Effect of noncontingent "rights" and random reinforcements on concept identification as a function of the relevant dimension's cue value¹

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For the initial six trials of a two-category concept-identification task, Ss were told "right" regardless of their response (R), told "right" and "wrong" randomly (RR), or given no feedback (NF), and the value of the to-be-relevant dimension either remained constant (C) or varied randomly (V). Performance after R and RR was significantly inferior to performance after NF, but R and RR did not differentially retard learning. Neither the C-V factor nor its interaction with type of feedback reached significance. These results were said to be compatible with the idea that Ss use memory to eliminate hypotheses in concept identification.

Restle (1962) and Bower & Trabasso (1964) have proposed models of two-category concept identification (CI) in which S is said to sample randomly from a fixed set of hypotheses (H). It is assumed (1) that after an informed error, S resamples at random from H *with replacement*, and (2) that after a correct response, S does not resample but retains the same hypothesis for the following trial. Accordingly, subsequent performance on a CI task should not be influenced by an initial series of trials in which E's feedback to S is predetermined, i.e., not contingent upon S's behavior. Contrary to this prediction, Levine (1962) and Holstein & Premack (1965) found that in two-category CI tasks an initial series of random reinforcements (RR) produced slower learning.

To account for the RR effect, Levine (1962) suggested that hypotheses resulting in errors are eliminated from H or, at least, assigned a smaller probability of being resampled after subsequent errors. The RR procedure would be detrimental to S if, during RR, he sampled the correct hypothesis but, after a misinformative "wrong," eliminated it from H. Holstein & Premack (1965) suggested that S adds new hypotheses to H after "wrongs" produced by RR. Neither position supposes that any change in H occurs after responses that are called "right," although Levine has elsewhere proposed that elimination of

hypotheses also occurs after "rights" (Levine, 1966).

Merryman, Kaufmann, Brown, & Dames (1968) made a direct comparison of the separate effects of "rights" and "wrongs" in a CI task. One group began the task with six trials on which E said "right" regardless of S's response. A second group began the task with six "wrongs." From the viewpoint that changes occur in H only after "wrongs" (Holstein & Premack, 1965; Levine, 1962), one would predict a damaging effect from six "wrongs" but no effect from six "rights." Instead, Merryman et al found that six "rights" significantly retarded learning but that six "wrongs" did not. This finding suggests that the composition of H changes after "rights" but not after "wrongs," and it is intuitively reasonable to suppose that, after a correct response, S eliminates hypotheses from H as opposed to adding new ones.

From S's viewpoint in a CI task, a stimulus dimension is not present unless distinguishable values of it have appeared (Bower & Trabasso, 1964). It follows that, if a stimulus dimension is held constant in value, it is absent as a cue, i.e., it has no cue value. Hence, S should not entertain or eliminate hypotheses that involve it. In particular, S should not eliminate the correct hypothesis during an initial series of noncontingent reinforcements if the relevant dimension remains constant over the series.

The present experiment afforded a direct comparison of the effects of six initial "rights" (6R) and six initial random reinforcements (6RR) as a function of the presence or absence of the relevant dimension *as a cue* during noncontingent reinforcement. It was hypothesized that the detrimental effects of 6R (Merryman et al, 1968) and 6RR (Holstein & Premack, 1965; Levine, 1962) resulted from S's elimination of the correct hypothesis after misinformative "rights." In this event, neither procedure (6R, 6RR) should be detrimental to S's subsequent performance in a CI task if the relevant dimension is held constant until the initial, noncontingent phase has ended, whereas both procedures should retard learning if the relevant dimension is varied randomly.

SUBJECTS

The Ss were 120 female undergraduates

from introductory lecture and laboratory courses in psychology at Indiana University. Their participation in the experiment satisfied a course requirement.

APPARATUS AND MATERIALS

The stimuli were 64 slides of geometric figures differing on six two-valued dimensions: background (plain vs striped), color (blue vs red), number (one vs two), position (left vs right), shape (circle vs square), and size (large vs small). The slides were projected onto a screen 8 ft away from S by a Kodak Carousel 700 projector. The projector was rigged to change slides 4 sec after the activation of a timer by E.

DESIGN

The experiment employed a 3 by 2 factorial design. The six conditions differed (1) in the type of noncontingent feedback given during an initial series of six trials and (2) in whether one or both values of the relevant dimension appeared over this series. For all Ss, the relevant dimension in the CI task was "position," and the other five dimensions were irrelevant.

For the first six trials of the CI problem, one group of Ss (6R) was told "right" on each trial, a second group (6RR) was told "right" three times and "wrong" three times in random order, and a third group (6NF) was given no feedback at all. In addition, for half the Ss in each feedback condition (6R, 6RR, 6NF), the side (left or right) on which the figure(s) appeared was held constant for the initial six trials of the CI task. For the other half, each position value appeared three times during the initial six trials in random order. For all Ss, feedback was response-contingent from Trial 7 to criterion (15 successive correct responses or the completion of 50 response-contingent trials, whichever was first to occur).

PROCEDURE

All Ss were told that their task was to learn a simple principle or rule by which all slides could be classified correctly. They were instructed to classify each slide into one of two categories by verbally responding "A" or "B," after which they would be told by E if their classification was correct. In addition, Ss in the 6NF condition were told that they were to respond but would not receive feedback for the first six trials. The Ss were not told that they might receive misinformation. In contrast to the Merryman et al study, the Ss were not shown example slides, and the dimensions and their values were not named by E.

On a given trial, immediately after S's response ("A" or "B"), E said either "right" or "wrong" and pressed a button to activate the timer. Thus, a 4-sec interval between verbal feedback to S and offset of the stimulus was uniformly maintained

Table 1
Mean and Standard Deviation of Trial of Last Error for Each Group

Group	Mean	SD	Group	Mean	SD
6R-C	30.5	18.6	6R-V	25.3	16.7
6RR-C	26.0	15.6	6RR-V	19.0	15.3
6NF-C	15.8	14.6	6NF-V	13.1	14.3

within and across Ss. The assignment of "A" and "B" to the two values of the relevant dimension was counterbalanced over Ss within each condition.

The Ss were run individually in blocks of six (one S in each of the six cells). Within each of the 20 blocks, Ss were assigned to the six cells randomly in order of appearance in the laboratory. For each block of Ss, the order of presentation of the stimuli over the 50 response-contingent trials was randomized, with the restrictions that (1) the position value (left or right) on the first response-contingent trial be opposite that which appeared on the first six trials in the position-constant (C) condition in that block, and (2) each value of the position dimension appear 25 times. The position value held constant for the first six trials in Condition C was counterbalanced, and the particular six slides shown were drawn at random from the remaining slides not used in the response-contingent phase. The first six slides shown in the position-varied (V) condition consisted of a random three of the six slides shown in Condition C and three slides drawn at random from the remaining slides having the opposite value on the position dimension. This procedure was repeated for each of the 20 blocks of six Ss each.

RESULTS

Table 1 shows the mean and standard deviation of the trial of last error for each group. A two-way analysis of variance indicated that the main effect of type of feedback during the first six trials (6NF, 6RR, 6R) was significant, $F(2,114) = 6.86$, $p < .01$. Neither the C-V main effect [$F(1,114) = 2.79$, $.10 < p < .05$] nor the interaction [$F(2,114) < 1$] was significant at the 5% level.

The marginal means for each feedback type (6NF, 6RR, 6R) were compared pairwise using the Newman-Keuls procedure. According to this analysis, the 6R vs 6NF comparison was significant at the 1% level and the 6RR vs 6NF comparison was significant at the 5% level. The 6RR vs 6R comparison did not reach significance at the 5% level.

Thus, both six "rights" and six random reinforcements at the beginning of the CI task significantly retarded learning but not to significantly different degrees. Further, the detrimental effects of 6R and 6RR did not require that both values of the relevant dimension be shown S during the noncontingent phase.

DISCUSSION

The results of the present experiment are consistent with previous findings that an initial series of noncontingent "rights" (Merryman et al, 1968) or random reinforcements (Holstein & Premack, 1965; Levine, 1962) retarded learning in CI. The reliability of these effects underscores the inadequacy of "no memory" models (Bower & Trabasso, 1964; Restle, 1962) of CI.

Merryman et al (1968) suggested "...that noncontingent 'rights' rather than noncontingent 'wrongs' contribute maximally to the retarding effects of RR in CI learning." From this view, the additional finding of the present experiment, that 6R and 6RR did not affect performance differentially, is compatible with earlier findings that the effects of RR reached asymptote within six trials (Holstein & Premack, 1965; Levine, 1962). To state that the effect has reached asymptote with six random reinforcements is to say that the effect is maximally produced by three noncontingent "rights." Why the effect should reach asymptote so quickly remains to be explained.

The main point of the present experiment was to test the idea that S eliminates hypotheses from H after "rights" in CI. If the correct hypothesis were eliminated or suppressed after misinformative "rights" during noncontingent feedback (6R, 6RR), learning would be impaired by these procedures. However, active elimination of the correct hypothesis should not occur unless the relevant dimension has cue value at the time S is misinformed. Thus, 6R and 6RR should harm Ss in Condition V but have no effect on Ss in Condition C. Contrary to this prediction, the detrimental effects of 6R and 6RR were present under both conditions (C, V) of the relevant dimension. If taken at face value, this result would tend to disconfirm the proposition that S eliminates hypotheses from H after "rights" in CI. Instead, it is more favorable to the idea, albeit counterintuitive, that S adds new hypotheses to H after correct responses. The addition of new hypotheses to H, unlike the elimination of the correct hypothesis, could occur after misinformative "rights" during noncontingent feedback even if the relevant dimension were without cue value for S.

A more reasonable interpretation is that

Ss in the position-constant condition eliminated the correct hypothesis after the relevant dimension, "position," was introduced as a cue. These Ss may have eliminated the correct hypothesis from H on the basis of information in memory to the effect that the correct category of a stimulus changed whereas position did not vary in value during the noncontingent trials. Although a dimension is held constant in value, it can, nonetheless, be functional in CI. It is known, for example, that a dimension having no cue value can serve as an emphasis (Trabasso, 1963). Thus, it is plausible that S would retain in memory the fact that the stimuli remained constant with respect to position of the figure(s). In this event, misinformation, in particular misinformative "rights," would have a delayed rather than immediate effect upon the composition of H for Ss in the position-constant condition. In contrast to Ss in the position-varied condition, these Ss presumably did not discard the correct hypothesis immediately following misinformative "rights" during noncontingent reinforcement. Instead, they eliminated it from H after position had been activated as a cue and on the basis of relatively nonspecific information in memory concerning the attributes and correct categories of previous stimuli.

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NOTES

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