

*UNBIASED AND UNNOTICED VERBAL CONDITIONING:
THE DOUBLE AGENT ROBOT PROCEDURE¹*

HOWARD M. ROSENFELD AND DONALD M. BAER

THE UNIVERSITY OF KANSAS

Subjects who were told they were "experimenters" attempted to reinforce fluent speech in a supposed subject with whom they spoke via intercom. The supposed subject was to say nouns, one at a time, on request by the "experimenter", who reinforced fluent pronunciation with points. Actually, the "experimenter" was talking to a multi-track tape recording, one track of which contained fluently spoken nouns, the other track containing disfluently spoken nouns. If the "experimenter's" request for the next noun was in a specified form a word from the fluent track was played to him as reinforcement; requests in any other form produced the word from the disfluent track. Repeated conditioning of specific forms of requests was accomplished with two subject-"experimenters," who were unable to describe changes in their own behavior, or the contingencies applied. This technique improved upon an earlier method that had yielded similar results, but was less thoroughly controlled against possible human bias.

The enduring interest in the conditioning of verbal behavior (Holz and Azrin, 1966) probably is attributable not only to the obvious importance of language in human behavior, but also to the special status accorded language in some non-behavioral or semi-behavioral theories. In this context, a particular body of research (Spielberger, 1965; Spielberger and DeNike, 1966) appears to have demonstrated that when verbal conditioning has proven possible in subjects, it has been accompanied by "awareness" in those subjects: it has occurred only in groups of subjects who could either state or recognize the contingencies of reinforcement applied to them. These results have been interpreted to indicate that changes in verbal responses were not attributable directly to the reinforcing function of the experimenter's contingent verbal approval; rather they were mediated by the discriminative function of private recognitions of the reinforcement contingencies. This inference of a controlling "awareness", derived

from probes of introspection, is of course questionable. However, the inference becomes unnecessary if a verbal conditioning situation can be devised in which such probes fail to show any "awareness" to be explained. To facilitate such outcomes the present report describes an improvement on a technique designed by Rosenfeld and Baer (1969) for conditioning verbal behavior without "awareness".

The original technique used by Rosenfeld and Baer required that the subject of the study be recruited for the nominal role of experimenter in a study of social reinforcement. This subject was told that he would interview another person, and in the course of that interview, would socially reinforce some selected response shown by the interviewee. The interviewee was in fact a confederate of the authors—a "double agent"—and served as the true experimenter of the study. The interviewee deliberately displayed a simple hand gesture (rubbing his chin) in a random way. The interviewer attempted to reinforce that gesture by nodding vigorously in consequence. The interviewer was also told that to keep the interviewee "involved" (and hence "conditionable"), it was necessary to prompt him verbally to give fuller answers to the interview question being asked. One interviewer used prompts such as "Yeah" and "Mm-hmm" for this purpose. The interviewee deliberately

¹The research was conducted at the Bureau of Child Research Laboratories in Lawrence, Kansas, and supported by Program Project Grant HD 00870 from the National Institute of Child Health and Human Development. The authors appreciate the assistance of Pamela Gunnell and Charles Salzberg. Reprints may be obtained from the authors, Department of Psychology, University of Kansas, Lawrence, Kansas 66044.

gave short answers, thus evoking a steady rate of prompting by the interviewer. The interviewee then selectively reinforced one of the prompts ("Yeah") by displaying his gesture (chin rubbing) whenever that prompt occurred. Thus, while the interviewer prompted the interviewee to answer questions fully, and also attempted to reinforce the interviewee's chin-rubs (by nodding at them), the interviewee in fact emitted those chin-rubs as reinforcement for a selected kind of verbal prompt by the interviewer. Conditioning not describable by the interviewer resulted.

A drawback of such interpersonal paradigms is that the experimenter himself is also reinforceable (by success), and thus may purposefully or inadvertently elicit critical responses from the subject by behaviors other than those formally designated as reinforcers. For example, in the original study, "Yeah" or "Mm-hmm" might have been differentially elicited by choice of words, inflection, or facial expression, in addition to being reinforced by experimentally controlled chin rubs. Thus, the human double agent was replaced with a semi-automated mechanism not susceptible to having its own behavior changed by unrecognized contingencies. In addition, such a mechanism requires virtually no training of special personnel and is typically more reliable than the human experimenter.

PROCEDURE

Subjects

The subjects of this report (referred to below as "experimenters") were two undergraduate college girls of 12 students initially contacted. They were asked to participate in a study of what makes people successful in influencing other people. They were offered a minimum payment of \$1.00 each to participate, and the possibility of two additional dollars if they could influence another person and explain to the authors exactly what accounted for their success, respectively.

Setting and Instructions

The subject was told by an assistant that she would be the "experimenter" in a verbal conditioning study. She would operate alone in a laboratory room, to guard against accidentally giving "cues" to the supposed subject. Seated at a desk, she was shown her inter-

com with a manual press-to-talk switch, a pair of lever switches, a pair of counters, and a small light. A tape recorder on her desk played initial instructions, summarized in the following comments.

The "experimenter" was told that the intercom connected her to her "subject" in another, nearby room, that if she pressed the intercom switch she could speak to the "subject" who would speak back to her through the intercom. She was also told that the lever switches produced points on an add-subtract counter located in front of the "subject", one switch adding points, the other subtracting them. Her own counters would record the numbers of correct and incorrect responses that later would be produced by the "subject" (operated by the assistant who would monitor the intercom). The light would signal timeout periods, during which she would rest, make notes, and sometimes receive further instructions.

The "experimenter" was told that she was to attempt to condition the "subject", specifically, some aspect of the "subject's" speech. It was explained that the "subject" had already been told that her task was to emit nouns, when asked, one at a time. The task for the "experimenter", then, was three-fold:

1. Use the intercom to tell the subject when to emit the next word.
2. Use the lever switches to add or subtract points on the counter before the "subject" at any time, to influence her noun-emitting behavior in some specific way.
3. Write down at any time whatever she thought might be responsible for any changes in the "subject's" noun-emitting behavior. (Paper and pencil were supplied.)

The researchers and their apparatus were located in an adjoining room that allowed observation of the "experimenter" through a one-way window. The essential item of apparatus was a multi-channel tape recorder, programmed to play very brief segments of tape at any moment to the "experimenter" through her intercom. On one channel of tape a series of nouns had been recorded, at 3-sec intervals, each fluently enunciated. On a parallel channel, in the corresponding positions of the tape, the same nouns had been recorded, but enunciated in a disfluent manner, typically in the form "Uhh (noun)". Both tracks

had been recorded by a professional actress, who read a list of 1000 nouns from a previously free-associated list, simulating the performance of an actual subject. A research assistant, listening to the "experimenter" request the next word from the subject over the intercom, could then play to her the next noun from either channel. (The relay-operated recorder stopped after any word had been played, thus remaining in position to play the next word at any time.)

The Practice Session

The first visit was described to the "experimenter" as a practice session, during which she would become familiar with the situation and the execution of her assignments. More importantly, it allowed an assessment of her typical use of various requests for nouns from the subject, so that one could be chosen for future verbal conditioning. The form of request chosen will be referred to as the "critical request".

After the instructions were completed, the research assistant explained to the "experimenter" that in a moment the assistant would act out the role of the subject, so the "experimenter" could practice.

The assistant then retired to the next room. From there she played over the intercom a tape recording of her own voice (not the actress') which contained a liberal sprinkling of animate and inanimate, singular and plural, and fluent and disfluent nouns. One word at a time was played, following each request by the "experimenter" for the next word. The kind and sequence of these requests were recorded for 30 min. The "experimenter" was then given an appointment to return, to attempt conditioning a "real subject".

Meanwhile, the kinds and relative frequency of her requests for each next word were analyzed. (Typical requests were of the sort "Next", "Next word", "Go ahead, please", "O.K.", or "Now".) One of these requests (e.g., "Next word") was tentatively chosen as the critical request for future verbal conditioning. Criteria for such choice included a moderate frequency of use (not too close to 0 or 100% of all requests used), and some evidence of stability over the 30-min session (judged informally).

It should be noted that of 12 potential "experimenters", some produced requests during

their practice session that were either too unstable over time, or entirely too stable, to make them acceptable candidates for future conditioning. In these cases, the research assistant sometimes instructed the "experimenter" to be "more interesting". These instructions generally eliminated such problems only briefly. The two "experimenters" described here showed satisfactory baselines of requests during the practice session.

The Experimental Session

Baseline period. When the "experimenter" returned for the second session, she was told that a "real subject" was in the next room, and that it was necessary to gather a baseline of that "subject's" noun emitting behavior, so as to choose some aspect of it to condition. She then was left alone to interact via intercom with the multi-channel tape recording of the actress' voice. A segment of tape was played containing a portion of disfluencies equal to the "experimenter's" baseline proportion of critical requests during the practice session, and her rate of the critical request was checked for its current stability. The criterion for stability was that the rate of this request could vary no more than three responses out of 25, for at least two consecutive blocks of 25 requests each (a "nonsignificant" variation if the sequential requests met the assumptions of the binomial distribution). The rate during this baseline did not have to match the rate of the previous day's baseline session; however, it had to comprise reliably between 20 and 80% of the responses per block. If less than 50%, it was selected for reinforcement (fluencies); if over 50% it was to be followed by disfluent responses. If the critical request did not meet this criterion of stability during the first four 25-response blocks of this session, it was abandoned as a candidate, and other forms of request were examined for stability. If no such request could be found by the sixth block, the subject was considered unsuitable, debriefed, paid, and dismissed. Debriefing was delayed if the subject was recruited from a group in which other members had not yet participated.

Conditioning period. Once a stable critical request had been chosen, the "experimenter's" timeout light was illuminated, and the assistant returned to tell her that the "subject" had a characteristic rate of disfluency that should

be a good target for influence through point addition or subtraction. (In case the "experimenter" had not noticed the disfluencies, they were imitated for her.) She was told to use points in any way that would decrease the rate of these disfluencies, and to keep notes about her techniques and their relative success. These notes were to be made whenever the timeout light was illuminated and at any other times that she wished. Further, she was told that the counters before her now would record the cumulative numbers of fluencies and disfluencies emitted by the subject, so that she could see how well her techniques had been working. She was to re-set the counters during each timeout, so that they would always show current success or failure.

After these instructions the assistant left and the "experimenter" resumed her interaction with the tape, via intercom. From this point throughout the Conditioning Period, experimental contingencies operated as follows:

1. Each time the "experimenter" used the critical request, the next word played was from the fluent track of the tape; each time she used any other request, the next word played was from the disfluent track of the tape;
2. No more than five consecutive fluent or five consecutive disfluent nouns were played, even though the occasion called for another according to the first rule. (This was to reduce the probability that the "experimenter" would notice the contingency.)

Conditioning by these contingencies continued for at least three blocks of 25 requests each, and until a criterion of conditioning had been met. The criterion required that at least two consecutive 25-request blocks each contain at least enough critical requests to exceed the baseline rates of these requests at the 0.05 level of confidence as specified by tables of the binomial distribution.² If conditioning to this criterion was not evident by the end of eight 25-request blocks, the subject was considered a failure, debriefed, paid, and dismissed.

²In the absence of a rapid technique for testing for independence of sequential responses, the 0.05 level was used as a guide, not as an accurate estimate of the probability that such results could have occurred by chance.

During the Conditioning Period, a timeout was held typically after every third 25-request block to allow the "experimenter" to survey counters, write notes on the effectiveness of her techniques, and re-set the counters.

First reversal period. When the criterion of the Conditioning Period had been met, the contingencies of that period were reversed. Now, in general, it would be true that:

1. Each time the "experimenter" used the critical request, the next word played was from the disfluent track of the tape; each time any other request was used, the next word played was from the fluent track of the tape; *except that*:
2. Fluent nouns were played for only half of the non-critical requests of the first 25-request block of this Reversal Period. (This was to reduce the probability that the "experimenter" would notice an otherwise blatant reversal of the just-prior contingencies.);
3. Subsequent to the first block of 25 requests, no more than five consecutive fluent or five consecutive disfluent nouns were played, even though the occasion called for another according to the first rule.

Otherwise, experimental conditions during the First Reversal Period were similar to those of the Conditioning Period. The criterion of a successful reversal was similar to that of a successful conditioning, except that now performance was compared to that of the last block of the preceding Conditioning Period.

Second reversal period. Given a successful reversal according to the above criteria, the critical request was again subjected to the same contingencies used during the Conditioning Period, plus the qualification that only half of the critical requests of the first 25-request block during this period would be followed by fluent nouns. The same type of criterion for successful reversal was applied as had been used for the First Reversal Period.

Both subjects reports here finished within a single experimental session lasting 90 min. The session took place the day after the practice session.

Interview. At the conclusion of the Second Reversal Period (or on the occasion of earlier dismissal of subjects), an interview was conducted by the assistant to see if the "experi-

menter" could state the contingencies applied to her or describe the changes that had taken place in her verbal behavior. The interview procedure was adapted from standard procedures employed by Levin (1961) and Spielberger (1962). It began with fairly distant questions asking about what had happened, what techniques were used, and how well they worked, and progressed to increasingly detailed questions about all the contingencies holding between the "experimenter" and her subject.

Recording

The requests made by the "experimenter" were tape-recorded and also recorded verbatim in handwriting by a second assistant in the adjoining room. (Handwritten records allowed the immediate calculation of the rates of the "experimenter's" critical requests, necessary to determine when the criteria of Baseline, Conditioning, First Reversal, and Second Reversal had been met.) Reliability of the handwritten records was established as 96%, by comparing them to the tape recordings of requests.

RESULTS

Six of 12 potential subjects examined met the criteria cited for stability of individual baseline within six blocks of 25 responses, during their practice sessions. Of these six subjects, two met all further criteria of successful conditioning, suppression, and reinstatement of the critical response. Inasmuch as variations in several experimental parameters between the subjects could have accounted for the differential successes, the question of generality or of specific conditions for unaware verbal conditioning cannot be answered in this study. The following accounts of the two successful cases are offered as evidence of the possibility of the effect. Of the remaining cases, one conditioned and was aware of the contingencies; two others unknowingly conditioned but failed to reverse; and one failed to condition at all.

Figure 1 displays the rate of critical request for the successful subjects. Subject A displayed several requests in apparently random fashion. The most stable of these was the phrase, "Next word". In the Experimental Session Baseline Period her rate of "Next word" varied from 44 to 48% per block and was accordingly chosen as the critical request. The criterion for

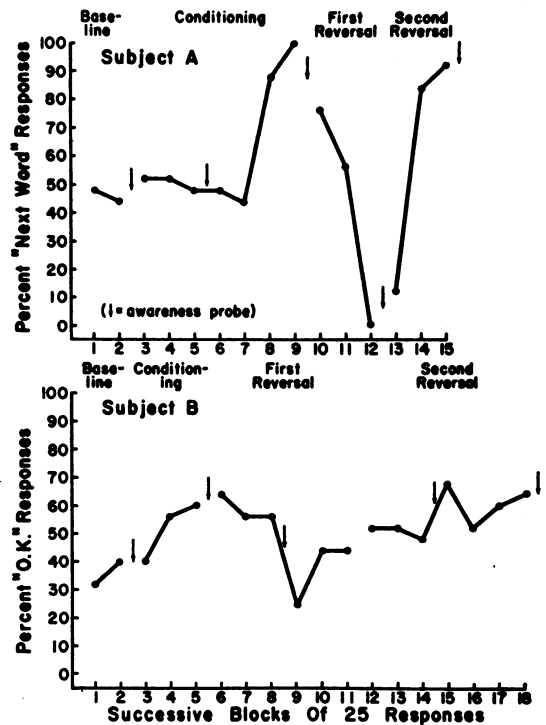


Fig. 1. Effect of double-agent robot's contingent verbal fluencies on selected verbal responses of two subjects ("Experimenters").

reliable conditioning was set at 60% for two consecutive blocks. This was achieved and surpassed during the sixth and seventh 25-request blocks of the Conditioning Period, as Fig. 1 shows.

The criterion for reliable reversal was set at 80% for two consecutive blocks. This criterion excluded the first reversal block, when only half of the non-critical responses produced fluencies, according to the experimental convention designed to avoid awareness. The reversal criterion was met almost immediately, and rate of critical response in fact fell below the criterion, reading 0% during the third 25-request block of the First Reversal Period. The Second Reversal Period followed a pattern similar to that of the First Reversal Period, but more quickly: rate of the critical request increased such that the third 25-request block contained 23 critical requests.

In contrast to the variability in baseline responses of Subject A, Subject B emitted only two responses throughout the study ("All right" and "O.K."). In general, her results were similar to those for the first subject in

that criteria for conditioning "O.K." and two reversals were met. In this case, changes in rate following changes in contingency were more gradual. Inasmuch as her critical response never exceeded 75% of any block, the prescribed one-block 50% schedule was not employed.

Subject A wrote notes on her techniques four times after the conditioning phase began. The first of these stated that she supposed "the subject doesn't seem to catch on at all." By the second, Subject A had "produced" a high ratio of fluent responses and commented: "The new strategy seems to have worked much better. At first she seemed to think it was parts of the body but she still did not say 'uh'—even after she went on to other words. She seems to have caught on consciously since she hasn't made one mistake." The next timeout came at the end of a successful reversal, and Subject A wrote: "At first did very badly like at beginning of exp. and then did O.K. again. Once she got going she never reverted back. Did not stick to any subject matter for a great length of time." Virtually the same comments were written during the last opportunity, which followed the final reversal period.

In the terminal interview, carried out by a research assistant, Subject A offered several explanations, illustrated in the following transcriptions:

Assistant: "How effective did you feel you were as an experimenter?"

A: "Hmm, well, I don't think she ever caught on to what it was, so I consider that it was O.K. You know, because it's kind of an unconscious thing."

Assistant: "What strategy were you using?"

A: (Repeated comments written in timeout periods).

Assistant: "And you think it was the point-giving that influenced her?"

A: "I think so. It might have been the words she got on to; but yet it still changes. When she got on to the parts of the body like nose, throat, ear—maybe just because they're sharp words, but when she used other words like 'negotiation' she didn't go 'uh, negotiation.' So I think it must have been the points and not the subject matter."

Assistant: "I see. Did you think that anything else you might have done influenced her in any way?"

A: "Maybe I sound more pleased when she did well. I don't know. I didn't try to."

Assistant: "Yeah?"

A: "Maybe my inflection, uh, my own inflection."

Assistant: "Uh-huh, anything else?"

A: "I don't know if my, you know, response would make a difference. Like if I would say 'go on' or 'next'."

Assistant: "Did it seem to?"

A: "I don't think so."

Assistant: "You don't know that it did in any way?"

A: "No."

Subject B wrote only comments on the details of the various point-giving strategies she had employed. In her interview she produced no hints at all of any possible awareness that her verbal responses had any effect on her success.

DISCUSSION

The validity of inferring awareness of elicitation of post-behavioral interpretations from subjects is a matter of epistemological preference. Yet on the basis of pervasive evidence of such "awareness", attempts have been made to diminish the significance of verbal conditioning. Evidence that there are conditions under which probes do not produce awareness should discourage such generalizations. More important, the availability of "awareness"-avoiding procedures can further conditioning research in general by unconfounding instructional and reinforcement effects.³

The apparently successful production of the double-agent effect in the present study indicates that verbal conditioning without awareness (as defined here) is a real possibility. Only one of the subjects even noted the possibility that her verbal behavior might somehow have contributed to her success. Even in this case the possibility was not stated during the regular within-experiment probes, but occurred only in response to extreme prodding and suggestion after the experimental session.

A major advantage of the current automated procedure over previous methods is that

³When awareness of reinforcement contingencies has been induced by instructional sets, conditioning has been facilitated (DeNike and Spielberger, 1963).

the robot experimenter isolates the subject (the "experimenter") from uncontrolled sources of stimulation that are possible in any human experimenter (Rosenthal, 1966). Despite its artificiality, it nevertheless is apparently accepted by college students as real; all subjects seemed to believe they were dealing with a real person at the other end of the intercom. The use of a professional actress to record the tapes being played was probably an important part of the success of this illusion. She sometimes appeared momentarily at a loss for the next word, or amused by her choice, or curious (presumably about the listener's reaction to the word), or even bored. The words she recorded were realistically balanced for variety and sequence. Thus, the "experimenter" might sometimes develop the hypothesis that the "subject" had fallen into a pattern (such as animal names), but soon would be forced to abandon that hypothesis.

The false leads implicit in the content of the taped noun sequences may indeed contribute to the overall effectiveness of the robot procedure, but it is presumably subordinate to the distraction from awareness provided by the subtle reversal of roles of subject and experimenter. While the effect of the double-agent procedure itself on awareness has not been directly demonstrated (by direct comparison with a control condition), the hypotheses produced by "experimenters" in this and the initial study suggest that they were attending to aspects of their relationship to the "subject" other than the "subject's" attempt to manipulate their verbal behavior.

There probably are numerous other sources of distraction from awareness in interpersonal settings which could be submitted to experimental analysis. On the assumption that schedules of reinforcement are prominent among these possibilities, "experimenters" in the current study typically were allowed to receive only a limited number of consecutive reinforcers. Also, when very high rates of the critical request occurred during the conditioning phase, the contingencies of the subsequent reversal phase were faded in, rather than switched abruptly. While these procedures may have served to prevent awareness, they also may have contributed to a certain ineffectiveness in the reversal procedures, perhaps accounting for those "experimenters"

who conditioned but failed to reverse. For example, by effectively putting a fully conditioned response on a fixed-ratio 6 schedule during the fading in of the reversal, that response may have been maintained even in the face of the disfluencies produced by five of every six emissions. Particularly if the disfluencies had no punishing function for the "experimenter", fixed-ratio 6 could prove a reasonable maintenance schedule. Failure to reverse might be eliminated in future research by instructions to do better than one fluency in six; by starting reversals before too extreme a response shift has been produced; by a different convention concerning the number of consecutive reinforcements allowed; or by a different convention concerning the number of reinforceable responses allowed reinforcement during the first 25-request blocks of reversal periods. Thus, a better balance between procedures designed to modify verbal behavior and procedures designed to prevent awareness of these modifications is an important problem for future methodological research.

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Received 21 April 1969.