation of the first task, more correct responses were given under visual than under aural presentation of Task 2 for the A-Br condition than for the A-C. Following aural presentation of the initial task, performance under the A-Br condition similarly showed greater facilitation when continued within the same rather than within a different modality than under the A-C condition.

The main effect for transfer showed performance under the experimental paradigms to be significantly superior to that under the control [$F(1,32) = 15.1840$, $p < .01$]. A significant interaction of transfer with paradigms was obtained [$F(1,32) = 10.7883$, $p < .01$]. A Newman-Keuls test (Winer, 1962, p. 80) indicated significant positive transfer for the A-C paradigm only ($p < .01$) and no reliable difference between the experimental and control paradigms under the A-Br condition ($p > .05$).

The expected improvement over trial blocks was obtained [$F(1,32) = 141.3281$, $p < .01$]. Mode of presentation in the transfer task interacted with trial blocks [$F(1,32) = 4.3156$, $p < .05$] in that the superiority of performance under visual presentation increased over trials. No other main effects or interactions were significant ($p > .05$).

DISCUSSION

The children learned the initial task equally well under aural and visual modes of presentation. Although this finding would be expected on the basis of Schulz and Hopkin's failure to obtain a main effect for mode of presentation, it is of interest that their findings could be extended to young children.

With little exception, both analyses of

initial transfer effects yielded comparable findings. The main effects of mode of presentation in Tasks 1 and 2 were not significant. In both analyses, the effect for paradigms was significant, with more correct responses given under the A-Br paradigm. The Transfer by Paradigms interaction failed to reach significance in either analysis. However, in both, there was a consistent trend toward positive transfer with the A-C paradigm and toward negative with the A-Br paradigm. These trends occurred even though more correct responses were given under the A-Br paradigm, since performance for the control as well as the experimental pairs was elevated under the A-Br condition.

The trend toward negative transfer under the A-Br condition is consistent with the significant chi square obtained for frequency of interlist intrusions in the transfer task in that more such errors occurred under this paradigm. Postman (1962) also has reported a much higher frequency of such errors under the A-Br than under the A-C paradigm. This difference in frequency of interlist intrusions occurring under the two paradigms is not open to an unambiguous interpretation since, as Postman has pointed out, interlist intrusions cannot be distinguished from intralist errors, incorrect Task 2 responses, under the A-Br paradigm, since the same responses appear in both tasks. However, interlist intrusions would be expected to be most frequent in the initial learning of the transfer task and should then drop in frequency as Task 2 learning progressed. In general, investigations comparing the A-Br and A-C paradigms have found more negative transfer under the former paradigm (e.g., Postman, 1962; Price, Cobb, & Morin, 1968); this is attributed to combined associative interference resulting from both backward and forward associations; only forward associations would lead to associative interference under the A-C paradigm.

Analysis of second-task learning again failed to produce a significant effect for mode of presentation in either Task 1 or

Task 2. The interaction of modes of presentation in Tasks 1 and 2 with paradigms was interesting in that it suggested that performance under the A-Br condition was adversely affected by a change in modality from Task 1 to Task 2, whereas performance under the A-C paradigm suffers from no such adverse effect. Quite possibly, any difficulty that Ss might experience in switching from one modality to the other is offset by increased task differentiation under the A-C paradigm, whereas the appearance of both the same stimuli and responses under the A-Br paradigm would attenuate any effect of task differentiation occasioned by a change in modality.

All analyses were consistent in failing to reveal a significant effect for mode of presentation in either the training or transfer task. All showed mode of presentation to interact with other variables. Thus, the present study and that of Schulz and Hopkins suggest that mode of presentation does exert an effect on performance in interaction with other variables. Additionally, the present findings indicate that mode of presentation may be expected to interact with transfer paradigms as learned by young children. The implications of these results for educational settings dictate the need for additional research with mode of presentation in combination with other variables.

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NOTE

1. Mr. Bennett was an undergraduate NSF summer trainee at The University of New Mexico during the conduct of this experiment.