Performance changes in human conditioning as a function of shifts in the magnitude of attitudinal reinforcement

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Ss ($N = 40$) performed an instrumental response and were given either a large magnitude of reinforcement (agreement on high-interest items) or a small magnitude of reinforcement (agreement on low-interest items). Preshift response speeds indicated that agreement on high-interest items led to significantly faster responding ($p < .05$). Half of the Ss in each group were shifted to the opposite reward magnitude. Ss switched to the opposite reward magnitude showed the appropriate increase ($p < .025$) and decrease in response speeds ($p < .01$). The results were interpreted as additional support for the reinforcement theory of attraction.

The reinforcement theory of attraction (Byrne, 1969) states that attitudinal statements that express views similar or dissimilar to those of an individual constitute, respectively, reinforcing and punishing stimuli for him. This central hypothesis of Byrne's theory has received ample support in both discrimination learning studies (e.g., Byrne, Griffitt, & Clore, 1968) and from discrete-trials studies of instrumental conditioning (Lamberth, 1971; Lombardo, Weiss, & Buchanan, 1972). In both types of experiments, agreeing and disagreeing attitudinal statements were effective in altering response probabilities, indicating that attraction stimuli are analogous to more traditional reinforcers.

The reinforcement theory of attraction (Byrne, 1969) further states that disagreement arouses a noxious drive (effectance drive), while attitudinal agreement reduces drive or prevents arousal of the noxious effectance drive. This second assumption of Byrne's theory has also received support. The results of a study by Lombardo, Libkuman, & Weiss (1971) clearly supported the disagreement-drive hypothesis of arousal. In their experiment, Lombardo, Libkuman, and Weiss used competitive and noncompetitive paired-associates lists to measure drive effects. Their findings indicated that disagreement possesses general drive properties (D) in that disagreement interacted with task complexity, facilitating performance when the correct responses were dominant (noncompetitive list) and impeded performance when incorrect responses were dominant (competitive list). In a series of four experiments, the noxious nature of effectance drive was clearly

shown by Weiss, Lombardo, Warren, & Kelley (1971). Using a discrete-trials instrumental conditioning paradigm, they found that their learning curves were isomorphic with those usually found in instrumental escape conditioning rather than in reward conditioning.

Within the framework of the reinforcement theory of attraction, several analogs of magnitude of reinforcement have been studied. These analogs include: item interest (Clore & Baldridge, 1968; Lombardo, Weiss, & Buchanan, 1972); personal evaluation vs impersonal opinions (Byrne & Rhamey, 1965; Lamberth & Craig, 1970); type of agreement (Lombardo, Libkuman, & Weiss, 1971); and amount of information given to an S (Lombardo, Weiss, & Stich, 1971). Several studies have shown that these variables not only lead to differences in attraction but, when employed in a discrete-trials instrumental conditioning paradigm, lead to significant between-group differences in response speeds. This direct relationship between attitudinal reinforcement in a discrete-trials instrumental conditioning task and attraction was clearly established in a series of experiments by Lombardo, Libkuman, & Weiss (1971) and Lombardo, Weiss, & Buchanan (1972). In their experiments, Ss had to perform an instrumental response (throw a toggle switch) to listen to another person agree with them on items of either high or low interest to the Ss. The results of these studies indicated that Ss reinforced (agreed with) on high-interest items responded faster than Ss agreed with on low-interest items (between group differences in conditioning) and that Ss in the high-interest/agree group

were more attracted to this agreeing other person. These results clearly supported the hypothesis of Clore & Baldridge (1968) that agreement on high-interest items is analogous to a large magnitude of reinforcement, and that agreement on low-interest items is analogous to a smaller magnitude of reinforcement.

The present study is an extension of the between-group conditioning experiments of Lombardo, Libkuman, & Weiss (1971) and Lombardo, Weiss, & Buchanan (1972) to a within-Ss design. The within-Ss design was employed as a more sensitive test of the hypothesis that attitude similarity can act as a more traditional reinforcer, and that manipulating agreement on items of different interest (high and low interest) to Ss is analogous to manipulating magnitude of reinforcement. In the present experiment, Ss were switched from agreement on high-interest attitudinal items (large magnitude of reinforcement) to agreement on low-interest (small magnitude of reinforcement) attitudinal items or from agreement on low-interest to high-interest items.

Because the results of Weiss, Lombardo, Warren, & Kelley (1971) clearly indicated the noxious nature of effectance drive, the present study is modeled on escape-conditioning studies of magnitude shift (e.g., Bower, Fowler, & Trapold, 1959; Wood, 1967; Woods & Steiner, 1970). For Ss in the present experiment, reinforcement was listening to another person agree on high- or low-interest items and was contingent upon an instrumental response (pressing a toggle switch).

Based upon the assumption that the present experiment is analogous to discrete-trials instrumental-escape conditioning studies, it was hypothesized that: (1) preshift response speeds would be an increasing function of the type of agreement (high vs low interest), with the high-interest/agree group (large magnitude of reinforcement) responding faster than the low-interest group (small magnitude of reinforcement); (2) Ss switched from agreement on high-interest items to low-interest items would show the characteristic downward shift in response speeds, and that Ss switched from agreement on low-interest items to agreement on high-interest items would show the appropriate increase in response speeds.

METHOD

The Ss were 40 male volunteer undergraduate introductory psychology students. Early in the semester, a 50-item attitude questionnaire was administered to all

introductory psychology students. After completing the questionnaire, all students were asked to rank-order the 10 items in which they were most interested and the 10 items in which they were least interested. Because of the reinterpretation of attraction data, specifically those of Clore & Baldridge (1968) and Lombardo, Weiss, & Buchanan (1972), it was assumed that item interest determined the reinforcement value of the items. Later in the semester, 40 volunteers from this pool of Ss were individually run in the 16-trial conditioning experiment.

APPARATUS

The S's room and the E's control room shared a common wall. The S was seated at a table facing this wall, which included four windows of transparent mirror glass. The windows were opaque except when illuminated from behind, and instructional signals appeared in each window upon illumination. The signals were the large printed words (1) "listen," (2) "throw switch if you wish to comment," (3) "talk," (4) "move dial to final opinion." A panel mounted on the tabletop contained the S's "comment" switch (a telephone toggle switch with a spring return), a microphone, and a speaker, as well as an opinion change indicator used in the masking task. Also mounted in the wall were two Standard Electric timers, by means of which the S could monitor the length of time he and the "other S," respectively, had spoken.

On the E's side of the wall were the controls for turning on the various signals, a loudspeaker for monitoring the S's comments, a microphone, and a control timer. A digital stop clock (Lafayette 5720, 1/100 digital readout stop clock) automatically measured the S's response latency to .01 sec (the time between the signal "throw switch if you wish to comment" and the time the circuit was broken by the switch being thrown). The S's masking-task opinion-change dial was attached to a synchronous motor that drove a matching dial in the control room, enabling the E to determine when the S was finished with the intertrial masking task and therefore ready for a new trial.

DECEPTION AND MASKING TASK

The experiment was presented to the S as a study of opinion change. The Ss were told: "We are interested in how your opinions may be affected by what someone else says; how your opinions may be affected by what you yourself say; and how what you say may affect the opinions of someone else." After each statement by the S and reply by the confederate, the S indicated whether he changed his

opinion by moving the opinion-change dial. The deception was used to mask the learning task so that the conditioning process would not be overridden by the Ss' normal use of their higher mental processes (Spence, 1969).

PROCEDURE

As each S arrived for the experiment, the E explained that the other "S" (the confederate, referred to as S A) had not yet arrived. After a short time, both Ss received the deceptive rationale and the operating instructions over the intercom (the confederate was in the control room with the E throughout the course of the experiment). It was explained that S A (the confederate) was in another room and had been provided with a list of topics they were to discuss. The S was told that having the two Ss in separate rooms would ensure confidentiality of his candid opinions on controversial issues. Both Ss were asked to keep their statements to about 20 sec if they could, but they were never interrupted if they spoke for more than 20 sec, since interruption would have been punishing (Mandler & Watson, 1966). For all groups, each trial was started by a confederate's (always the same sex as the S) reading a topic. After the S made the instrumental response and gave his opinion on the topic, the confederate either agreed or disagreed with the S. In all groups, reinforcements (agreements) were given on only 50% of the 16 trials. Earlier studies by Lombardo, Weiss, & Buchanan (1972) and Lombardo, Libkuman, & Weiss (1971) had indicated that Ss became suspicious when the confederate agreed on either 100% or 75% of the trials. Therefore, a 50% partial reinforcement schedule was employed in which the confederate agreed on only one-half of the trials. Reinforcements were given in three random orders, with the exception that Trial 1 was always reinforced (agreed) and Trial 2 was always nonreinforced (disagreed). In the large magnitude of reinforcement groups, Ss were agreed with on high-interest items and disagreed with on low-interest items. In the small magnitude of reinforcement groups, the Ss were agreed with on low-interest items and disagreed with on high-interest items.

An experimental trial began with the "listen" signal. When the confederate finished reading the topic, the E operated the control switch which both (1) presented the CS—the signal, "throw switch if you wish to comment"—and (2) started the latency timer. When the S threw the comment switch, the latency timer stopped. Latency was recorded and converted

to speed. If the trial was reinforced, the confederate agreed with the S. If the S did not throw the comment lever within 20 sec, latency was considered to be infinite and speed counted as zero. In this case, an unscored make-up trial was given to equalize the number of reinforcements.

The Ss were randomly assigned to one of four experimental groups (N = 10). One group received the large magnitude of reinforcement (agreement on high-interest items) in both phases of the experiment (L-L); one group received the small magnitude of reinforcement (agreement on low-interest items) in both phases of the experiment (S-S); one group received first the large magnitude of reinforcement and was shifted to the small (L-S); and the fourth group received the small magnitude of reinforcement and was shifted to the large (S-L). Each group was started with either large or small magnitude of reinforcement (N = 20). After eight trials, one-half of each group not shifted served as control groups for the postshift phase.

DRIVE MANIPULATIONS

All groups received the first part of the drive manipulations as part of the instructions. Each S was told that the confederate had a list of attitudinal statements that they would be discussing. In an attempt to insure some initial effectance arousal, the following sentence was included in the instructions: "Due to the nature of the opinions that will be expressed during the course of your conversation, it is possible that there will be some initial disagreement between the two of you." It was assumed that this statement, plus the fact that the confederate disagreed with the S on Trial 2, would assure some effectance arousal as soon as the opinion statement was read. The assumption of arousal from Trial 3 on was based on the hypothesis that agreement and disagreement on Trials 1 and 2, respectively, would create a certain amount of uncertainty in the S, i.e., the S would be expressing his opinion but had no indication of how the confederate felt about the issue, since he was agreed with and then disagreed with.

RESULTS

Pre- and postshift mean response speeds for discrete blocks of two trials are presented in Fig. 1. Although response speeds for the L (agreement on high-interest items) and S (agreement on low-interest items) groups are approximately equal on the first trial block, the improved speed over trials indicates that the Ss learned the instrumental response. However, the diverging curves indicate that response speeds, and therefore

learning, increased differentially during the course of acquisition.

A 2 by 8 repeated-measures analysis of variance (Magnitude of Reinforcement by Trials) performed on preshift response speeds indicated a significant increase in response speeds over trials ($F = 40.27$, $df = 7/266$, $p < .01$), and that the divergence in the curves represents a significant Trials by Magnitude Reinforcement interaction ($F = 13.83$, $df = 7/266$, $p < .01$) typically found in learning studies where magnitude of reinforcement is varied. Further support for the effects of magnitude of reinforcement on response speeds was denoted by a significant magnitude of reinforcement main effect ($F = 4.68$, $df = 1/38$, $p < .05$), supporting the first hypothesis.

As may be seen on the right half of Fig. 1, the groups shifted in magnitude of reinforcement showed rapid changes in response speed, supporting the second hypothesis. In order to test for changes in response speeds, one-way repeated-measures analyses of variance were performed on the response speeds of the four groups over the last eight trials. The results of the analyses on the L-L and L-S groups indicated that the L-L group had reached asymptote and that there was no further increase in response speeds over trials ($F < 1$). However, analysis of response speeds for the L-S group indicated that there was a significant decrease in response speed over trials ($F = 4.07$, $df = 7/63$, $p < .01$). The analysis of variance on response speeds for the S-S group indicated that this group had also reached a stable asymptote and that there was no further increase in response speeds ($F < 1$). The upward shift presented in Fig. 1 for the S-L group represents a significant increase in response speeds over Trials 9-16 ($F = 2.78$, $df = 7/63$, $p < .025$). The significant increase and decrease in the S-L and L-S groups, respectively, support the second hypothesis and are in agreement with escape conditioning studies employing more traditional reinforcers. Results of t tests performed over a block of the last four trials indicated that response speeds for the L-S group were significantly slower than response speeds for its control group (L-L) ($t = 4.30$, $df = 18$, $p < .001$) and that the response speeds for the S-L group were significantly faster than response speeds for its control group (S-S) ($t = 6.07$, $df = 18$, $p < .001$).

In the escape conditioning literature, an "elation" or positive contrast effect is never found (Bower, Fowler, & Trapold, 1959; Woods, 1967; Woods & Steiner, 1970) and a "depression effect" or negative contrast is rarely found (see Woods,

Fig. 1. Acquisition and performance changes as a function of magnitude of attitudinal reinforcement.

1967). Results of the present study indicated that, although the S-L group's response speeds went above those of the L-L group, this difference was never significant and therefore was in agreement with previous escape conditioning studies. In order to test for the positive contrast effect, t tests were performed on Trials 11, 13, and 16. The results of the t tests were: Trial 11 ($t = 1.50$, $df = 18$, n.s.); Trial 13 ($t = 1.65$, $df = 18$, n.s.); and Trial 16 ($t < 1$). However, the results of the present experiment indicate that there was a "depression" or negative contrast effect. This depression effect is evident on Trial 11, where response speeds for the L-S group are significantly slower than those of the S-S group ($t = 2.90$, $df = 18$, $p < .01$). However, at Trials 13 and 16, the difference between the S-S and the L-S groups is not significant ($t = 1.53$, $df = 18$, n.s., and $t = .86$, $df = 18$, n.s., respectively). The fact that response speeds for the L-S group are slower than those of the S-S group, but that this difference disappears, is also in agreement with escape conditioning studies (see Woods, 1967) employing the magnitude shift paradigm.

DISCUSSION

The preshift acquisition response speeds, as presented in Fig. 1, replicated the between-group

differences found by Lombardo, Libkuman, & Weiss (1971) and Lombardo, Weiss, & Buchanan (1972) and further supported the hypothesis that stimuli influencing attraction (attitudinal agreements) have the same effect as more traditional reinforcers. These differential response speeds and the Magnitude of Reinforcement by Trials interaction also indicated that the present paradigm was analogous to the instrumental escape conditioning studies of Bower, Fowler, & Trapold (1959) and Woods (1967) in which the intensity of drive induction is equivalent in all groups, but magnitude of drive reduction is varied. The differences in drive reduction for L and S groups can be explained by reinterpreting the results of two studies by Clore & Baldridge (1968) dealing with item interest and attraction. Both experiments found Ss more attracted to strangers who agreed with them on high-interest items and less attracted to others who agreed on low-interest items. In the context of the present experiment, it appeared that the interest an S had in an item determined the amount of effectance aroused by that item as it was read by the confederate. Since the number of agreements and disagreements were equated in both groups, and since both groups were presented with four high-interest and four low-interest

items prior to the shift, the between-group difference in response speed can only be explained by the greater magnitude of reinforcement (effectance drive reduction) that Ss in the L group received through agreement on high-interest items.

The results presented in the right half of Fig. 1 (postshift response speeds) show that appropriate and rapid changes in performance occur following shifts in magnitude of reinforcement (effectance drive reduction). These shifts in performance add support to the hypothesis that the mechanism of reinforcement was in fact effectance drive reduction, and that item interest determined the magnitude of reinforcement. A comparison of the L-L and L-S groups will clarify this assumption. Throughout the postshift phase of the experiment, Group L-L received agreements on high-interest items and disagreements on low-interest items. However, Group L-S was shifted to agreements on low-interest and disagreement on high-interest items. Here again, the number of agreements and disagreements were equated, as was the number of high- and low-interest items presented to the S. Therefore, it appears that these performance differences lie in the differential amount of effectance drive reduced on agree trials, and this difference is clearly reflected in the rapid downward shift in performance for the L-S group.

The rapid increase in response speeds for the S-L group lends itself to a similar interpretation. In both the S-L and S-S groups, the number of

agreements were equated, as were the number of high- and low-interest items. The only difference between the groups was the type of item agreed with. Therefore, the sudden upward shift in performance for the S-L group appears to be due to the greater magnitude of effectance drive reduction for Ss in the S-L group as a result of being agreed with on high-interest items.

The basic postulate of the reinforcement theory of attraction, i.e., that stimuli influencing attraction are reinforcing, was supported in the present experiment. The results of the present experiment both replicated the results of earlier instrumental conditioning studies employing attraction stimuli and further extended the results to a within-Ss design. The fact that response speeds in the present experiment were sensitive to sudden changes in magnitude of reinforcement adds additional support to the reinforcement model of attraction.

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