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THE UNIMPORTANCE OF EXPLICIT SPATIAL INFORMATION IN SERIAL RECALL OF VISUALLY PRESENTED LISTS

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The superiority of auditory over visual presentation in short-term serial recall may be due to the fact that typically only temporal cues to order have been provided in the two modalities. Auditory information is usually ordered along a temporal continuum, whereas visual information is ordered spatially, as well. It is therefore possible that recall following visual presentation may benefit from spatial cues to order. Subjects were tested for serial recall of letter-sequences presented visually either with or without explicit spatial cues to order. No effect of any kind was found, a result which suggests (a) that spatial information is not utilized when it is redundant with temporal information and (b) that the auditory–visual difference would not be modified by the presence of explicit spatial cues to order.

Introduction

It is well established that serial recall following visual presentation with silent rehearsal is inferior to that following auditory presentation or visual presentation with vocal rehearsal (Conrad and Hull, 1968; Corballis, 1966; Murray, 1966; Routh, 1970). The advantage to auditory presentation is confined to the last few items presented and has been given considerable theoretical importance. For example, Crowder and Morton (1969) argue that the modality effect indicates the presence of a sensory store for auditory information which has a relatively long decay time compared with its visual counterpart. However, most of the evidence for the modality effect has come from experiments where the items were presented in a temporal sequence. The question arises as to whether such sequences are more compatible with the auditory system than the visual one, since auditory information is primarily temporally structured whereas with visual inputs the spatial distribution of information is relatively more important. It is therefore quite possible that the recall of visually presented sequences is improved when the items are distributed in space as well as time.

Murdock (1969) has already shown that the modality effect does not depend crucially on testing recall for temporal order. In his experiment items were presented sequentially at separate spatial locations which were uncorrelated with the temporal order. The auditory advantage was still present, even when spatial location was used as the cue for recalling individual items. However, Murdock's results do not entirely settle the issue, since the spatial distribution of information

may have a different effect when spatial location and temporal order are correlated as opposed to uncorrelated. The present experiment was intended to examine whether the recall of visually presented sequences would be affected by the explicit provision of correlated spatial cues to order.

Method

Material

Two sets of 90 sequences of seven consonants were constructed by random selection from the set B, F, G, H, J, K, L, Q, R, V, Y, Z. Within a sequence no letter was repeated. Sequences were coded on to punched paper tape.

Procedure

Letter sequences were presented visually at a rate of 80 items/min and recall was tested immediately after presentation. The visual display consisted of seven horizontally arranged in-line digital displays (Type 650/1/7, Counting Instruments, Ltd.) which were driven from a paper tape reader. Each sequence was preceded by a warning signal consisting of three presentations of a red floodlamp at the item presentation rate in the extreme left-hand location of the display. In the spatially distributed presentation condition each sequence item appeared at a separate location advancing from left to right across the display. The signal for recall was the single presentation of a red floodlamp at the extreme right-hand location immediately following the offset of the last letter. In the non-spatially distributed presentation condition, each letter appeared at the extreme left-hand location. In this condition the signal for recall was a presentation of the red floodlamp at the left-hand location.

The main experiment was preceded by a demonstration of the two experimental conditions and by four practice lists to familiarize subjects with the procedure. The 80 experimental lists followed, of which half were presented in each of the two conditions. Within this block of trials the two conditions were randomly intermingled. About 11 s was allowed between lists for subjects to recall as many letters as they could in the correct serial order, writing their responses on prepared answer sheets.

Subjects

Twelve housewives from the APU subject panel were used. They were tested in two equal groups, each group receiving a different set of sequences in which the ordering of the trials differed.

Results and Discussion

The recall data were scored on a strict order criterion and are shown in Fig. 1. A repeated measures analysis of variance confirms the visual impression that no differences exist between the two conditions. The F ratio was less than one for both the main effect of presentation conditions and the Serial position $\times$ Presentation condition interaction. The only significant effect was due to serial position ($F = 8{\cdot}11$, $df = 6, 66$, $P < 0{\cdot}001$).

For each method of presentation we have the typical "visual" serial position curve, with performance on the last item being equivalent to performance on items in the middle of the list. This is as opposed to the "auditory" curve, in which the

final item is recalled almost as well as the initial item. It is therefore clear that the explicit presence of correlated spatial information would not modify the standard auditory–visual comparison, in line with a model such as that of Crowder and Morton (1969). However, it is surprising that spatial information had no effect at

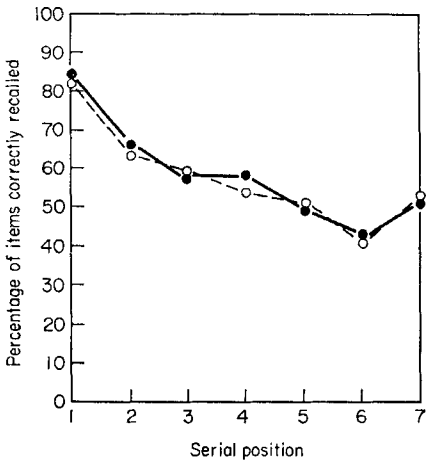

FIG. 1. Serial position distributions of errors for the two methods of sequence presentation. Single location presentation, ○ – – – ○; spatially distributed presentation, ●——●.

all on recall. It would seem that when spatial and temporal information are correlated the redundancy cannot be used to advantage by the memory system. This conclusion may be restricted to the serial recall of correlated spatio-temporal sequences, as probed recall of visually-presented uncorrelated sequences does show some influence of spatial information (Hitch, 1974).

A final point concerns the possibility that the recall signal, which was a red light, may have acted as a stimulus suffix (Crowder, 1967; Morton, 1968). Both Kahneman (1973) and Hitch (in press) have shown that there is a small but reliable tendency for a visual suffix to depress recall of the final items of a sequence. Kahneman's data suggest that the suffix must be perceptually similar to the memory items for it to have any effect, so the red light used here would not be expected to have any influence. Indeed, a control experiment which is not reported here compared the presence and absence of the recall cue and found no difference.

In summary, the provision of correlated spatial order information has no effect on the serial recall of visual sequences, suggesting that the auditory–visual modality effect is not an artefact of using sequences that are more compatible with the auditory system.

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