Stimulus memory in concept attainment¹

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Both inconsistencies in concept guesses and attribute-recall errors were affected by the type of stimulus series (positive, negative, mixed) and by stimulus position in the series. Selected aspects of recall were related to concept guesses.

When S guesses a concept following presentation of a stimulus series, his guess is most likely to be inconsistent with stimuli presented earlier in the series (Cahill & Hovland, 1960). Inconsistencies presumably reflect S's inability to recall stimulus attributes. However, attribute-recall errors are most likely in the middle of the series, least likely for the first stimulus (Trabasso & Bower, 1964). Although this suggests that inconsistencies do not directly reflect recall errors, these studies differ in several respects (Dominowski, 1965). In the present study, the type of stimulus series was varied, and both inconsistencies and recall errors were measured.

Method

The stimuli were geometric forms varying on six binary dimensions. Each training slide contained the figure, an index number (1-6), and indicated category membership (+ or -). For each of two unidimensional concepts (small, two) there were three training series, positive (P), negative (N), and mixed (M), the latter alternating stimuli from the two categories. Within each series, successive stimuli logically eliminated one dimension as relevant.

Each individually-run S received tape-recorded instructions describing the stimuli (with examples) and the nature of the concept; S was required to describe possible concepts. Finally, S was told that after the series, he would be asked to state what a plus sign meant.

Six training stimuli were shown at an 8 sec rate (7.5 sec on, .5 sec blank), after which S was given 15 sec to write his guess about the concept. Then S was given a booklet, each page of which instructed him to recall one of the stimuli (1-6) by circling one of the two values for each dimension and category; 30 sec were allowed per page. Six orders of the pages were used to balance stimulus number with testing order.

This was the complete procedure for Conditions P, N, and M. In Condition MI, Series M was preceded by the additional instruction that stimulus recall would be tested. Twelve introductory psychology students served in each of the eight groups formed by the combination of four conditions with two concepts.

Results and Discussion

Each S's concept guess was scored in terms of

the number of training stimuli with which it was inconsistent; Ss not stating a guess were assigned scores of 6. These scores tended to be bimodally distributed, precluding comparison of means. The proportions of Ss whose guesses were inconsistent with zero or one stimulus were .62, .33, .79, and .54 for Groups P, N, M, and MI, respectively, representing significant differences ($\chi^2=10.69$, $df=3$, $p<.02$). Further chi square analyses indicated that Group N was significantly inferior to Groups P and M, while the M-MI difference approached significance ($p<.10$). The data support Huttenlocher's (1962) finding that showing only negative instances of a unidimensional concept results in poorest performance, and suggest that instructing Ss about stimulus recall impaired their performance.

The probability of an inconsistency varied with stimulus position (Fig. 1). For Groups N, M, and MI, concept guesses were most likely to be inconsistent with the first stimulus, which supports Cahill & Hovland's (1960) finding, and group differences were fairly stable over stimulus positions. The increase at the end of the series differed from expectations. Group P showed a general decrease in consistency from early to late stimulus positions (the point at position 5 seems spuriously high).

The proportion of attribute recall errors was determined for each S for each stimulus. The mean proportions were .25, .21, .37, and .42 for Groups P, N, M, and MI, respectively, a significant effect

Fig. 1. Probability of a concept guess being inconsistent with stimuli at six temporal positions, for four treatment groups.

Fig 2. Probability of an error in recalling the six attributes of stimuli at six temporal positions, for four treatment groups.

($F=22.67$, $df=3/88$, $p<.001$). Presenting mixed series resulted in poorer attribute recall; Groups M and MI also produced more category misrecalls (34%) than Groups P and N (3%). Instructing Ss about stimulus recall did not facilitate performance, but rather impaired it slightly.

The probability of recall errors varied with stimulus position ($F=13.98$, $df=5/440$, $p<.001$), and group differences were stable over stimulus positions (Fig. 2). The data are in agreement with Trabasso & Bower's (1964), both in terms of the shape of the function over stimulus positions and in the level of recall for Group MI, which was treated most similarly to their Ss.

It is readily apparent that inconsistencies in concept guesses do not directly reflect recall errors. Group N had both the most inconsistencies and the fewest recall errors. Groups P and M, approximately equal in terms of inconsistencies, had very disparate recall levels. The functions relating the measures to stimulus position are almost reversed, except for Group P. For Groups N, M, and MI, recall of stimuli consistent with the concept guess was no different from that for inconsistent stimuli. For Group P, however, recall for consistent stimuli was superior to that for inconsistent stimuli, with 85% of the differences positive ($\chi^2=6.23$, $df=1$, $p<.02$). Since this group also had the most similar inconsistency and recall-error functions, it appears that

stimulus recall and concept guesses are related when only positive instances are presented.

Recall tended to agree with S's concept guess; e.g., if S stated "plus means large," he tended to recall stimuli as either "large and plus" or "small and minus." The mean proportions of such agreement varied over groups, with means of .83, .49, .71, and .73 for Groups P, N, M, and MI, respectively ($F=4.75$, $df=3/79$, $p<.01$). It is clear that recall does not agree with concept guesses at greater than chance levels for Ss shown only negative instances.

Accuracy of recall for these subjectively relevant attributes was superior for stimuli consistent with concept guesses, compared to inconsistent stimuli, with 70% of differences positive ($\chi^2=8.64$, $df=1$, $p<.01$). Thus, when S's concept guess was inconsistent with a stimulus, his recall of the relevant attribute(s) and category for that stimulus tended to be wrong. This difference is not merely a result of S's generating his recall to agree with his guess, since such agreement occurred in only 55% of the cases in which this selective recall was inaccurate. It is thus more appropriate to infer that an inconsistency in the concept guess reflected an error in recalling the relevant attributes. Although a test of independence over groups proved nonsignificant, this difference was not actually present for Group N, in which selective recall was equal for consistent and inconsistent stimuli.

The relationship between stimulus recall and concept guesses appears to vary with the type of stimulus information. These two behaviors were independent for Ss shown only negative instances, suggesting that inconsistencies reflect an inability to utilize information rather than forgetting. For other groups, selective recall (of attributes included in the guesses) distinguished consistent from inconsistent stimuli, indicating a role for forgetting in formulating hypotheses about the concept.

References

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