

Skinner Boxes for Psychotics: Operant Conditioning at Metropolitan State Hospital

Alexandra Rutherford
York University

Between 1953 and 1965, Ogden Lindsley and his associates conducted free-operant research with psychiatric inpatients and normal volunteers at Metropolitan State Hospital in Waltham, Massachusetts. Their project, originally named “Studies in Behavior Therapy,” was renamed “Harvard Medical School Behavior Research Laboratory” in 1955. This name change and its implications were significant. The role of the laboratory in the history of the relationship between the experimental analysis of behavior and applied behavior analysis is discussed. A case is made for viewing Lindsley’s early work as foundational for the subfield of the experimental analysis of human behavior that formally coalesced in the early 1980s. The laboratory’s work is also contextualized with reference to the psychopharmacological revolution of the 1950s. Finally, a four-stage framework for studying the historical and conceptual development of behavior analysis is proposed.

Key words: history, behavior analysis, free operant, human behavior

The first systematic replication of the free-operant paradigm with adult humans was initiated and undertaken by B. F. Skinner and Ogden Lindsley at the Harvard Medical School Behavior Research Laboratory at Metropolitan State Hospital in Waltham, Massachusetts, between 1953 and 1965. The Behavior Research Laboratory (hereafter, BRL) played a key role in the history of the extension of operant principles to human behavior, and, further, provided a pivotal application of operant methods to the study of psychopathology. It was truly an example of one of the expanding visions of operant psychology in the 1950s.

In this paper, I provide a brief descriptive history of the BRL, outlining its inception, its research activities and apparatus, its sources of funding, and its eventual closure in 1965. Throughout, I draw heavily on a recently pub-

lished account of the BRL by Lindsley (2001), Skinner’s account in the third volume of his autobiography, *A Matter of Consequences* (1983), the BRL’s published research, and published conference proceedings.¹

Beyond a descriptive history of the BRL, the important role it played in the relationship between the experimental analysis of behavior and the applied analysis of behavior is examined. Although the term *behavior therapy* was used by Skinner and Lindsley to describe some of the BRL’s activities, and although the BRL sometimes portrayed its work as “therapeutic,” the actual and intended spirit of the research at the BRL was experimental, not applied. At its inception, Skinner and Lindsley intended to use the BRL

I thank Don Dewsbury, Vic Laties, Ed Morris, and Wade Pickren for comments on earlier versions of this manuscript. I also thank Ogden Lindsley, Ed Morris, Vic Laties, Peter Nathan, Carol Pilgrim, and Beatrice Barrett for sharing their experiences, knowledge, and archival material with me.

Please address correspondence to Alexandra Rutherford, Department of Psychology, York University, 4700 Keele St., Toronto, Ontario M3J 1P3, Canada (e-mail: alexr@yorku.ca).

¹ At this point, my archival investigations and correspondence with participants in the BRL have just begun, so the material presented here will undoubtedly undergo modification as additional first-hand accounts, perspectives, and experiences of the BRL’s participants are collected. Lindsley and Peter Nathan, who was a postdoctoral researcher at the BRL between 1962 and 1964, have given me useful information and insights. Also of immense help has been Beatrice Barrett, who worked with Lindsley at the BRL between 1960 and 1962, and who subsequently established a laboratory of her own at the nearby Walter E. Fernald State School.

to study whether the reinforcement of human operant behavior would follow the same lawful regularities that had been demonstrated in animals studied in operant chambers. Although application was a logical corollary of their work, and the problems and population studied certainly attracted researchers interested in applied fields, the BRL itself was foundational, both methodologically and conceptually, in the extension of the experimental analysis of behavior to applied behavior analysis that occurred more distinctly throughout the 1960s.²

Finally, the activities of the BRL are contextualized by examining the role that psychopharmacology played in its research program. Because the BRL was located in a psychiatric hospital and chronic schizophrenics were its primary research participants, the pharmacological revolution that beset psychiatry in the 1950s influenced its research activities (indeed, operant research also changed the pharmacology field; see Laties, 2003, for a history of behavioral pharmacology). To conclude, a four-stage model of the historical and conceptual development of behavior analysis is proposed, which situates the BRL (and other human free-operant laboratories) as the link between the animal operant tradition and applied behavior analysis. The foundational significance of the BRL's work in the formation of the subfield of the experimental analysis of human behavior (EAHB), which formally coalesced during the early 1980s, is acknowledged and discussed.

The Birth of the Behavior Research Laboratory

In *A Matter of Consequences* (1983), the last volume of his autobi-

² The first issue of the *Journal of the Experimental Analysis of Behavior* appeared in 1958. The *Journal of Applied Behavior Analysis* was founded in 1968. The period from the mid-1950s to the late 1960s was a momentous one in the history of behavior analysis, marked by the rapid expansion of both experimental and applied branches.

ography, Skinner noted that his interest in psychotic behavior had begun with his development of the verbal summator (see Skinner, 1936), which resulted in a short collaboration with Saul Rosenzweig at Worcester State Hospital in the 1930s. As I have described elsewhere (Rutherford, 2000a), Skinner initially conceptualized the verbal summator, not only as an experimental device to evoke latent verbal behavior but also as a possible auditory projective technique, or, as he put it, a "device for snaring out complexes" (Skinner, 1979, p. 176). He arranged to try out the verbal summator on schizophrenic patients at Worcester. Although his interest in this particular aspect of the work soon waned (although others remained or became interested; see Ball & Bernardoni, 1953; Bean, 1965; Grings, 1942; Shakow & Rosenzweig, 1940; Stone, 1953), by 1952 his interest in investigating psychotic behavior had been piqued again. As Lindsley, then a graduate student of Skinner's at Harvard, wrote,

Whenever Fred and I met to discuss my doctoral dissertation . . . we always strayed from the topic. We wondered whether the catatonic schizophrenic standing in a corner all day was the result of total extinction. We wondered whether the hebephrenic was reinforced for giggling on a variable ratio schedule. . . . Fascinated, I promised Fred that if he could get funds, I would give human free operant research five years of my life. (2001, p. 138)

Skinner was able to procure funds, and also found a site for the research. In 1952, a colleague introduced Skinner to Harry Solomon, head of the Department of Psychiatry and director of the Boston Psychopathic Hospital. Solomon, interested in Skinner's proposal, spoke with William F. McLaughlin, the superintendent of Metropolitan State Hospital in Waltham, Massachusetts, and persuaded him to give Skinner space for a laboratory.³ Skinner pro-

³ Annual reports from Metropolitan State Hospital indicate that starting around 1953, Boston Psychopathic Hospital forged a training affiliation with Metropolitan, which accounts for the connection between Harry Solomon, the director

cured funds from the Office of Naval Research (ONR; they had funded the ORCON project), the Rockefeller Foundation, and the Milton Fund of Harvard University. With these supports in place and Lindsley's offer on the table, the BRL took up residence in an abandoned hydrotherapy unit at the hospital in June, 1953, with the sum of \$7,500 for the year with which to set up an operant research facility for humans.

Over the course of the next 10 months, two experimental rooms (6 ft by 6 ft) were equipped with plunger operanda and magazine delivery chutes designed to administer a variety of reinforcements to human subjects (for a detailed description of the rooms, subjects, and experimental procedures, see Lindsley, 1956). The plungers were connected to cumulative recorders situated in a hallway adjacent to the experimental rooms, which Lindsley came to call "Apparatus Alley." In a presentation to the Massachusetts Society for Research in Psychiatry in April of 1954 (Skinner, Solomon, & Lindsley, 1954) and subsequently to the American Psychological Association in September (Lindsley & Skinner, 1954), Skinner and Lindsley reported that 15 male patients of various psychiatric classifications, average age of 38 years and hospitalized an average of 17 years, served as initial research participants. In the typical experimental situation, subjects were shown a variety of potential reinforcers—such as candy, cigarettes, or coins—and were asked to select their preferred reinforcer. They were then taken to the experimental room where they were either shown how to operate a plunger that would deliver the reinforcer or were allowed to explore the room freely until plunger-pulling behavior was emitted.

of Boston Psychopathic, and William McLaughlin, who remained superintendent of Metropolitan throughout the tenure of the BRL. The annual reports for the hospital for the years 1931 through 1969 are held at the Massachusetts State Archives in Boston.

In some cases, they reported, none of the potential reinforcers appeared to work for the subjects. In these cases, other options were tried, including projecting "short exposures of interesting pictures" (Skinner et al., 1954, p. 403) onto a wall in the room (the "interesting pictures" were photos of pin-up girls). Lindsley and Skinner reported that two schedules of reinforcement were investigated—a 1-min variable interval and a fixed ratio of 20. They concluded that the effects of different schedules of reinforcement on the behavior of the BRL's subjects were similar to those found in rats, pigeons, and dogs, and recommended further study, including observing the effects of drug therapy on operant behavior. So how did behavior *therapy* fit into this picture?

*"Studies in Behavior Therapy" to
"Behavior Research Laboratory"*

So far, I have referred to the laboratory as the Harvard Medical School Behavior Research Laboratory. This was not its first name. According to Lindsley (2001), Skinner first named the project the "Experimental Analysis of the Behavior of Psychotic Patients," but the use of the term *experimental analysis* produced negative reactions among hospital staff, patients, and parents. Lindsley then drew up a list of 12 alternate names, and chose "Studies in Behavior Therapy."⁴ This name, he reported, was more positively received and was used to designate the laboratory until 1955, when its name was changed from "Studies in Behavior Therapy" to "Behavior Research Laboratory." "Studies in Behavior Therapy," however, appeared in Lindsley,

⁴ In an e-mail posting to the Behavior2000 electronic mailing list on June 18, 1996, Ogden Lindsley reported that in consulting his laboratory notebook from that time, he also considered the names "Behavior Therapy Research," "Behavior Reclamation," "Reinforcement Therapy," and "Behavior Reconditioning," before settling on "Behavior Therapy." My gratitude to Ed Morris for sharing this correspondence with me.

Skinner, and Solomon's first three status reports to the ONR, covering the June, 1953, through December, 1954, activities of the laboratory. Both Skinner (1983, p. 53) and Lindsley (2001, p. 139) remarked that the first ONR status report marked the first published use of the term *behavior therapy*—a claim that has been debated.⁵ Of interest here, however, is not whether they were the first to use the term, but why they chose it and whether it accurately reflected the spirit of their endeavor. Were Skinner and Lindsley doing therapy? If not, what was the goal and significance of their project?

Interestingly, in presenting their results from the 1st year of the laboratory's research at scholarly meetings in April and September of 1954 (as discussed above), both Skinner and Lindsley used Skinner's original designation, entitling their presentations, "A Method for the Experimental Analysis of Psychotic Patients." Lindsley, in his presentation, explicitly referred to the laboratory, not as "Studies in Behavior Therapy" but as the "Laboratory for Behavior Research," at least a year before the official name change. This implies that there may have been strategic political reasons for presenting the laboratory as a therapeutic setting to hospital staff, patients, and the ONR, but not to the scholarly research community. (Evidently the National Institute of Mental Health didn't care about the wording either—Lindsley, Skinner, and Solomon received their first standard research grant from NIMH in 1954, MH-977, entitled "Experimental Analysis of Psychotic Behavior.")

⁵ The debate centers on whether Skinner and Lindsley, or Eysenck, used the term first. Arnold Lazarus has also claimed to have been the first to use the term *behavior therapy* in a scientific journal (see Lazarus, 2001, p. 156). Evidently, at an invited dialogue between Skinner and Eysenck at the 1980 APA convention in Montreal entitled "Behavior Modification, Behavior Therapy, and Other Matters," Skinner conceded that Eysenck had invented the term. The session was audiotaped. If anyone has this tape, the author would be most grateful for a copy or a transcript.

Skinner (1983) remarked in his autobiography that their first status report to the ONR in 1953 included a section outlining "Plans for Future Work," in which he noted,

Practically every one of these proposals is related to therapy. . . . As our experiments are extended to more and more complex behavior, we should be in a position to undertake in many cases the particular kinds of change in behavior needed to bring about recovery. (pp. 53–54)

Clearly, the use of the name "Studies in Behavior Therapy" and an occasional published nod to the therapeutic implications and potential of their findings served to mask somewhat the truly experimental nature of the research. It is likely that Skinner also believed that their research would, in time, lead to more direct therapeutic interventions.

In his presentation to the Massachusetts Society for Research in Psychiatry in April of 1954, Skinner made no allusion to the therapeutic implications of the laboratory's work, stating simply, "The rate at which the [plunger-pulling] machine is operated is studied" (Skinner et al., 1954, p. 403). But the published commentary provided by three discussants—two of whom were psychiatrists—clearly highlighted connections to therapy and the accomplishment of therapeutic aims. For example, one of the psychiatrists noted, "The hypothesis of Dr. Skinner's study is that direct reinforcement has great motivational value and will lead to behavior change in the direction of recovery" (p. 405). The other psychiatrist objected strongly to the control of the operant behavior of the experimental subjects, comparing it to control brought about by the "extirpation of the brain, bit by bit" or the "brain washing methods of totalitarian states" (pp. 404–405).

It is clear from the abstracts of Lindsley and Skinner's 1954 papers that the initial and ongoing objective of the laboratory was to test whether an out-and-out replication of the free-operant paradigm would succeed with humans as it had with nonhumans; in this case,

whether the paradigm would prove to be an appropriate method for investigating the functional properties of the behavior of psychotics. No mention was made of trying to modify or shape the subjects' behavior towards therapeutic ends. Lindsley noted of their results, "On the fixed-ratio schedule, clear-cut 'fixed ratio breaks' in response rate followed reinforcement. These breaks are characteristic of the performance of lower organisms on this schedule." He concluded by stating, "The behavior of the psychotic patient can be successfully investigated with operant conditioning techniques. The behavior generated is stable and predictable and provides a uniform base line for investigating pharmacological and physiological variables" (Lindsley & Skinner, 1954, p. 419). Skinner also noted the potential use of the regularity of operant responding as an evaluative baseline, remarking that the "records already obtained provide an excellent baseline for observing the moment-to-moment effects of drugs or the effects of other forms of therapy" (Skinner et al., 1954, p. 404).

In his retrospective account of the BRL, Lindsley (2001) wrote, "After two years we were accepted as part of the hospital staff by patients and families. Our stationery and business cards were used up. We felt *secure enough* [italics added] to change our name to 'Harvard Medical School Behavior Research Laboratory'" (p. 140). In a 1996 e-mail posting to fellow behavior analysts, Lindsley likewise remarked, "On 11 January 1955, I felt secure enough in our hospital setting and with the clinical psychiatrists at Harvard to change our name to Behavior Research Laboratory—which was what we were doing all along" (Lindsley, 1996). Thus, it may have been easier for the laboratory to gain initial acceptance and funding if, by implication, the nature of their work was seen as applied and therapeutic, as opposed to experimental. After all, they were at a hospital, and their research participants were patients. Once institutional accep-

tance had been achieved, however, the use of the term *behavior therapy* was no longer used. More important, although much activity and published research was coming out of the laboratory, very little, if any, of it involved "bringing about recovery," as Skinner had projected.

In 1956, Lindsley presented and published a paper at an American Psychiatric Association conference on "Research Techniques in Schizophrenia." In this paper, Lindsley noted,

The primary purpose of our investigations has not been to produce therapy through the automatic reinforcement of an isolated segment of a patient's behavior, although such a development would be more than welcome. Our purpose has been to develop a basic research tool for the measurement of the simple and complex, individual and social behavior of psychotic patients. (pp. 135–136)

Indeed, what was unfolding at the BRL was a sensitive, continuous, and reliable method of measuring and recording behavior. This method could then be used to assess the effects of pharmacological agents on the behavior of psychotic patients. What was emerging was not a new therapy, but a new assessment technique.

"Therapeutic Evaluation" of Psychotic Behaviors

Skinner's direct involvement with the BRL dissipated by the late 1950s, but by this time Lindsley had officially received his PhD from Harvard (1957) and was working at the BRL full time. Funding continued from the National Institute of Mental Health, and the titles of the grants awarded to the BRL provide an indication of the direction of some of its research activities. From 1958 to 1962, Lindsley received funds for a project entitled "Screening Potential Stimulants on Inactive Psychotics" (MH-2778) and from 1961 to 1965 for "Drug-Sensitive Free-Operant Measures of Psychosis" (MH-5054). The late 1950s and early 1960s were a burgeoning period for operant research on drug effects (see Laties, 2003). Skinner (1983) remarked,

Thanks mainly to Joe Brady, who was actively promoting the experimental analysis of behavior in the assessment and study of drugs, almost all the large ethical pharmaceutical companies had set up operant laboratories. Advertisements for new drugs began to show cumulative recorders, and *Life* magazine ran a full-page picture in color of an unboxed rat pressing a lever surrounded by racks of relays and timers. (p. 116)

But rats were soon not the only experimental subjects. After a meeting with Karl Beyer of the research laboratories of Sharp and Dohme, a large pharmaceutical company, Skinner suggested that they try some of their more promising drugs on the psychotic patients at the BRL (Skinner, 1983, p. 101). Evidently, they followed through on his suggestion. In a 1962 article on operant conditioning techniques in the measurement of psychopharmacologic response, Lindsley outlined results from four case studies investigating both the immediate and chronic effects of benactyzine, methastyrindone, and iproniazid on plunger-pulling behavior reinforced on a 1-min variable-interval schedule. (The benactyzine and methastyrindone were provided by the aforementioned Merck, Sharp, and Dohme Research Laboratories. The iproniazid was supplied by Hoffmann-LaRoche, Inc.; Lindsley, 1962.) In each case, the subject served as his own control. Extensive preexperimental baseline records of behavior were available, and the effects of the drug could be tested over long periods of time. The effects of the compound were evaluated according to whether it decreased the rate of vocal hallucinatory behavior and increased the rate of nonsymptomatic responding (i.e., plunger pulling). Lindsley noted, "The technique of direct, continuous, and simultaneous recording of symptomatic and nonsymptomatic responding is the most sensitive index we have yet developed for screening psychotherapeutic compounds" (p. 378).

In his retrospective account of drug research at the BRL, Lindsley (2001) reported that over the course of a 7-hr session, schizophrenics displayed a reliably different pattern of interactions

among vocal hallucinatory, pacing, and operant behavior than the pattern exhibited by other psychiatric patients and normal controls.⁶ Specifically, normal controls obviously had no vocal hallucinations, typically had very few pacing behaviors, and demonstrated uninterrupted operant responding throughout the 7-hr session. Schizophrenics, in contrast, displayed what Lindsley termed "coextensive reflex emission," which meant that their vocal hallucinatory and pacing behaviors either overlapped or alternated with periods of operant responding, and that these patterns were reliable within the individual.

The BRL had developed an elaborate technical setup that allowed the moment-by-moment recording of all of these behaviors. In addition to a plunger attached to a magazine for delivering reinforcement, the rooms were eventually equipped with recording devices calibrated to pick up only the frequencies of the human voice (not whistling, singing, or moving-about noises), as well as electrical floor mats to record pacing. Cumulative recorders were attached to the plungers, mats, and microphones to graph the rates and frequencies of plunger pulling, vocal

⁶ Seven-hour sessions were required to adequately record baseline behavior, drug effect, and return to baseline for a drug injection that lasted about 5 hr (Lindsley, 2001). Over the course of the BRL's history, Lindsley's core group of 50 male psychotics supplied daily sessions of 1-hr duration for over 10 years. It is probable that this kind of extended experimental participation would have been possible only with a captive population, such as back ward psychotics. However, in addition to psychiatric inpatients, over time the BRL tested hospital attendants, adult volunteers, and school children under various experimental setups, and to provide control data against which to compare the results of inpatients. In some cases, sessions with unhospitalized normal adults (hospital attendants) lasted over 5 hr (see Lindsley, 1960, Figure 5). A 1-min variable-interval schedule of reinforcement with nickels was responsible for their extended participation. Lindsley also noted that female patients were not used as subjects to eliminate any behavioral fluctuations that might be correlated with menstrual cycles (Lindsley, 1960).

hallucinations, and pacing. Lindsley noted, "We had a screening device. We could screen one new drug a week on the normal work, pacing, and hallucinating of chronic and acute psychotic patients," and, "this screening efficiency appealed to drug companies and to the NIMH" (2001, p. 149). Lindsley also noted that due to the durability and indestructibility of the rooms and work panels, this setup was appropriate for use with even the most disturbed and violent patients.

In 1963, Lindsley published an article in which he noted,

Although free-operant methods show promise as therapeutic devices, we have primarily focused our research on developing new techniques for automatically evaluating within the behavior laboratory the types and severity of the psychoses. We have concentrated on evaluation . . . because our exploratory attempts at free-operant therapy with chronic psychotic patients were too time-consuming to be practical, and did not produce general or dramatic recoveries. . . . We began to adapt the method to provide objective therapeutic evaluation rather than to perform therapy. (1963a, p. 293)

The research at the BRL was influenced by the availability of funds for research on drug effects, but was also uniquely suited to such research. With the rooms and recording devices Lindsley had constructed, continuous measures of responding that were sensitive to a number of classes of behavior were available to record moment-by-moment changes due to drug effects. But in the above quote Lindsley again implies that free-operant *therapy* had been one of the BRL's foci. There were only two indications of studies whose aim was to change, either directly or indirectly, the frequency of patients' maladaptive behavior. An examination of these two studies reveals that again sensitive recording and measurement apparatus played a key role in the investigations.

Beatrice Barrett, one of the researchers at the BRL between 1960 and 1962, at the request of Norman Geschwind, a physician in the Department of Neurology at the Boston VA Hospital, performed a study designed to re-

duce the tics of a 38-year-old veteran using free-operant conditioning methods. The influence of the technical apparatus at the BRL on the design of her study is immediately apparent. She and her colleagues approached the problem by designing a chair operandum that allowed them to pick up and record a variety of bodily tic movements. When these movements occurred, a number of specified response-contingent events would be delivered to the patient, in this case the cessation of pleasurable music or the presentation of white noise, an aversive stimulus (see Barrett, 1962).

In 1959, Lindsley published a short report on the effects of differential positive reinforcement on the rate of vocal psychotic symptoms. In keeping with the general research paradigm of the BRL, Lindsley investigated the effects, not of extinguishing vocal hallucinations (which would not have been possible anyway; none of the patients had ever been reinforced for these vocalizations in the room-sized operant chamber), but of reinforcing plunger-pulling behavior and then withdrawing this "nonsymptomatic" reinforcement and substituting reinforcement for the vocal hallucinations. The result of this procedure was to extinguish plunger-pulling behavior, as expected, but paradoxically, vocal hallucinations also decreased in rate even though they were being explicitly reinforced. When reinforcement was reinstated for plunger pulling and withdrawn for vocal hallucinations, the hallucinations again increased. Lindsley concluded, "Vocal psychotic symptoms appear to be under some strong control that resists direct differential positive reinforcement" (1959, p. 269). It may have been findings like these that directed the BRL's attention towards "therapeutic evaluation" (or functional analysis) of behavior, rather than towards modification. A rigorous functional analysis of the behavior was required before attempts at changing the behavior could be considered or undertaken.

Fifteen years after the closure of the BRL, in a 1980 invited dialogue with Hans Eysenck at the American Psychological Association convention in Montreal, Skinner noted that, despite the use of the term *behavior therapy* in conjunction with the BRL, its work was not intended to be therapeutic. Peter Nathan, one of the postdoctoral researchers at the BRL from 1962 to 1964, wrote, "The lab was certainly seen by hospital staff as devoted to research. As I saw it, there was little relationship between clinical staff at the hospital and research staff at the lab" (personal communication, August 5, 2002).

Closing Its Doors

In 1965, Lindsley decided to close the BRL. Over the course of its 11-year history, five postdoctoral trainees or researchers had worked there: Nathan Azrin, Beatrice Barrett, Peter Nathan, Martha Mednick, and Paul Blachly (Lindsley, 2001). Numerous other graduate students and visitors had passed through its doors. Among them were many prominent behavior analysts, such as Sidney Bijou, Donald Baer, Ted Ayllon, Matthew Israel, Charles Catania, and others. By the mid-1960s, Azrin and Ayllon had developed a token economy system with psychiatric inpatients at Anna State Hospital (see Ayllon & Azrin, 1965, 1968). Azrin had worked as a postdoctoral researcher at the BRL, and Ayllon had been a visitor. Among other influences, their exposure to the BRL probably played a role in this work. Beatrice Barrett, after collaborating with both Charlie Ferster at the Institute of Psychiatric Research, Indiana University School of Medicine, and Lindsley at the BRL (between 1960 and 1962), opened her own laboratory to study operant behavior at the Fernald School. She quickly observed and exploited the therapeutic potential of a functional analysis of behavior to help modify the behaviors of children with a number of developmental and behavioral prob-

lems. The question thus becomes, what is the BRL's proper place in the history of behavior analysis?

Lindsley indirectly alluded to the unique niche occupied by the BRL by remarking, "Application research grew like wildfire compared to the behavioral laboratory research that had originally triggered it. The laboratories were expensive, hard to fund, and ignored by both clinicians and small animal laboratory researchers. Behavior modification, behavior therapy, and applied behavior analysis were clearly going to dominate the field" (2001, p. 150). The BRL's work studying the free-operant response rates of human beings in experimental rooms fell, both conceptually and historically, between the animal laboratory research tradition and the emerging field of applied behavior analysis. As applied behavior analysis established its own (and sometimes dramatic) successes, thus taking center stage in the behavior analysis field, perhaps the functions served by the human operant research laboratory appeared to many to be superfluous.

In addition, although the heyday of the pharmacological revolution had provided the BRL with funding and a research goal for a number of years, the success of a number of neuroleptic drugs had been established by the 1960s. The United States Food and Drug Administration licensed chlorpromazine, the first major neuroleptic used to treat schizophrenia, in 1954. Many more compounds, in what historian of medicine Edward Shorter has called the "second biological psychiatry," were soon to follow (Shorter, 1997). The demand for free-operant measures of drug response in humans had subsided. Lindsley alluded to several of these factors contributing to the laboratory's closure:

The combination of too few new drugs to try, increased university overhead charges, increased competition for smaller and smaller government research grants, lack of interest in our results, and the crisis of losing frequency and standard self-charting . . . made continuing our laboratory research a poor choice. (2001, pp. 150–151)

Thus, in 1965, the Behavior Research Laboratory closed its doors. The scope of its influence on subsequent behavior analysts, the development of token economies, and the field in general has yet to be adequately explored. As this work continues, I hope to continue to talk to former BRL researchers and to examine some of the unpublished material that emerged from the BRL (including grant proposals and status reports). Finally, of particular interest would be any record of the BRL's activities kept by Metropolitan State Hospital staff or administrators. This perspective is notably missing from the published record.

History, Behavior Analysis, and the BRL: Concluding Remarks

The history of the BRL, and other laboratories like it, is significant for a number of reasons. First, a review of the studies and findings from the laboratory provides additional evidence to counter claims that Skinner's experimental findings on schedules of reinforcement with animals in operant chambers were never sufficiently replicated with humans. The experimental rooms at the BRL were in fact operant chambers for human beings, the very first "human Skinner boxes" (see Baron, Perone, & Galizio, 1991, for the background and controversy over this term), and much of the research conducted there was intended to replicate the methods and design of Skinner's animal research, but with human subjects. In addition to this basic aim, the operant chambers were used to research drug effects and to investigate more complex forms of human behavior, such as cooperation, competition, and other social behaviors (see D. J. Cohen & Lindsley, 1964; Lindsley, 1963b, 1966). As Skinner put it, "People were different from rats or pigeons, but we should never know how different until we had studied them as we studied other species" (1983, p. 54). Although the success of applied behavior analysis now speaks for itself,

Lindsley's work at the BRL predated this field and functioned as a link between the experimental analysis of behavior and applied work. The relationship between experimental work with animals and applied behavior analysis with humans was thus bridged by the BRL's experimental work with humans.⁷

The history of the BRL also provides a window on the relationship between behavior analysis and psychiatry in this period. During this time, a substantial amount of behavior-analytic research was being carried out by psychologists affiliated with medical schools or psychiatric institutions. The BRL was affiliated with the Harvard Medical School and located in a psychiatric hospital; Charlie Ferster's work on the functional analysis of the behavior of autistic children (e.g., Ferster, 1961; Ferster & DeMyer, 1962) was carried out at the Indiana University Medical Center; and Harold Weiner's work with schizophrenics was carried out at St. Elizabeth's Hospital in Washington, DC (see Weiner, 1964a, 1964b). Much of the research was published in psychiatric journals, such as the *Journal of Nervous and Mental Disease*, the *American Journal of Orthopsychiatry*, and *Psychiatric Research Reports*. Perhaps this fact has served to historically obscure this period of activity, especially in surveys of the field that draw on work published in more traditional behavior-analytic outlets. Examining the history of the BRL and its contemporaries can thus serve to further uncover this aspect of the history of behavior analysis and reassert the link between the experimental analysis of behavior and applied behavior analysis.

To conclude, I would like to propose

⁷ Sidney Bijou's work replicating operant principles with children in this period (e.g., Bijou 1955, 1957, 1958) provides a similar bridge between experimental work with animals and applied behavior analysis with humans. An historical review of Bijou's work, however, is beyond the scope of this paper. See Bijou (2001) for a first-hand account.

a four-stage framework for studying the historical and conceptual development of behavior analysis. Although these four stages necessarily overlap, one might argue that Stages 3 and 4 rely somewhat on the preceding two. The outline proceeds from low to high complexity in terms of the class of behavior investigated (i.e., from lever pressing in animals to self-management in humans), and from low to high complexity in terms of the environment in which the behavior occurs (i.e., from the operant chamber to the natural environment):

Stage 1. The experimental analysis of animal behavior in operant chambers (e.g., Ferster & Skinner, 1957; Skinner, 1938).

Stage 2. The experimental analysis of human behavior in operant chambers (e.g., Bijou, 1955, 1957, 1958; Lindsley, 1956, 1960).

Stage 3. Applied behavior analysis with humans in controlled settings, such as psychiatric wards (e.g., Athowe & Krasner, 1968; Ayllon & Azrin, 1965, 1968), classrooms (e.g., O'Leary & Becker, 1967; O'Leary & Drabman, 1971), and prisons (e.g., Bassett & Blanchard, 1977; H. L. Cohen & Filipczak, 1971).

Stage 4. Applied behavior analysis with humans in community settings (e.g., Glenwick & Jason, 1980; Hayes & Cone, 1977; Martin & Osborne, 1980; L. K. Miller & Miller, 1970), and for behavioral self-management or self-control (e.g., Goldfried & Merbaum, 1973; Goldiamond, 1965; Martin & Pear, 1983; Thoresen & Mahoney, 1974; Watson & Tharp, 1972).

The proposed outline offers a framework through which to understand and analyze the historical relationships between the field's experimental and applied branches, branches whose relationship today remains complex. It is clear that the transition from experimental work with animals to experimental work with humans was an explicit topic of discussion in the 1960s. In 1966, for example, a Division 25 symposium entitled "The Transition

from Animals to Humans in Operant Conditioning" explored whether animal operant methodology and principles could be effectively applied in such areas as human communication, mental illness, and education (Schoenfeld, 1966). (Participants were Israel Goldiamond, Peter Nathan, Charles Ferster, and Ogden Lindsley.)

In the early 1980s, the field of behavior analysis experienced the beginnings of a renaissance in the area of experimental human operant research (called the experimental analysis of human behavior, or EAHB; see Davey & Cullen, 1988; Hyten & Reilly, 1992).⁸ At this time, the assessment of the state of EAHB echoed Lindsley's assessment of the field at the closing of the BRL in 1965 when he noted that the operation of human operant laboratories was becoming increasingly financially untenable, that the work was ignored by both clinicians and animal re-

⁸ In October of 1982, the Association for Behavior Analysis chartered a special interest group in the Experimental Analysis of Human Behavior, and in 1983 the group published its first *Experimental Analysis of Human Behavior Bulletin* (thanks to Carol Pilgrim for these facts; C. Pilgrim, personal communication, January 13, 2003). At this time, Buskist and Miller (1982) published a topical bibliography of research in EAHB from 1958 to 1981. Because their survey included only studies published in the *Journal of the Experimental Analysis of Behavior* and *The Psychological Record*, Lindsley's research does not appear. Despite this, in an article in 1983, Miller acknowledged Lindsley's role in the development of EAHB, noting that Skinner's publication of *Science and Human Behavior* and *Verbal Behavior* were key for the field, but also noting that "At about the same time [as these books], Skinner and his collaborators were pursuing applications of EAB in two different directions involving humans. The first dealt with programmed instruction (see, e.g., Skinner, 1968) while the other dealt with the *treatment* [italics added] of individuals who had been institutionalized as mentally ill (see, e.g., Lindsley, 1959)" (H. L. Miller, 1983, p. 552). Again, however, this quote reveals the perhaps tenacious misperception that the BRL was administering treatment, thus obscuring its historical role as the link between the experimental analysis of behavior and applied behavior analysis and ignoring Lindsley's technical and methodological innovations in the functional analysis and recording of continuous behavior.

searchers, and that applied behavior analysis was “clearly going to dominate the field” (Lindsley, 2001, p. 150). Almost 20 years later, Hake (1982) wrote that basic human research was seen by other experimental researchers as too applied, and applied researchers saw it as too basic: “This has left human operant research in a relatively weak position which is more often described as the ‘crack’ between basic and applied instead of the ‘bridge’ ” (p. 23). A historical analysis of the role of the BRL in the development of the field of behavior analysis can provide a clearer genealogy for EAHB and reestablish the area as an important bridge rather than a crack between the experimental analysis of behavior and applied behavior analysis.

The stages of this model also reflect, albeit somewhat too linearly, the path that behavior analysis has traveled from the animal laboratory to the culture at large. The field has come a long way, as Krasner has noted,

In the 1970s, the self-identified behaviorists emerged from the laboratory, the clinic, and the mental hospital to the “natural” social environment. They were guided by earlier applications of behavioral principles in schoolrooms and hospitals and were also influenced by national concerns and debates on the social issues of the 1960s. A new generation of behaviorists began to take on the *total* natural and man-made environment as the focus for investigation and social change with a purpose—namely a “better environment” for members of society. (1990, p. 20)

In addition to a burgeoning of behavioral interventions directed at communities, behavior-analytic principles also came to infuse the self-help literature (see Glasgow & Rosen, 1978, 1979; Rutherford, 2002). Finally, the public image of operant psychology has changed and fluctuated over time, as the field of behavior analysis has tackled a wider range of problems in an ever-widening range of settings (for historical analyses of the popular reception of Skinner’s behaviorism, including behavior analysis, see Dinsmoor, 1992; Rutherford, 2000b, 2003).

Analyzing the popular image of behavior analysis at each of these stages can elucidate aspects of the broader disciplinary and sociocultural environment in which behavior analysis is and has been embedded.

Postscript

Although the BRL closed its doors in 1965, Metropolitan State Hospital continued to operate until 1992, when it too was closed after being sold to a private corporation that shortly went bankrupt. The Massachusetts Film Office then advertised the hospital and its grounds to filmmakers as a fee-free shooting location.⁹ Presently, the grounds have been divided among the three towns of Lexington, Belmont, and Waltham, and plans for the development of the site are underway (Beam, 2001). For the moment, however, the buildings themselves still stand. Perhaps somewhere in the basement, in a 6 ft by 6 ft room, an adept plunger-pulling rat is enjoying a photo of Betty Page.

REFERENCES

- Atthowe, J. M., & Krasner, L. (1968). Preliminary report on the application of contingent reinforcement procedures (token economy) on a “chronic” psychiatric ward. *Journal of Abnormal Psychology, 73*, 37–43.
- Ayllon, T., & Azrin, N. H. (1965). The measurement and reinforcement of behavior of psychotics. *Journal of the Experimental Analysis of Behavior, 8*, 357–383.
- Ayllon, T., & Azrin, N. H. (1968). *The token economy: A motivational system for therapy and rehabilitation*. New York: Appleton-Century-Crofts.
- Ball, T. S., & Bernardoni, L. C. (1953). The application of an auditory apperception test to clinical diagnosis. *Journal of Clinical Psychology, 9*, 54–58.
- Baron, A., Perone, M., & Galizio, M. (1991).

⁹ In fact, the movie “A Civil Action,” starring John Travolta, featured the grounds of the hospital. The film dramatized the story of the real-life civil action suit of eight Woburn, Massachusetts, families who charged two large corporations with contaminating local drinking water, leading to the deaths of their children by leukemia. The hospital grounds were used to film the dumping site.

- Analyzing the reinforcement process at the human level: Can application and behavioristic interpretation replace laboratory research? *The Behavior Analyst*, 14, 95–105.
- Barrett, B. (1962). Reduction in rate of multiple tics by free operant conditioning methods. *Journal of Nervous and Mental Disease*, 135, 187–195.
- Bassett, J. E., & Blanchard, E. B. (1977). The effect of the absence of close supervision on the use of response cost in a prison token economy. *Journal of Applied Behavior Analysis*, 10, 375–379.
- Beam, A. (2001, August 9). Seeking asylum. *The Boston Globe*, p. 1. Retrieved January 27, 2003, from <http://www.boston.com/globe/>
- Bean, K. L. (1965). The sound apperception test: Origin, purpose, standardization, scoring, and use. *Journal of Psychology*, 59, 371–412.
- Bijou, S. W. (1955). A systematic approach to an experimental analysis of young children. *Child Development*, 26, 161–168.
- Bijou, S. W. (1957). Patterns of reinforcement and resistance to extinction in young children. *Child Development*, 28, 47–54.
- Bijou, S. W. (1958). Operant extinction after fixed-interval schedules with young children. *Journal of the Experimental Analysis of Behavior*, 1, 25–29.
- Bijou, S. W. (2001). Child behavior therapy: Early history. In W. T. O'Donohue, D. A. Henderson, S. C. Hayes, J. E. Fisher, & L. J. Hayes (Eds.), *A history of the behavioral therapies: Founders' personal histories* (pp. 105–124). Reno, NV: Context Press.
- Buskist, W. F., & Miller, H. L. (1982). The study of human operant behavior, 1958–1981. A topical bibliography. *The Psychological Record*, 32, 249–268.
- Cohen, D. J., & Lindsley, O. R. (1964). Catalysis of controlled leadership in cooperation by human stimulation. *Journal of Child Psychology and Psychiatry*, 5, 119–137.
- Cohen, H. L., & Filipczak, J. (1971). *A new learning environment: A case for learning*. Boston, MA: Authors Cooperative.
- Davey, G., & Cullen, C. (Eds.). (1988). *Human operant conditioning and behavior modification*. New York: Wiley.
- Dinsmoor, J. A. (1992). Setting the record straight: The social views of B. F. Skinner. *American Psychologist*, 47, 1454–1463.
- Ferster, C. B. (1961). Positive reinforcement and behavioral deficits of young children. *Child Development*, 32, 437–456.
- Ferster, C. B., & DeMyer, M. K. (1962). A method for the experimental analysis of the behavior of autistic children. *American Journal of Orthopsychiatry*, 32, 89–98.
- Ferster, C. B., & Skinner, B. F. (1957). *Schedules of reinforcement*. New York: Appleton-Century-Crofts.
- Glasgow, R. E., & Rosen, G. M. (1978). Behavioral bibliotherapy: A review of self-help behavior therapy manuals. *Psychological Bulletin*, 85, 1–23.
- Glasgow, R. E., & Rosen, G. M. (1979). Self-help behavior therapy manuals: Recent developments and clinical usage. *Clinical Behavior Therapy Review*, 1, 1–20.
- Glenwick, D., & Jason, L. (1980). *Behavioral community psychology: Progress and prospects*. New York: Praeger.
- Goldfried, M. R., & Merbaum, M. (1973). *Behavior change through self-control*. New York: Holt, Rinehart & Winston.
- Goldiamond, I. (1965). Self-control procedures in personal behavior problems. *Psychological Reports, Monograph Supplement 3-V17*, 851–868.
- Grings, W. W. (1942). The verbal summator technique and abnormal mental states. *Journal of Abnormal and Social Psychology*, 37, 529–545.
- Hake, D. J. (1982). The basic-applied continuum and the possible evolution of human operant social and verbal research. *The Behavior Analyst*, 5, 21–28.
- Hayes, S. C., & Cone, J. D. (1977). Reducing residential electricity energy use: Payments, information, and feedback. *Journal of Applied Behavior Analysis*, 10, 425–435.
- Hyten, C., & Reilly, M. P. (1992). The renaissance of the experimental analysis of human behavior. *The Behavior Analyst*, 15, 109–114.
- Krasner, L. (1990). History of behavior modification. In A. S. Bellack, M. Hersen, & A. E. Kazdin (Eds.), *International handbook of behavior modification and therapy* (pp. 3–25). New York: Plenum.
- Laties, V. G. (2003). Behavior analysis and the growth of behavioral pharmacology. *The Behavior Analyst*, 26, 235–252.
- Lazarus, A. (2001). A brief personal account of CT (conditioning therapy), BT (behavior therapy), and CBT (cognitive-behavior therapy): Spanning three continents. In W. T. O'Donohue, D. A. Henderson, S. C. Hayes, J. E. Fisher, & L. J. Hayes (Eds.), *A history of the behavioral therapies: Founders' personal histories* (pp. 155–162). Reno, NV: Context Press.
- Lindsley, O. R. (1956). Operant conditioning methods applied to research in chronic schizophrenia. *Psychiatric Research Reports*, 5, 118–139.
- Lindsley, O. R. (1959). Reduction in rate of vocal psychotic symptoms by differential positive reinforcement. *Journal of the Experimental Analysis of Behavior*, 2, 269.
- Lindsley, O. R. (1960). Characteristics of the behavior of chronic psychotics as revealed by free-operant conditioning methods. *Diseases of the Nervous System (Monograph Supplement)*, 21, 66–78.
- Lindsley, O. R. (1962). Operant conditioning techniques in the measurement of psychopharmacologic response. In J. H. Nodine & J. H. Moyer (Eds.), *Psychosomatic medicine: The first Hahnemann symposium* (pp. 373–383). Philadelphia: Lea & Febiger.
- Lindsley, O. R. (1963a). Direct measurement

- and functional definition of vocal hallucinatory symptoms. *Journal of Nervous and Mental Disease*, 136, 293–297.
- Lindsley, O. R. (1963b). Experimental analysis of social reinforcement. *American Journal of Orthopsychiatry*, 33, 624–633.
- Lindsley, O. R. (1966). Experimental analysis of cooperation and competition. In T. Verhave (Ed.), *The experimental analysis of behavior* (pp. 470–501). New York: Appleton-Century-Crofts.
- Lindsley, O. R. (1996, June 18). Message posted to the Behavior2000 Behavior and Digital Technology List, BEHAVIOR2000@LISTSERV.TEMPLE.EDU.
- Lindsley, O. R. (2001). Studies in Behavior Therapy and Behavior Research Laboratory: June 1953–1965. In W. T. O'Donohue, D. A. Henderson, S. C. Hayes, J. E. Fisher, & L. J. Hayes (Eds.), *A history of the behavioral therapies: Founders' personal histories* (pp. 125–153). Reno, NV: Context Press.
- Lindsley, O. R., & Skinner, B. F. (1954). A method for the experimental analysis of the behavior of psychotic patients. *American Psychologist*, 9, 419–420.
- Martin, G. L., & Osborne, J. G. (Eds.). (1980). *Helping in the community: Behavioral applications*. New York: Plenum.
- Martin, G., & Pear, J. (1983). *Behavior modification: What it is and how to do it*. Englewood Cliffs, NJ: Prentice Hall.
- Miller, H. L. (1983). More than promissory? Reflections on the once and future experimental analysis of human behavior. *The Psychological Record*, 33, 551–564.
- Miller, L. K., & Miller, O. L. (1970). Reinforcing self-help group activities of welfare recipients. *Journal of Applied Behavior Analysis*, 3, 57–64.
- O'Leary, K. D., & Becker, W. C. (1967). Behavior modification of an adjustment class: A token reinforcement program. *Exceptional Child*, 33, 637–642.
- O'Leary, K. D., & Drabman, R. (1971). Token reinforcement programs in the classroom: A review. *Psychological Bulletin*, 75, 379–398.
- Rutherford, A. (2000a, June). *B. F. Skinner and the auditory inkblot: The rise and fall of the verbal summator as a projective technique*. Paper presented at the 32nd annual meeting of Cheiron, The International Society for the History of the Behavioral and Social Sciences, Gorham, ME.
- Rutherford, A. (2000b). Radical behaviorism and psychology's public: B. F. Skinner in the popular press, 1934–1990. *History of Psychology*, 3, 371–395.
- Rutherford, A. (2002). *How to really win friends and influence people: Skinnerian principles in self-help*. Paper presented at the 34th annual meeting of Cheiron, The International Society for the History of the Behavioral and Social Sciences, Eugene, OR.
- Rutherford, A. (2003). B. F. Skinner's technology of behavior in American life: From consumer culture to counterculture. *Journal of the History of the Behavioral Sciences*, 39, 1–23.
- Schoenfeld, W. N. (Chair). (1966). Symposium: The transition from animals to humans in operant conditioning. *American Psychologist*, 21, 710–711.
- Shakow, D., & Rosenzweig, S. (1940). The use of the tautophone ("verbal summator") as an auditory apperceptive test for the study of personality. *Character and Personality*, 8, 216–226.
- Shorter, E. (1997). *A history of psychiatry: From the era of the asylum to the age of Prozac*. New York: Wiley.
- Skinner, B. F. (1936). The verbal summator and a method for the study of latent speech. *Journal of Psychology*, 2, 71–107.
- Skinner, B. F. (1938). *The behavior of organisms*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1979). *The shaping of a behaviorist*. New York: Knopf.
- Skinner, B. F. (1983). *A matter of consequences*. New York: Knopf.
- Skinner, B. F., Solomon, H., & Lindsley, O. R. (1954). A new method for the experimental analysis of the behavior of psychotic patients. *Journal of Nervous and Mental Disease*, 120, 403–406.
- Stone, D. R. (1953). *The auditory apperception test*. Los Angeles: Western Psychological Services.
- Thoresen, C. E., & Mahoney, M. J. (1974). *Behavioral self-control*. New York: Holt, Rinehart & Winston.
- Watson, D. L., & Tharp, R. G. (1972). *Self-directed behavior: Self-modification for personal adjustment*. Monterey, CA: Brooks/Cole.
- Weiner, H. (1964a). Conditioning history and human fixed-interval performance. *Journal of the Experimental Analysis of Behavior*, 7, 383–385.
- Weiner, H. (1964b). Response-cost and fixed-ratio performance. *Journal of the Experimental Analysis of Behavior*, 7, 79–81.