Reprinted from Current Psychiatric Therapies, Volume III
Copyright Grune & Stratton, Inc., 1963
Printed in U.S.A.

PART II

TECHNIQUES OF PSYCHOTHERAPY

Free-Operant Conditioning and Psychotherapy[1]

by OGDEN R. LINDSLEY, PH.D.[2,3]

IN OPERANT CONDITIONING the frequency of a response is altered by locating and arranging suitable consequences (reinforcement). This conditioning of responses by altering their consequences is contrasted with Pavlovian conditioning, in which responses are conditioned by arranging their antecedents.[4] If an organism being conditioned is at all

[1]The research was supported by grants MH-977 and MY-2778 from the National Institute of Mental Health, Public Health Service.

[2]The assistance of Jack R. Ewalt, M.D., and Elvin V. Semrad, M.D., of the Mass. Mental Health Center in interpreting the results of the psychotherapeutic evaluation is gratefully acknowledged. The patient contact program of the student nurse therapists was directed by Teresa J. Mouid, R.N., M.S., Boston College School of Nursing, and included classes given by Fr. William P. Sullivan, Metropolitan State Hospital. Therapy described in detail in this paper was conducted by Thomas Housenecht, M.D., Mass. Mental Health Center, and Marion Donahue, R.N.

[3]The cooperation of the staff and patients of Metropolitan State Hospital, Waltham, Mass., (William F. McLaughlin, M.D., Superintendent) is gratefully acknowledged. Appreciation is extended to Sol Sherman, M.D., Chief Psychiatrist, who arranged that somatic therapies would not confound our psychotherapeutic evaluations.

[4]If both controlling antecedents and controlling consequences were located for the same response, then the response could be both classically and operantly conditioned. Therefore, we see that the type of conditioning is a controlling procedure, rather than an iron-clad characteristic of the response. Theoreticians would be happier if nature's categories and man's methods did not overlap, but in most cases they do overlap. The natural scientist realistically accepts these overlaps and often uses them to his advantage for independent measurement.

times free to emit the response and to receive the arranged consequence, and if more than one response can occur within a given experimental session, then we use the term *free-operant conditioning*. The adjective *free* separates this form of conditioning from controlled-operant conditioning, in which only one response can be emitted per trial.

Free-operant conditioning provides *a method of experimentally analyzing behavior in the laboratory*. By isolating an individual within an appropriate enclosure, all variables which affect the behavior under study are experimentally rather than statistically controlled. The behavioral response and any environmental manipulations whose effects on the response are being studied are automatically and continuously recorded. This environmental control and automatic continuous recording qualify the method as a laboratory natural science, comparable to chemistry, physics, and biology.

The topography of the response is usually kept as simple as possible (e.g., pressing a small lever) in order to minimize peripheral effector variables and permit more exact study of general behavioral processes. The functional meaning of the response is primarily determined by the nature of its experimental consequence, or reinforcement. Usually only a small portion of the responses is reinforced (intermittent schedules of reinforcement) in order to generate a high frequency of responding without satiation and to study discriminations demanded by particular patterns of reinforcement (Ferster and Skinner, 1957). Rate of response emission is of primary interest and is continuously recorded as the slope of a cumulative response record. Since the method is sensitive to subtle changes in an individual's rate of responding, it is especially useful for longitudinal studies of single organisms.

Rapid development and wide application of the method of free-operant conditioning has opened up to scientific control and laboratory investigation the type of behavior which was once considered "voluntary." The discovery that such behavior is subject to control by its consequences makes it unnecessary to explain the behavior in terms of hypothetical antecedents. Although antecedents may eventually be found and objectively measured, it seems more profitable at this time directly to manipulate and analyze behavior in terms of its consequences.

Free-operant methods are especially appropriate to the problems of psychotherapy, because both fields (1) emphasize behavioral modification and control, (2) deal with single individuals, (3) use frequency of response over a period of time as a datum, (4) concentrate on the consequences of behavior, and (5) are interested in the functional and dynamic relationships between individuals and their social and nonsocial environments.

A sensitive and appropriate method, free-operant principles and techniques may provide psychotherapy with: (1) a fresh theoretical background, (2) refinements of current therapeutic practices, (3) new therapeutic methods, (4) independent evaluations of therapeutic effects, and (5) direct experimental analyses of therapeutic processes. Several recent exploratory experiments support these suggested areas of application. The particular studies which will be mentioned merely indicate the kind of research that has been done. They should not be considered a summary of research to date.

A Fresh Theoretical Background

Free-operant conditioning principles can provide a fresh, exciting, and highly relevant theoretical background for the practice of office, group, and ward psychotherapy. Time-worn habitual practices can be re-evaluated and revised as information is reshuffled according to the new descriptive nomenclature. For such an application it is not necessary to purchase complicated controlling and reinforcing apparatus. Although information derived from carefully controlled experiments has higher scientific credulity than information derived from the application of principles, new descriptive and theoretical approaches can lead to important advances.

Ayllon and Michael (1959), for example, had marked success in training ward nurses to make the behavior of their psychotic patients more socially acceptable. Entering the nurses' office, talking psychotically, and sitting or lying on the floor were disturbing responses which were successfully extinguished by the nurses' use of free-operant principles. By dropping food on patients' clothing while feeding them, the nurses were able to generate self-feeding in patients who previously had to be spoon-fed. This mild punishment for spoon-feeding, accompanied by the positive reinforcement of self-feeding and the nurses' talking to the patients while they fed themselves, successfully conditioned the patients to feed themselves.

Refinement of Current Therapeutic Practices

Rado (1962) has recently stressed the need for determining the truly important aspects of current psychoanalytic practices. Free-operant experimental methods appear to be useful for this purpose. Slack (1960), for example, conducted an experiment to determine the importance of the therapist's presence during therapeutic sessions. Neurotic patients spoke into a microphone while alone in a small chamber. Patients never saw the therapist but were told that he would listen to tape recordings

of their talk. The patients were reinforced for talking by being given points on a counter placed in front of them during the sessions. Regardless of speech content, high rates of talking were reinforced with high scores. At the end of each session scores were converted to money. Therapeutic results suggested strongly that patients developed insight and worked out their problems as rapidly as they would have in non-directive office counseling.

New Therapeutic Methods

Free-operant conditioning techniques promise to provide therapists with methods of directly manipulating the behavior of patients in controlled laboratory settings. These methods involve placing the patient alone in a controlled experimental environment with a suitable operandum which automatically records the behavior being manipulated. Suitable reinforcing events are automatically presented to the patient as a consequence for appropriate responding. Conditioning sessions are usually held each week-day for at least one hour.

Strengthening Normal Responses

If pulling a small plunger competes with a major symptom of a chronic psychotic, intermittently presented reinforcement (candy or cigarettes) for plunger-pulling increases the rate of plunger-pulling to within the normal range in 250 hours of conditioning (Lindsley, 1956, 1960). The rate of symptom display decreases and does not return even during subsequent extinction (non-reinforcement) of plunger-pulling. Symptom display outside of the experimental environment is also reduced.

Attempts at direct reinforcement of psychotic symptoms themselves have not been successful. This observation suggests that a *psychotic symptom* can be objectively and functionally defined as a frequently occurring response not currently under the control of its immediate environmental consequences.

As a patient is slowly conditioned, it is possible to increase the therapeutic value of experimental environments by successively approximating more complex situations. Gradual addition of interpersonal factors should maximize therapeutic potential (Lindsley, 1954). King, Armitage, and Tilton (1960), for example, have recently shown that 30-minute sessions of operant-interpersonal therapy given three times a week have a greater therapeutic effect than verbal and recreational control therapies. Initially, with the therapist present, patients made simple operant responses for candy, cigarettes, and presentations of colored slides as reinforcers. Increasingly complex manual and verbal tasks were incorporated in

accordance with the patients' therapeutic progress. At maximum complexity, the method required verbal communication and cooperation between two patients together in an experimental room.

Brady and Lind (1961) reinforced a patient, who had been hysterically blind for over two years, with points on a counter for correct responses to the presence of a light. The points were exchanged for canteen coupons after each session. Gradually the patient began to respond only when the light was on. This reconditioned sight transferred to extra-experimental situations, with the patient regaining his sight.

Decreasing Rate of Symptoms

Flanagan, Goldiamond, and Azrin (1958) successfully reduced the rate of stuttering in stutterers by making a 1-second blast of loud noise contingent upon the stuttering. They were also able to increase rate of stuttering by making termination of the noise contingent upon stuttering. Barrett (1962) was able to reduce the rate of multiple tics in a neurological patient by allowing the patient to hear pleasant music of his own choice while he did not tic and making brief periods of silence contingent upon ticing.

Evaluation of Therapeutic Effects

There is a great need for an objective laboratory technique to evaluate independently the effects of various therapeutic treatments. Individual differences in type and severity of mental illness and in degree and direction of therapeutic response are so great that techniques which demand grouping data from different patients are unsuitable. Furthermore, many patients show high day-to-day and hour-to-hour variability in degree of behavioral deviation.The practical impossibility of controlling important variables such as personal interaction on the wards and home visits makes evaluation of therapy even more difficult.

Free-operant methods may provide psychiatry with an objective evaluative device. With further modification and higher clinical relevance, these methods promise to provide sensitive differential measurement of the effects of single therapeutic sessions.

Experiments conducted in our laboratory have shown that even the simplest free-operant design (pulling a single plunger for intermittent candy reinforcement) is sensitive to the effects of psycho-active drugs, insulin and electro-shock coma, and psychotherapy on the rate of response of individual psychotic patients (Lindsley, 1960). Figure 1 shows the effect of psychotherapy sessions on the rate of response of an inactive chronic schizophrenic. This patient had previously participated

in 659 experimental sessions, during which he usually made less than 10 responses per hour, except for eight spontaneous improvement phases lasting two to four weeks. During these improved periods, the rate of response rose as high as 1,500 responses per hour. Including the experimental sessions shown in Figure 1, this experimental baseline covers six calendar years with a few brief experimental interruptions.

Therapy sessions, conducted by a student nurse three times a week, began at the first arrow. At the second arrow the patient stopped swearing at the nurse during therapy. At the third arrow the nurse, who had become quite involved with the patient, became very emotional and directive. She told the patient that he would not get well unless he stopped listening to his voices and paid attention to her. As the nurse began to cry, the patient also began to cry, for the first time in six years. In the experimental session immediately following this therapy session, the rate of response climbed to 350 responses per hour. In the second session after this, the rate increased to 750 responses per hour, and in the third session to 2,450 responses per hour. Responding was maintained at this high rate, which is well within the "normal" range, even on the two days each week that the nurse did not see the patient. During this time, the patient did not hallucinate on the wards or hospital grounds.

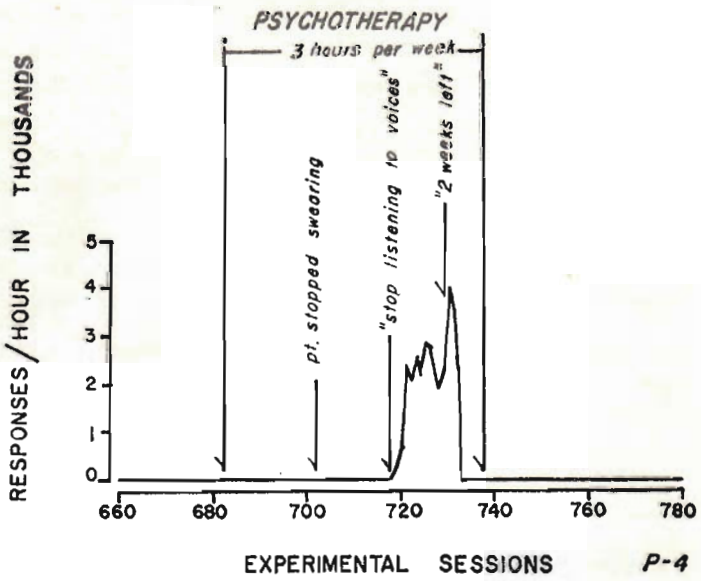

FIG. 1. Effect of psychotherapy sessions on free-operant response rate of a chronic schizophrenic.

At the fourth arrow, the nurse informed the patient that her affiliation with the hospital would be over in two weeks. Immediately after this notice of termination, the patient's rate of response jumped to almost 4,000 responses per hour. This responsing peak appears to be an objective measure of the "flight into health" often described by experienced therapists. Within two experimental sessions, however, the rate fell to zero as the patient again "withdrew into his psychosis." On the 734th session the nurse took the patient to Boston for a day's outing, with no therapeutic effect. The nurse saw the patient for the last time at the fifth arrow.

Attempts to reproduce this psychotherapeutic effect using student-nurse therapists have succeeded with only one of four patients. Since three months of student-nurse therapy is not notably effective and since chronic psychosis is so resistant to therapy, the method was modified to increase its sensitivity to therapeutic relationships. After seeing their patients three times a week for 10 weeks, student-nurses went into the experimental rooms with their patients during an experimental session. There were two experimental conditions, one in which the nurse told her patient she would keep him company and simply sat with him for 15 minutes, and another in which the nurse requested her patient to get her some candy or gum. In addition, there were two 15-minute control periods with the patient alone in the experimental room. Table 1 shows the number of responses emitted by patients during each of these four 15-minute periods. Note that all four patients showed significantly increased rates of responding when answering the requests of their nurse-therapists.

TABLE 1.—*Effect of Therapist's Presence on Free-Operant Responding of Chronic Schizophrenics for Candy and Cigarette Reinforcement*

	No. of Responses in Successive 15-Min. Periods of One Experimental Session			
No. Patient	Patient Alone	Therapist's Company	Patient Alone	Therapist's Requests
P-4	0	4	0	14
P-5	1	0	0	15
P-6	0	0	0	11
P-60	0	0	0	714

Since student nurses are a relatively homogeneous group, nurses who had no previous contact with the patients were used as controls subjects. Table 2 contains the number of responses emitted by patients in the

company of these strange student nurses and the number of responses emitted in answer to the strangers' requests. It appears that when they served merely as company, neither significantly affected the patients' rates of responding, but that when they requested reinforcers, therapists produced much higher rates of responding than strangers. This difference suggests that a slight therapeutic relationship can be developed even under these limited conditions and that its effect can be measured with free-operant methods.

TABLE 2.—*Effect of Stranger's Presence on Free-Operant Responding of Chronic Schizophrenics for Candy and Cigarette Reinforcement*

	No. of Responses in Successive 15-Min. Periods of One Experimental Session			
Patient No.	Patient Alone	Stranger's Company	Patient Alone	Stranger's Requests
P-4	0	10	0	8
P-5	0	0	0	4
P-6	0	0	0	0
P-60	0	0	0	0

DIRECT EXPERIMENTAL ANALYSIS OF THERAPEUTIC PROCESS

Perhaps the most exciting application of free-operant methods to psychotherapy would be the direct measurement of the viewing and listening responses of patient and therapist during psychotherapy. Direct measurement of leadership in cooperation and competition has been previously accomplished and demonstrates the utility of the free-operant for analysis of social behavior (Cohen, 1962; Lindsley, 1961).

With a patient in one small room and a therapist in another, the degree and direction of visual and auditory communication could be controlled by using closed-circuit television. The patient would have two switches in front of him. A rapid rate of pressing one switch would bring the therapist into view on a closed-circuit television screen in front of the patient. A rapid rate of pressing the other would increase the intensity of the therapist's voice, heard over a speaker in the patient's room. The immediate reinforcing effects of the therapist's movements and speech would be indicated by variations in the patient's rates of pressing the viewing and listening switches. These two rates of responding would be separately but simultaneously recorded in another room on cumulative response recorders.

Fluctuations in rates of responding would indicate subtle changes in communication and the degree of transference within therapeutic sessions.

Correlation of rate variations with the verbal content of communication between patient and therapist would reveal and test many of the dynamics supposedly involved in the therapeutic process.

In a more complex experimental design, the therapist could have two switches parallel with the patient's switches. If a patient failed to operate either switch, permitting the therapist to revert to visual and auditory oblivion, the therapist could lend support by pressing his own switches to present himself visually and auditorily to his patient.[5] Since all responses by both patients and therapist would be simultaneously recorded, the interplay of these operations could be manipulated or experimentally analyzed.

Other refinements and variations of the method may permit analysis of even more subtle effects. For example, the importance of the content of the therapist's speech could be tested by breaking the connection between the therapist's microphone and the patient's speaker. The therapist could have two switches, one to light a sign in the patient's room saying "yes" and another to light a sign saying "wonderful." The therapist could use these signs to reinforce specific behavior in his patient. The effects of such contentless reinforcement could be compared with therapeutic effects of full speech. The effect of catharsis could be determined by having the patient respond to produce movies or tape recordings of his arguments with his spouse or of arguments between couples with similar problems.

Conclusion

Exploratory experiments have shown that free-operant principles and methods have wide application in social and clinical behavioral research. The method shows promise in the analysis of psychotherapy behavior and process.

At this time, further refinements and applications appear to be limited only by the originality of the investigator and the behavioral accuracy with which the clinical problems are interpreted. When clinical relevance is wedded to methodological refinement, the magic of the word may be strengthened by the power of the number.

---

[5]"Support" appears to be used in another, quite different way by therapists. Not only does it mean fairly direct positive reinforcement of socially appropriate responses by the patient, but also it means letting the patient emote without consequent punishment, in ways that are socially disapproved. In other words, some therapists use the word "support" to describe the provision of a non-punishing audience.

REFERENCES

AYLLON, T., AND MICHAEL, J.: The psychiatric nurse as a behavioral engineer. J. Exper. Anal. Behav., 2:323-334, 1959.

BARRETT, B. H.: Reduction in rate of multiple tics by free operant conditioning methods. J. Nerv. Ment. Dis., 135:187-195, 1962.

BRADY, J. P., AND LIND, D. L.: Experimental analysis of hysterical blindness. Arch. Gen. Psychiat., 4:331-339, 1961.

COHEN, D. J.: Justin and his peers: An experimental analysis of a child's social world. Child Develpm., 33:697-717, 1962.

FERSTER, C. B., AND SKINNER, B. F.: Schedules of Reinforcement, New York, Appleton-Century-Crofts, 1957.

FLANAGAN, B., GOLDIAMOND, I., AND AZRIN, N.: Operant stuttering: The control of stuttering behavior through response-contingent consequences. J. Exper. Anal. Behav., 1:173-177, 1958.

KING, G. F., ARMITAGE, S. G., AND TILTON, J. R.: A therapeutic approach to schizophrenics of extreme pathology: An operant-interpersonal approach. J. Abnorm. Soc. Psychol., 61: 276-286, 1960.

LINDSLEY, O. R.: Discussant for B. F. Skinner, A new method for the experimental analysis of the behavior of psychotic patients. J. Nerv. Ment. Dis., 120: 403-406, 1954.

——: Operant conditioning methods applied to research in chronic schizophrenia. Psychiat. Res. Rep., 5: 118-139, 1956.

——: Characteristics of the behavior of chronic psychotics as revealed by free-operant conditioning methods. Dis. Nerv. Sys., monogr. suppl., 21:66-78, 1960.

——: Experimental analysis of cooperation and competition. Paper read at Eastern Psychol. Assn., Philadelphia, April 1961.

RADO, S.: Towards the construction of an organized foundation for clinical psychiatry. In P. H. Hoch & J. Zubin (Eds.) The Future of Psychiatry. New York, Grune & Stratton, 1962, pp. 116-126.

SLACK, C. W.: The automatic interview machine: A system for reinforcing verbal behavior in the absence of an interviewer. Mimeographed Rep., Harvard Center for Research in Personality, 1960.