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THE EXPERIMENTAL ANALYSIS OF HUMAN BEHAVIOR BULLETIN

The EAHB Bulletin is published twice yearly, in the Spring and Fall, by the Experimental Analysis of Human Behavior Special Interest Group (EAHB SIG), a group organized under the auspices of the Association for Behavior Analysis (ABA). The inside back cover has information about joining the SIG and contributing to the Bulletin. Publication costs are paid by the dues of the SIG members and by the Department of Psychology of West Virginia University.

Editors: Philip N. Chase & Michael Perone, West Virginia University

Editorial Assistants: Theodore A. Hoch, James H. Joyce, & Barbara J. Kaminski, West Virginia University

THE BEHAVIOR ANALYSIS SPECIALTY AT WASHINGTON STATE UNIVERSITY

The Ph.D. program in the Department of Psychology at Washington State University is one of the oldest in the West with many distinguished graduates in all areas of psychological research and practice. The department offers major concentrations in experimental and clinical psychology (the clinical concentration is fully accredited by APA). Students wishing to study behavior analysis must be admitted to either the experimental or clinical concentration, and must fulfill all of the department's general requirements.

Although WSU does not offer a specific degree program in behavior analysis, the department does have a long history of research and training in the area. Beginning in the early 1960's with the work of Ken Lloyd and Warren Garlington, there has been an unbroken record of extensive research programs in the experimental and applied analysis of behavior at WSU. The behavior analysis faculty and their research programs are highly regarded by the department and the university's administration.

The department itself consists of 25 full-time faculty and approximately 50 graduate students in residence. The low faculty-to-student ratio means that much instruction is tutorial in nature. Students in the behavior analysis specialty area are expected to become involved in experimental research in their first year. There are two well-equipped animal laboratories devoted to basic research and the Self-Control Research & Training Unit devoted to basic and applied human research.

Five graduate courses are taught primarily from a behavior analysis perspective. They are behavior modification, applied behavioral research, models of learning, experimental analysis of behavior, and the seminar in learning. While these courses can be the core of a graduate program, they clearly are not sufficient to provide the complete training a student needs to become sophisticated in behavior analysis. Our expectation is that students will gain the majority of their advanced skills from close research collaboration and intellectual relationships with the faculty. Many informal advanced seminars are given by faculty for the graduate and undergraduate students in their research programs. Similarly, behavior analysis faculty frequently collaborate in advising students on ideas for experiments and papers. In summary, WSU offers strong behavior analysis training within a traditional but supportive psychology department.

Application materials are available from the Department of Psychology, Washington State University, Pullman, WA 99164-4830. Indicate your interest in behavior analysis both at the time you write for materials and when you apply.

PROCEEDINGS OF THE 1987 EAHB SIG GROUP POSTER SESSION

Twenty-eight posters were presented at the fourth annual Experimental Analysis of Human Behavior poster session held at the Association for Behavior Analysis Convention on May 27 from 10:00 to 11:30 a.m. The session was well attended and stimulated much discussion.

Awards for outstanding posters were given for five of the presentations:

Philip N. Chase, James H. Joyce (West Virginia University), & Janet R. LeFrancois (Converse College), "Effects of a Strategic Instruction on Fixed-Interval Performance."

Laura D. Fredrick, Patrick C. Quinn, Gerald R. Gaydos, & Samuel M. Deitz (Georgia State University), "Effects of Minimal, Complete, and Mastered Instructions on the Acquisition of Sequential Ordering."

Stephen T. Higgins, Beatrice M. Woodward (University of Vermont), & Jack E. Henningfield (National Institute on Drug Abuse), "Time-Course of the Effects of Atropine on Repeated Acquisition and Performance of Response Sequences in Humans."

Theodore M. Surdy & Alan Baron (University of Wisconsin-Milwaukee), "Behavioral Flexibility of Older Adults: Adjustments to Changing Reinforcement Contingencies."

Dean C. Williams (Parsons Research Center, University of Kansas) & James M. Johnston (Auburn University), "Interval Schedules of Continuous Response and Reinforcement Dimensions."

Following are abstracts of some of the posters. To encourage correspondence, we have included the name of a contact person at the end of each abstract.

IMPROVING PRESCHOOLERS' "SELF-CONTROL:" DIFFERENTIALLY REINFORCING THE CHOICE OF LARGER, DELAYED OVER SMALLER, IMMEDIATE REWARDS

J. Schweitzer & B. Sulzer-Azaroff
University of Massachussetts/Amherst

Choosing larger or otherwise more reinforcing stimuli, despite a time delay, in preference to smaller but immediate reinforcers is an important aspect of self-control. Can young children, including those who are identified as exhibiting hyperactive behavior or conduct problems, and who have been found consistently to choose smaller but immediately obtained rewards, be taught to wait for larger rewards instead? Five children (and one comparison subject), three of whom were labeled hyperactive or who displayed conduct problems, were pre-assessed and found to select small, immediate rewards much more often than larger, more delayed ones. Treatment consisted of shaping the child's choice of the delayed reward by differentially reinforcing that choice with more reinforcers than for the more immediate selection, while gradually increasing the durations of the delay interval by very small increments. The post-assessments showed that all five children increased their proportions of choice of the delayed rewards. Prior to training, the point at which the children selected either reward about equally often (point of indifference) ranged from 1.5 to 51.5 s. Following shaping, their points of indifference rose to a range of from 37.5 to at least 90 s with three children preferring the larger reward at all delay intervals tested. Apparently it is possible to shape choice of delayed rewards by differentially reinforcing those choices in a series of small graduated increments in the delay interval.

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STIMULUS EQUIVALENCE AND READING BY HEARING-IMPAIRED PRE-SCHOOL CHILDREN

J. G. Osborne and M. B. Gatch
Utah State University

In a conditional discrimination task, two 5 year-old, hearing-impaired preschool children were taught relations between 20 manually signed words, pictures of the words, and their printed forms. One student was taught relations between manually signed words and their pictures and between manually signed words and their printed forms. For this student, no relations were taught between the pictures and printed words; however, testing showed that these relations emerged after the prior training. A second student was taught relations between manually signed words and their pictures and the pictures and their printed words. For this student, no relations were taught between the manually signed words and the printed words; however, testing showed that these relations emerged after the prior training. The results replicate and extend the work by Sidman (1971) to hearing-impaired preschool children.

Contact: J. Grayson Osborne, Department of Psychology, Utah State University, Logan, UT 84322-2810.

NESTED DESIGNS FOR AN EXAMINATION OF ALTERNATIVE MECHANISMS FOR THE MULTIPLE-TEACHER-EFFECT IN PROGRAMMING THE GENERALIZATION OF NEW LANGUAGE REPERTOIRES

J. Stewart-Baer
University of Kansas

Different discriminative function was imparted to teacher-puppets and their questions when "normal" preschool children acquired language responses. Procedures made some puppets effective teachers. When they asked their respective questions following acquisition, their questions usually evoked high-level correct responses even during nonreinforcement conditions. The same puppets' physical presence without questions usually evoked their previously correlated language responses, and questions without puppets present usually evoked their previously correlated language responses. Procedures imparted different discriminative function to another puppet. When the teachers' questions were asked by this puppet, generalized responding typically occurred. However, unlike the other puppets, this puppet's physical characteristics without questions did not consistently control correct responding. Physical characteristics may have controlled observation better than the content of the questions. Support for this hypothesis is suggested by improved responding when the questions recurred in the absence of this puppet's body. This study suggests that: (a) the contextual arrangement of acquisition might be designed to explicate predictions about subsequent generalization, and (b) nested designs (Winer, 1971; Campbell & Stanley, 1963) may effectively be used to study separate and interactive effects exerted by more than one independent variable within the same subject.

Contact: Jacqueline Stewart-Baer, Bureau of Child Research, The University of Kansas, Lawrence, KS 66045.

THREE TYPES OF CHOICE IN SECOND-ORDER DISCRIMINATION WITH VERBAL STIMULI

R. Hernandez-Pozo, E. Gonzalez, F. Gutierrez, & E. Ribes
National University of Mexico-Iztacala

Adults were trained in second-order conditional discrimination with pairs of words as second-order stimuli (SOS), and single words as sample (SS) and comparison stimuli. SOS were associated to 4 relations of equivalence: same

color, same size of letters, synonymy, and semantic inclusion. Equivalences were trained concurrently in each session. Three procedures were used: (a) choice of COS, with selection of one among three COS, given a particular SOS and SS; (b) choice of SOS, given one SS and one COS; and (c) choice of SS, provided one SOS and one COS. Groups were exposed only to one procedure. Transference and emergence tests were used at the beginning, and after every six experimental sessions. An additional control group received only the test sessions. These tests had the form of a three-by-three matrix of options, three SOS, three SS, and three COS. Results showed overall higher performance for semantic equivalences, particularly for synonymy. Two subjects had strong chromatic bias in transference, but not in emergence. Latencies were shorter for semantic equivalence. Choice of COS yielded higher scores. The control group performance was poorer than any of the experimental groups. Exploratory data analysis was used, and results are discussed within an interbehavioral frame, making contact with cognitive explanations for differential processing of verbal and nonverbal aspects of words.

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SCHEDULE SENSITIVE PERFORMANCE: DEFINING TRAINING VARIETY

J. H. Joyce, P. N. Chase, & J. S. Danforth
West Virginia University

Most research on human schedule performance has shown that instructions produce responding that does not change when the schedules change. However, one study has shown that subjects given instructions about a variety of reinforcement schedules change their responding under a novel contingency (LeFrancois, Chase, & Joyce, in press). The question remained, though, as to what constitutes sufficient variety to produce a change in responding under a novel schedule. The current experiment, therefore, compared 4 conditions. Some subjects were exposed to either an instructed fixed-ratio 40 (FR 40) condition or an instructed differential-reinforcement-of-low-rate 20-s (DRL 20-s) condition. Others were exposed to instructions on both schedules (instructed-variety). In addition, one group of subjects was exposed to both schedules without instructions (shaped-variety). After training to stability under each schedule, subjects participated in six sessions that consisted of exposure to the trained schedules followed by exposure to a novel fixed-interval 10-s (FI 10-s) test schedule. The change to the FI test schedule was unsignaled for either two, four, or all six sessions. Responding under the test schedule did not change, regardless of condition, until the contingency change was signaled. Once signaled, the responding in the instructed-variety, shaped-variety, and instructed-DRL conditions became more efficient under the FI schedule, but the instructed FR responding did not. These data demonstrated: that a minimum variety of shaped or instructed training produced efficient responding under a novel contingency; that when reinforcement contingencies were changed, subsequent changes in response rates were dependent on contact with a stimulus change; and although a history of DRL training was sufficient to produce a change in response rate under an FI schedule, the change was only with respect to the interval between possible reinforcers. Subjects responded at low rates under the FI schedule, but continued to respond as if an interresponse time contingency was in place; therefore, it is not clear whether this responding was sensitive to the FI contingency.

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EFFECTS OF STRATEGIC INSTRUCTIONS ON FIXED-INTERVAL PERFORMANCE

P. N. Chase & J. H. Joyce
West Virginia University
J. R. LeFrancois
Converse College

Research on human schedule performance has shown that instructions produce responding that does not change when the schedule changes. The type of instructions, however, has received little attention. Most studies have used a simple instruction that tells the subject how to respond. In the present study, a simple instruction was compared to a strategic instruction that explained how to vary performance to determine the best way to gain reinforcers. Five undergraduates received nine sessions of training on a multiple-schedule button-pushing task for which they received points exchangeable for money. The sessions consisted of 6 min of a fixed-ratio 40 (FR 40) schedule followed by 6 min of each of the following schedules presented in different orders each session: fixed interval 10-s, fixed time 10-s, and variable interval 10-s schedules. Group 1 received a strategic instruction for all sessions. Group 2 received a simple instruction about the FR 40 schedule for the first three sessions and the strategic instruction on the fourth through ninth sessions. Group 3 received the FR 40 instruction for the first six sessions and the strategic instruction for the seventh through ninth sessions. By the third session, subjects in Group 1 reliably changed performance when the schedule changed. Subjects from Groups 2 and 3 continued to respond at high rates on all schedules until they received the strategic instruction, but thereafter changed their performance when the schedules changed. These data replicated previous findings that simple instructions will lead to persistent performance even when the contingencies do not support such responding. However, the data also demonstrated that an instruction that provides the subjects with problem solving strategies can prevent or correct this inefficiency.

Contact: Philip N. Chase, Department of Psychology, West Virginia University, P. O. Box 6040, Morgantown, WV 26506-6040.

EFFECTS OF ORAL STIMULATION ON RUMINATIVE BEHAVIOR

J. M. Johnston, T. Vazin, M. Winston, A. Rawal, & K. Green
Auburn University

Previous research has shown that the amount of oropharyngeal and esophageal stimulation present before or during meals influences the frequency of ruminative behavior in retarded individuals who engage in this maladaptive and unhealthy behavior. One study showed that high levels of pre-meal gum chewing was associated with decreased ruminating, and another study varied the quantity of fluids swallowed before and during meals and discovered a similar positive inverse correlation. The present study was designed to investigate the role of oral stimulation further by varying the consistency of the diet. Subjects were fed meals of either pureed or normal consistency in successive phases, which provided a different though practical way of manipulating oral stimulation. The data showed that ruminating frequencies were generally lower after normal than pureed meals, thus further clarifying the influence of oral stimulation.

Contact: James M. Johnston, Department of Psychology, Auburn University, Auburn, AL 36849.

EFFECTS OF CALORIC DENSITY ON RUMINATIVE BEHAVIOR

J. M. Johnston, K. Green, A. Rawal, T. Vazin, & M. Winston
Auburn University

An earlier study showed that the caloric density of the diet of ruminating

retarded individuals influenced the frequencies of post-meal ruminating. The present experiment was designed to further explore the role of this variable. Ruminating clients were fed meals that varied in their caloric density from that appropriate to normal single-portion meals to satiation-sized meals, while the quantity of food was held constant. The results were similar to those from the earlier study. Increased caloric density was associated with decreased rates of ruminating, although the size of the decrease was significantly less than the effect of satiation-feeding procedures. Nevertheless, caloric density of the diet may be clinically useful in developing treatment procedures.
Contact: James M. Johnston, Department of Psychology, Auburn Univesrity, Auburn, AL 36849.

LEADER-FOLLOWER INTERACTIONS: AN EXPERIMENTAL ANALYSIS OF CONTROL AND COUNTERCONTROL

K. Lockwood & M. Perone
West Virginia University

This research examined how a leader's use of instructions, monetary rewards, and monetary penalties can be affected by the success of these actions in controlling a follower's performance. College freshmen (hereafter called "leaders") were told that their job was to operate a computer console to train other subjects (hereafter called "followers") to perform a variety of complex tasks, and that the followers' performance would be depicted on the computer's display. Leaders were also told that their own earnings depended on how well their follower performed. In actuality, the "follower" was a computer program that mimicked human performance. Experiment 1 demonstrated that a follower's performance can markedly change a leader's allocation of instructions, rewards, and penalties. Experiment 2 showed that these leadership behaviors can be brought under the discriminative control of different followers' identities. By showing that leadership is operant behavior maintained by its effects on followers, these experiments call attention to the control and countercontrol inherent in leader-follower interactions.
Contact: Michael Perone, Department of Psychology, West Virginia University, P. O. Box 6040, Morgantown, WV 26506-6040.

MAINTENANCE OF HUMAN OBSERVING BEHAVIOR BY INSTRUCTIONAL STIMULI BEFORE AND AFTER EXPOSURE TO THE STIMULUS-REINFORCER CORRELATIONS

B. J. Kaminski & M. Perone
West Virginia University

An observing response procedure was used to investigate the reinforcing properties of instructional stimuli that were correlated or uncorrelated with the components of a compound schedule of monetary reinforcement. Three female college students produced monetary reinforcement according to a VI 27-s EXT schedule. In the observing conditions, presses on two independent response keys produced either a verbal stimulus correlated with EXT ("At this time NO SCORES can be earned") or a stimulus uncorrelated with the schedule component ("Some of this time points are TWICE AS LIKELY as normal and some of this time NO SCORES can be earned"). Following an initial assessment of stimulus preference via observing, the women were given discrimination training on multiple schedules that provided extended exposure to the relationship between the stimuli and monetary reinforcement. Stimulus preference was then reassessed. A strong and immediate preference for the uncorrelated stimulus was shown by two of the three subjects in the initial observing condition. This preference was not altered by exposure to the stimulus-reinforcer relationships. A third subject showed no preference initially, but developed a preference for the uncorrelated stimulus

following the discrimination training. The appearance of stimulus preferences before exposure to the stimulus-reinforcer relationships points to instructional control rather than the effect of conditioned reinforcement.
Contact: Barbara J. Kaminski, Department of Psychology, P. O. Box 6040, West Virginia University, Morgantown, WV 26506-6040.

BIOLOGICAL EXPOSURE FROM COMMERCIAL BRAND CIGARETTES DURING CONTROLLED SMOKING

L. L. Weinhold & M. L. Stitzer
The Johns Hopkins University School of Medicine

Carbon monoxide (CO) exposure from ultralow- low--, and high-CO delivery commercial brand cigarettes was examined under controlled smoking conditions. Seven chronic smokers of mid- to high-CO delivery commercial brand cigarettes served in the experiment. Subjects participated in three trials with each cigarette yield. Eight puffs of 50 ml volume were taken during each trial. CO boost data were obtained from two pre-session and two post-session end-expired breath samples. CO boosts of 2.10, 5.76, and 7.38 ppm were obtained from ultralow yield (1.6 mg CO), low yield (5.9 mg CO) and high yield (14.3 mg CO) cigarettes, respectively. Subjects achieved a significantly greater CO boost from both low- and high yield cigarettes than from ultralow yield cigarettes, but CO boosts from low- and high yield cigarettes were not different from each other. The data suggest that degree of CO absorption by the lungs during a short time period may limit obtained CO boost from high yield cigarettes.
Contact: Linda L. Weinhold, The Johns Hopkins University School of Medicine, Department of Psychiatry & Behavioral Sciences, The Francis Scott Key Medical Center, Behavioral Pharmacology Research Unit, D-5-West, 4940 Eastern Avenue, Baltimore, MD 21224.

TIME-COURSE OF THE EFFECTS OF ATROPINE ON REPEATED ACQUISITION AND PERFORMANCE OF RESPONSE SEQUENCES IN HUMANS

S. T. Higgins & B. M. Woodward
University of Vermont
J. E. Henningfield
National Institute on Drug Abuse

The present study assessed a 24 hr time-course for the acute effects of atropine sulfate (0, 1.5, 3.0, 6.0 mg/70 kg) in normal humans responding under a two-component multiple schedule of repeated acquisition and performance of response sequences. Subjects resided on an inpatient clinical research ward for the duration of the study. In each component of the multiple schedule, subjects completed a different sequence of 10 responses in a predetermined order using three keys of a numeric keypad. In the acquisition component, a new response sequence had to be acquired each session. In the performance component, the response sequence always remained the same. On test days, subjects completed sessions predrug and at 0.5, 1.5, 3.0, 5.0, 7.0, 9.0, and 24 hr postdrug. Overall percent errors increased and overall response rates decreased in the acquisition and performance components as an orderly function of drug dose. However, these effects were selective in that behavior in the acquisition component generally was affected at lower doses (3.0 mg) than in the performance component (6.0 mg). When behavior was affected in both the acquisistion and performance components, the time-course of effects was similar. Drug effects onset at 0.5 or 1.5 hrs, reached peak effects between 3.0 and 5.0 hrs, and returned to placebo levels from 7.0 to 9.0 hrs postdrug in both schedule components. None of the drug doses produced reliable effects the day after drug administration (24-hr postdrug) in either schedule component. The present study provides the first within-subject assessment of the magnitude and duration of the effects of an anticholinergic drug on acquisition and performance, and extends to atropine

the selective effects on repeated acquisition versus performance demonstrated previously with other compounds in humans and nonhumans.
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MEASUREMENT OF REINFORCEMENT IN DEPRESSION: A PILOT STUDY

J. R. Hughes, C. N. Pleasants, & R. W. Pickens
University of Minnesota

We tested whether performance on a progressive ratio schedule of reinforcement with increasing magnitudes of monetary reward could be used as a behavioral measure of response to reinforcement during depression. Performance on the task was recorded before, during, and after treatment of depression in six melancholic patients. The amount of money earned and the number of responses to obtain money during the task increased in the three subjects who improved with treatment but did not increase in three subjects who did not improve. In addition, the degree to which responses increased with increasing monetary reward became greater in two of the three subjects who improved but in none of the subjects who did not improve.
Contact: John R. Hughes, Department of Psychiatry, University of Vermont College of Medicine, Burlington, VT 05405.

INTERVAL SCHEDULES OF CONTINUOUS RESPONSE AND REINFORCEMENT DIMENSIONS

D. C. Williams
Parsons Research Center, University of Kansas
J. M. Johnston
Auburn University

Schedules relating continuous response and reinforcement dimensions are relatively rare in the behavior analytic literature. Four fixed-interval schedules were studied that related responding and reinforcement by count (discontinuous) or duration (continuous). These contingencies related (a) response count to reinforcement count (traditional FI), (b) response count to reinforcement duration, (c) response duration to reinforcement count, or (d) response duration to reinforcement duration. Subjects were college student volunteers. Cumulative records of response number and duration showed pause-respond patterns in response number or duration under relations a and b, respectively, but continuous, high rate or long duration responding under c and d, respectively.
Contact: Dean Williams, Parsons Research Center, 2601 Gabriel, Parsons, KS 67357.

STIMULUS CLASS DEMONSTRATION AS A FUNCTION OF PROBING TECHNIQUE

K. Saunders, R. Saunders, & J. Spradlin
Parsons Research Center, University of Kansas

A mildly retarded female learned four two-choice conditional discriminations, each with the same two samples. Programmed consequences followed correct and incorrect responses. Eight probes for stimulus classes were then interspersed among 24 training trials under three conditions: (a) immediate consequences for training trials, none for probes, and 8 cents paid after the session for probes; (b) 32 cents paid before the session, no consequences during the session; (c) payment after the session as per Condition a, and the instruction "the computer will keep track of how you do." Stimulus classes were shown under Condition c only, indicating that reinforcement and instructions during probing affect the demonstration of stimulus class.
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SCHEDULE CONTROL OF HUMAN AND ANIMAL BEHAVIOR: HOW DIFFERENT?

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Current understanding of operant principles derives from decades of research in the animal laboratory. Much of the evidence for the generality of these principles at the human level has been indirect, having been provided by their successful use in interpreting human society and in modifying behavior in applied settings. Paradoxically, when more direct evidence has been sought in laboratory studies of human behavior, the animal-based principles do not appear to fit nearly as well, particularly with regard to control by schedules of reinforcement. Comparison of the schedule performances of humans and animals has uncovered a number of discrepancies. The purpose of this article is to consider the bearing of these discrepancies on the adequacy of operant principles in the analysis of human behavior.

Discrepancies Between Studies With Humans and Animals

Three types of discrepancy have attracted considerable attention, and it will be helpful to review them briefly. First, different procedures are required to establish responding at the outset of an experiment. In studies of positive reinforcement with animals, one successful procedure is to train the subjects to eat from the food magazine and then leave them to encounter the contingency between responding and reinforcement. In studies of shock avoidance, magazine training is not needed and the animals may simply be exposed to the schedule (e.g., Bolles & Popp, 1964; Sidman, 1953). But problems arise when similar procedures are tried with humans. For example, when Ader and Tatum (1961) exposed students to shock avoidance schedules without telling them "anything about the nature of the experiment" (p. 275) many failed to acquire the response even though they received repeated shocks as a consequence.

A second set of discrepant findings involves response patterns on simple schedules, especially the fixed interval. Descriptions of animal performances on this schedule have emphasized temporal control, as reflected in the well-known "scallop" in the cumulative record (e.g., Dews, 1970; Mackintosh, 1974). But scalloped patterns are unusual with human subjects (Weiner, 1969). Instead, some people respond at high rates throughout the interval, whereas others respond at very low rates.

The third discrepancy is that humans are less sensitive to changing schedule

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This article is based on a contribution to a symposium entitled "Current Conceptual Issues in Human Operant Research," chaired by I. Rosenfarb at the Association for Behavior Analysis convention in Nashville, TN, May 1987. An expanded treatment of these and other topics will appear in Human Operant Conditioning and Behavior Modification, edited by G. Davey and C. Cullen, to be published by Wiley. Our chapter is entitled "The Relevance of Animal-Based Principles in the Laboratory Study of Human Operant Conditioning."

conditions. Performances of rats and pigeons have been found to vary in orderly ways as a function of schedule parameters (de Villiers, 1977; Zeiler, 1977), whereas human responding is inconsistently affected by parametric variations (e.g., Takahashi & Iwamoto, 1986; Weiner, 1969). Moreover, human behavior may be insensitive even to gross qualitative changes in schedule conditions. A dramatic example is the persistance of human responding when a reinforcement schedule is replaced with extinction (Kaufman, Baron, & Kopp, 1969).

Interpreting Discrepancies

If comparable laboratory procedures produced similar performances in human and animal subjects, a straightforward interpretation would be in terms of a unified set of behavioral principles. But discrepant performances make the proper interpretation considerably less clear.

One view points to the unique verbal capability of humans and argues that the principles must undergo major revision to account for the behavior of organisms who can describe contingencies between responding and its consequences (Lowe, 1979; 1984). On this view, the key to human operant behavior lies in verbal descriptions of contingencies rather than contingencies themselves. Covert events, conceptualized as implicit verbal behaviors, are assigned a central explanatory role.

We favor an alternative view: Given the limited effort thus far to study human operant behavior within the laboratory, strong conclusions about human-animal discrepancies are premature. Discrepancies should not be regarded as limits on the development of a unitary set of operant principles, but rather as evidence that our current understanding of these principles is incomplete.

We will discuss two reasons why strong conclusions may be premature. First, the regularity observed in animal experiments has emerged from a set of standard laboratory procedures. Appropriate counterparts are not in common use in operant research with humans. Thus, one cannot be certain whether discrepant human performances reflect special features of the laboratory procedures or fundamental differences in the relevant behavioral principles. Second, unexplained variability is by no means unique to studies with human subjects. Characterizations of animal performances that overlook such variation may paint an exalted and unrealistic picture of what is known about operant conditioning.

Standard Procedures

In research with rats and pigeons, standard procedures are available for setting the deprivation level, habituating the subject to the apparatus, and selecting discriminative stimuli, reinforcers, and punishers. Unfortunately, the investigator of human conditioning does not enjoy clear precedents for many of these decisions. Different workers arrive at idiosyncratic solutions to methodological problems, and the variation in methods may lead to variation in results.

Consider the finding that human subjects may fail to acquire the response when simply exposed to a contingency. To meet this problem, researchers have used a range of procedures including instructions, demonstration, and shaping. Beyond the observation that human performances appear more variable than those of animals, it is difficult to specify the exact influences of these different procedures. We suspect that the histories engendered by the different procedures interact in complex ways with subsequent control by the schedule.

Let us acknowledge that failures of response acquisition also occur in animals. Consider the literature on

free-operant avoidance with rats. Researchers who simply have placed animals within a test chamber and started the shock schedule have found that many rats fail to learn. According to Robert Bolles, "there are investigators who have never been able to get [avoidance learning] in any [rats]" (Bolles, 1971, p. 201). An important point is that procedures are available which markedly increase the likelihood of successful acquisition. In our own studies, the standard procedure is to shape the lever-press, with the consequence that most rats respond during the initial session and become proficient avoiders during subsequent ones (e.g., DeWaard, Galizio, & Baron, 1979; Perone & Galizio, 1987; see also Ferrari, Todorov, & Graeff, 1973).

Within the animal laboratory, it is customary to reduce longstanding influences of initial training procedures by using research designs that emphasize behavior in the "steady state" (Sidman, 1960). Extended exposure to contingencies is needed to establish steady-state performances. Such exposure may eventually counteract complications caused by the initial procedures. Unfortunately, this antidote usually is not used in human research, where exposure to contingencies can be quite brief. This limitation, in conjunction with the diverse procedures used in different experiments, would seem to make variations in outcomes all but inevitable.

Irregularities in Animal Performance

The second reason why strong conclusions about human-animal discrepancies are premature pertains to the unsettled state of the animal literature. Recent discussions offer the view that animal performances are more consistent, predicatble, and reflective of pure control by environmental contingencies. Throughout this literature are references to the "characteristic," "typical," and even "classic" performances of rats and pigeons. By comparison, human performances are viewed as erratic and unpredictable. But our examination of the data leads us to urge caution in using the animal literature as a benchmark for evaluating human performances.

It is a serious error, or at least a gross oversimplification, to regard the animal literature as a monolithic structure of regular findings and well agreed-upon principles. To the contrary, controversy reigns with regard to matters that outsiders may view as settled--including many investigators of human behavior. The list of controversies is a long one, but a representative sample should be sufficient to illustrate our concerns.

Discrepancies Between Rats and Pigeons

First, consider some persistent species differences. By comparison with pigeons, rats have been found to be more susceptible to control by temporal contingencies, including fixed-interval and differential-reinforcement-of-low-rate schedules. When fixed-interval schedules are replaced with response-independent fixed-time schedules, pigeons continue responding across a fair range of schedule parameters, whereas rats' responding is markedly reduced (Lowe & Harzem, 1977). On multiple schedules with variable-interval and extinction components, pigeons show behavioral contrast, but this has been an elusive phenomenon with rats (e.g., Pear & Wilkie, 1971, vs. Gutman, 1977). As a further complication, contrast effects depend on subtle variations in the way multiple-schedule stimuli are introduced (Kodera & Rilling, 1976; Terrace, 1963), and some studies have found that contrast dissipates after extended training (Terrace, 1966) whereas others have not (Hearst, 1971).

Generality of Functional Relations

Even when species differences are not of concern, there continue to be discrepancies in the description of basic functional relations. A case in point is the relation between the size of a fixed-ratio schedule and running response rates. One conclusion is that rates are more or less invariant (Felton & Lyon, 1966; Powell, 1968), but another is that rate and ratio size are inversely related (Mazur, 1983). Or consider the effects of reinforcer magnitude. Although magnitude has been studied intensively in the animal laboratory, the findings are not well understood. Kling and Schrier (1972, p. 630) wrote that it "comes as something of a shock" to discover that such a seemingly important and robust variable often is "ineffective ... when manipulated in laboratory studies, and that there is considerable discrepancy between the results of studies which appear to be equally well designed and executed."

Fixed-Interval Schedules

Given the attention that has been paid to human performances on fixed-interval schedules, it is important to consider rather carefully whether animal behavior provides a suitable standard of comparison. Our reading of the literature is that there continues to be difficulty in reaching firm conclusions about findings from the animal laboratory.

Cumulative response records from Ferster and Skinner's (1957) seminal research with pigeons often serve as examples of the smooth acceleration in response rates known as the "fixed-interval scallop." But close examination indicates considerable variation from interval to interval. A convenient example is found in a summary of this research by Skinner (1957/1969 Figure 2, p. 129). One of the cumulative records, illustrating what Skinner described as "characteristic performance," shows scallops in some intervals, but three additional patterns are also present: Abrupt transitions from zero to high rates ("break-and-run patterns;" cf. Schneider, 1969); low rates with just one or perhaps two responses late in the interval; and the interruption of response runs midway in the interval.

One might infer that Skinner's records may not be "characteristic" after all, but similar variability is not difficult to find in other reports. For example, all of the patterns just described can be seen from interval to interval in records from pigeons and rats presented by Lowe and Harzem (1977, Figure 3, p. 193). Their records also show decelerating response rates in some intervals--negative or inverted scallops--as well as substantial variation in overall response rates, with nearly zero rates in some intervals but rates over 70 responses per minute in other intervals within the same session.

In the face of this variation, one might wonder about the origin of the consensus that has developed about the "fixed-interval scallop" in animals. Perhaps this has come about because some experimenters have dealt with irregularities by averaging over several intervals. Thus, the classic scallop may be a construction rather than an accurate depiction of the organism's actual performance (see Shull, 1979). Another factor is textbook authors' reliance on idealized representations of performance rather than actual records (e.g., Reynolds, 1975, Figure 6.4, p. 81). These idealized records seem to fit expectations about scalloped responding better than actual data.

Comparing Human and Animal Performances

To some, our concerns may provide additional ammunition for attacks against a unified conceptual framework. The original objection was that human performances are discrepant from those of animals. Now we add the further

objection that disagreements about the conditioning process on the animal level do not provide a good basis for comparisons. Taken together, these objections might suggest the need for a fresh start in the study of human operant behavior. But we do not see things that way.

The methods and theories developed in the animal laboratory provide a framework for the study of operant conditioning that has barely been tapped. But in turning to the animal laboratory as a source for the study of human conditioning, it is easy to forget that the study of conditioning in animals--as well as humans--is a dynamic and changing endeavor. On the one hand, the controversy we have described is indicative of the vitality of the effort: if all the empirical and theoretical problems of operant conditioning already were solved, there would be little point in conducting research. On the other hand, the controversy suggests caution and conservatism in reaching conclusions about the implications of the findings for human behavior.

Summary and Conclusions

Our assessment is that the available data do not support the need for qualitatively different operant principles of human and animal behavior. We have made two sets of observations and arguments in support of this conclusion:

First, direct comparisons of human and animal research are complicated by uneven development of appropriate techniques of experimental control. Animal research is characterized by standard laboratory procedures and observations of steady-state performances after long-term exposure to the experimental variables. In contrast, human research is characterized by procedures which differ from one laboratory to the next, and observation of stable performances often is not possible because of abbreviated exposure to the variables.

Second, despite the rigorous control of the animal laboratory, unexplained variation persists and questions about fundamental variables and processes still await firm answers. Given this unsettled state of affairs, normative statements about "typical" or "characteristic" schedule performances are oversimplifications, and do not provide a sound basis for assessing the degree to which human performances reflect sources of control other than the schedule.

Our position has a counterpart in Sidman's (1960) discussion of comparative psychology and its role in explicating questions of species similarities and differences. Sidman wrote:

> Comparative psychology has become a discipline largely devoted to discovering differences in the behavior of various species of organism. When similarities, the stuff of which most sciences are made, are found, they are dismissed as unimportant phenomena. ...[Yet] a comparative psychology that seeks to determine differences rather than similarities among species really has an easy time of it. Differences are not difficult to find. (p. 55)

When comparisons are made between human and animal behavior, discrepancies also are not difficult to find and, in themselves, provide little basis for satisfaction. The challenge for the student of human operant conditioning is to identify the similarities in the variables underlying the discrepant performances and ultimately to bring them under experimental control.

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PHIL'S FUN FACTS

Questions

1. What eminent behavior analyst had the distinction of serving as Past President of the Southeastern Association for Behavior Analysis without serving as President?

2. What was Skinner's title of "Beyond Freedom and Dignity" before the publishers changed it?

3. Skinner and Keller often engaged in an activity that required that both work together. What was this activity?

Answers (Read each answer from right to left.)

1. RELLEK DERF 2. YTINGID DNA MODEERF 3. EKIB MEDNAT A GNIDIR

1988 DUES

This issue of the Bulletin marks the end of another year of SIG activities. Please continue your support by sending your 1988 dues at your earliest convenience. See the inside back cover for details.

GRANTS TO EAHB SIG MEMBERS

Following are summaries of research grants recently awarded to SIG members.

TITLE: "New Hanover County Breast Screening Program--Increasing the Use of Mammography and Breast Palpation for Early Detection of Breast Cancer;" INVESTIGATORS: Carol Pilgrim, University of North Carolina at Wilmington, Suzanne Fletcher, University of North Carolina at Chapel Hill, and others; DATES: 7-1-87 TO 6-30-91; AMOUNT: $1,117,991; AGENCY: Department of Health and Human Services, National Cancer Institute.

ABSTRACT: This is a comprehensive program to increase and improve breast cancer screening (BCS), including annual clinical breast examination and mammography among women ages 50 to 74 in New Hanover County, North Carolina. The program will be coordinated by a committee of local medical leaders and the project investigators.

Interventions will be aimed at (a) primary care physicians, (b) radiologists, and (c) community women ages 50 to 74. For physicians, an educational meeting focusing on the need for mammography, training sessions for improved performance of the clinical breast examination, and adoption of a prompting system to remind physicians to perform BCS will be introduced. University of North Carolina radiologists will work with local radiologists to establish ongoing quality assurance systems for mammography. Radiologists and local medical leaders will work to make high quality mammography available at lower charges. Finally, a community intervention will increase women's awareness and use of BCS with a mass media campaign. In addition, a patient-prompting program using written material (pamphlets, posters, and cards) will remind patients to ask their physicians about BCS. Each of the interventions will be developed in a modular fashion so that, if useful, it can be used in other communites around the country.

Evaluation will include pre- and post-test measurements in New Hanover County and a control community, Pitt county: (a) a telephone survey of women ages 50 to 74 to determine the percentage who have received BCS in the previous year; (b) a telephone survey of physicians, to determine knowledge about and attitudes towards BCS; (c) assessment of breast lump detection competency of physicians, using manufactured silicone breast models; (d) review of medical records to determine frequency of BCS in physicians' practices; (e) documentation of the number and cost of mammograms performed and the existence/extent of quality assurance for mammography in radiology units; and (f) review of local hospital pathology reports to document the pathological stage of all newly diagnosed breast cancers.

Carol says this is a multidisciplinary project that has five investigators, with Suzanne Fletcher, M.D., as the principal one. Carol is the behavior analyst on the team; the other investigators represent a range of medical specialties including radiology and pathology.

TITLE: "Simulating Complex Behavior in Children;" INVESTIGATOR: Barry Lowenkron, California State University, Los Angeles; DATES: 10-1-87 to 9-30-89; AMOUNT: $49,562; AGENCY: U. S. Public Health Service.

ABSTRACT: The development and function of so-called cognitive processes in children will be studied by producing explicit, overt simulations of the behaviors using standard operant training techniques.

The use of overt responses in the simulations is expected to reveal something of the nature of the components necessary for a particular complex behavior, and the precise

stimulus control afforded by errorless training will show how these components must interact. The entire simulation will provide complex behavior in a form in which its inner workings are directly measurable.

The experiments will proceed by combining and modifying previously studied components to produce a series of performances involving increasingly more abstract relations. Beginning with identity matching, additional overt components will be added to develop two different forms of oddity matching, and the effect of these differences on generalization of the matching relation will be studied. In the next experiment, identity matching and one form of oddity matching will be brought under stimulus control to produce instructional control over two matching-strategies and identify conditions necessary for the generalization of instructional control.

Later experiments will study the effect of adding components that compensate for the absence of a specified matching stimulus and lead to the selection of a substitute appropriate to the current matching relation.

TITLE: "An Undergraduate Psychology Research Apprenticeship Program;" INVESTIGATORS: Jean L. Hatten & Anna D. Hatten, Averett College, Danville, Virginia; DATES: 5-15-86 to 10-31-88; AMOUNT: $15,603; AGENCY, PROGRAM, & OFFICER: National Science Foundation, CSIP Program, Alexander J. Barton, Phone (202) 357-7051.

ABSTRACT: Undergraduate psychology students will learn research skills using up-to-date instrumentation and data management methods through a sequence of three lab courses that require students to take increasing responsibility for conducting psychological research. The equipment will allow us to offer this program to an increased number of students and improve both the quality and variety of research projects in the labs. Student research projects will be automated using Macintosh microprocessors with software to control 10 research stations and to support data management, statistical analysis, and graphics functions.

Jean and Anna say that this instrumentation grant covers both animal and human research and will greatly increase their ability to conduct human operant research.

TITLE: "Research and Development of Instructional Design Stategies for Management Software;" INVESTIGATOR: Philip N. Chase, West Virginia University; DATES: 8-15-86 to 2-15-87; AMOUNT: $20,488; AGENCY: Enabling Technologies, Inc., Chicago.

ABSTRACT: The purpose of this grant is to design and test instructional materials that will facilitate use of management applications software by typical users. Instructional design involves four primary features: (a) analyzing and structuring the content of the software; (b) analyzing and structuring the tasks that will enable users to master the software, that is, tasks that require the users to use relevant features of the software package in a maximally effective order; (c) sequencing the relations among content and tasks to optimize the time and effort that it takes to learn the software; and (d) establishing a motivational context to facilitate the users' mastery of the software. Testing also involves four components: (a) formative evaluation of the training materials during development of the product; (b) selection of representative users with whom to test the training materials; (c) summative evaluation of the total training system with representative users; and (d) report generation that facilitates changes in the training materials or software during its development and that clearly documents the effectiveness of the training and the software for the typical user.

ABOUT THE EAHB SIG

The Experimental Analysis of Human Behavior Special Interest Group (EAHB SIG) consists of over 110 members of the Association for Behavior Analysis (ABA). The group is organized to facililtate the growth of a multi-faceted experimental literature using human subjects to analyze the relations between behavior and the variables influencing it. The EAHB Bulletin serves the SIG by disseminating information that customarily is not published in the archival journals of behavior analysis.

CONTRIBUTORS are encouraged to submit materials such as articles about EAHB as a specialty area; research notes, e.g., information about specific procedures, anomolous findings, etc.; annotated bibliographies; research profiles; convention and conference notices; course materials; and job announcements and other news of interest to SIG members (see recent issues for examples). Submissions should be sent to the EAHB Bulletin at the address given below.

NEW MEMBERS may join the EAHB SIG by completing the membership form and sending it, along with a check for dues (see below), to the Bulletin.

CONTINUING MEMBERS may renew their membership for 1988 by sending their name and a check for dues (see below) to the Bulletin. Please write "Renewal" in the memo section of your check. Send the membership form only if you wish to report a change of address or interests.

DUES for 1988 are $6 U.S. funds. Despite rising costs, the SIG has been able to hold dues at a low level because (a) mailing and administrative costs have been subsidized by West Virginia University, and (b) most of our members have generously added a voluntary contribution of $2 or more to their dues. Unless this support continues, the SIG may have to cut back on its activities. If you can afford an extra $2, please send it--the SIG will put it to good use in promoting the experimental analysis of human behavior.

ADDRESS all correspondence to: EAHB Bulletin, Department of Psychology, West Virginia University, P. O. Box 6040, Morgantown, WV 26506-6040.

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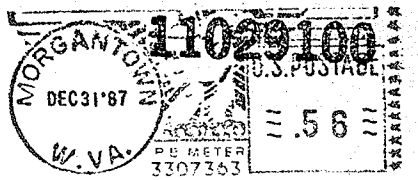

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