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Associative symmetry: V. An interference interpretation of the failure of stimulus availability

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A list of paired associates was learned to partial criterion. Using a completely between design, stimulus and response recall was then ascertained after delays of 10 min and 24 h. Forward recall was initially superior to backward recall. However, while stimulus recall improved with the passage of time, the responses deteriorated so that the two were equivalent after 24 h. These data were explained in terms of interference theory.

Asch and Ebenholtz (1962) attributed the asymmetry in paired-associate learning to the partial learning of the stimulus items, rather than the superiority of the forward to backward associative process. They showed that asymmetry dissipated with the use of prefamiliarized materials and thereby concluded that it was due to a lack of stimulus availability. Having first related asymmetry to a failure of stimulus acquisition, it was illogical to explain the superiority of forward performance in terms of stimulus unavailability, which refers to a problem in the mechanism for retrieval and recall. The present study represents an attempt to explain asymmetry in terms of a failure of recall, rather than acquisition.

It was reasoned that the very nature of a paired-associate task promotes the grouping of materials into stimuli, on the left, that precede response items on the right. Furthermore, this state of phenomenal primacy-recency may be sufficient to generate interference between the stimulus and response members of a list. It was speculated that perhaps the initial superiority of response to stimulus recall may be due to the retroactive interference of the phenomenally recent responses upon the more remote stimulus items. In accord with this logic, it would seem reasonable to expect the stimuli to spontaneously recover in long-term recall with a concomitant decrement in the response items due to proactive interference. Therefore, the following study was directed at assessing the short- and long-term recall of stimuli and responses in a paired-associate task.

METHOD

Subjects

Sixty males and 44 females participated in this study. Ranging in age from 18 to 24, their mean age was 19.4 years. All were naive as to the purpose of the experiment.

Apparatus and Materials

Paired-associate lists were presented on a Lafayette memory drum (Model 303). There were two such lists which consisted of 12 pairs of CVC trigrams of 0% association value, according to the Glaze table. The two lists were composed of the same items, except the stimuli in one served as the response terms in the other, and vice versa. As a given subject was required to learn only one list, the lists were counterbalanced over subjects within groups. The nonsense syllables appeared in bold black type. Each list was typed in three different orders which enabled the order of presentation to be varied over trials.

Procedure

The subjects were told that this was a two-part experiment attempting to assess the difficulty of learning nonsense materials. They were informed that the first part would be followed by a break, after which a new set of materials would be presented.

All subjects were required to learn a list of pairs, to a criterion of 8 out of 12^1 according to the method of cued or aided recall. The pairs were presented at a 2-sec rate with no delay between pairs. The subjects were required to pronounce each pair aloud as it appeared in the drum. Testing commenced 10 sec after completion of the list exposure. The stimuli were presented in a different order, at a 2-sec rate, with the subject required to verbalize the correct response. The next trial began 30 sec after the completion of the test. The trials continued until partial criterion was achieved. At that point the subjects were divided into four groups.

Groups 1 and 2 were retested on the response items. They were presented with the stimuli at a 2-sec rate, in yet a different order, and required to emit the appropriate responses. Whereas Group 1 was retested after a 10-min delay, Group 2 was retested 24 h later.

Groups 3 and 4 were retested on the stimulus items 10 min and 24 h later, respectively. They were presented with the response items at a 2-sec rate and required to pronounce the words that went along with them on the left. Thus, the short- and long-term recall of stimuli and responses was ascertained using a completely between design.

RESULTS AND DISCUSSION

Groups 1-4 mastered the task in a mean of 21.5, 20.8, 20.4, and 18.5 trials, respectively. These differences were not significant according to a completely randomized block design ($F = .51$; $df = 3,100$). The mean number of correct responses to criterion for the four groups was 85.4, 86.3, 84.6, and 82.7. These differences were also not significant according to a one-way analysis of variance ($F = 2.63$; $df = 3,100$). Thus, the groups may be considered to be matched on original

learning and, thereby, compared on the recall data.

There was a mean of 6.08 responses recalled after the 10-min interval, compared to 4.65 after the 24-h delay. While a mean of only 3.31 stimuli were recalled after 10 min, there was an improvement to 4.92 after 24 h. A significant interaction between time and type of recall (stimulus or response) was found using a completely randomized block factorial design ($F = 53.05$; $df = 1,100$; $p < .01$). Simple effects indicated that there was a significant increment in stimulus or backward recall with time ($F = 30.0$; $df = 1,100$; $p < .01$), accompanied a significant decrement in forward or response recall ($F = 23.28$; $df = 1,100$; $p < .01$). In addition, while forward recall was significantly superior to backward recall after 10 min ($F = 88.15$; $df = 1,100$; $p < .01$), both equalized after 24 h ($F = .83$; $df = 1,100$).

If Asch and Ebenholtz (1962) were correct in their contention that the inferiority of backward recall was based upon the partial learning of stimuli, then that inferiority should have endured over time. There is no way in which this notion can explain the equalization of forward and backward recall with time, particularly since it was partially achieved by a significant increment in stimulus recall. As opposed to the "familiarization hypothesis," an interference interpretation of the data obtained in this study seemed most appropriate.

As specified earlier, the stimulus and response items of a paired-associate list seem to be grouped, so as to create the impression of primacy-recency. The stimuli cluster together in memory as clearly preceding their response counterparts, which follow. The perception of "before and after" or "this follows that" is as evident in this case, as it is in the instance of temporally separating an original (OL) and an interpolated list (IL). In fact, the OL-IL interval, which is an inescapable operation in an RI paradigm, may serve no function other than to generate the perception of primacy-recency. Thus, stimulus recall may be analogous to that of recalling an OL, and response recall to that of an IL. The data clearly fit this model. The initial superiority of forward recall can be explained as the retroactive interference of the phenomenally recent responses upon the stimulus items. Furthermore, the stimuli seemed to spontaneously recover to proactively interfere with the responses, resulting in a long-term decrement in response recall. Thus, the immediate superiority of forward to backward recall seems to be due truly to a failure of stimulus availability, rather than partial learning.

Unfortunately, we were unable to conceive of a control that was appropriate to this study.[2] However, there is a wide range of ongoing research in our laboratory demonstrating retroaction and proaction in a variety of simultaneous learning tasks where perceptual primacy-recency has been created. The operations needed for RI and PI, as well as "unlearning theory" is being seriously questioned. However, these are matters for another series of papers.

REFERENCE

ASCH, S., & EBENHOLTZ, S. M. The principle of associative symmetry. *Proceedings of the American Philosophical Society*, 1962, **106**, 135-163.

NOTES

1. Partial criterion was used instead of a fixed number of presentations, so as to keep criterion level constant. This enabled the subsequent analysis to be performed on absolute forgetting data. Subjects learning beyond eight pairs were immediately dropped. The subjects were not informed of the partial criterion being used.

2. RI and PI data are usually obtained by comparing the relearning of an OL and IL to a control.

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