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EXPERIMENTAL ANALYSIS OF HUMAN BEHAVIOR BULLETIN

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Announcements

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). Articles in the Bulletin represent the views of the authors. They are not intended to represent the approved policies of the SIG or ABA, or the opinions of the membership of the SIG or ABA. The inserted page 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 the University of North Carolina at Wilmington.

Editors: Carol Pilgrim and Mark Galizio, University of North Carolina at Wilmington

Editorial Assistants: Martha Jo Clemmons and Lydia R. Woodard

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Announcement: New SIG Chairs

Kate Saunders of Parsons Research Center and Bill McIlvane of the E. K. Shriver Center have been elected new chairs of the SIG, and will become co-editors of the Bulletin effective with the next issue. Manuscripts and dues should now be sent to Kate Saunders, Parsons Research Center, P. O. Box 738, Parsons, KS 67357.

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Graduate Student Paper Competition Deadline is September 20

The Human Behavior SIG seeks submissions for its Annual Graduate Student Paper Competition, the purpose of which is to recognize and promote student scholarly activity in the experimental analysis of human behavior.

All current graduate students, and individuals who received terminal degrees less than 1 year before the submission deadline, are eligible to submit conceptual, review, or empirical papers that address issues relevant to the experimental analysis of human behavior. There is no a priori limit on the number of awards. All papers receiving favorable reviews will be recognized.

All student authors receive the benefit of journal-quality reviews from established members of the EAHB-SIG, many of whom serve on editorial boards of the major behavioral journals. Winners receive an Outstanding Paper plaque and will present their papers in a special ceremony at the 1992 ABA Convention in San Francisco. Space permitting, a summary of each winning paper will appear in the pre-convention issue of the Bulletin. Past winners also have received wider recognition in ABA (e.g., acknowledgement at the banquet or convention social).

Submission rules:

1. The student must be first author. The faculty advisor may provide both conceptual and technical assistance, but the paper must represent primarily the student's work.
2. The submission must be accompanied by a letter from the faculty advisor describing the relative contributions of the student and advisor.
3. Recent graduates may submit only work authored during graduate training.
4. The paper must be prepared in APA format, and not exceed 25 double-spaced pages, including all references, tables, and figures.
5. To facilitate blind review, title pages should not contain any identifying information. Instead, attach a cover letter stating the title of the manuscript you are submitting for review.
6. Papers not meeting these specifications may be returned without review.

Submissions must be received no later than September 20, 1991. Mail 4 copies of the paper to: EAHB Competition, c/o Thomas S. Critchfield, Department of Psychology, Auburn University, Auburn, AL 36849-5214.

INTERCHANGEABILITY OF STIMULUS TERMS IN FIVE-TERM CONTINGENCIES

Richard W. Serna

Eunice Kennedy Shriver Center for Mental Retardation

In an arbitrary matching-to-sample task, a subject's responses are reinforced for selecting one of two (or more) comparison stimuli conditionally upon the presence of a sample stimulus (Cumming & Berryman, 1961). For example, over a series of trials where stimuli B1 and B2 serve as comparisons, the subject could be reinforced for selecting B1 if the sample stimulus is A1, and B2 if the sample is A2. These conditions define the minimal arrangement for a conditional discrimination. When the subject reliably makes the above selections, the subject's performance is under relational (sample-comparison) stimulus control as specified by a four-term (stimulus-stimulus-response-reinforcement) contingency (Fields, Verhave, & Fath, 1984; Sidman, 1986). For convenience, the performance in the example above will be referred to as A1B1/A2B2 matching.

Numerous studies (e.g., Sidman, Rauzin, Lazar, Cunningham, Tailby, & Carrigan, 1982; Sidman & Tailby, 1982; Stromer & Osborne, 1982) have demonstrated the emergence of symmetrical sample-comparison relations following conditional discrimination training. For example, after A1B1/A2B2 matching is established through direct training, human subjects tend to demonstrate emergent B1A1/B2A2 matching; the A and B stimuli function interchangeably as conditional (samples) and discriminative (comparison) stimuli.

Recently, Sidman (1986) extended the analysis of the conditional discrimination to include conditional control of sample-comparison relations. For example, A1B1/A2B2 matching could be reinforced in the presence of an additional stimulus X1, and reversed sample-comparison relations -- A1B2/A2B1 matching -- could be reinforced in the presence of another stimulus, X2. This represents the minimal arrangement for a five-term contingency (i.e., stimulus-stimulus-stimulus-response-reinforcement), or the contextual control of conditional discriminations (Sidman, 1986).

The interchangeability of contextual stimuli with the other stimuli within the minimal five-term contingency has not yet been explored. My current research is examining whether stimulus term interchangeability is demonstrable after training with five-term contingencies. How will subjects respond when the stimulus terms are interchanged?

To answer this question, three undergraduate students were first taught the arbitrary visual-visual match-to-sample performance A1B1/A2B2. To establish the remaining four-term contingencies necessary for subsequent five-term contingency training, the subjects were next taught to perform A1B2/A2B1 matching. Then, contextual stimuli X1 and X2 were introduced and the four-term matching performances were brought under contextual control (if X1 then A1B1/A2B2, and if X2 then A1B2/A2B1). Finally, I asked how subjects would respond when the stimulus terms were interchanged on unreinforced probe trials. All three subjects virtually always demonstrated emergent relations that were consistent with the training contingencies: (a) if X1 then B1A1/B2A2, and if X2 then B1A2/B2A1; and even where former contextual stimuli were presented as comparisons: (b) if A1 then B1X1/B2X2, and if A2 then B2X1/B1X2.

These results suggest that the often demonstrated finding of stimulus term interchangeability in conditional discriminations extends to the five-term contingency. The results also raise two issues that call for resolution through additional research. First, if the stimulus terms of a five-term contingency are interchangeable, this might suggest that four three member classes of stimuli (X1-A1-B1, X1-A2-B2, X2-A1-B2, X2-A2-B1) had formed. However, it cannot be inferred that these are equivalence classes because all of the stimuli would be equivalent to each other via the common elements between classes, and one large class would emerge (Sidman, Kirk, & Willson-Morris, 1985; Sidman, 1986). If this were the case, then the subjects would have had no basis for responding differentially because both comparisons would be equivalent (Bush, Sidman, & deRose, 1989). Thus, the type of stimulus classes that formed as a result of the above training, or whether classes formed at all, remains in question.

The second issue is whether interchangeability results because subjects merely respond to compound stimulus configurations (cf. Bush et al. 1989; Lynch & Green, May, 1990). For example, given the trial with contextual stimulus X1, sample stimulus A1, and comparisons B1 and B2, subjects may have learned to respond to a three-element compound stimulus, X1+A1+B1, by selecting the element of the compound that appeared in the comparison location. Responding on probes where X1 was a comparison and A1 and B1 were the contextual and sample stimuli, respectively, might involve nothing more than responding to a different element of the same compound. The logic of this issue requires that subjects trained to respond to one compound spatial arrangement of visual stimuli would also respond when the stimuli are spatially rearranged. Searching for some precedent, I briefly reviewed the literature on control by compound stimuli. However, the primary focus of such work has been on training compound stimuli and testing with the individual components, or training the individual components and testing with the compound (cf. Kehoe & Gormezano, 1980). While it would seem obvious that normally capable human subjects would respond to spatially rearranged elements of a compound, my review of the literature revealed no direct precedent. I would appreciate it if readers who may have published or unpublished data pertinent to this issue communicate with me.

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Author Notes

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HUMAN OPERANT LABORATORY PRACTICES: PROCEDURES FOR INSTRUCTING SUBJECTS

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1987 and 1988 issues of the EAHB Bulletin featured articles by James Joyce and Phil Chase, describing laboratory practices of the human operant research community as reported on SIG questionnaires. The articles were designed to provide information on facets of research procedures that often receive little attention in published reports. Issues of subject recruitment and retention, debriefing procedures, use of verbal reports, and use of computers for research on human behavior were addressed.

In keeping with this tradition, members of the SIG were surveyed again in the Spring of 1990, regarding their procedures for providing experiment-related instructions. Twenty surveys were returned, a number of which included multiple responses to certain questions. Thus, the total number of responses per question vary in the following data descriptions.

Question 1: In what format are your instructions presented?

Thirteen of 18 people reported that instructions were presented verbally by the experimenter, while nine reported that instructions were presented in a written format (via computer in 4 cases). In another four cases, subjects were given a written copy of the instructions while the experimenter read them aloud. Five people stated that instructions were modeled, and one described the use of minimal physical prompting such as pointing to a response button.

Question 2: When are instructions presented?

By far the most common response, 11 of 18 individuals reported that instructions were presented at the beginning of the first experimental session only. One respondent specified that instructions were given prior to obtaining informed consent from subjects. Repeating instructions prior to each experimental session was reported three times, and there was one report of repeating instructions intermittently at the beginning of some sessions. One person said that written instructions remained beside the subject throughout the first session, but were removed for subsequent sessions, while five reported that written instructions or prompts were continuously available for the duration of the study. One researcher described providing instructions whenever reinforcement rates were decreased (see question #4), and one reported providing instructions when subjects failed to meet mastery criterion.

Question 3: Do you use any technique to ensure that your subjects have attended to/understood the instructions?

Of the 19 who answered this question, eight respondents said that no special techniques were used to ensure that instructions had been understood. Three people reported asking their subjects if they understood or if there were any questions. One researcher required subjects to repeat instructions, while six required a response or demonstration to indicate understanding. There was one report of having subjects respond to multiple choice questions, although another respondent commented that he had tried using "quizzes" and found that they interfered with other aspects of experimental procedure.

Question 4: Do you give any instructions regarding changes in experimental conditions? If so, what?

Eleven of 20 respondents answered no to this questions, and two others said "sometimes", without further description. Four researchers either described a range of possible experimental conditions or simply stated that conditions might vary as part of their introductory, orienting instruction set; no further instruction was provided at the time of an experimental manipulation.

For the researchers who answered this survey, the only type of manipulation accompanied by instructional stimuli was a reduction in reinforcement schedule (described by three respondents). According to respondents, such instruction has practical as well as methodological significance. For example, "We tell subjects when intermittent reinforcement or extinction conditions are introduced, and explain when the subject will be paid for these sessions. This prevents a lot of question asking during the session." Another respondent commented, "I have done so in a study where point contingencies were withdrawn, to make it clear when the contingency, the feedback about contingent outcomes, or both, was withheld. This is one of the problems with using reinforcers that aren't immediately consumable -- their delivery is mediated by an instructional message, leaving it open to interpretation by the subject whether unsignalled extinction is, in fact, extinction, or merely the withholding of feedback."

Question 5: Would you describe your instructions as tacts (e.g., descriptions of apparatus), mands (e.g., you should press quickly), or both? Please describe what is tacted or manded.

For 11 of the 18 who completed this question, instructions are comprised of both tacts and mands. Four individuals said that they only present tacts, two provide only mands, and one researcher described her instructions as neither tacts nor mands.

More specifically, researchers reported tacts describing equipment operation (6 reports), experimental stimuli (2 reports), general contingencies (e.g., "When you're right, you get a penny; when you're wrong you get a buzzer", or "Responses will produce points" - 3 reports), reinforcers (e.g., "Points are worth 5 cents" - 3 reports), and environmental changes (e.g., "You will no longer receive points for responding, but you will be paid as usual at the end of the session - 4 reports). Of the 12 mands described, seven specified the operant response (e.g., "Press the button", or "Find the right one", or "Touch one"). Only one of the mands reported specified any detail of how the response was to be made (i.e., "You will need to press more than once"). In four cases, subjects were instructed to "Earn as many points as possible" or "Perform as best as you can".

Question 6: What functions are your instructions designed to serve?

Responses to this question were many and varied. The most common response, facilitation of response acquisition, was mentioned by 10 researchers. Eight individuals reported designing instructions to help motivate performance, while four said that instructions were used to facilitate contact with experimental contingencies. Three respondents mentioned the goal of decreasing subjects' questions during experimental sessions, and two reported using instructions to "eliminate frustrations" or "avoid emotional responses". Incorrect or deceptive information was provided by two researchers, while one other presented a false rationale to get subjects to remove their watches. General orientation to the task and providing enough information to obtain informed consent were each mentioned one time.

Question 7: Do you ever evaluate the impact of your "standard" experimental instructions?

Eleven of 20 respondents answered yes to this question. Use of control conditions was specified once and debriefing sessions were mentioned twice as the mode of evaluation.

Question 8: Have you used instructions as an independent variable?

Ten of 20 respondents reported analyzing instructions experimentally. Two additional individuals replied that they planned on doing so in the future.

Question 9: Do you ever conduct research in which no verbal instructions are provided? If so, please specify the subject population.

Of the 20 researchers who answered this question, only two had conducted experiments with uninstructed human subjects. Severely retarded persons and preschool-age children were the subject populations.

We hope that you will find this information useful, and we would like to thank the SIG members who contributed to the survey. If there are questions about experimental procedures that you would like to see addressed in future issues of the Bulletin, please contact the authors or the new Bulletin editors.

WHAT'S IN A NAME? EXPERIMENTAL AND APPLIED BEHAVIOR ANALYSIS CONSIDERED

Robert P. Hawkins
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Do you have difficulty remembering which of the errors in interpreting experimental results is called a Type I error and which is called a Type II error? Similarly, is it obvious to you what parental command constitutes an "alpha command" and what a "beta command" (Forehand & McMahon, 1981)? What's wrong with these names? In both of these cases the tasks of learning and recalling are made unnecessarily difficult by the fact that the names are not descriptive; they make insufficient use of the stimulus control that would be provided by words selected appropriately from our existing language repertoires. In general, communication seems to be best when we use terms that are as descriptive as possible. Descriptive names are both more efficient and more accurate than nondescriptive ones; they exert stimulus control which is rapid and neither too narrow, too broad, nor otherwise off the mark in their effect.

Another desideratum in naming concepts and procedures is consistency with other terms in the same scheme, system, or theory. Of course other criteria are also relevant in deciding what to call something--brevity, pronouncability, aesthetic quality, etc.--but what I want to address is descriptiveness and consistency with other terminology. Terms that are not descriptive or not consistent with other terms and concepts in the system are difficult to establish as reliable cues (teach), are readily misunderstood, and are likely to be misused.

The issue of teachability was part of Jack Michael's (1975) objection to the term "negative reinforcement;" it is difficult to teach. Many of us have experienced that difficulty when teaching undergraduate students; but I also knew a well-published behavior analyst who insisted that the term was synonymous with "punishment" (which admittedly is consistent with Skinner's original use; Michael, 1975). The term "extinction" also has its difficulties, in my experience.

Now consider the term "the experimental analysis of behavior." A listener/reader might reasonably assume this to mean any research that is experimental and which analyzes how behavior is controlled, possibly further qualifying the definition by requiring that it be described in behavior analytic terms or even that it employ individual-subject designs (as Skinner, 1969, did). But by these criteria most of the research published in Journal of Applied Behavior Analysis qualifies as the experimental analysis of behavior. Why, then, is the research in JABA not called the experimental analysis of behavior?

What I am pointing to is one of the little incongruities within behavior analysis that I think detract from the field's appeal to novices and to others not integral in our verbal community. The incongruity is that we point to basic research and call it "the experimental analysis of behavior," then point to applied research and call it "applied behavior analysis." This uses two different dimensions to divide our science/technology. One is the basic-applied dimension, which is quite logical, useful, and applicable to all sciences. The other is a methodological dimension, probably inherited from general psychology's use of "experimental psychology" to denote basic research, usually in laboratories and with non-humans. The basic-applied dimension is a logical and useful one; but the experimental-nonexperimental is probably not a useful term, at least at this level of describing our science.

Dividing behavior analysis along the experimental-nonexperimental dimension risks omitting significant segments of the science, because it fails to exhaust the methodological possibilities. If we are to have a segment of our science called the experimental analysis of behavior, the implication is that we will also have "the descriptive analysis of behavior," in which one simply collects data on what already exists, such as White's (1975) measurement of the "natural" rates of teacher approval and disapproval. And then there will be studies that correlational different descriptive variables, so we should have "the correlational analysis of behavior." All such research could be better subsumed under the more general and useful labels "basic" or "applied."

By our illogical terminology--that is, our failure to apply the same dimension in naming the segments of our science and our failure to use a name that accurately identifies the dimension we are implying--we make it more difficult to learn our terminology, so pointlessly difficult that we appear more like a secret society or religion than is healthy for a science. Such terminology also makes us appear less than logical and analytic, despite our name, behavior analysis.

I suggest that we stop using the term "the experimental analysis of behavior" and instead divide our field simply into "the basic analysis of behavior and "the applied analysis of behavior." One is primarily theory-generating, the other primarily for solving practical problems in human living (including problems of other species that we are concerned about). That denotation would be easy for anyone to learn and remember; and it would show how logical and consistent behavior analysis can be. We need not be constrained by either the traditions of general psychology or those of behavior analysis. As our field has expanded and become more complex, the teaching and learning of behavior analysis has become likewise more demanding; there is no value in adding unnecessary complexity, aside from the value that secret handshakes and chants provides. This seems a good time to clear up as much of the inconsistency as we can, so that the teaching and learning of behavior analysis are not made any more difficult than the subject matter itself requires.

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A NOTE ON THE RELATIONSHIP BETWEEN EQUIVALENCE CLASSES AND FUNCTIONAL STIMULUS CLASSES

William V. Dube, Stephen J. McDonald, and William J. McIlvane

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This note concerns the relationship between membership in stimulus equivalence classes and functional stimulus classes. Equivalence classes are demonstrated when conditional stimulus-stimulus relations are shown to have the properties of reflexivity, symmetry, and transitivity (Sidman & Tailby, 1982). Functional classes are demonstrated when (a) two or more stimuli exert functional control over the same response class and (b) a change in the functional relations involving one class member results in a corresponding change in the other(s) (Goldiamond, 1962, 1966). Our specific interest is the nature of the relationship between equivalence classes and so-called "contingency" classes (cf. Sidman, Wynne, Maguire, & Barnes, 1989).

Functional contingency classes have been established via repeated yoked simple-discrimination reversals (McIlvane, Dube, Kledaras, Iennaco, & Stoddard, 1990; Sidman et al., 1989; Vaughan, 1988). For example: Three two-choice simple simultaneous (S+/S-) discriminations are established and maintained on intermixed trial types: A1/A2, B1/B2, and C1/C2. Then, the discriminative functions are repeatedly and concurrently reversed via explicit discrimination training: A2/A1, B2/B1, C2/C1; then A1/A2, B1/B2, C1/C2; then A2/A1, B2/B1, C2/C1; and so on. Contingency classes A1-B1-C1 and A2-B2-C2 are demonstrated when exposure to reversed contingencies for one of the discriminations results in immediate emergent reversal of the others.

Contingency classes and equivalence classes have some of the same properties. For example, both are documented via emergent behavior that has not been directly conditioned. Also, matching-to-sample methods may be used to add members to existing classes of both types (Sidman et al., 1989; deRose et al., 1988a, b). These and other observations have led some to ask whether equivalence classes and functional classes differ in any fundamental way (Vaughan, 1989; Hayes, 1989). The answer to this question seems to depend on whether membership in one type of class is accompanied by membership in the other.

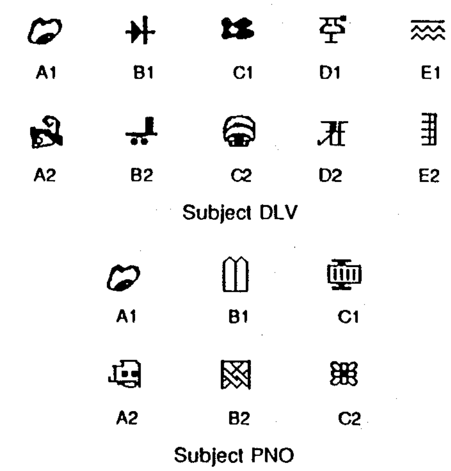
The relationship between equivalence class membership and contingency class membership was examined directly in two previous experiments (McIlvane, Kledaras, Dube, Iennaco, & Stoddard, 1988; Sidman et al., 1989). In these experiments, contingency classes were established. Then, matching-to-sample trials tested whether subjects would match the contingency class members with one another. Three of the four subjects did so. The results of these and subsequent tests showed that the stimuli in the contingency classes were also members of equivalence classes. The question, therefore, is whether the exception represented by the fourth subject (a) was due merely to some procedural artifact or (b) showed the potential for an interesting independence of equivalence class and functional class membership (cf. Stoddard & McIlvane, 1986).

In the present study, we asked the same question in a different way. Membership in stimulus equivalence classes was established first, and then tests for contingency class membership were conducted. Would contingency class membership be demonstrable in the context of verified equivalence class membership?

Procedures

Mentally retarded young men DLV (CA = 27; MA = 4-7 [yr-mo]) and PNO (CA = 22; MA = 3-8) served. Both had extensive experience with simple and conditional discrimination procedures. Experimental sessions were held 3-5 days per week.

A microcomputer testing apparatus displayed five square white "keys" on a gray background. One was in the center of the screen and the other four were on the corners (see Dube & McIlvane, 1989 for a complete apparatus description). Simple-discrimination trials displayed forms on any two of the outer keys. On matching-to-sample trials, a sample form appeared on the center key first; a touch to it was followed by the appearance of two comparison forms on outer keys. The stimuli are shown in Figure 1. During 10-s intertrial intervals (ITI), the screen displayed five blank keys.



Simple- and conditional-discrimination performances were established via stimulus shaping procedures that had reliably taught similar performances to both subjects previously. Three reinforcement schedules were used. Continuous: all S+ selections were followed by reinforcing consequences (a flashing visual display, melodic tones, and presentation of a food item) and all S- selections by a 3-sec blackout of the screen. Intermittent: about 2/3 of the responses were followed by differential consequences and 1/3 by the ITI. Procedural nonreinforcement: all responses were followed by the ITI.

Stimulus Equivalence Training

DLV was trained to perform four two-comparison conditional discriminations: AB, BC, CD, and DE (AB designates selection of comparisons B1 and B2 conditionally upon samples A1 and A2, respectively, etc.). Then, nonreinforced probe trials for all of the possible 16 untrained conditional discriminations (EA, DA, CA, etc.) were interspersed among intermittently reinforced baseline trials. Emergent matching performances demonstrated the formation of two five-member equivalence classes: A1-B1-C1-D1-E1 and A2-B2-C2-D2-E2.

With PNO, two three-member classes, A1-B1-C1 and A2-B2-C2, were established with similar procedures. AB and AC matching was trained, and BC, CB, BA, and CA matching was demonstrated on test trials. This smaller baseline made it feasible to conduct more extensive and stringent contingency-class tests in each session.

Contingency Class Training and Test Procedures and Results

DLV. Each test session started with a 16-trial review of AB, BC, CD, and DE matching. Then, 16-30 training trials taught DLV a simple discrimination with one stimulus set, for example, C1/C2. Thereafter, each of the remaining sets were displayed on one simple-discrimination test trial (A1 vs. A2, B1 vs. B2, D1 vs. D2, and E1 vs. E2 in the example). Would DLV's test-trail selections be consistent with established equivalence class membership (A1, B1, D1, and E1 in the example)? Test trials were interspersed among 6 review trials with the simple discrimination that was taught directly. A different simple discrimination was trained in each session (e.g., E1/E2, A2/A1, C2/C1, B1/B2, etc.). Because each test trial type was displayed only once, responses could be reinforced without compromising test integrity (cf. Sidman, 1971).

Table 1 (top row) summarizes the test procedures and results. DLV had 10 test sessions (Sess; Rev not applicable here); each taught one simple discrimination (#SimDis) with continuous reinforcement (Conseq = CRF) and tested for the four potentially emergent ones with reinforcers following every selection of a member of the same equivalence class as the S+ during the immediately preceding simple-discrimination training. During these sessions, 37 of 40 test selections were reinforced; the 3 out-of-class selections were on the 5th, 12th, and 25th test trials. Thus, for DLV, coincident equivalence class and functional class membership was apparent.

Table 1

				Baseline		Test trials		
Subj	Test	Sess	Rev	#SimDis	Conseq	#SimDis	Conseq	Results
DLV		10	no	1	CRF	4	CRF	37/40
PNO	1	12	yes	2	INT	4	NRF	25/48
	2	6	yes	4	INT	2	NRF	5/12
	3	9	no	1	CRF	2	CRF	16/18
	4	6	no	1	INT	2	NRF	12/12
	5	6	yes	2	INT	4	NRF	20/24

PNO: Pretraining. In the first phase, sessions began with a 12-trial review of all A-B-C matching performances (AB, BA, AC, CA, BC, CB). Then, the stimulus shaping procedure established one simple discrimination to a criterion of 6/6 consecutive correct unprompted trials. The continuous schedule was used. A different simple discrimination was trained in each of 6 sessions: A1/A2, B2/B1, C2/C1, B1/B2, C1/C2, A2/A1.

In the next phase, sessions included two A-B-C matching reviews, each followed by training on a different simple discrimination. If A1, B1, or C1 was S+ on the first simple discrimination, then A2, B2, or C2 was S+ on the second (and vice versa). The first "midsession reversal" session (Rev in Table 1), for example, consisted of: A-B-C matching (12 trials), A1/A2 training (6 trials), an A1/A2 criterion block (6 trials), A-B-C matching (12 trials), B2/B1 training (6 trials), and a B2-B1 criterion block (6 trials). Across sessions, S+ for the first simple discrimination alternated irregularly between stimuli from the "1" and "2" classes. The first three midsession-reversal sessions used the continuous reinforcement procedure; the next six used the intermittent procedure. PNO was errorless in these sessions.

PNO: Test 1. Test sessions added nonreinforced (Conseq = NRF in Table 1) test trials in the simple-discrimination criterion blocks. The test trials displayed the two simple-discrimination trial displays that had not appeared in the immediately preceding simple-discrimination training. For example, if A1/A2 was trained, test trials displayed the B- and C-stimuli. The trial preceding each test trial was always a reinforced selection of the stimulus that had been S+ in the immediately preceding simple-discrimination training.

Table 1 (PNO, first row) summarizes the conditions and results of the 12 sessions that comprised Test 1. Only 25 of 48 test-trial selections were consistent with contingency class membership (52%). Out-of-class selections (a) were equally likely in the first and second test blocks, (b) were equally distributed between the two equivalence classes, and (c) did not become less frequent with repeated testing. Baseline accuracy scores were 286/288 for A-B-C matching and 163-164 for simple discrimination (excluding prompted trials).

PNO: Further training and Test 2. Next, PNO was given extensive exposure to a yoked repeated reversal procedure to encourage contingency class formation. Sessions alternated trial blocks that (a) reviewed A-B-C matching and (b) trained, via stimulus shaping, concurrent simple discriminations in which the members of one equivalence class were S+ and members of the other were S- (e.g., A1/A2, B1/B2, and C1/C2). PNO received 49 such sessions with midsession reversals, 22 with continuous reinforcement and 27 with intermittent reinforcement. Performance was >90% accurate overall and virtually perfect (1 error) in PNO's last 6 sessions.

Test 2 sought to encourage positive results by teaching two simple discriminations concurrently (e.g., B2/B1, C2/C1), reserving only one for testing (e.g., A2/A1). Again, all training and review trials were intermittently reinforced and all test trials were nonreinforced. Results were like those of Test 1; only 5 of 12 test trials were consistent with contingency classes. Accuracy on baseline trials was virtually perfect.

PNO: Tests 3, 4, and 5. Test 3 taught one simple discrimination and tested two others with continuous reinforcement and without a midsession reversal (resembling DLV's tests). Results were consistent with contingency class formation on 14 of 16 test trials. Test 4 reintroduced nonreinforced testing in an intermittently reinforced baseline without a midsession reversal. Test 5 repeated the conditions of Test 1. Test selections remained consistent with contingency class formation (12/12 and 20/24, respectively.)

Discussion

equivalence and contingency class membership can but need not coincide. Our results thus lend weight to those reported by Sidman and colleagues (1989), providing one more case where contingency classes appear to be independent of equivalence classes as defined by Sidman and Tailby (1982). These data may also be a small step toward understanding the variables that determine whether or not membership in both types of classes does coincide. With PNO, neither membership in well-established equivalence classes nor protracted yoked repeated reversals training were sufficient for a demonstration of contingency classes when the conditions included intermittently reinforced baseline trials, nonreinforced test trials, and midsession reversals. It is important to note, however, that those same conditions were sufficient (a) to test and maintain equivalence class membership and (b) to establish and maintain the simple-discrimination baselines in which contingency class tests were conducted. These observations seem to provide further support for the possibility that equivalence and contingency classes can be independent. The results of PNO's later tests, however, show that certain training experiences may eliminate initial independence. Direct and systematic replications will be necessary to determine the limits of this finding. As in studies of independence of the verbal repertoires of listener and speaker, the most fruitful area for conducting independence searches may be with subjects who do not have already highly developed behavioral repertoires.

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Author Notes

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Association for Behavior Analysis, Milwaukee, WI, May 1989. We Thank Fred Rocco for assisting with data collection. Correspondence may be addressed to W.V. Dube, Behavior Analysis Division, E. K. Shriver Center, 200 Trapelo Rd., Waltham, MA 02254.

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LABORATORY DESCRIPTION: BEHAVIOR ANALYSIS RESEARCH AT THE EUNICE KENNEDY SHRIVER CENTER FOR MENTAL RETARDATION

R. Stromer, W. V. Dube, W. J. McIlvane, G. Green, R. W. Serna, H. A. Mackay, and L. T. Stoddard

Behavior Analysis Department, Eunice Kennedy Shriver Center

The Eunice Kennedy Shriver Center was established in 1970 and is located on the grounds of the Walter E. Fernald State School. The Center's mission is to determine causes of mental retardation and to develop methods to treat and prevent it. Ongoing programs seek solutions to problems in behavior analysis, biochemistry, developmental neurobiology, medical genetics, and social science. The Center is affiliated with several academic institutions including Massachusetts General Hospital, Harvard Medical School, and Northeastern University.

Behavioral research at the Shriver Center was initiated under the direction of Murray Sidman. The current director is L. T. Stoddard. The Behavior Analysis Department's major research focus is stimulus control. Short-term goals include resolving several issues in basic behavioral science and devising procedures for overcoming a number of specific learning problems in people with developmental disabilities. Long-term goals include broad-based analysis of behavior that emerges without explicit training and application of the resulting knowledge to improve educational practice. A new program is adapting stimulus control methods to study the behavioral correlates of normal and abnormal neurological development. The research is funded primarily through program project and individual grants from the National Institute of Child Health and Human Development.

Our primary study population consists of individuals classified as severely or moderately retarded. There is also substantial research directed at learning in persons with profound mental retardation, specific learning disabilities, autism, and brain injury and disease. Normally capable contrast subjects are also studied. Advanced automated programming techniques are employed to maintain a high degree of environmental control and precise management of teaching contingencies. Coincident with ongoing research is the pursuit of effective application of microcomputer technology to problems in special education.

Selected Ongoing Research Projects

Emergent behavior in severely and profoundly retarded individuals. Directed by L. T. Stoddard, this project uses the programming capabilities of an automated laboratory to ask fundamental questions about the nature of conditional discrimination in severely and profoundly retarded subjects. The central question is whether nonverbal individuals are capable of equivalence class formation and other forms of advanced relational learning.

Stimulus-reinforcer relations: Enhancing conditional behavior. This project, co-directed by W. J. McIlvane and W. V. Dube, studies reinforcement procedures that may enhance learning and retention in mentally retarded persons. The studies focus on procedures that provide specific, discriminably different reinforcing consequences for each new performance to be learned. The primary comparisons are between training procedures that provide performance-specific consequences and those that provide the same reinforcing consequences for all performances. The project also examines conditions under which reinforcing stimuli become members of stimulus classes, a line of research that may be relevant to functional analyses of verbal behavior.

Teaching prerequisites for conditional discrimination and learning set formation. Directed by W. V. Dube, this project seeks to validate errorless instructional methods for teaching large numbers of discriminations to moderately and severely retarded individuals. It further seeks to determine whether instructional support can be gradually withdrawn until one-trial discrimination learning is achieved, and, if so, whether this capability will lead directly to some forms of matching to sample. Basic research questions include whether "learning set" formation necessarily requires exposure to extinction conditions and whether previous failures to demonstrate learning set formation in lower-functioning retarded persons reflect limitation of capacity or merely of teaching technique.

Programming conditional discrimination and production: Acquisition, generalization and retention. Directed by W. J. McIlvane, this project seeks to develop and validate broadly effective methods for teaching educationally useful forms of conditional discrimination. Its principal focus is establishing arbitrary auditory-visual and visual-visual stimulus relations, such as those between dictated or written words and pictures. Among the research topics are the formation of stimulus classes based on relations with common consequences, learning by exclusion, the development of conditional-discrimination learning sets, and equivalence class formation. Other topics include the stability of increasingly large behavioral baselines and variables that influence maintenance of those baselines over time.

Studies of control by complex and compound stimuli. Led by R. Stromer, this project studies variables that affect the development of stimulus control by elements of complex visual stimuli. Further, the project examines methods for broadening control in circumstances where subjects characteristically display restricted stimulus control, apparently ignoring redundant elements of complex stimuli. Finally, the project asks basic questions about the number of discrete elements of complex stimuli that can simultaneously become members of a stimulus class.

Stimulus equivalence in rudimentary reading and spelling. This project is led by H. A. Mackay and examines methods for teaching prerequisites for reading and spelling to moderately and severely retarded people. One of the studies examines the relative efficiency of auditory-visual vs. all-visual training procedures in the formation of equivalence classes. It also examines the relative effectiveness of standard matching-to-sample training methods and those that require the subject to construct words by selecting letters from an unsorted pool. This project also examines the development of contextual control of sequence class membership, thus studying basic behavioral processes that may be relevant to elementary syntactic relations.

Stimulus equivalence in rudimentary monetary and numerical skills. Directed by G. Green and L. T. Stoddard, this project continues and expands a program that seeks to develop effective, efficient methods for teaching rudimentary math and money skills to moderately and mildly retarded individuals. Beyond its practical potential, this program establishes a framework for studying more basic stimulus control questions. In particular, it permits studies of behavioral processes that may be prerequisite for acquisition of elementary arithmetic skills, including quantity discriminations and numerical equivalence classes.

Studies of auditory discrimination learning. This project is led by R. W. Serna, W. J. McIlvane, and L. T. Stoddard and studies variables that influence acquisition of auditory stimulus control. One objective is to develop procedures that reliably produce auditory stimulus control in subjects who have exceptional difficulty discriminating the presence vs. absence of a spoken word. The project is also investigating the use of errorless teaching methods to establish discriminative control by different spoken words.

Ordinal relations and transitivity. This project, directed by R. Stromer, applies recently developed stimulus control methodology and concepts to the study of transitive inference in both mentally retarded and normally capable subjects. Novel conditional-discrimination procedures examine traditionally studied transitive relations such as "greater than" and "less than." Also featured is a detailed basic analysis of the formation and expansion of sequence classes. Membership of stimuli in such classes is defined by their ordinal position in a series of stimuli presented or responded to. A fundamental question is whether such relations can be studied at the level of process (i.e., independently of particular physical stimulus properties). The project also seeks to develop and apply new research methodology; the paradigms selected for study effectively eliminate ambiguity about whether transitive inferences are or are not being made in a given situation.

Stimulus control methods in specific reading dysfunction. Lead by R. Stromer, this project examines the utility of stimulus control methodology in assessing and remediating behavior deficits in children who have specific learning difficulties. One series of studies investigates the effectiveness of equivalence procedures in establishing networks of reading, spelling, and matching-to-sample performances.

Frequency analysis of stimulus control. This project, led by W. J. McIlvane, analyzes persistent discrimination learning problems that are frequently observed in people with mental retardation and autism. Such problems are conceptualized in terms of competing stimulus-response relations co-existing within the same discrimination baseline. The goal is to design and apply methods that isolate unwanted forms of stimulus control in order to decrease their frequency. Also a goal is to relate the persistence of unwanted stimulus control to several subjects and training variables.

Training Opportunities

The authors have a close relationship with the Center's University Affiliated Program. One of the UAP's principal training activities is the program leading to a Master of Arts in Applied Behavior Analysis at Northeastern University (Dr. Karen Gould, Director). Most members of our department play an active role in this program.

Selected Recent Publications

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EAHB SIG MEMBERS PUBLICATIONS

Case, D. A., Ploug, B. O., & Fantino, E. (1990). Observing behavior in a computer game. Journal of the Experimental Analysis of Behavior, 54, 185-199.

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EAHB SIG MEMBERS - GRANTS

Following are research grant summaries proposed by or awarded to SIG Members.

Fantino, E.
University of California, San Diego.
Factors influencing response strength.
Agency: National Science Foundation - Biological Basis of Behavior
Amount Awarded: $300,000
Summary: The proposed experiments investigate choice behavior. All of the experiments are relevant to the PI's delay-reduction theory of choice and conditioned reinforcement which states that the effectiveness of a stimulus as a conditioned reinforcer may be predicted most accurately by calculating the reduction in the length of time to primary reinforcement correlated with the onset of the stimulus in question relative to the length of time to primary reinforcement measured from the onset of the trial. In other words, the greater the improvement, in terms of temporal proximity or waiting time to reinforcement, correlated with the onset of a stimulus, the more effective that stimulus will be as conditioned reinforcer. The proposed experiments assess two potentially important modifications of this theory. First, DRT makes the assumption that preference is, in part, a function of the ratio of primary-reinforcement rates but is independent of the ratio of conditioned-reinforcement rates. Second, it has never been ascertained whether the effectiveness of a stimulus as a conditioned reinforcer, in delay-reduction terms, is predicted most accurately by calculating the reduction in the time to primary reinforcement measured from the onset of the preceding stimulus or by calculating the reduction in the time to primary reinforcement measured relative to the average time to primary reinforcement in the situation. The first set of proposed experiments assess those questions which are central to an appreciation of response strength. The second set of proposed experiments explores the adequacy of delay reduction in accounting for choice in situations where the theory predicts nonoptimal behavior. The third set of proposed experiments includes a

novel extension of the theory to conditional discrimination problems, in which we propose to assess the effectiveness of two sources of information on choice in delayed-matching-to-sample and simultaneous-matching-to-sample tasks. This section also should help illuminate the factors governing base-rate errors reported in judgment tasks. The final set of proposed experiments continues our research on the conditions under which human observing is maintained by stimuli associated with undesirable outcomes. We propose to explore the effects of instructions, descriptive stimuli and contingencies on the extent to which information regarding undesirable outcomes. We propose to explore the effects of instructions, descriptive stimuli and contingencies on the extent to which information regarding undesirable outcomes will maintain behavior. Topics such as conditioned reinforcement, choice - including nonoptimal decision-making - and the reinforcing status of information all have relevance for health concerns.

Hughes, J. R.
University of Vermont
Behavioral/epidemiological treatment studies of drug use.
Agency: National Institute on Drug Abuse
Amount Awarded: $79,631
Summary: This application is for a Research Scientist Development Award (RSDA), Level 2. In the first four years of the present RSDA Level 1, the candidate published 62 scientific articles, including articles in JAMA and JPET. He has acquired two R01 and two drug company grants. He developed the Human Behavioral Pharmacology Laboratory at the University of Vermont which now has eleven grants. The present application would help the candidate continue to integrate laboratory, epidemiological and treatment methods in the study of drug abuse.

Laboratory studies will develop methods to examine the reinforcing and discriminative effects of alcohol, caffeine and nicotine in humans, examine the effects of nicotine administration in smokers and nonsmokers, further characterize caffeine and nicotine withdrawal, describe the effects of combining stimulants (e.g. cocaine) and sedatives (e.g. alcohol) and test the effects of drugs on learning, performance and social interaction. Laboratory studies will also examine the influence of environmental, pharmacological, organismic (e.g. behavioral history and genetics) and procedural variables on the reinforcing, discriminative, and direct effects of drugs.

Epidemiological studies will longitudinally study the process of smoking cessation in self-quitters, examine the prevalence of DSM-III-R defined caffeine and nicotine disorders, and test the association of nicotine dependence with past and present psychiatric disorders.

Treatment studies will test new nicotine replacement and non-nicotine pharmacological treatments for nicotine dependence, as well as behavioral treatments for cocaine and nicotine dependence.

Continued funding of the candidate will help develop the Human Behavioral Pharmacology Laboratory and allow the applicant to select only administrative, clinical and teaching activities that are consistent with his career goals and growth of the laboratory.

Hughes, J. R.
University of Vermont
Caffeine as a reinforcer in humans (Competing Renewal).
Agency: National Institute on Drug Abuse
Amount Awarded: $212,994
Summary: Over 90% of Americans drink caffeinated beverages daily. Caffeine appears to fulfill several criteria for a drug of dependence; i.e., it can produce: 1) adverse effects (e.g. arrythymias, insomnia, etc.), 2) physical dependence (e.g. withdrawal symptoms of headache and fatigue), and 3) behavioral effects that might be rewarding (e.g. decreased fatigue and improved performance). However, whether caffeine fulfills the most crucial criteria for dependence potential - ability to serve as a reinforcer - is debatable. For example, whether coffee drinkers will consistently self-administer caffeinated coffee in preference to decaffeinated coffee has only begun to be studied.

The ability of a drug to function as a reinforcer is highly dependent on pharmacological, environmental and behavioral conditions. This application proposes six parametric studies to determine conditions under which caffeine will

August 28, 1991

To: EAHBSIG Members

From: Kate Saunders and Bill McIlvane, Chairs

Greetings from your new chairs!

The deadline for submissions for the next issue of The EAHB Bulletin is November 1, 1991. We would like to call special attention to two types of submissions:

1) Please submit abstracts from posters presented at ABA in 1991. Your abstract should not exceed 200 words. Include the name and address of a contact person.

2) The Bulletin is increasingly serving as a vehicle for the publication of brief reports. We want to encourage this trend. These reports can follow standard APA format, or they can be in a narrative form (examples of both formats appear in the Spring, 1991, issue). The text can be no longer than 2,000 words. Figures should be camera ready. Also, we will reproduce your tables rather than having them typeset, so construct them with the column width of the Bulletin in mind (they can be one or two columns wide).

We would also like to encourage submission of the other types of articles traditionally included in the Bulletin (see "About the EAHB SIG," which appears in each issue).

We are planning a March 1, 1991, deadline for the Spring, 1992, issue.

If you have not paid your 1991 dues yet, please send them to the new bulletin address below. You may wish to include your 1992 dues. Please write the year(s) for which you are paying on your check, along with whether you are a new or renewing member.

The SIG's new address is:
EAHB Bulletin
Kate Saunders
Parsons Research Center
P.O. Box 738
Parsons, KS 67357
(316)421-6550, ext. 1892

PARSONS RESEARCH CENTER
Bureau of Child Research
P.O. Box 738
Parsons, Kansas 67357

INDEPENDENCE, KS
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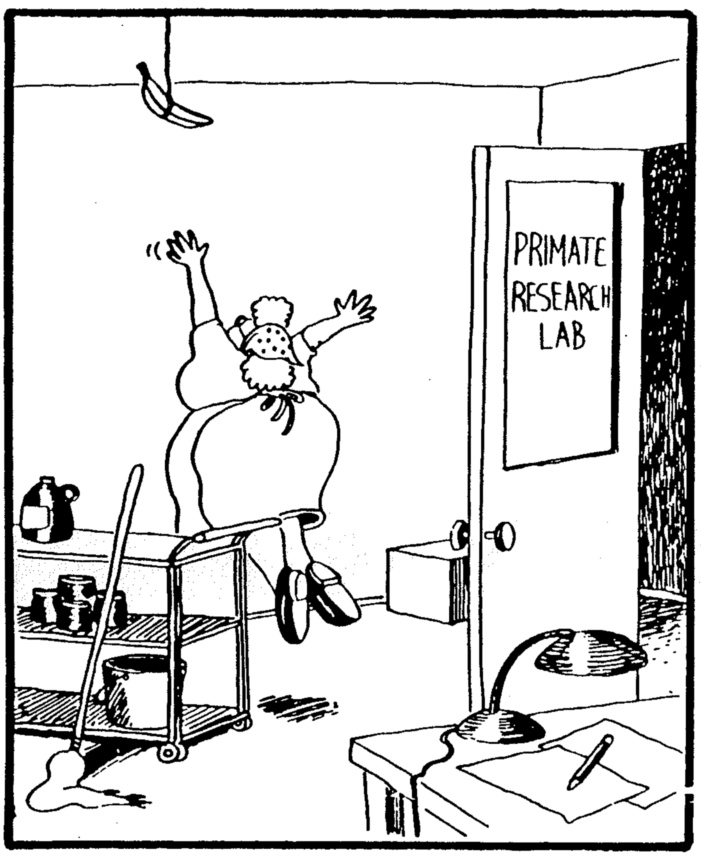
Cloyd Hyten
Center for Behavioral Studies
Univ. of N. TX, P.O. Box 13438
Denton, TX 76203

serve as a reinforcer. We will test dose (25, 50, 100, & 150 mg), present history of drug use (heavy users, light users & abstainers), vehicle (coffee, non-coffee beverage & capsules), instructions (told beverage does or does not contain caffeine), fatigue (after normal sleep vs. after sleep deprivation) and method of testing (concurrent access vs. exclusive choice tests).

These studies will help NIDA deliver rational public information about whether coffee drinking is a drug dependence. They will also help devise treatments for those who need to abstain from caffeine but have difficulty doing so. Finally, the studies will test whether commonalities across forms of substance abuse can be extended to coffee drinking.

O'Neill, R.
University of Oregon
General case communication training for persons with severe disabilities.
Agency: National Institute on Disability and Rehabilitation Research (NIDRR)
Amount Requested: $50,000
Summary: The proposed project will develop a conceptual paper which describes the application of a General Case model to teaching generalized communication skills to persons with severe disabilities. In addition, a research study will be conducted which will compare both more typical and General Case approaches to teaching functional communication skills to learners with severe disabilities.



Our apologies to Gary Larson.
It's been fun!

Carol and Mark

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