

*FEEDBACK IN BEHAVIOR MODIFICATION:
AN EXPERIMENTAL ANALYSIS IN TWO PHOBIC CASES¹*

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Two illustrations of single-case research are described in which an isolated therapeutic variable was sequentially introduced, withdrawn, and reintroduced while changes in a clinically relevant behavior were measured. A claustrophobic patient and a knife-phobic patient received graduated practice in facing their phobic stimuli; length of time the claustrophobic patient stayed in a small dark room per trial, and length of time the knife-phobic patient kept knife exposed per trial were measured. In both experiments, when feedback of these time scores was withdrawn, ongoing progress was retarded. Reinstatement of feedback led to renewed improvement. In Experiment 2, adding and removing contingent verbal praise against a constant background of precise feedback did not significantly alter rate of progress.

Systematic desensitization (Wolpe, 1958) and operant shaping procedures (Ullmann and Krasner, 1965) have three apparently important characteristics in common: (a) the desired behavioral changes, whether in frequency, duration, amplitude, or form, are clearly designated before therapy begins; (b) to effect these specific changes, learning tasks are arranged in small, "manageable" (Pascal, 1959) steps; (c) partly as a consequence of the "pin-point" behavioral focus and the graduated learning procedure, and partly as a result of emphasizing continuous assessment and objective measurement, the target behavior is made overt and observable to both therapist and patient. Throughout therapy, therefore, the patient can see if his behavior is changing in the desired direction.

Although knowledge of progress and results has been considered an important variable in other applied learning areas, *e.g.*, training in motor skills (Wolfle, 1951) and programmed instruction (*e.g.*, Pressey, 1950), its contribution to the behavior therapies has not been experimentally analyzed. Previous research concerning the effects of reinforcement and in-

structions on neurotic behavior (Leitenberg, Agras, Barlow, and Oliveau, in press; Agras, Leitenberg, and Barlow, in press; Leitenberg, Agras, and Thomson, in press) has, however, indirectly suggested that information provided to the patient about his performance may be a significant factor in the success of behavior modification procedures. The present study tested this hypothesis in two phobic cases.

General Method

The research was conducted in the University of Vermont Clinical Research Center as one of a series of studies designed to investigate the variables involved in the modification of neurotic behavior. The Center is a six-bed, hospital-attached research ward in which both medical and psychiatric patients can be treated without charge. The nursing staff is somewhat familiar with behavior modification procedures, the notions of a controlled social environment, and the need to measure behavior accurately. Before being admitted, all potential research patients are told that we are interested in studying their behavior, and if they are suitable, in trying a therapy which might help them. Because each case represents a separate experiment, the procedure and results for each are presented separately.

EXPERIMENT 1

In a discrete trial situation, information concerning performance can be given to the pa-

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tient either during or at the end of a trial. In the present case, feedback was provided throughout the trial; in the second experiment it was provided after the trial was completed.

Subject

The first subject was a 51-year-old woman, diagnosed as claustrophobic. She reported that although her fears started in childhood, they had become more intense and incapacitating since the death of her husband 7 yr before admission. She said she could not stay in a house by herself, in a room with a closed door, a cinema, a church, or drive in a car alone for more than three or four miles. Her son indicated that for years he had had to stand outside ladies' rooms holding the door ajar because she was afraid to have it closed. She also expressed fears of choking and indicated that she had occasional "throat spasms".

Before the present study, the patient had been a subject for two months in another unrelated experiment. During this time her ability to sit in a small room with the door closed had been increased from 25 sec to 9 min, as long as the therapist remained just outside the room. Both patient and therapist agreed at the start of the experiment that increasing the duration of being alone was a desirable therapeutic goal.

Procedure and Design

A room 4 ft wide and 6 ft long, illuminated by a 100-w shaded bulb, provided a situation in which the patient's claustrophobia could be measured. While in the room, the patient sat in a chair but was not allowed to read or engage in any other activity such as knitting, doing crossword puzzles, *etc.*

There were three sequential phases in the experiment: feedback, no feedback, and feedback again. Each phase lasted six days, with two to four sessions per day and a total of 22 sessions per phase; there were five trials per session.

At the start of the first feedback phase, the patient received the following instructions: "You have been improving nicely. In order to further reduce your fears we will continue this repeated practice with a slight change. Larry (LET) will no longer remain just outside the room. Instead, he will be in the recording room at the other end of the corridor. Remember you are to come out of the room

as soon as you feel the slightest discomfort or anxiety, and you are to go back only after you rest a while" (typically 1 min). It was then pointed out: "In order to increase the accuracy of our recording we have installed an automatic timer (LVE elapsed time meter, model #1306A) that will operate when the door is closed. In order to check on the timer, we want you to use a stopwatch to keep track in each trial of the time you spend in the room." She was shown how to work the stopwatch and told to record the exact time for each trial on a slip of paper. She was also told not to wear a wristwatch "as it might distract you from paying attention to the stopwatch." At the end of each session this paper was collected by the therapist. He did not mention if the times she recorded corresponded with the times recorded by the automatic timer, nor did he praise her for any increases in time spent in the room.

In the no-feedback phase, the patient was told that the stopwatch had broken and had been sent out for repairs. This explanation was accepted without question. (She made no attempt to wear a wristwatch during this phase.) When the last trial of a session ended, the therapist told the patient that the session was over. He did *not* comment on her performance, neither giving information about time spent in the room, nor praise such as, "that was fine", "you did well", *etc.*

When feedback was resumed, the patient was told that the stopwatch had been repaired and that the earlier procedure of having a double-check on accuracy of measurements would be reinstated. As in the first feedback phase, no praise was provided for improved performance.

An attempt was made to provide an equally supportive, encouraging, and friendly social environment during all three phases. The nurses were not aware of shifts in experimental procedure and the psychiatrist and experimenters were repeatedly reminded to try to talk to the patients in the same amount and manner throughout the experiment. No effort was made, however, to confirm objectively that this was indeed done.

Results

The major findings are summarized in Fig. 1. Mean time per trial spent in the closed room increased progressively during the first feed-

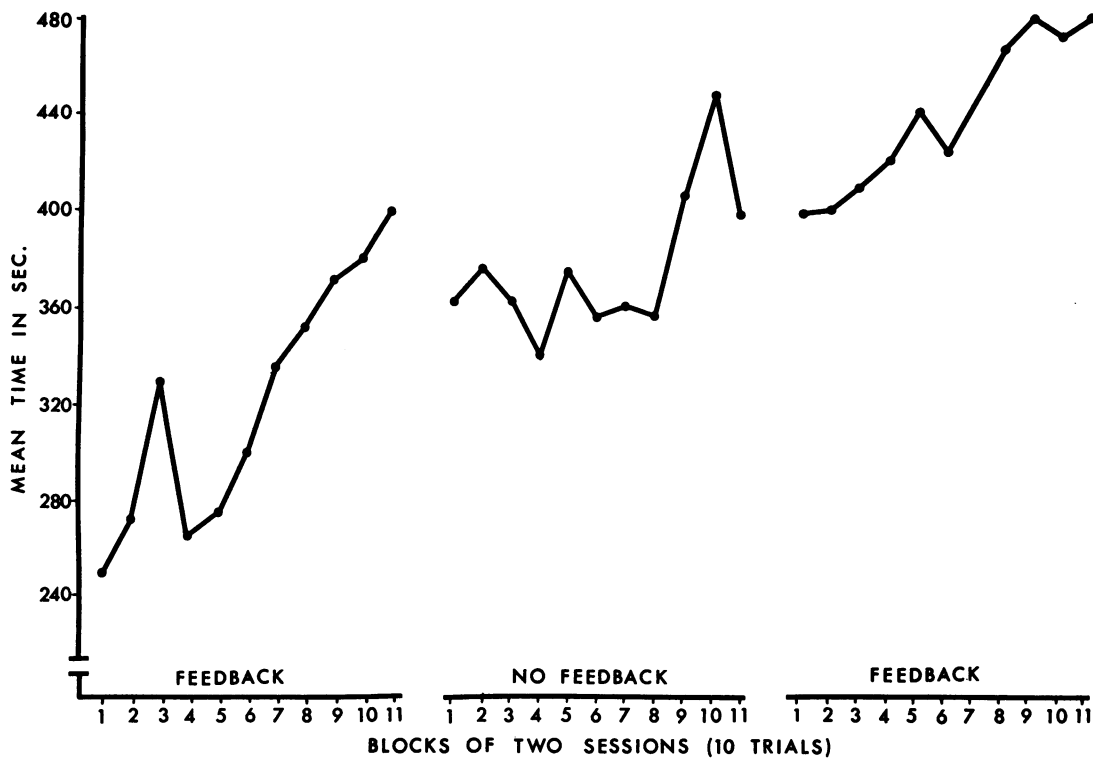


Fig. 1. Time spent in a closed room by a claustrophobic as a function of feedback, no-feedback conditions.

back phase. When the stopwatch was removed in the no-feedback phase, there was a drop in time and a rather sustained plateau before any rise began to reappear. Although this late rise was not sustained—performance in the last two sessions of the no-feedback phase returned to the level exhibited at the end of the preceding feedback phase—it was rather marked, and was presumably due to repeated trials. As the results of the next phase suggest, however, feedback appeared to hasten and sustain this practice effect. When feedback was reinstated, time in the room immediately increased and continued to move steadily upwards throughout the remainder of the experiment.

The change in performance from beginning to end of each phase clearly indicates that improvement in each of the feedback phases was greater than in the no-feedback phase. In each phase, mean time spent in the room during the first 10 trials (first two sessions) was subtracted from mean time during the last 10 trials (last two sessions). The mean increase in the first feedback phase was 149 sec, in the no-feedback phase 31 sec, and in the second feedback phase 80 sec.

A striking difference between feedback and no-feedback conditions was observed in performance changes within, as well as across, sessions. Trial-by-trial performance varied more when feedback was absent than when it was present. Each phase provided 88 trial transitions (trial 1 to 2, 2 to 3, 3 to 4, etc.). From one trial to the next, time spent in the room could increase, stay the same, or decrease. In the no-feedback phase, time spent in the room decreased in 38% of the trial transitions. In contrast, the percentage was 3 during the first feedback phase and 11 during the second.

Similarly, when there was an increase in time over the preceding trial, it was likely to be more regular (and actually smaller) in the combined feedback phases than in the no-feedback phase. The range of increases was 1 to 70 sec in the combined feedback phases and 4 to 206 sec in the no-feedback phase, with respective medians of 20 and 45 sec.

Despite the absence of other therapies, this patient was released from the Center following brief practice in staying alone in other formerly fearful situations such as cars and elevators. At a three-month follow-up, the pa-

tient reported a sustained improvement in the home situation; tests in the experimental room and the hospital elevator indicated that performance was at the same level as when she left hospital.

EXPERIMENT 2

In the first experiment, feedback of performance was available to the patient during each trial; in this experiment, it was provided at the end of each trial. As in the first experiment, feedback was a precise measure of time. Often in behavior modification programs, however, the patient can glean some information about his performance and progress from more vague and general forms of feedback. For example, a shift to a more difficult step in a hierarchy, verbal praise, or material reinforcement, all signify success and improvement. In all likelihood, a therapist's remarks such as "good", "you did well", "that was excellent", suggest to the patient that his behavior is changing in the desired direction, that he is "recovering". There is considerable experimental evidence on verbal conditioning (*e.g.*, Greenspoon, 1962) and social reinforcement (*e.g.*, Gewirtz and Baer, 1958) to support the notion that praise may have powerful reinforcing properties.

The present experiment explored whether or not providing and withdrawing such general praise alters patient's behavior if precise feedback is maintained. The specific interest was to determine if: (a) adding praise to precise feedback furthered clinical progress; (b) removing praise from precise feedback hindered progress; (c) removing all externally provided information of performance, *i.e.*, praise plus precise feedback, hindered progress. There was no instance when praise was provided without precise feedback; the experiment was not designed to compare directly the effects of general praise with the effects of precise feedback.

Subject

The second subject was a 59-year-old woman with a severe knife phobia. She reported that four years before the present study, while using a kitchen knife, it suddenly occurred to her that it would be easy to kill one of her grandchildren who was being somewhat bothersome. The patient indicated that during

the next year her obsessive thoughts and fear of knives increased so that she became unable to use a knife. Her medical record indicated that she was diagnosed as a compulsive personality with phobic reactions and was treated as a psychiatric inpatient with systematic desensitization and various drugs including sodium amytal, thioridazine, and chlorpromazine. She was discharged as improved. According to the medical record, a series of family deaths, including that of her husband, led 1.5 yr later to a marked depression. She was treated with ECT and again improved.

Since that time the patient reported that her fear of knives slowly returned. At the time of the present study, she said she was unable to look at or come into contact with sharp knives and had been unable to cook or do other housework in the kitchen. In addition, she reported becoming increasingly depressed once again. She indicated that she rarely left home, had difficulty in sleeping, and had lost interest in life. Over the few months just before admission she had lost 15 pounds. Patient and therapist agreed that increasing the duration of looking at a knife was a desirable therapeutic step toward holding a knife and eventually using it in normal kitchen activities.

Procedure and Design

In order to quantify the patient's knife fear, a box with a sliding door was constructed so that opening the door exposed a knife and closed a switch connected to an elapsed time meter (LVE #1306A) located in an adjoining room. Five different knives, varying in length and sharpness of point, were each tested three times in random sequence. The therapist was not in the room during these tests. Closed-circuit TV was used for monitoring purposes throughout the experiment (with patient's knowledge) and an intercom system enabled easy communication between subject and experimenter. The initial assessment discovered, within the limits tested, that the patient avoided looking only at pointed knives; the length of blade was of no consequence. Of the five knives, the one used in this experiment was a steak knife with a 5-in. blade. On the first test the subject closed the door on this knife after 8 sec and on the second and third tests after just 4 sec.

The day after assessment she was given the following therapeutic instructions: "We find

that repeated practice in a structured situation is very helpful in reducing fears of this sort." There were four practice sessions per day with 10 trials per session and a 45-sec intertrial interval. [No sessions were scheduled Saturday afternoon and Sunday; typically she went home during this period.] A trial consisted of opening and closing the door to expose and conceal the knife. She was told that "during these sessions we want you to practice opening the door and looking at the knife for as long as you can without feeling the slightest anxiety. You are to close the door as soon as you feel any discomfort or upset. Through repeated practice we expect that you will gradually be able to increase your times."

There were seven sequential stages to the experiment: feedback alone; feedback plus praise; feedback alone; no feedback and no praise; feedback alone; feedback plus praise; and feedback alone. (See Fig. 2 for the number of sessions per phase.)

Precise feedback was provided in the following manner. When the patient closed the door, thus concluding a trial, the therapist would report over the intercom: "That was x sec." In addition, at the end of the session, he would report the cumulative time spent in observing the knife. When feedback was removed, she was told the timer had broken down. This was accepted without question.

When praise was added to the procedure, the therapist would enthusiastically remark: "excellent", "good", "that was great", *etc.*, whenever her trial time exceeded a progressively increasing criterion. For example, if the criterion for delivering praise on Trial 9 had been 20 sec and she looked at the knife on this trial for 40 sec the criterion for Trial 10 was set at 30 sec. The new criterion, then, was always an increment of one-half the difference between the old criterion and the next exhibited increase. This resulted in the patient's performance being praised on about 80% of the trials.

Throughout all phases, a psychiatrist (WSA) spent 5 to 10 min per day with the patient. Although he was aware of the different contingencies, a special effort was made to maintain an equally "supportive" relationship throughout all experimental conditions. [No objective record was taken of these conversations.] The nurses were not aware of changes in experimental procedure and presumably

provided a constant social environment for the patient.

Results

The mean time the knife was kept in view per trial is plotted in Fig. 2 as a function of the different experimental conditions. There was a slow but steady increase within and across the first three phases (feedback alone, feedback plus praise, feedback alone). Adding and then removing verbal praise in Phases 2 and 3 had no apparent effect. The magnitude of increase from one session to the next in each feedback-alone phase was not substantially different from that exhibited during the feedback-plus-praise phase. The mean increase between sessions was 0.75 sec in feedback alone (Phase 1), 0.57 sec in feedback plus praise (phase 2), and 0.85 sec in feedback alone (Phase 3). It appears that precise feedback of performance was sufficient to maintain small but regular gains during experimental sessions and that selective praise for improved performance did not enhance the rate of progress.

In Phase 4, when both feedback of time and praise were withdrawn, there was a regular session-by-session decline in performance. During the last four sessions of this phase, the trial durations (length of time the patient observed the knife) were consistently shorter than during the first four sessions. In contrast with the first experiment, variance was not increased in this experiment when all external feedback was removed. This can be attributed, perhaps, to the fact that feedback in this instance was provided only after a trial was completed; performance during a trial could not be guided by feedback and therefore could not be so regularly paced as was the case in the first experiment.

Precise feedback was reinstated in Phase 5, and time spent observing the knife resumed its upward trend with a steeper slope than before. This accelerated rate of progress was maintained throughout the remainder of the experiment. It is possible that depriving the subject of all feedback in Phase 4 increased the incentive value of feedback in later phases. It is also possible that at this point in progress, reduction of fear or avoidance behavior is always positively accelerating. For example, a similar positively accelerating function has been reported for progress in later stages of systematic desensitization (Wolpe, 1963).

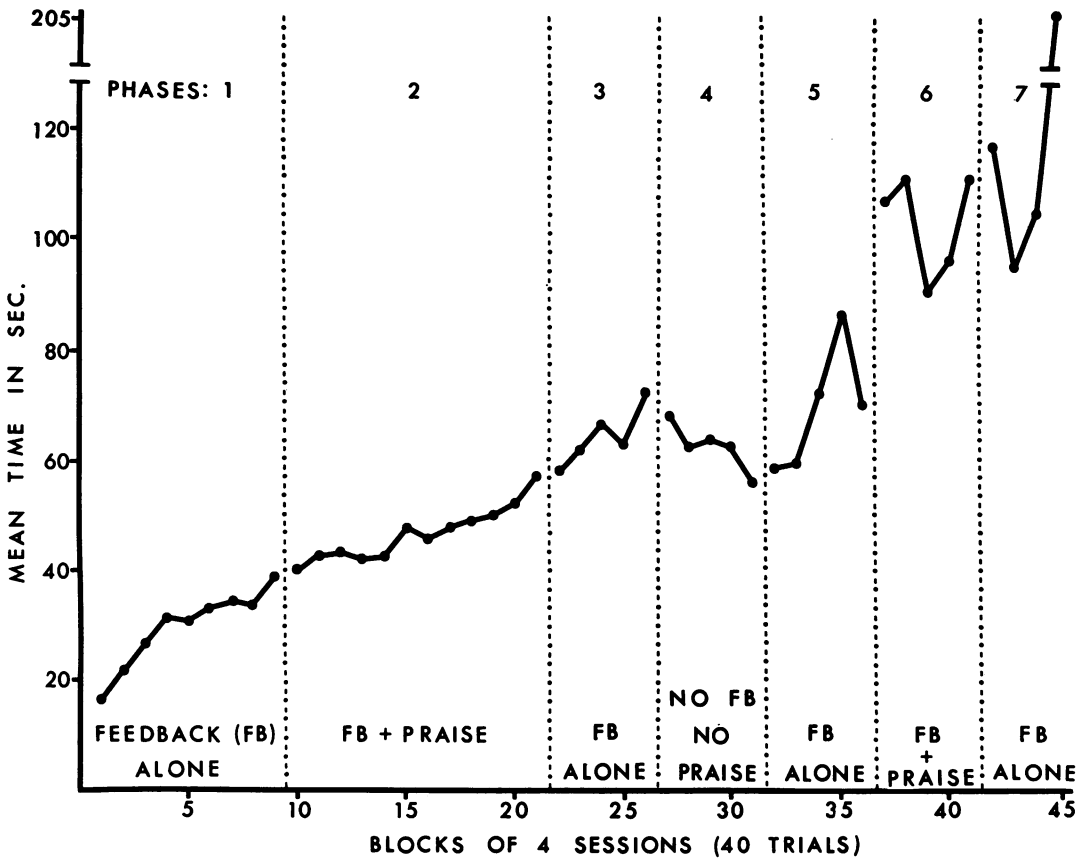


Fig. 2. Time in which a knife was kept exposed by a phobic patient as a function of feedback, feedback plus praise, and no feedback or praise conditions.

Adding and removing praise in Phases 6 and 7 respectively once again failed to have any specific effects. This confirms the findings in Phases 2 and 3.

By the end of the experiment, the patient's avoidance of knives had disappeared to the extent that she was able to peel and slice potatoes and carrots for use in the ward. She was then transferred to another hospital for treatment of her complaints of depression and obsessive thoughts of "hell" and "sin", *etc.*

DISCUSSION

The results of these two experiments demonstrate that precise feedback of trial-by-trial performance can facilitate behavioral change in phobic disorders within the context of a structured, graduated therapeutic program. This appears to be the case if feedback is provided either during or at the end of each trial. In both experiments, withdrawal of feedback

caused a decline in ongoing progress, and reinstatement of feedback led to renewed improvement.

These results cannot be readily attributed to other variables such as a change in therapeutic instructions and therapeutic support, *e.g.*, nursing care, since these were kept constant across experimental conditions. No suggestion was made to either patient that feedback was therapeutically important and that its removal was likely to have deleterious effects.

The fact that adding and removing selective praise did not cause any positive or negative behavioral effects in Exp. 2 suggests that the motivating and informational function usually fulfilled by praise (Kennedy and Wilcutt, 1964; Parton and Ross, 1965) had already been provided by precise feedback. It is also possible, of course, that even without precise feedback, contingent praise might not have been reinforcing in this case. The design of this study

does not permit a clear answer. However, previous studies with other phobias, especially agoraphobic behavior (Agras *et al.*, in press) have shown contingent praise to be effective in modifying patient's behavior. In the agoraphobic studies, however, such praise was the only form of feedback provided by the therapist to the patient about his performance.

Several interpretations are possible of the therapeutic importance of feedback. Precise feedback may act as a repeated reminder of the specific behavioral objectives of therapy. In a recent review of research in the area of programmed instruction, Anderson (1967) indicated that an "emphasis on defining and attaining specific behavioral objectives" facilitates learning. Furthermore, there is already evidence to suggest that in other behavioral tasks, knowledge of prior success contributes to future success (*cf.*, Feather and Saville, 1967). Precise feedback may allow the patient to detect slight but successful changes in his target behavior. Presumably this knowledge of prior success increases the patient's expectations of a favorable therapeutic outcome.

It appears that the strategy of sequentially manipulating independent variables within individual cases can be a useful approach to psychotherapy research. The generality and therapeutic usefulness of findings based on such studies are of course questionable without more extensive clinical trials. However, an experimental analysis within individual cases allows one to isolate the variables which modify "abnormal" behavior. Once isolated, such variables can either singly or in combination be investigated further with larger patient populations.

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