# EXPERIMENTAL ANALYSIS OF HUMAN BEHAVIOR BULLETIN

Volume 14 Spring 1996 Number 1

## 1996 WINNING STUDENT PAPER SUMMARIES



## INVITED PAPERS



## 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 inside back cover has information about joining the SIG. Publication costs are paid by the dues of the SIG members and by the Parsons Research Center of the University of Kansas.

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We would like to thank Donna Dutcher, Mark Johnston, and Kathy Morris for help with this issue.


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# 1996 WINNING STUDENT PAPER SUMMARIES

## EQUIVALENCE CLASS FORMATION AND COMPLEX STIMULI: EMERGENT ARBITRARY MATCH TO SAMPLE VIA IDENTITY MATCHING TO COMPLEX SAMPLES

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Stimulus equivalence research generally employs simple stimuli, but recent studies have begun to explore emergent stimulus relations that result when complex (compound) stimuli are incorporated (e.g., stimuli that may have multiple elements which exert control over behavior). One noteworthy finding is that, when complex stimuli are used in matching-to-sample (MTS) procedures, the elements comprising those stimuli can come to function as members of an emergent equivalence class (Markham & Dougher, 1993; Stromer & Mackay, 1992). Because the stimuli contain multiple elements, the explicit training of relatively few stimulus relations results in a high yield of emergent relations. Table 1 shows the contrast between a single-element and a multi-element approach to creating a three-member stimulus class.

Two studies were conducted, using identity MTS, to increase the number of emergent relations yielded from training with complex stimuli. Experiment 1 (a) employed complex stimuli consisting of more elements than in previous studies, while (b) programming a common element between pairs of complex sample stimuli in an attempt to promote a merger of stimulus classes. The yield: 84 emergent arbitrary relations from 12 trained identity relations.

College students (3 M, 3 F) earned extra credit in psychology courses contingent on their MTS selections. A briefly-delayed MTS procedure was used to train identity relations between four element (three visual and one auditory) sample stimuli and comparison stimuli consisting, on each trial, of one of the visual elements of the sample. Across trials, all three visual sample elements served as the correct comparison. In Phase 1, two different complex samples were intermingled within both training and testing sessions. During emergent relations tests, elements from each complex sample were presented as single-element sample and comparison stimuli on arbitrary MTS tasks. For example, among the relations tested following training of the relation ABCD-B would be B→C and C→A. Phase 2 was a direct replication of Phase 1 using two new four-element samples, each sharing an auditory element with one of the samples in Phase 1. In Phase 3, emergent relations tests assessed whether individual elements from the complex stimuli sharing a common auditory element had merged to form seven-member stimulus classes. The mean percent correct for all six subjects across all 84 possible emergent relations was 97%, SE = .004.

Results like those of Experiment 1 have applied promise because of (a) low error rates in training and testing, (b) a high ratio of emergent to trained relations, and (c) the use, as a basis of training, of identity matching, which may be easier for persons with developmental limitations to acquire than the arbitrary relations usually used in equivalence procedures. Experiment 2 explored this promise by systematically replicating procedures of the first study to teach vowel and consonant classification to two adolescents with moderate mental retardation. Training 8 identity relations engendered 32 arbitrary MTS relations and 40 additional generalized performances (oral naming and recognition within the context of words). These performances were maintained in follow-up testing after 6 weeks of no experimental sessions.

Table 1

| Type of Training | Trained Relations | Emergent Relations | Yield (Emergent: Trained) |
|---|---|---|---|
| Single element | A-B<br>B-C | A-A, B-B, C-C, B-A, C-B, A-C, C-A | 3.5 : 1 |
| Multi-element | AB-C | A-A, B-B, C-C, B-A, A-B, A-C, C-A, B-C, C-B, C-AB | 10 : 1 |

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# *RESPONSE ALLOCATION TO STEREOTYPY: SYSTEMATIC REPLICATION OF GREEN & STRIEFEL (1988) WITH STUDENTS WITH MENTAL RETARDATION*

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In determining whether reinforcement is responsible for the increase in an instrumental response (e.g., on-task work behavior), the instrumental response is analyzed in terms of the effect of (a) the contingency and (b) deprivation of the contingent response (e.g., consumption of a preferred edible; Diorio & Konarski, 1989). In a closed behavioral system, where responses are mutually exclusive, the establishment of a reinforcement contingency induces time previously allocated to the contingent response to other available responses. Therefore, restriction of the high-probability (contingent) response may result in increases in the low-probability (instrumental) response independent of a contingency. To separate deprivation effects from contingency effects on the instrumental response, experimental paradigms manipulate environments containing more than two possible responses. Such investigations could establish a rule for time reallocation after response deprivation in a multi-response context.

Green and Striefel (1988) provided preferred materials to children with autism, reduced the array of materials available, and measured the reallocation of time to other responses. The results supported the selective substitution rule proposed by Bernstein and Ebbesen (1978), which stated that the restriction of a higher-probability item causes the reallocation of time to one lower-probability item. Green and Striefel (1988) expanded the rule to include reallocation of time to one or two lower-probability items.

The present systematic replication exposed four male adolescent students with severe or profound mental retardation (MR) to decreasing numbers of preferred materials. A bar code data collection system permitted the concurrent duration measurement of interaction with four sets of materials appropriately and stereotypically; the duration of stereotypy not involving materials; and a default category for any other behavior. Discrete occurrences of aggression and attempts to leave the area were also recorded.

The design consisted of a single-subject reversal (ABCDA) for each student within a multiple baseline across students. The initial baseline consisted of four sets of materials with which the student could interact. After the condition met a stability criterion, removal of the highest probability response (the response with the highest mean percentage of interaction time during the condition) created the next condition, which presented the three remaining sets of materials to the student. The procedure continued until one set of materials remained with which the student could interact. Finally, the initial baseline consisting of four sets of materials was reintroduced.

The results indicated that the distribution of time after response deprivation was idiosyncratic for each student. These students allocated their time principally to stereotypic behavior with materials when the number of sets of materials available was high. Contrary to the belief that persons with MR engage in self-stimulatory behavior due to restriction from engagement with materials, these students spent very little time engaged in stereotypy not involving materials, even when the number of materials available decreased. Rather, time allocated to appropriate interaction with materials increased. The low incidence of aggression and attempts to leave the area suggest the use of response restriction to evaluate potentially reinforcing activities without occasioning destructive behavior. The results did not support a comprehensive rule for predicting response reallocation.

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# *THE EFFECTS OF A POINT-LOSS CONTINGENCY ON EQUIVALENCE*

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The present experiment examined the effects of a point-loss contingency for symmetrical performances on other derived relation performances, on the emergence of equivalence performances in another context, and on derived relation performances in a context where point loss was never introduced.

Three undergraduates at the University of North Texas participated as subjects. All training and testing occurred on an IBM-compatible 386 personal computer. Three sets of 9, two-dimensional figures were used as stimuli (shaded figures, thin-lined figures, & thick-lined figures). Each session was composed of 3 subsessions, one for each stimulus set (e.g., Subsession #1 presented shaded set only, Subsession #2 presented thick set only, etc.). The order in which each set was delivered varied across sessions, and no subsession mixed stimulus sets.

Subjects used the left most button on the computer's mouse to select. "Correct" selections on original relation trials resulted in a "+1 point" on the computer screen, "incorrect" selections resulted in a 1 s ITI (Inter-Trial Interval) followed by presentation of the next trial. Performances on probe trials, "correct" or "incorrect," resulted in a 1 s ITI followed by presentation of the next trial. During point loss sessions selecting the "correct" symmetrical comparison on symmetry trials (BA & CB) resulted in a "-1 point" on the computer screen. Points were exchangeable at a rate of $.01 per point and subjects were paid after each session for the total number earned.

Subjects were taught three pairs of conditional discriminations in each of three different contexts (e.g., shaded stimuli: A1B1, A2B2, A3B3, B1C1, B2C2, B3C3). After training and reinforcement reductions (to 25%), probe trials were interspersed among original relation trials in stimulus Sets 1 and 2, while in Set 3, only original relation trials were delivered. After symmetrical, transitive, and symmetrically transitive performances were observed in Sets 1 and 2, the point-loss contingency was placed on symmetrical performances in one of these sets. During this same session both probe trials and point loss for symmetry were *simultaneously* introduced in the third set. Point loss only followed symmetrical performances, not all probe trial performances.

Point loss suppressed symmetrical performances for Subjects 1 and 2, suppressed symmetrical transitive performances for Subject 2, and had no effect on performances for Subject 3. While symmetrical performances were suppressed for Subject 1, transitive, symmetrically transitive, and original relation performances remained consistent with the originally trained relations for this subject. A similar partitioning of equivalence performances was observed with Subject 2.

The simultaneous introduction of point loss and probes did not disrupt the emergence of equivalence for Subjects 2 and 3. Performances were initially disrupted for Subject 1, however symmetrical performances were immediately suppressed while the remaining derived relation performances emerged. The point-loss contingency in two contexts also disrupted performances in the third context, where point loss was never introduced.

A closer analysis of the suppressed performances revealed systematic responding; selections on these trial types (symmetry and/or symmetrical transitivity trials) were equally distributed between the two "incorrect" comparisons. Such results are consistent with Carrigan and Sidman's (1992) analysis of control by negative stimuli. Even though the subject is recorded as alternating between the two negative comparisons, the positive comparison in being rejected controls the recorded choice ("type R" control). These results suggest that delivering point loss for one derived relation performance of an equivalence class while maintaining original relation performances (25% Sr) may establish "type R" conditional stimulus control relations for some derived conditional discriminations of an equivalence class and not others.

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# *INVITED PAPERS*

## *A HOME FOR HUMAN OPERANT RESEARCH: CONTRIBUTIONS OF THE PSYCHOLOGICAL RECORD*

WILLIAM BUSKIST, THOMAS R. SHERBURNE, AND THOMAS S. CRITCHFIELD
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The Experimental Analysis of Human Behavior (EAHB) plays an increasingly prominent role in the scholarly data base of behavior analysis (e.g., Cataldo & Brady, 1994; Hyten & Reilly, 1992; Dougherty, Nedelman, & Alfred, 1993). But such was not always the case. After surveying the relevant literature, Buskist and Miller (1982a) found *EAHB* publication rates to "paint a rather cheerless picture of experimental activity" (p. 139) in the area. Perhaps reflecting this state of affairs, discussions at early business meetings of the EAHB Special Interest Group often focused on the desirability of founding a new journal devoted only to publishing EAHB reports. The discussion was lively and sometimes heated. Advocates of a new journal argued that (a) enough EAHB research was being conducted to warrant a new publication outlet, but (b) editors of the *Journal of the Experimental Analysis of Behavior* (*JEAB*) tended to be insensitive to the peculiarities of EAHB, and therefore (c) the survival of EAHB might depend on a publication outlet that was more tolerant to deviations from standard operating procedures of the animal laboratory. Critics of the proposed new journal argued that (a) such a publication could potentially harm *JEAB*, because submissions were down at the time, and a new journal would stand in direct competition for a limited number of research reports; (b) the mission of the new journal was functionally redundant with that of *JEAB*; and (c) it would be counterproductive to fracture, along species lines, a behavior analytic community already struggling with the tenuous relationship between basic and applied enterprises.

Obviously, a separate EAHB journal was not founded and *JEAB* remains vital. Because animal operant psychology may be on the wane in an actuarial sense (Hyten & Reilly, 1992), and because a growing proportion of *JEAB* reports describe EAHB research (Dougherty et al., 1993), critics of the proposed new journal may have been prescient in their concerns. *JEAB* may well have followed a different course of development had a separate EAHB journal been founded. Nevertheless, alternative outlets have played a role in nurturing EAHB research, as separate-journal advocates assumed. Rather than establish an alternative to *JEAB*, many EAHB researchers submitted their work to an existing journal, *The Psychological Record*, which in its current format has published a broad range of experimental and theoretical articles since 1956. From the outset, the *Record* was friendly to operant work, including human studies (e.g., Rice & McDaniel, 1966; Schoelkopf & Orlando, 1966). Especially since about 1980, the *Record* has played an important and progressive role in publishing EAHB reports. Nearly as many EAHB articles have appeared in the *Record* during that interval as in *JEAB* (see Figure 1), and the *Record* often contains more EAHB papers per issue than *JEAB* (see Figure 2).

EAHB articles published in the *Record* have had measurable impact. To date, the EAHB *Record* articles most often cited in *JEAB* (excluding self-citations) are, in order of decreasing frequency: Baron and Galizio (1983), Navarick (1986), Weiner (1983), Buskist and Miller (1981), and Kennedy and Laitinen (1988). Other less-cited studies published in the *Record* have been creative in topic or approach and probably deserve more attention than they have received. For example, Wurster and Griffiths (1979) presented one of the few analyses to date of reinforcer magnitude effects on human concurrent schedule performance; Weiner (1971) described a rare systematic analysis of the effects on human schedule performance of varying reinforcer type; and Baron and Journey (1989) showed that response latency can vary as a function of response mode (manual versus vocal), an outcome that could present a stimulating challenge for operant theory. Additionally, the *Record* has published conceptual and review papers that might not appear in other journals, a case in point of which is Barnes' (1994) coherent summary of the "relational frame theory" of emergent stimulus relations. (For other recent examples, see Barnes & Holmes, 1991; Bickel, 1987; Overskeid, 1992, with related commentaries published in subsequent issues; and Verhave, 1993.)

The *Record* has devoted two special issues to the experimental analysis of human behavior. The first, published in 1983 (Number 4), addressed the current status and pressing problems of an emerging research area. The second, published in 1993 (Number 4), incorporates the proceedings of a meeting of the Society for the Quantitative Analysis of Behavior on stimulus equivalence. In addition, the *Record* (1987, Number 1) published the proceedings of a 1985 symposium at the American Psychological Association convention that focussed on the "history, current status, and future" of EAHB, and as well as two

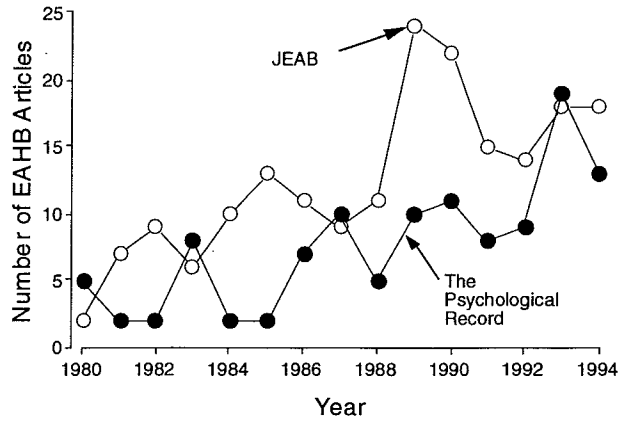


Figure 1

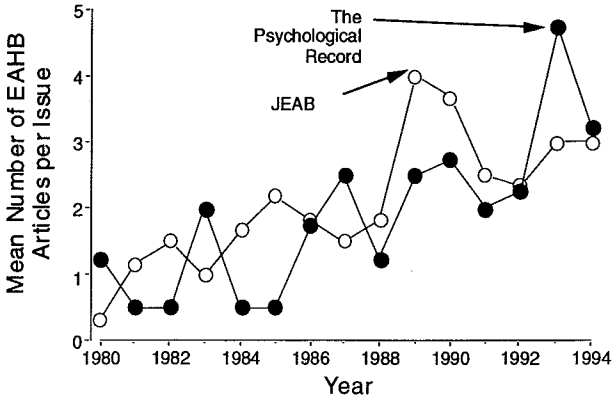


Figure 2

bibliographies of the human operant literature (Buskist & Miller, 1982b; Dougherty et al., 1993).

In summary, as we celebrate the growing presence of EAHB in JEAB as a positive indicator of the general health of the field (Hyten & Reilly, 1992), we should also acknowledge our debt to the "other home" for EAHB research. *The Psychological Record* has encouraged exploration and synthesis that, judging by *JEAB* citation patterns, has indeed influenced the broader EAHB audience. It remains an important outlet for EAHB work. Perhaps best of all, the journal is one of the best bargains among psychology periodicals, at $30 per year for professional subscriptions and $20 for student subscriptions. For subscription information, write to *The Psychological Record,* Gambier, OH 43022.

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## ANNUAL MEETING OF THE EAHB SIG

All members and persons interested in the future of basic human research are invited to attend. Sunday evening, 6:30 - 7:20 PM, May 26, 1996 at ABA in the Yerba Buena Ballroom (Salon 15).

ELECTION: This year we must "elect" a new Sig Chair(s)/Bulletin Editor(s). So all members better show up or you may be "elected." If you have any nominations prior to the meeting--write, call, or email them to Tom or Dean (see inside cover).

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## STUDENT PAPER SESSION AND AWARD PRESENTATION AT ABA '96

The annual symposium of award winning student papers will take place at 9:00 to 10:20 AM Monday, May 27 in Pacific Suite I. Come to the symposium to hear these promising young scientists and scholars present their outstanding work in person and to contribute to the future of Behavior Analysis by reinforcing our students' fine work.

# *EXPERIMENTAL ANALYSIS OF RESPONDENT CONDITIONING IN HUMANS: A PRIMER AND CALL TO ACTION*

MICHAEL R. MARKHAM, EMILY BRANSCUM, CARLOS G. FINLAY, AND RANDALL A. ROARK
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In mainstream psychology, interest in respondent conditioning (also termed classical or Pavlovian conditioning) has declined substantially during the past 30 years, an outcome that Rescorla (1988) attributes to two widely held misunderstandings of respondent conditioning. One is that respondent conditioning is already well understood and needs no further investigation. Another is that respondent conditioning is a simple, mechanistic process built around stimulus contiguity. Recent analyses, however, make it clear that respondent conditioning is a complex and incompletely understood process (Rescorla, 1988; Donahoe, Burgos, & Palmer, 1993).

Behavior analysts also have paid relatively little attention to respondent conditioning, although probably for different reasons. In his early work, Skinner distinguished operant from respondent conditioning and thereafter focused on control by consequences rather than antecedent stimuli. Skinner (e.g., 1953) also noted that respondent conditioning can occur only with a relatively limited range of elicited behaviors, making operant behavior more relevant to human affairs. Thus, the very tradition of behavior analysis began with an emphasis on operant conditioning rather than respondent conditioning. Subsequent progress in the experimental analysis of operant behavior, and in the application of operant principles, has further concentrated research efforts on operant behavior.

We contend, however, that respondent conditioning is an important and interesting learning process that merits investigation by behavior analysts. Below, we stress the importance of the experimental analysis of respondent conditioning in humans, and discuss several issues relevant to instrumentation, methodology, and interpretation.

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We welcome interactions with anyone interested in human respondent conditioning. Send comments, inquiries, and requests for our Windows-compatible software program for monitoring and recording response data from an analog-digital conversion card to: Michael Markham, Department of Psychology, Florida International University, University Park, Miami, FL 33199 (Internet: markham@solix).

## WHY STUDY RESPONDENT CONDITIONING IN HUMANS?

### *Basic Science Considerations*

Respondent conditioning merits investigation as a basic learning process, and thus as an essential part of a complete account of behavior. Although our understanding of respondent learning is far from complete (Rescorla, 1988), it is now clear that respondent conditioning is a complex contextual process that results, not from mechanistic stimulus-response associations forged by stimulus contiguity, but rather from contingent relations among behavioral and environmental events. Some authors have argued that operant and respondent conditioning be reconsidered as different facets of a single learning process (e.g., Donahoe et al., 1993; Donahoe & Palmer, 1994). The success of a unified account will certainly depend on continued analyses of both operant and respondent learning. Additionally, it is possible that interactions with verbal behavior might impart unique characteristics to respondent phenomena in humans (Augustson, Markham, & Dougher, 1994; Dougher, Augustson, Markham, Greenway, & Wulfert, 1994). If so, even "fundamental" respondent phenomena reported in the animal literature may require parallel investigation with human subjects. Finally, most of our knowledge of respondent conditioning comes from hypothetical-deductive methods and conclusions based on averaged group data. Many existing published reports may overlook important variables that can be discovered through precise experimental analyses of respondent conditioning in individual subjects.

### *Everyday Relevance*

Although relatively few behaviors may undergo respondent conditioning, these behaviors can have a profound influence on an organism. For example, respondent conditioning has been shown to influence immune system suppression (Rogers, Reich, Strom, & Carpenter, 1976), immune system activation (Jenkins, Chadwick, & Nevin, 1993), allergic reactions (Kierulff, 1984), asthma (Kierulff, 1984; Miller & Kotses, 1995), anxiety (Edelmann, 1992), and drug

tolerance (Siegel, Hinson, Krank, & McCully, 1982).

Respondent conditioning also may be relevant to the explanation of emotions (e.g., Skinner, 1953), whether viewed as behaviors (as in the behavior analytic tradition), or as causes of behavior (as in other traditions). We expect a thoroughgoing experimental analysis to directly support the behavior analytic position that emotions are not first causes of behavior.

It has long been assumed — without adequate empirical support — that respondent conditioning is an important foundation of psychopathology and psychotherapy for selected disorders (Ross, 1981). Recent writings have attempted to recast a variety of clinical problems in terms of futile efforts by clients to control and avoid respondently-conditioned emotional responses that, by their nature, are inevitable and uncontrollable (Dougher, 1993; Hayes & Wilson, 1994). The exact role of respondent conditioning in the etiology, maintenance, and treatment of clinical disorders awaits further investigation.

## LOGISTICAL ISSUES IN RESPONDENT CONDITIONING RESEARCH WITH HUMANS

We turn now turn to a discussion of the logistics of conducting respondent conditioning research with humans. Preparations used to study respondent conditioning in humans have included the conditioning of heart rate changes, pupillary dilation or constriction, finger withdrawal, tickle withdrawal, eyeblinks, and skin conductance changes (galvanic skin response). Of these, the two most widely used preparations are skin-conductance and eyeblink conditioning. Fortunately, both preparations are relatively easy to set up and can be implemented inexpensively by constructing equipment from readily available parts.

### *Instrumentation*

It is relatively easy to establish a laboratory for studying respondent conditioning in humans once a few specialized needs are met. Because the most commonly used procedures are sensitive to small disturbances such as noise and lighting changes, it is important to isolate subjects in a quiet room, with control equipment located elsewhere. In addition, we use white noise amplified through a speaker in the subject room to mask extraneous noise.

The computer controlling the experiments should be equipped with an analog/digital (A/D) conversion card to allow the recording of skin conductance or eyeblinks. An excellent, inexpensive choice is PC Cards model CIO-DAS801. Commercial software can be purchased for monitoring and recording incoming data from the A/D card, but we have developed our own Windows-compatible software package. This is available on request. Of course, each conditioning preparation requires specialized equipment for delivering the appropriate unconditioned stimulus (US) and recording the response of interest. In our laboratory, we have built most of this equipment and have been pleased with the low cost, ease of repair, and potential for customization.

The recording of skin conductance requires sensor electrodes, a signal conditioner, and a signal amplifier. Many commercial suppliers can provide this equipment, or it can be constructed following the advice of published sources (e.g., Fowles, Christie, Edelberg, Grings, Lykken, & Venables, 1981; Lowry, 1977; Venables & Christie, 1980). The most common US for skin conductance conditioning is mild electric shock (1.0 - 2.0 mA) delivered to the exterior forearm. Shock electrodes are attached using a neoprene arm band with 1-cm nickel plated electrodes placed 2 cm apart on the armband. Several related technical considerations in skin-conductance conditioning are discussed by Augustson et al. (1994). An interesting and promising alternative to using shock as a US is the use of sexually-explicit films (Roche & Barnes, 1995).

To detect and record eyeblinks, we use a pair of protective goggles with an infrared emitter and detector attached to a movable apparatus positioned in front of the subject's left eye. A similar arrangement is described by Oster and Stern (1980). The infrared light is reflected by the subject's eye and detected by the infrared sensor. Eyeblinks disrupt the reflected infrared beam. These disruptions are amplified and recorded by the computer. Any bioamplifier can be used for this purpose. We use a small custom-constructed amplifier. The best US for eliciting eyeblinks is a puff of air or neutral gas delivered through a small (3-mm) vinyl tube to the subject's cornea or just below the subject's eye. We use an airpuff delivered below the eye to minimize risk and discomfort. The airpuff can be a compressed gas, usually nitrogen or medical oxygen, controlled by a pressure regulator. The air puff is filtered and turned on/off electronically by a small solenoid valve.

Suggested methods for skin conductance conditioning are described elsewhere (Dougher et al. 1994; Augustson, et al. 1994; Fowles et al., 1981). The currently accepted standards for recording and scoring skin conductance are those proposed by

Fowles et al. (1981) and Venables and Christie (1980). For eyeblink conditioning, a useful resource is Oster and Stern (1980).

## OTHER CONSIDERATIONS

*Operant Control of the Target Behavior*

A persistent concern in the study of human respondent conditioning is the fact that elicited behaviors can also come under operant control. The biofeedback literature shows that skin conductance can be brought under operant control, and so far there appears to be no way of distinguishing operant from respondent skin conductance responses. Eyeblinks, too, can come under operant control, but there is some evidence suggesting that it is possible to distinguish operant from respondent eyeblinks (Coleman & Webster, 1988). Although inter-subject variability in blink topography complicates this process, we believe that we have been able to distinguish operant from respondent eyeblinks in at least some subjects. If operant and respondent eyeblinks can be reliably distinguished, then this work may provide a fertile arena for studying operant-respondent interactions in humans.

A related concern is the possibility of verbal control over putative respondents (Augustson et al. 1994). Conditioned responses may sometimes be elicited or evoked by subjects' verbal behavior during the experiment. Because normal humans are distinctly verbal creatures, however, it may be a mistake to regard verbal control of the putative respondent strictly as a contamination of the respondent procedure. Rather, such an effect may exemplify the complex and dynamic relations involving human respondent behavior that await further study. If verbal behavior and respondent conditioning interact, for example, then it is possible that respondent conditioning may occur differently in humans than in non-humans, something which only extensive empirical work can tell us for certain.

*Constraints on Interpretation*

A behavior analytic account must explain respondent conditioning in terms of environment-behavior relations rather than constructs inferred from the conditioning data. Extreme caution should be exercised in making inferences about unobserved events based on respondent behavior. Consider, for example, that skin conductance responses have been used to infer anxiety, fear, arousal, attention, reward expectancies and many other events (Stern & Wolrath, 1977)—yet in all cases the form of the skin conductance responses is identical. All skin conductance responses, in fact, reflect sympathetic nervous system arousal (Dawson, Schell, & Filion, 1990), which could result from a wide range of events.

*Conclusion*

The goal of this discussion has been to stimulate interest in human respondent conditioning research and to facilitate the development of other labs. Setting up a lab for respondent conditioning is relatively easy and can be accomplished with the guidance of a few sources listed here. As in all research areas, standard technical considerations and problems must not be overlooked. Yet, as in all research areas, many potential problems can be viewed as promising avenues of research. Behavior analysts, perhaps more than anyone, are well suited to conduct the needed research.

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## CALL FOR SUBMISSIONS

Manuscripts in all categories listed on the inside front cover of the *Bulletin* are sought on an ongoing basis. In the category of Brief Reports, negative results and direct replications are reasonable topics for manuscripts in addition to the usual types of empirical papers.

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See the inside, front cover of the *Bulletin* for submission guidelines

# *BEHAVIOR ANALYSIS RESEARCH IN JABA: A NEED FOR STUDIES THAT BRIDGE BASIC AND APPLIED RESEARCH*

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A remarkable trend emerged in research published in *JABA* during Nancy Neef's tenure as editor (1992-1995). Via a variety of initiatives (most notably the "Developments in Basic Research" essays and the special issue on "Integrating Basic and Applied Research"), an increased number of articles were published that sought to establish a connection between basic and applied research. As discussed by Mace and Wacker (1994), and much earlier by Hake (1982), there exists in behavior analysis an exciting possibility of reciprocity between basic and applied research. As socially relevant problems are encountered that prove to be difficult to treat, findings from basic research can stimulate changes in current treatment as well as occasion the design of specific basic analogue studies. As systematic replications are published in the applied literature, difficulties in application can be used to generate further basic research. For example, current applied research on the dimensions of reinforcement that influence choice responding (e.g., Neef, Shade, & Miller, 1994) is directly linked to basic research on concurrent operants.

As discussed by Mace (1994), the primary positive outcome of this reciprocity in the applied literature is the development of new treatments that are based directly on basic laboratory research (e.g., use of high probability requests to increase persistence of compliance). However, reciprocity has also led to some fundamental changes in the way applied treatments are studied and discussed. For example, we now see fewer studies in *JABA* that compare Treatment A to Treatment B. Instead, an increasing number of studies evaluate the conditions under which various treatments may be effective and the mechanisms that underlie behavioral changes occurring within a specified treatment. These types of analytical studies both improve our treatments and identify gaps in our knowledge that require increased study of a given mechanism.

After more than a decade of various calls for greater integration of basic and applied research, *JABA* has begun to establish a history that, while still quite brief and tentative, is making progress toward the goal of greater integration. Although cross citations between applied (e.g., *JABA*) and basic (e.g., *JEAB*) journals remain low (Poling, Alling, & Fuqua, 1994), the trend of applied researchers referencing basic research appears to be increasing. My optimism for this trend continuing to increase is based on two developments in applied behavior analysis. The first development is the rapid increase in the use of experimental (functional) analysis approaches to assessing aberrant behavior. The second is the application of similar analytical approaches to other socially relevant behavior.

## FUNCTIONAL ANALYSIS OF ABERRANT BEHAVIOR

The history and current applications of functional analysis as an assessment of aberrant behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982, 1994) were well-documented in a special issue of *JABA* (1994, Volume 27, Number 2). Of primary importance to the current discussion is that functional analysis provides a systematic, analytical method for identifying the variables maintaining aberrant behavior. It is based on a well-conceptualized model of the possible operant influences on aberrant behavior (Carr, 1977) and involves tightly conducted conditions that represented those influences within single-case designs. This assessment methodology is of particular interest because it involves analogue conditions. Although each analogue condition represents possible "real-life" situations (e.g., periods of low attention coupled with contingent attention for aberrant behavior), the construction of the conditions as analogues (i.e., tightly controlled, extended analyses of steady-state behavior) rather than as simulations (i.e., representative samples of real-life situations) permits far greater control over the reinforcers that maintain aberrant behavior. Thus, the methodology provides a more precise analysis of the variables affecting target behavior than any previous behavioral assessment of aberrant behavior.

The widespread acceptance of this methodology by practitioners, as well as by applied researchers, is noteworthy and illustrates the power of basing practice on direct links to basic processes. The assessment is an analysis of dimensions of reinforcement that maintain behavior under specified

conditions. Although assessment is based on analogue conditions, the results provide information that practitioners can use to develop highly effective treatments, leading to a rather profound change in the way that clinical services are provided (Wacker et al., 1994). Of equal importance is that the assessments, because they are conducted as analogues, increase our basic knowledge of aberrant behavior. Treatment failures then become more a matter of increased study (in both the basic and applied literatures) than of increased frustration.

Most of the initial studies involving functional analysis of aberrant behavior emphasized control over behavior during assessment (e.g., via multielement designs) rather than during treatment. The treatment phase was often implemented only as a social validation of the utility of assessment, and it was common to simply indicate that treatment was "matched" to the results of assessment. This is noteworthy because the analysis of behavior within analogue conditions took priority over the analysis of the effects of treatment. The implication here is that the more precise and thorough our assessment, the better our treatment. This represents a departure from most applied studies in the literature that historically have focused on the effects of a given treatment on aberrant behavior.

When the initial link between assessment and treatment of aberrant behavior was replicated, the focus of applied researchers quickly shifted to developing better and more creative treatments. The analyses conducted in these studies focused as much on the mechanisms responsible for behavior change as on the changes observed in behavior. Preceding treatment with a functional analysis allowed for a more precise identification of the mechanisms underlying behavior. Studies emerged reporting treatments based on basic studies of concurrent operants, establishing operations, behavioral persistence, and stimulus control. Two other very fruitful trends in the applied literature were correlated with the development of this approach. First, a new conceptually-based treatment technology emerged that emphasized social validity (e. g., Carr & Durand, 1985). Second, conceptual analyses of variables such as negative reinforcement (Iwata, 1987) served to stimulate further applied work on specific operant functions. These outcomes in the applied literature on aberrant behavior provide a striking example of the applied benefits of reciprocity.

*Application to Other Topographies of Behavior*

The analytical model used to develop and expand functional analyses of aberrant behavior is now stimulating the development of similar approaches to other socially meaningful behavior, such as academic performance (Neef et al., 1994) eating disorders (Kerwin, Ahearn, Eicher, & Burd, 1995), and compliance to adult requests (Cooper et al., 1992). In most cases, these researchers conducted analyses of the mechanisms underlying behavior concurrent with analyses of the outcomes (social validity) of treatment. The basic research on response allocation (choice) and behavioral economics is, for example, well-represented in this emerging literature. Thus, the link between basic and applied research is expanding within the applied literature, and the application of basic processes in applied research published in *JABA* has never been more evident.

*Studies that Bridge Basic and Applied Research*

As we continue to more closely link basic and applied research, the categorical distinction between these types of studies should be replaced with the view that research in behavior analysis exists along a continuum (Hake, 1982). The categorical description of a study as basic or applied is evident only for studies on either end of the continuum, leaving the middle area of the continuum more relative than categorical. If we were to plot the studies published to date relative to their placement on the continuum, a u-shaped curve would emerge. Studies in the middle section of the curve provide the link that keeps the curve intact. These types of studies are of critical importance because they provide the bridge that is necessary for the reciprocal relationship discussed previously.

A potential dilemma for these bridge studies is their place for dissemination in our literature. I am concerned that while we discuss the importance of establishing connections, the authors who seek to provide these links via their research will not be reinforced by editorial boards. I am firmly convinced that now is the time for *JABA* to provide an outlet for bridge studies. This transition will likely be difficult at first because bridge studies will continue to represent a small proportion of the studies submitted to *JABA*. For this reason, reviewers for applied journals may express concerns regarding the social validity of bridge studies. Analyses of socially relevant behavior must continue to be the primary focus of *JABA*, but there is a place for studies that take the initial steps necessary to more firmly establish the link between

basic and applied research. On occasion, those steps will be rather large (e.g., the studies by Neef and her colleagues on choice responding), but studies that take smaller steps also should be welcome.

If we return again to the view that research in behavior analysis exists on a continuum and that the studies published can be plotted on a u-shaped curve, we can perhaps discriminate two overlapping distributions of studies. On one side of the continuum are studies that present mostly basic research, and on the other side are the applied studies. Using *JABA* and *JEAB* as exemplars, the distribution of both sets of studies are skewed, with the tails of the distributions comprising the explicit links that bridge applied and basic research. I am not suggesting that the tails of these distributions be extended but that the frequency of bridge studies appearing in our field be increased in proportion to the overall curve. Thus, the curves will remain skewed, but the tails will be more pronounced in elevation rather than in length.

Mace (1994) provided an elegant discussion of the benefits of basic and applied researchers collaborating on topics of mutual interest. His research has also shown some of the difficulties encountered by applied researchers who seek to replicate the findings from basic research (Mace, Neef, Shade, & Mauro, 1994). As described in these articles, there is much potential benefit for both applied and basic researchers in designing and publishing studies that replicate basic research.

For basic researchers who study human behavior, some of the research issues may surround the robustness of an effect. How many mutations are possible before the applied researcher is actually studying something quite different from what was initially studied in the laboratory? There are, of course, substantial methodological differences between basic and applied studies that make it unclear if there really is much of a link between given sets of applied and basic studies. As an example, Peck (1994) recently completed an analysis of choice responding with toddlers who were admitted to a pediatric unit. The toddlers were admitted for long periods of time due to repeated surgeries and had central lines and tubes attached to monitoring equipment. When a line was pulled hard enough, alarms sounded and nursing staff provided immediate attention. Treatment consisted of providing the toddlers with a different "mand" to gain attention.

This is a two-choice situation with both response alternatives (pulling a line and manding appropriately) resulting in the same reinforcer. Given that both responses always received reinforcement, a concurrent operants paradigm was present. Unfortunately, attention was not completely controlled (noncontingent attention by family and medical staff was provided on a random basis), other sources of potential reinforcers were available (e.g., toys), and various dimensions of reinforcement changed in a dynamic fashion relative to the health of the child, the schedule of the nurses, and so forth. In other words, the mutations from more basic research on concurrent operants were extensive in both total number and variation of any given mutation. Despite these mutations, the treatment was successful. In addition to pointing out these differences (and being careful relative to terminology), discussion sections should highlight the various mutations of most concern and therefore of most interest. In this way, applied researchers can offer some guidance for topics that more basic researchers can address in their laboratories. My point here is that, if basic researchers then address some of the issues encountered by applied researchers, a more complete reciprocal relationship will exist. *JABA* must reinforce the efforts of basic researchers to address these questions even if the research completed does not, in and of itself, have obvious social validity. The types of bridge studies that should be welcomed in *JABA* include those that take the small but needed steps to address problems encountered by applied researchers.

There are many examples of these issues that are currently appearing in *JABA*. With applied problems, such as feeding disorders, the behavioral economic system is seldom closed. In these same situations, a dynamic combination of negative (food avoidance) and positive (preferred foods, attention) reinforcement schedules occur over the course of treatment. The child's history of reinforcement further interacts with current schedules. Relative to applications of concurrent operants, the effects of verbal rules, value of reinforcement, and change over delays interact in unknown ways. Socially valid studies can seldom be controlled sufficiently to offer a precise accounting of the relative influence of these variables at different points in time during treatment. Basic research with humans can better isolate these variables and thus offer specific guidance on how variables may interact during the course of treatment. Describing the purpose of a basic study in applied terms can provide a bridge between basic and applied research that will be of interest to many applied researches. *JABA* is committed to publishing those types of studies because of their implications for socially relevant behavior.

*Summary*

The need for establishing links between basic and applied research has been discussed repeatedly for over a decade. The research in functional analysis of aberrant behavior provides one example of how this link can have a dramatic and durable effect on applied practice. The initiatives established by Neef during her tenure as Editor of *JABA* to strengthen these links will continue during my tenure as Editor and, I hope, will continue to increase the number of bridge studies published in *JABA*. Although the priorities for *JABA* are unchanged, there is sufficient room for a subset of studies that explicitly seek to link basic to applied research. In this way, the reciprocal aspect of the connection will be made more complete.

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## DR. SIG THANKS OUTGOING EDITORIAL BOARD MEMBERS

This issue marks the end of Editorial Board terms for Philip Chase, Bill Dube, Mark Galizio, Bill McIlvane, Mike Perone, Carol Pilgrim, and Kate Saunders, all of whom have served in some editorial capacity for the *Bulletin* continuously since the Editorial Board was formed in 1991. Dr. SIG gratefully acknowledges their years of service.

## SEABA 1996 ANNOUNCED

The 1996 Convention of the Southeastern Association for Behavior Analysis will take place October 10-12 in Wilmington, NC. The meeting offers a varied, single-track program of invited addresses that span all areas of behavior analysis. A call for posters will be issued during the summer. For information, contact Program Chair Philip N. Chase, Department of Psychology, West Virginia University, Box 6040, Morgantown, WV 26506-6040 (by internet: u24fd@wvnvm.wvnet.edu).

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## CALL FOR NOMINATIONS FOR EDITORIAL CONSULTANTS

This issue marks the creation of a panel of Editorial Consultants (listed on the inside front cover) to complement the role of the Editorial Board. The purpose of the panel is to integrate junior colleagues into the peer review process, formalizing a policy employed informally during the last 2 years. Editorial Consultants serve a 2-year term and function identically to members of the Editorial Board.

Those eligible for appointment as Editorial Consultants include advanced graduate students and recent graduates, including those holding both tenure-track and temporary (e.g., postdoctoral fellowship) positions. Nominees should have strong writing and editorial skills, be well acquainted with the peer review process, and have solid experience conducting and writing about EAHB research. Nominations must be sponsored by an established member of the EAHB-SIG. To make a nomination, send the nominee's curriculum vita and a letter of nomination to Dean Williams c/o the *Bulletin*.

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