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EXPERIMENTAL ANALYSIS OF HUMAN BEHAVIOR BULLETIN

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SPECIAL ISSUE: DEDICATED TO STUDENTS OF EAHB

ARTICLES

Thomas S. Critchfield	
The EAHB-Sig Student Paper Competition: A Decennial Retrospective	1
Thomas S. Critchfield	
Preparing a Successful Convention Presentation: A Listener's Perspective	4
Marshall Lev Dermer	
An Insider's Guide to Choosing a Graduate Adviser and Research Projects in Laboratory Sciences ..	7
Lawrence T. Stoddard	
Reminiscences and Some Early Data	11

SUMMARIES OF STUDENT PAPER COMPETITION WINNING PAPERS

Nancy C. Brady	
In the Beginning there was the Mand: A Review of Research on Teaching Mands to Individuals with Severely Limited Verbal Repertoires	15
Jan Jackson	
Thematic Match to Sample: Teaching Children Conditional Discriminations Without Verbal Instructions	16
Kathleen M. Dougherty	
Say-Do Correspondence: A Verbal Operant Analysis	17

MEMBER ACTIVITIES

Conference Presentation Abstracts	19
Grants Awarded to EAHB SIG Members	32
Recent Publications of EAHB SIG Members	35

ANNOUNCEMENTS

Erratum	19
Submissions for the Next Issue	36

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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Guidelines for Submissions

Please send three copies of brief reports and one copy of other materials. In addition, send one clearly labeled, reproduction quality copy of each figure or table. For general information on preparing materials for publication in the *Bulletin*, we encourage authors to consult the author guidelines in the January issue of the *Journal of the Experimental Analysis of Behavior*. If possible, send text and figures of final versions on disk.

Brief Reports and *Technical Information* should be no longer than 2,000 words. They can be written in APA style (without an abstract) or in summary form. Please prepare figures and tables to fit the column or page width of the *Bulletin*. Incorporate information typically included in figure captions in the text.

Research in Progress may be up to 1,000 words long.

Laboratory Descriptions (as in Spring, 1990 and Spring, 1991 issues) may be up to 2,000 words long (including publication list).

EAHB members have a standing invitation to submit *Abstracts* from posters and presentations given at conferences. Abstracts should be 200 words or less. Please include, on the same page as the abstract, the name and address of a contact person and a full citation for the presentation.

Please submit brief reports, technical information, and laboratory descriptions to Bill McIlvane (Behavioral Sciences Division, E. K. Shriver Center, 200 Trapelo Road, Waltham, MA 02254); submit research in progress, abstracts, and news to Kate Saunders (Parsons Research Center, P.O. Box 738, Parsons, KS 67357).

Submit brief reports and technical information by November 1 and all other materials by November 15 for the Fall, 1993 issue.

THE EAHB-SIG STUDENT PAPER COMPETITION: A DECENNIAL RETROSPECTIVE

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The last issue of the *Bulletin* carried a call for papers for the 10th Annual EAHB-SIG Student Paper Competition. With a 10-year anniversary on the horizon, a look back at the competition and the individuals it has recognized seems in order. What follows is a brief history and description of the Student Paper Competition, a look at the first nine years of award recipients and where they are now, plus some brief personal comments on the place of the competition in the special interest group's mission of supporting the experimental analysis of human behavior.

HISTORICAL CONTEXT

Chartered by the Association for Behavior Analysis in October, 1982, the EAHB-SIG was formed to "encourage the development of a large and varied literature reflecting the entire range of analytical questions which require human subjects' responding under relatively controlled laboratory environments" (Johnston, 1983, p. 1). Toward this end, the EAHB-SIG launched three initiatives: (a) the *Bulletin*, launched in 1983, which published primarily laboratory lore, bibliographies, program descriptions, and announcements; (b) a group poster session at the ABA convention, started in 1984, which streamlined submission procedures and ensured that basic human operant research could be found in one central location at the convention; and (c) the Student Paper Competition, begun in 1984, which originally was viewed as a way of directing bright students toward the special problems associated with human operant research. Only review and conceptual papers were solicited initially for the competition because relatively little systematic empirical work was being conducted with human subjects at the time (e.g., Buskist & Miller, 1982).

Today, as EAHB gains momentum (Hyten & Reilly, 1992), the EAHB-SIG's three initiatives reflect its robust state of health. The *Bulletin* has expanded and now regularly includes invited articles and brief empirical reports. The group poster session became obsolete and was discontinued. By 1991, with EAHB presentations flourishing at the ABA convention, members of the EAHB-SIG decided that a single venue for posters was no longer necessary. Finally,

the Student Paper Competition continues, with a shift in emphasis toward recognizing rather than promoting student work in EAHB. As EAHB expands, and as animal research facilities become more costly, more students are conducting basic EAHB research than perhaps at any time previously. Evidence comes from the types of papers submitted to the competition: Although review and conceptual papers continue to be appropriate, empirical reports make up an increasing proportion of competition submissions (e.g., 5 of the last 9 winning papers described experiments).

DETERMINATION OF AWARDS

The process of selecting papers for recognition has remained relatively constant over the first nine years of the competition. A Spring call for papers (i.e., manuscripts authored by students with minimal help from a faculty advisor) specifies a submission deadline in the early Fall. Established members of the EAHB-SIG and selected outside experts—a veritable Who's Who in the experimental analysis of behavior—serve as reviewers in a journal-format peer review process. Reviewers recommend awards based on the broad criteria of clarity, scholarship, thoroughness, and conceptual or methodological rigor. Importantly, the "competition" actually is noncompetitive. All papers recommended for an award receive recognition. Recognition currently consists of publication of a summary of each paper in the *Bulletin*; an invitation to present the paper at a special awards symposium at the ABA Convention (the invitation includes convention registration fees); and a commemorative plaque, presented at the ABA business meeting.

Throughout the review process, a competition coordinator distributes manuscripts for review, assimilates their comments, and sends each participant an "editorial decision" letter based on reviewer suggestions. Coordinators have included Bill Buskist of Auburn University (1985); R. Alan Williams of Johns Hopkins University (1986); Barbara Wanchisen of Baldwin-Wallace College (1987-1991); and Tom Critchfield of Auburn University (1992-1993). Barbara Kaminski of Johns Hopkins University assumes the reigns as the fifth coordinator starting with the current (1994) competition.

AWARD RECIPIENTS

Twenty-one student papers, from 11 different institutions, have received recognition in the last 9 years. Students from West Virginia University (5) and University of Kansas (4) have collected the most awards, followed by Auburn University, University of New Mexico, and Temple University (2 each). Other schools producing winners to date include Rutgers University, University of North Texas, UNC-Greensboro, UNC-Wilmington, University of Victoria, and University of Wisconsin-Milwaukee. Among faculty sponsors, Michael Perone of West Virginia (4 student awards), Michael Dougher of New Mexico (2 awards), and Phil Hines of Temple (2 awards) deserve special mention.

Table 1 lists the award recipients to date and the titles of their papers. At the time of their awards, roughly half the recipients were enrolled in experimental psychology programs, about one-quarter in clinical programs, and the rest in other fields (primarily human development). All but one were pursuing an advanced degree at the time of the award. At this

year's convention, Jan Jackson of UNC-Wilmington will receive the competition's first-ever award for a paper prepared during undergraduate training.

WHERE ARE THEY NOW?

A survey returned by all but two of the award recipients from the competition's first nine years permits a general summary of the paths followed by those receiving Outstanding Paper Awards. Each of 10 respondents currently holding a terminal degree is employed in a professional setting. Seven currently hold academic appointments (e.g., as faculty, postdoctoral fellow, or research associate) in which research is at least part of the job assignment; three hold primarily clinical or other applied positions. The remaining respondents are still in graduate school.

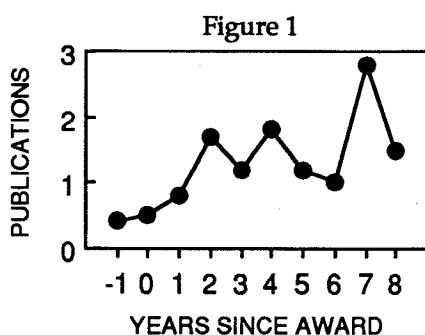
Allowing for multiple affiliations, those with current academic ties (including students) are affiliated with departments of psychology (73%), medical centers (13%), semi-autonomous research facilities (20%), and other academic departments (exceptional education and human development, 13%). Those with non-academic appointments are affiliated with

Table 1
EAHB-SIG Outstanding Paper Awards 1985-1993

Year	Recipient / Affiliation	Sponsor(s)	Paper Title
1993	N. Brady, Kansas	J. Spradlin/ K. Saunders	In the beginning there was a mand: A review of research on teaching mands to individuals with severely limited verbal repertoires
1993	K. Dougherty, Auburn	J. Johnston	Say-do correspondence: A verbal operant analysis
1993	J. Jackson, UNC-Wilmington	C. Pilgrim	Thematic match-to-sample: Teaching children conditional discriminations without verbal instructions
1993	M. R. Markham, New Mexico	M. Dougher	Compound stimuli in emergent stimulus relations: Expanding the scope of stimulus equivalence
1992	K. G. Augustson, New Mexico	M. Dougher	Stimulus equivalence as a theoretical framework for the study of category learning in children
1992	K. M. Drake, Kansas	R. Saunders	The development and merger of classes resulting from differential response and delayed conditional discrimination training
1992	G. J. Madden, North Texas	S. Glenn/C. Hyten	Biological and behavioral selection: Similar subprocesses?
1992	D. A. Polson, U. of Victoria	J. Parsons	Precurrent operants: A preliminary analysis
1992	M. W. Schlund, Milwaukee	A. Baron	Human manual and vocal responding under temporal schedules of reinforcement
1991	R. J. DeGrandpre, Auburn	W. Buskist	Effects of accuracy of instructions on human behavior: Correspondence with reinforcement contingencies matters
1990	No award		
1989	No award		
1988	D. Greene, Rutgers	?	[Records missing]
1988	J. D. Lewallen, West Virginia	M. Perone	Self-control: A synthesis of the commitment model and correspondence training
1987	D. Cerutti, Temple	P. Hines	Discrimination theory of rule-governed behavior
1987	T. Critchfield, West Virginia	M. Perone	The experimental analysis of private events: An evaluation
1987	H. Reigler, Kansas	?	[Records missing]
1986	T. Critchfield, West Virginia	M. Perone	Conditioned reinforcement of human behavior: A review and evaluation of observing experiments
1986	A. Higgins Hains, Kansas	D. Baer	Interaction effects in multi-element designs: Unmentioned, unexamined, or unknown?
1986	K. T. Lockwood, W. Virginia	M. Perone	Stimulus equivalence: An emergent research area
1986	D. M. Sikora, W. Virginia	K. A. Lattal	Approaching a functional analysis of dreaming
1985	I. S. Rosenfarb, UNC-Greensboro	S. Hayes	B. F. Skinner's radical behavioral epistemology and the psychotherapy process
1985	B. A. Wanchisen, Temple	P. Hines	Increasing our awareness about awareness

either a state or a private mental health system or facility.

To the extent that publication rates say anything meaningful, Figure 1 suggests that respondents in academic positions have built on their success in the competition and maintained good levels of scholarly productivity. The figure shows the mean number of publications per year in peer-reviewed journals, beginning one year prior to the award and continuing for up to eight years after the award (the N on which means are based therefore varies across years). Publication rates have steadily increased across years after the award.



Award recipients have distinguished themselves in other ways. The individuals represented in Figure 1 have received \$185,814 in grants and contracts to conduct research and provide professional services. Past winners sit on editorial boards of *JEAB* and *The Behavior Analyst*, and have served as reviewers for *American Psychologist*, *American Journal of Mental Retardation*, *Analysis of Verbal Behavior*, *British Journal of Addiction*, *Education and Treatment of Children*, *JABA*, *Journal of Early Intervention*, *Psychological Record*, and the National Science Foundation. Award recipients also have been involved in convention program planning for ABA and Divisions 25 and 28 of the American Psychological Association. Finally, four award recipients are licensed clinical psychologists, and several others hold alternative forms of professional certification (e.g., in education, speech and hearing).

The survey asked award recipients to rate the utility of the Student Paper Competition. Most respondents said the reviews they received were of high quality (88% gave a rating of at least 4 on a 5-point scale), helped refine their thinking on the topic of the paper (71%), and helped improve their familiarity with the peer review process (71%). The majority also said that presenting their paper at the ABA Convention was an important step in their professional development (86%). Finally, when asked whether they would encourage a student interested in human behavior to participate in the competition, 100% said they would be very likely to do so.

THE BROADER CONTEXT

In lay conceptions, awards programs serve discriminative or reinforcing functions, but scholarly work rarely is designed with awards in mind, and awards occur long after the behavior they commemorate. The real benefits may be more subtle. For award recipients, the competition may provide a valuable public introduction into a professional verbal community. For the interest group that pays the bills, the awards symposium and the plaque presentation ceremony are high profile moments at the ABA convention.

Even so, this review of the Student Paper Competition has been misguided if it portrays awards as the competition's main currency. Far more importantly, all participants gain experience with that bittersweet reality of scholarly life, the blind peer review process. From a competition coordinator's point of view, this outcome is what motivates EAHB-SIG members to volunteer as manuscript reviewers, and thus what holds the competition together across years and coordinators. A personal conclusion is that the competition should exist neither to promote nor to recognize scholarly activity — these are happy side effects, if they occur — but rather to provide an ecologically valid training experience to supplement formal graduate training. From this perspective, the value of the Student Paper Competition ought to be measured via its impact on those who do not take home an award. In supporting the competition, we spend our time and money wisely only to the extent that we generate student reactions consistent with this unsolicited comment from a recent participant whose paper was *not* recommended for an award: "I have just read for the third time the reviews of the paper I submitted to the EAHB competition. Would you please extend my thanks to the reviewers and convey to them my sincere appreciation for their efforts? I intend to act on their feedback and wanted to voice my appreciation for the opportunity to participate in the EAHB competition. Our community is well served by a competition such as this."

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PREPARING A SUCCESSFUL CONVENTION PRESENTATION: A LISTENER'S PERSPECTIVE

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We spend more time in a professional career listening to spoken presentations than delivering them, yet in the bustle and terror preceding that fateful moment at the podium it is easy to lose sight of the fact that talks succeed or fail based on their effects on an audience. A good source of ideas for successful presenting, then, is to watch what other speakers do that works. The following suggestions, derived from advice given to award recipients in the EAHB-SIG Student Paper Competition, are based on a history as a listener more than on experience as a speaker. The list emphasizes matters of preparation and organization over matters of style, because speakers come equipped with different levels of charisma and stage presence. My own history as listener suggests that speakers usually can overcome a lack of charisma with solid preparation, but almost never the opposite.

PLAN TO FILL LESS TIME THAN IS ALLOTTED TO YOU

Where timing is concerned, few speakers err on the side of brevity. At the same time, no listener ever complained because a talk ended a minute or two early. A parsimonious talk usually is an organized talk, something for which your listeners will thank you. Moreover, the minute or two you don't fill with prepared remarks can allow you, if necessary, to field an ill-timed question or add explanation based on the reactions of your audience and still comfortably complete the talk on schedule.

CHOOSE YOUR SHOTS

Decide on one or two take-home messages and gear everything else toward making these points. You will do so at the expense of some of the richness of your topic, but studies show that auditory comprehension is severely limited. People are likely to absorb only one or two main points regardless of how many you try to make.

WRITE OUT YOUR REMARKS

Having a full text provides three advantages. First, the writing serves as a preliminary rehearsal of the talk. If you've considered every word carefully

enough to put it on paper, you've begun to prepare yourself for the delivery of the talk. Second, a full text provides a crutch in case the unusual stimulus control of a professional meeting disrupts your train of thought (translation: if you panic, you can always read until you regain your composure). Incidentally, having a text doesn't necessarily mean reading from it. If you write out the talk and practice from it, you may notice that you do not need to consult the text for long intervals. Large chunks of the talk will become a single behavioral unit, and you'll need the text only to initiate these units. Finally, a scripted talk will keep you on task, discouraging counterproductive digressions.

CREATE A SENTENCE OUTLINE OF THE FINISHED TALK

After you have drafted the talk, it can be helpful to create an outline by attempting to reduce each paragraph to one idea, expressed in one simple sentence. By scanning the outline you can easily determine if the progression of ideas is logical and matches your intent for the paper. You may also find that two paragraphs make the same basic point, allowing one to be eliminated. Or, you may find that some paragraphs cannot be reduced to a single idea sentence, meaning that two separate paragraphs are called for.

LIMIT YOUR INTRODUCTORY REMARKS

A general rule is to use no more than 20% to 30% of your time discussing background and the existing literature. Use more, and listeners will grow restless waiting for you to get to the point.

KEEP YOUR SENTENCES SHORT

Because of the limits of auditory comprehension, keep your sentences short and simple. Limit each sentence to one idea, even if, on paper, doing so makes your text look more appropriate for an eighth-grade audience than a professional one. Keeping sentences short and simple helps you as well as the audience, because you are less likely to lose your place in the middle of a short sentence than a long one.

KNOW YOUR AUDIENCE, BUT NEVER OVERESTIMATE IT

Although some members of your audience may know a lot about your general field, they may not be as familiar with your specific area as you are. Listeners also may have just walked in from an unrelated presentation, and thus are under very different stimulus control than you are. A common student mistake in presenting is to move too abruptly into the meat of the topic. Your first introductory statement(s) cannot be too general or too obvious. Lawyers use this technique all the time—they begin an argument with statements that everyone understands and that no one can disagree with. Rather than boring the audience, this seems to establish credibility. Think of it as building “agreement momentum” in your listener. Then, throughout the talk, be sure you do not introduce new ideas too quickly or without explanation.

BUILD REDUNDANCY INTO YOUR TALK

Good speakers use redundancy. Repetition of statements and ideas may be taboo in good writing, where the “listener” can always review what came before, but in good speaking the listener has no such resource. You can provide it by restating important points. For example, if a concluding remark gains its potency from an issue set up in your introduction, you might begin the remark by saying “Recall that....” and restating the earlier point. If you show a graphic (a table, figure, or diagram), plan on describing what the audience presumably can plainly see. In a graph, for instance, state what is measured on the axes, and note exactly what feature of the data function shows an effect.

GUIDE YOUR LISTENER WITH TRANSITION STATEMENTS

Good speaking includes good transition statements. Wherever possible, alert your reader to the relationship between adjacent ideas. Transition statements need not be eloquent or creative. If adjacent ideas make similar points, say “Relatedly...” or “In a similar vein....” When you are ready to move on to a new point, say “Another important issue is...” or “Moving to the next key characteristic...” or something to this effect. If one idea sets the groundwork for a subsequent one, you might say “This leads to an important conclusion...” or “The implications of this merit a moment of our attention....” Transition state-

ments are often best added after the basic text of the talk is in place.

LEAVE TIME FOR CONCLUDING REMARKS

It doesn't hurt to finish with a clear restatement of your rationale, your one or two major points, and perhaps a sentence on how your points should all be viewed in some larger context.

CONSIDER YOUR VISUAL AIDS CAREFULLY

Visual aids — assuming that they are clearly visible from at least 25 feet away (squinting interferes with listening) — can serve three important functions. First, they can capture in a moment what might take several minutes to explain orally (as in the case of a graph). Second, they can help keep the audience aware of the structure of your talk. Many speakers use outlines as graphics when they have no special expository material (such as graphs or diagrams) to display. This helps indicate to the audience when you've moved from one point to another and what your remarks are leading toward. Third, regularly changing your graphics during the talk may improve listener attention even if the visuals themselves are not especially dramatic. Many successful presentations include a mix of different types of visuals — some data (if appropriate to your talk), some diagrams, some “word” slides including a chunk of an outline, and perhaps key terms or definitions. My own strategy is to first determine what graphics I absolutely need (data, diagrams, etc.), fit them into the finished talk, and then see where gaps (long periods of time without a graphic) occur. Into these gaps I insert word slides as convenient to my topic. Julie Vargas once recommended changing graphics 2 to 3 times per minute. That pace is hard to maintain (especially if you have complicated graphics), but a good rule of thumb is to never orphan a graphic. Remove graphics when they are no longer relevant to your comments. If you have more than a minute or two between visuals, it's best to turn off the projector or insert a blank slide, so that nothing competes with your remarks for the listener's attention.

NEVER SHARE THE STAGE WITH A MACHINE YOU DON'T TRUST

Visual aids are useful only if you can actually get them displayed. Practice with them. For the novice, overhead transparency projectors have fewer pitfalls than slide projectors (and transparencies are quicker and cheaper to produce than slides), but no technol-

ogy is without peril. A friend of mine in graduate school became notorious for upending, inverting, and reversing transparencies for minutes on end before finally displaying them correctly.

PRACTICE IN FRONT OF AN AUDIENCE

Only an audience can tell you what to expect from an audience. I believe each talk should be practiced aloud at least three times. The first practice run occurs alone, with you as sole audience. It's easier to catch awkward sentences when you read them aloud. You also can get a rough estimate of how much time you're taking, and revise accordingly. The second practice run occurs in front of an informed audience (e.g., your advisor and others at least passingly familiar with your work). This audience can comment on the precision of your phrasing and anticipate some of the more sophisticated possible conceptual reactions to your talk. The third practice run occurs in front of a naive professional audience (e.g., one that understands behavior analysis at some level but is not necessarily well acquainted with your topic). This audience can alert you to weak transitions, places where you explain too little or assume too much of the audience, and so on.

EXPECT SOMETHING TO GO WRONG. . .

...And don't get discouraged when it does. Events known to plague even the most immaculately mani-

cured presentations include lost luggage (complete with slides), broken audiovisual equipment, squealing microphones, speakers from a previous session who refuse to vacate the room on time, hiccups, broken fasteners on a trouser or blouse, power outages, and scourges of Nature such as the sparrow that mysteriously appeared at a talk I once attended, careening around the room and smashing repeatedly into a closed window throughout the presentation. Experienced speakers anticipate problems (e.g., they carry an extra set of transparencies with them on the plane and try out their audiovisual equipment well before the talk) but some problems defy prevention. Be ready to do the best you can under whatever circumstances may arise. Most audiences appreciate grace under pressure and grant you a huge benefit of the doubt when things go wrong (relieved, perhaps, that you, not they, have been targeted by fate this time).

PLAN TO GET FEEDBACK

If you can learn from experience, each talk you give will be a little more polished than the last one. Unfortunately, once your talk begins, you may be too engrossed in presenting to monitor your performance. Ask a colleague you trust to attend and provide you with objective feedback. There will be other talks. Start preparing for them now.

AN INSIDER'S GUIDE TO CHOOSING A GRADUATE ADVISER AND RESEARCH PROJECTS IN LABORATORY SCIENCES

MARSHALL LEV DERMER

UNIVERSITY OF WISCONSIN--MILWAUKEE

As a new graduate student you will be making the transition from consuming knowledge to generating and disseminating knowledge. You will soon enjoy conceiving, conducting, and documenting research. This behavior, in turn, depends on your selecting an effective research adviser and productive research projects that can be completed in reasonable lengths of time.

SELECTING POTENTIAL RESEARCH ADVISERS

If you are not yet in graduate school, it is easier to appreciate the importance of timely progress than the importance of a research adviser. Consider, however, that you will become a researcher as an apprentice to your adviser who should provide immediate and constructive feedback regarding your attempts to understand nature. Without such feedback, you will likely waste time or simply fail. Your adviser may also provide various resources like space, equipment, supplies, an assistantship, and employment. On earning your degree, your adviser will also write vital letters of recommendation.

Whom To Look For

Someone with Similar Interests. Surely seek someone with similar research interests. You may not, however, know your interests. A graduate student in chemistry noted:

It is not possible for even the most motivated and successful undergraduates to have a clear understanding of their research interests. The projects are way too complex for college seniors to comprehend. The technology will almost always involve equipment and approaches never seen or imagined before. Students at best understand their inclinations. . . The search for common ground is usually a case of a research director convincing a willing subject. (R. Alston, personal communication, November 12, 1990.)

Someone with Compatible Interests. All organizations offer people common means to diverse ends. Even if you cannot work in a laboratory in which the goals are similar to your own, the procedures may be relevant to your goals. It is quite possible, of course, that as you work in this "second best" laboratory you may become interested in the research there. Consider the experiences that determined your current research interests.

Scholars: Renowned Researchers. Seek people who love science and are obsessive about research. They will document their work in articles, published in respected journals, that often describe a series of inter-locking experiments. When researchers value their work and others agree, others will extend the work. Invited articles and presentations to professional societies suggest that a researcher's work is well-received.

Grant support from major research foundations, for example, the National Science Foundation, indicates that other scientists judge this person to have made significant contributions. Such support is allocated more competitively than is space in major journals. A history of grant support from major foundations is, therefore, very impressive.

There are potential problems working with renowned researchers. Where research requires grant support, such advisers may be unable to spend much time with graduate students because they are busy writing grant proposals, justifying grants, administering grants, and supervising post-doctoral students. Another problem is that others will wonder whether you or your adviser conceived jointly authored work and even your dissertation! Complicating all this is the possibility that post-doctoral students may be your actual mentors. On the other hand, such advisers may offer the very best advice and they certainly have the best "connections" to help place you on earning your Ph.D.

Scholars: Less-Renowned Researchers. These researchers' records will have many of the attributes discussed above; often a record of grant support will be absent. Where research costs are low, such faculty can also be excellent advisers.

It is possible to have the best of both research types! If there are renowned researchers in your

This invited manuscript is a revision of an article with the same title that appeared in the *Journal of Chemical Education* (1993, Vol. 70, pp. 303-306). Please direct correspondence to: dermer@convex.csd.uwm.edu.

department include them on your research committee, seek their advice and eventually, if all goes well, seek their letters of recommendation and "connections" without the potential liabilities of having one serve as your adviser (S. Scheiner, personal communication, October 16, 1990).

Someone You Can Respect. If your adviser is honest, ethical, loves doing science and is reasonably successful, it would also be nice if you liked your adviser (and vice versa)! But choosing or keeping an adviser primarily because he or she is nice is a mistake. A nice person may withhold frank evaluations of your knowledge, skills, and progress. If you have an excellent adviser, your feelings toward your adviser might best be labeled as respect.

Whom To Be Cautious Of

Research Millers. Do not automatically equate grant support, the size of a laboratory, or the number of publications with quality advising (Ravetz, 1971, p. 46; Smith, 1985). Even without grant support, publishing may become more important than doing science when faculty salaries are determined merely by number of publications. So, be cautious of faculty who submit many short reports in which replication of findings is absent.

Those Not at the Bench. Be cautious of faculty who structure research so that there are multiple layers of authority and who are rarely in their laboratories (Cairns, 1986; Fox, 1991; Medawar, 1979, p. 89). Inadequate supervision is so prevalent in cases of scientific fraud that the American Association of Universities recommends that "students must be directed by experienced scientists. The director should supervise, teach, and encourage in-depth scrutiny and interpretation of results, emphasizing respect for primary data. Routine audit and review of all primary data by the laboratory director is strongly recommended" (1983).

Perpetual Administrators. Unless you are only one of a few advisees, beware of faculty who repeatedly choose to be officers of professional societies or departmental chairs. Although these activities help others do science (Medawar, 1979, pp. 56-58), they can substantially reduce supervision quality unless you are only one of a few advisees. Private practice or consulting may similarly reduce supervision.

ACQUIRING INFORMATION ABOUT POTENTIAL ADVISERS

Having outlined criteria for selecting potential advisers, it is appropriate to discuss acquiring relevant information.

Getting Started

It is best to decide on potential research areas and potential advisers by the end of your junior year in college. You can best make these decisions by working as an assistant in a laboratory where you can consult with the faculty and post-doctoral staff. Alternatively, discuss selecting potential advisers with your undergraduate adviser and the faculty who teach courses in the areas that most interest you.

Correspond with Potential Advisers

Corresponding with a few potential advisers can be very helpful, after you are familiar with their work. In your initial letter describe your training, grade point average, research experience, and your interest in the researcher's work. Write carefully; writing is public thinking. Ask for recent reprints and copies of manuscripts in press. You might also casually mention your interest in where this potential adviser studied and a list of his or her publications. Potential advisers may send you their vitae, saving you much detective work!

Talk with Graduate Students

If you have exchanged letters with a potential adviser, ask for the names and telephone numbers of senior graduate students. Call the students at their homes where they are most likely to have a private telephone. Items not covered above include determining: what proportion of this professor's advisees earn the Ph.D., how much time is typically required to earn the Ph.D. in this laboratory, and do graduates continue working in the area upon graduation? For potential advisers who are assistant professors, ask about their chances of becoming tenured. It is unwise to study with a person who will not be re-hired in a few years.

Discovering Publications, Grants, and Vitae

The *Science Citation Index* and the *Social Science Citation Index* can help you locate a researcher's publications and the extent they have stimulated other scientists. Grant support and whether an article was "invited" are usually indicated in an article's first footnote.

Face-to-Face Interaction with your Prospective Adviser

Meeting potential advisers may be scary; but you

must develop strong, positive, self-presentation skills. You can meet potential advisers and their students at professional conferences. A too-little exercised but most useful option is working on a summer project in a laboratory. If you arrive at graduate school without an adviser, then interview all potential advisers. You will learn about the work in your new department and, consequently, have a good idea about whom to select for your research committee.

When the Search is Not Over

The adviser-graduate student relationship is much like a marriage. It is important, for example, to consider carefully whether there is a good match between: your personalities, and the expected pace of work. Some marriages, of course, sour. Accordingly, you always have the right to change advisers. Once you have started a project, however, no other professor may feel qualified to supervise your work.

Changing advisers is a delicate matter, particularly if your adviser has invested much time in your education. When considering changing advisers, it is best to have an honest discussion (Cohen, 1982). Perhaps working conditions or your relationship can be changed. If you do change advisers, give your adviser adequate time to plan for the change. Just as some divorced couples remarry you might again want to work with your original adviser so follow the "golden rule."

SELECTING A RESEARCH PROJECT

The best scientists (and potential advisers) replicate and extend their research. Below, I outline the approach and describe the consequences of your adopting it or other approaches when selecting research projects.

Replication and Extension

Pavlov's laboratory (Babkin, 1949) best illustrates the replication and extension approach. As a new student, you would have replicated the last dissertation conducted there. This tested your ability to follow a write-up, and motivated Pavlov's senior students to work most carefully. Your dissertation would have been some logical extension of your preliminary work. You neither had to survey the literature nor wonder if the equipment could be constructed. The work had just been completed in your laboratory. Consequently, the duration and other costs of new research could be estimated well.

Unlike Pavlov, your adviser may not be very active and you may be unable to work with a better

one. In this case, you can search journals and attend conferences to locate a procedure and problem that **currently** is important to you and others. A portion of your research can be a fairly literal replication of a recently published work, whereas the remainder can be an extension that contributes to the solution of the problem.

If you replicate work in another laboratory, it is likely that when you submit your report for publication that the original researcher (or one or more collaborators) will be a reviewer. If you picked an important procedure and problem, then other reviewers will also find your replication and extension interesting!

Other Approaches for Selecting a Project

Another conservative approach is to select a problem for which **any** answer is interesting; it is difficult, however, to specify the defining features of such problems. One possibility is that for some problems there may only be a finite number of possible solutions. Even if a study does not solve the problem, a well-done study will rule-out one or more such possible solutions (e.g., Bliss, 1982, p. 53).

If you are ambitious, of course, you may want to develop an entirely new procedure (but see Spriestersbach & Henry, 1978). Discuss the ensuing risks and benefits with your research committee before you begin the work. A six-question test has been proposed for faculty to assess the quality of a student's research idea (Zanna & Darley, 1987a, p. 147); these questions may help with your research.

FURTHER READING AND DISCUSSION

Essentially my conservative advise is to select an adviser who successfully uses the replication and extension approach to understand important problems and do likewise for your dissertation and other research. There are, of course, plenty of important issues I have avoided like "Should you attend graduate school in the same department in which you earned your undergraduate degree (Campbell, 1969; Crick, 1988, p. 150; Feynman, 1985, pp. 59-63)?" Moreover, I do not discuss selecting a graduate school because I consider this far less important than finding a first-rate adviser. It is important, therefore, that you discuss the issues raised here with students and faculty.

Advice is available from "official" sources including professional associations (see Dermer, 1992), graduate schools, and departments. Frank advice, of course, is more likely found in "unofficial" sources

including: texts (e.g., Balian, 1982; Dukelow, 1980; Mahoney, 1976; Medawar, 1979; Moore, 1985; Sindermann, 1982, 1985, 1987; Smith, 1990; Stock, 1985; Vartuli, 1982; Zanna & Darley, 1987b), biographies (Babkin, 1949; Crick, 1988), and a few journal articles (Binkley, 1988; Dermer, 1992; Huey, 1987; Stearns, 1987). Library of Congress subject headings for locating more recent texts are available (Dermer, 1992). Frank advice is also exchanged on the USENET conferences: "soc.college.grad," "sci.edu," "sci.research," "sci.physics," etc.

Finally, you might propose that an upper-level, undergraduate/graduate seminar be created to discuss these important issues. A molecular biophysicist put the matter this way: "Beginning graduate students must make what may well be the most important choice of their careers, adviser and research topic, at a time when they are most lacking the knowledge to choose well" (D. Bashford, personal communication, October 15, 1990).

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REMINISCENCES AND SOME EARLY DATA

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In 1956, I came across a report of perhaps the first modern operant conditioning study with children (Azrin & Lindsley, 1956). It was a study of cooperation. Each of a pair of children had to put a stylus in a hole at the same time (within .04 sec) to produce a single jelly bean delivered to a cup that they both could reach. If one child grabbed all the candy, the other child quit. These contingencies led to cooperation among the children.

At the time, I was a first lieutenant in the Clinical Psychology Department at the Walter Reed Army Hospital in Washington, D.C. My duties included giving Rorschachs to psychotic soldiers and other things consistent with my ongoing psycho-dynamically oriented training at Teachers College, Columbia University. Like many graduate students, I was having trouble developing a dissertation project. My first failed attempt was during my internship at the Fitzsimmons Army Hospital in Denver. The topic, "perceptual defense," can be defined loosely as increased difficulty discriminating stimuli that have been associated with unpleasant events. I paired nonsense syllables with some truly horrible pictures that I got from the Denver Police Department. Although my research idea wasn't thoroughly bad, my apparatus was. My tachistoscope's shortest display time was too long, and all subjects discriminated all of the nonsense syllables with ease.

The procedures, instrumentation, and precise behavioral control described by Azrin and Lindsley gave me hope that I might yet complete a dissertation. I decided to study children's tolerance for delayed rewards. For example, would they wait twice as long for two candies as they would for one, etc.? My working title was, "Delay of ego gratification." (This research area is now termed "self-control," and the same basic concerns inspire current behavior

My thanks go to all the people named in the memoir, but especially to Murray Sidman, Joe Brady, and Fred Keller (and posthumously to Ralph Hefferline). Preparation of the article was supported in part by NICHD grant HD25995 and by the Department of Mental Retardation of the Commonwealth of Massachusetts (Contract 100220023SC). Address correspondence to: L. T. Stoddard, E. K. Shriver Center, 200 Trapelo Road, Waltham, MA 02254.

analytic work; even some of the designs are the same as those I planned [cf. Logue & Chararro, 1992; Schweitzer & Sulzer-Azaroff, 1988].)

I had no equipment and was advised to speak to Capt. Joseph V. Brady, the head of the Experimental Psychology Department at the Walter Reed Army Institute of Research (WRAIR). I rather nervously called him, told him who I was and why I called, and he agreed to see me. I went to his office at the appointed time, and waiting there with Joe was another man, a civilian scientist in the department. They asked me to describe my project, and I did, casting it in terms of its title. Both men listened politely. The civilian scientist, Murray Sidman, told me that my plans were related to work he was doing and asked if I would like some help. Murray's many interests then included research on differential reinforcement of low rate (DRL) schedules with rats, a procedure clearly designed to teach waiting (Wilson & Keller, 1953; Sidman, 1956). Also, as I later found out, both Murray and Joe were extremely interested in starting to work with humans. And so my dissertation became "Operant conditioning of timing behavior in children," a DRL study with variable interval (VI) schedules as contrast.

The apparatus soon followed. It was built by the WRAIR carpentry shop and incorporated an Ogden Lindsley pull-type lever and a Gerbrands universal feeder that delivered up to 67 Hersheyettes. I selected this M & M-type candy because its shape guaranteed that each one would roll down a chute with a shallow slope. M & Ms wouldn't do that reliably. The apparatus also included my purchases from a local 5- and 10-cent store, a metal soap dish that served as a reinforcer tray and Christmas tree lights mounted behind a translucent plastic window above the lever. I assembled and wired the relay and timer circuit that Murray designed.

The DRL data were collected first. We recorded the data with counters and a waxed red paper polygraph. The paper fed off a roll driven by a constant slow-speed motor, and four relay-operated metal styli scratched the wax off the paper, leaving traces (similar to an Esterline-Angus event recorder). Events were recorded by operating the relay that displaced the appropriate stylus. Using a millimeter ruler, I laboriously measured the distance between successive stylus marks to determine inter-response times (IRTS). We added a cumulative recorder when work with VI schedules began.

Murray wanted the apparatus set up first in his basement, where we could try it out with his two children. As it turned out, the availability of other children in the neighborhood led to its staying there. It sat on a table in one end of the room. Sitting in the other end was the programming and recording equipment, the furnace, the washing machine, and me. The children could see me if they turned around. I ran sessions with Murray's two children, Joe Brady's three, and ten of their friends, on Tuesday and Thursday afternoons after school and on Saturdays.

Some problems quickly arose. The first was the audible relay click when the DRL interval timer timed out. The children could hear it, and that could determine their responses. To mask it, we had to operate another relay irregularly 12 times a second. Unfortunately, the masking relay produced interference on the TV upstairs, so Murray's children could not watch their afternoon programs or Saturday morning cartoons. Scheduling was also a problem. My frequent use of the family phone finally led to my paying for an extension in the basement. Murray and his family endured, however, and I completed my data collection in early 1958.

To get the children started, we used instructions. We did that to hasten acquisition, because we were more interested in seeing what steady states looked like than in how they developed. The essence of the instructions was, "You have to wait before you pull it to get candy," or words to that effect. Instructions were given before each DRL session to all the children, except Murray's two-year-old son, Jimmy. Looking back, I'm sorry we didn't insist on contingency-shaped acquisition (Bijou & Orlando, 1961). Having used the instructions, however, we could examine their interaction with our schedule contingencies.

One child's behavior was particularly instructive. It got me thinking about the relation between verbal and nonverbal behavior, including helping to make me aware of their sometime lack of correspondence. This child was Frank, a nine-year-old boy, whose DRL conditioning began with the requirement of spacing two consecutive responses a minimum of 10 seconds apart. In his first session, Frank pulled the lever 2,024 times and earned only 15 Hersheyettes. These came after he stopped to ask me a question (and perhaps to rest his arm), pauses that usually exceeded 10 seconds. During these pauses, I reminded Frank that he had to wait before pulling the lever. He turned back and pulled, got a candy, and his high rate resumed. I vividly remember him turning and leaning away from the apparatus, as if to get as far from it as possible. Meanwhile, with his right arm

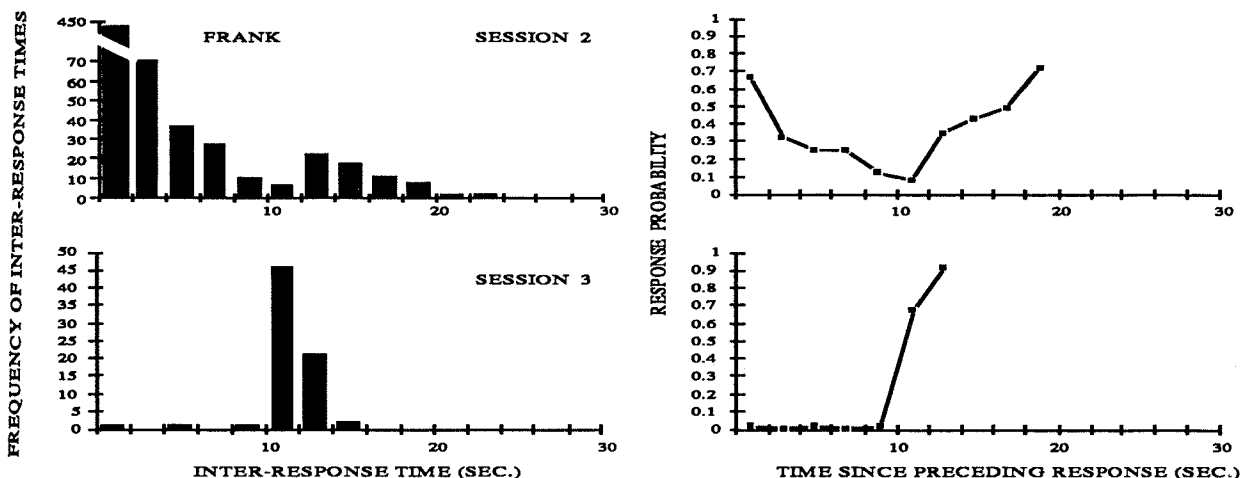
outstretched behind him, he continued to pull the lever incessantly. At least once he shouted over to me, "I am waiting."

Frank's second session began the same way, his back to the apparatus and pulling frantically with his right hand. Then, something interesting happened. With his left hand, he began pointing successively at several pictures on the rear wall of the room. While his left hand pointed, his right hand became still. After he had pointed for a bit, he stopped and pulled the lever, producing a candy. This alternating pattern continued for the rest of the session, but along the way a head bob at each picture replaced pointing. He earned all 67 candies.

After the session I asked Frank to tell me what had happened (a standard feature of our procedure). He told me: "I looked at all the pictures and then pulled it. At first I just pulled it. I found myself looking at them, and I pulled it and got one, so I kept on doing it. Sometimes I didn't get one because I pulled it too fast." In Frank's next session this behavior pattern continued. After it, he asked, "Do you think I got a candy because I looked at the pictures or because I was on time?" When asked what he thought, he said, "I think because I looked at the pictures." In later sessions head bobs stopped, and he told me afterwards, "I looked at them and pulled, and I was counting as I looked at them, so I started counting." What do Frank's electrically recorded data look like? The bar graphs at the left of Figure 1 present frequency distributions (in 2-second bins) of his inter-response times (IRTs) in his second and third sessions. If we look at the portions of the upper distribution that are below and above 10 seconds, we essentially see Frank's lever-pulling before and after he started pointing. Of the 587 IRTs below that value, most (444) were shorter than 2 seconds. Above, we see that he rather frequently pointed for a little longer than was needed to satisfy the programmed contingency. A substantial number of IRTs were longer than 16 seconds, and few were in the 10-12 second bin. Temporal stimulus control sharpened in Frank's next session, as shown by the lower left graph (note the changed ordinate scale). Almost two thirds of his IRTs were in the 10-12 second bin, and none were longer than 16 seconds. Remarkably, only three were shorter than 10 seconds. No other child reached that level of efficiency.

The line graphs to the right show the same data in the form of response probability functions (an IRTs per opportunity measure; see Anger [1956] for a detailed explanation). In this usage, response probability is defined as the frequency of responses within

Figure 1



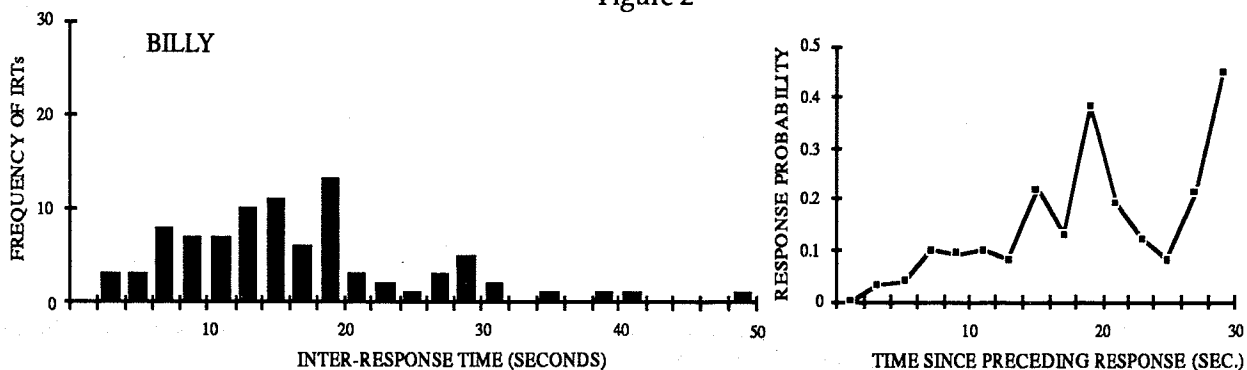
two seconds after a given pause length divided by the total number of times the child had actually waited that long. In other words, if Frank had waited n seconds, what is the probability that he would respond in the next two seconds? The lower right graph may be simpler to look at first. When Frank had waited 10 seconds, there is an abrupt jump in response probability (two thirds [.67] of IRTs 10 seconds and longer are shorter than 12 seconds). Then having paused for 12 seconds, there is an even greater likelihood (.91) that he would respond before 14 seconds had elapsed. In the upper right plot, the U-shaped function clearly describes the change in Frank's behavior from its initial high rate (high probability of pauses less than 2 seconds) to the low rate after he started pointing (increasing probabilities of pauses longer than 12 seconds).

One nice thing about the response probability functions is that they let me find order where other-

wise there appeared to be none. When I examined the IRT frequency distributions of several of the youngest children, it was difficult to see any evidence of temporal discrimination. However, that picture changed when the data for the children's best sessions were plotted as probability functions. Figure 2 gives an example, again showing data on the DRL 10-second schedule. The data were produced by a 4-year-old boy named Billy. His IRT frequency distribution at the left is relatively flat, with only slightly higher frequencies in the 12-20 second range. In contrast, his response probability curve reveals a relatively sharp increase in his tendency to respond above 14 seconds and a steep drop above 20 seconds (The final increase is an artifact of small n s.). These changes in probability clearly reflect the influence of the schedule contingency.

Returning to Frank, what do we make of his verbal and lever-pulling behavior? I learned several

Figure 2



things. The first was the complete lack of congruence between Frank's verbal interpretation of the instructions to wait ("I am waiting;" for what we'll never know) and his initial lever-pulling rate. Another was the automatic nature of reinforcement, without the need to invoke verbal mediation, which I am sure came as a total surprise to me at the time. When he pointed and then pulled, reinforcement had its way. Related to that point was the elimination of Frank's high lever-pulling rate by other behavior occurring in its place. Although pointing with one hand and pulling with the other were not topographically incompatible, the one did successfully compete with the other. I learned first hand, and with dramatic impact, about what is surely the best way to get rid of problem behavior. That is to substitute (teach) more constructive behavior. Where did Frank's pointing come from? I speculate that his high rate of unreinforced responding was aversive for him; perhaps this is why he turned away from the apparatus. When his first point occurred and the right hand became still, perhaps this effectively constituted an escape contingency.

I found Frank's verbal descriptions of what happened then just beautiful: "At first I just pulled it, and then I found myself looking at them [the pictures], and I pulled it and got one," And later we have: "... and I was counting as I looked at them, so I started counting." As a clinical psychologist in training and former English major, I was fascinated (and somewhat taken aback) by the possibility that consciousness might not have the central role in determining behavior that I assumed. Could consciousness reflect merely observing what is happening or has already happened in our own behavior for other reasons? Maybe my conclusion went too far for my data, but Frank got me started thinking about these things. That experience began the true conversion of a clinical psychologist into a radical behaviorist.

Space constraints force me to abbreviate the rest of my story. The children hung in there, even though my data made it plain that they were inadequately reinforced by the candies. When I told Og Lindsley about the problem, he commented, "Middle-class children are underdeprived." The story ended happily, however, after I added some more substantial candy (sour balls) and token reinforcers (exchangeable for toys and pennies). The change generated more orderly schedule performances. These lessons stayed with me.

When data collection reached a logical stopping point, I lugged my records up to New York and showed them to Fred Keller, who had agreed to serve on my dissertation committee and who had con-

sulted with me off and on earlier. After Fred studied the data for a while, he looked up and asked thoughtfully, "Well, is all this enough for a dissertation?" I remember my relief and satisfaction when he smiled and said he thought it was. Sadly for me, Fred left for his first prolonged stay in Brazil before I finished preparing the dissertation, so I didn't have his help with its completion and defense. The latter was critical. Defending an operant conditioning study to clinical psychology faculty was my problem. Teacher's College was across 120th Street from Schermerhorn Hall, where Fred was located in the psychology department of Columbia University proper. I called that street "the widest street in the world," and it still may be, even with Fred and the others gone from there. However, Ralph Hefferline capably replaced Fred, and I got my degree. I'll never forget the cab ride after the orals, down through Central Park on a sunny and warm May afternoon to meet my wife Joan at the fountain at the Plaza Hotel. Shortly afterwards, I went to Boston to work with Murray on problems in mental retardation, leaving schedules behind as a focus of study and embarking on stimulus control research. The papers we wrote together tell what's important in that story.

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SUMMARIES OF STUDENT PAPER COMPETITION WINNING PAPERS

IN THE BEGINNING THERE WAS THE MAND: A REVIEW OF RESEARCH ON TEACHING MANDS TO INDIVIDUALS WITH SEVERELY LIMITED VERBAL REPERTOIRES

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Skinner presented a functional account of verbal behavior in his 1957 book, *Verbal Behavior*. He parsed verbal behavior into different classes based on characteristic antecedent and consequent events. One of Skinner's primary classes of verbal behavior was the mand. Skinner defined mand as a class of verbal behavior whose antecedent control is a state of deprivation or aversive stimulation and whose reinforcer is characteristic to the response (Skinner, 1957, p. 35).

Michael (1988) refined Skinner's definition of the mand by replacing *conditions of deprivation or aversive stimulation* with the notion of *establishing operations*. Establishing operations are variables that momentarily establish the reinforcing effectiveness of some object or event. Primary deprivation or aversive stimulation are, of course, establishing operations, but not all establishing operations for mands involve primary reinforcers. Other establishing operations are conditioned. Conditioned establishing operations set up the reinforcing value of a stimulus through interactional histories.

Mands are an important starting point for teaching verbal behavior because they enable learners to gain control over their environment. Michael (1988) commented that language teaching programs for persons with developmental disabilities have neglected mand teaching in favor of other types of verbal behavior. However, what may have been neglected was Skinner's and Michael's terminology. I reviewed approximately 25 articles that reported the results of teaching mands to individuals with severe developmental disabilities. The vast majority of these articles used the term *request*, however instead of mand.

Importantly, few of these studies focused on mands established through primary reinforcement or the termination of aversive stimulation. Indeed, this body of work illustrates the value of Michael's refinement of Skinner's definition. The studies show

that conditioned establishing operations may be identified and manipulated as part of a procedure to teach mands to individuals with severely limited verbal repertoires. Many of the studies I reviewed established mands with procedures that interrupted an ongoing chain of behaviors that historically led to some terminal reinforcer. This was accomplished by removing or blocking access to an object necessary to complete the chain. The object was provided after the learner made the targeted response. For example, Goetz, Gee, and Sailor (1985) interrupted the following toast-making chain immediately before the third step: (1) pull bread from bag, (2) put in toaster, (3) push down knob, (4) take toast out, (5) put on plate, and (6) eat toast. The student was required to select a picture of the toaster knob to complete the routine. The events that precede pushing the toaster knob, as well as the history of successfully completing this behavior chain, constitute an establishing operation for the picture selection response. Once this mand was made, the student was allowed to complete the steps in the chain. The immediate reinforcer for the mand was pushing down the knob. We have no reason to believe that pushing down the knob is reinforcing outside of this context.

Similar procedures were used by Sigafoos, Reichle, Doss, Hall, and Pettit (1990) who interrupted a chain by removing an object before the learner initiated the chain. For example, they removed a spoon in a soup making and eating chain. The learners were required to mand the missing spoon before completing the chain.

These examples illustrate how everyday events can become powerful teaching contexts by manipulating establishing operations. Such contexts capitalize on the social interactions required to meet Skinner's definition of verbal behavior.

Teaching mands to individuals with severe developmental disabilities has important theoretical implications as well. Verbal behavior is acquired so

rapidly in most young children that it is very difficult to trace the development of specific classes of verbal behavior. In persons for whom the acquisition process has been slowed or arrested, however, we may be able to not only trace the development, but to isolate and manipulate the variables controlling that development. Thus, these individuals provide a natural laboratory to test some of the notions put forth in *Verbal Behavior*.

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THEMATIC MATCH TO SAMPLE: TEACHING CHILDREN CONDITIONAL DISCRIMINATIONS WITHOUT VERBAL INSTRUCTIONS

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Since the publication of Sidman and Tailby's (1982) landmark paper, research on conditional discrimination and the formation of equivalence classes has become increasingly popular in the field of behavior analysis. Through the use of match-to-sample procedures, differences in responding on equivalence tests across species (e.g., D'Amato, Salmon, Loukas, & Tomie, 1985; Sidman et al., 1982), and as a function of language abilities (Devany, Hayes, & Nelson, 1986) have been noted. As a result, a number of studies have focused on methods of training conditional discriminations (e.g., Saunders & Spradlin, 1990). Some of this research has focused on the trouble that children have acquiring the arbitrary match-to-sample performances (e.g., Zygmunt, Lazar, Dube, & McIlvane, 1992).

Recent research has focused on the attempt to teach young, preschool-aged children an arbitrary match-to-sample task without verbal instructions through differential reinforcement. An initial finding was that children did not learn the conditional relations through differential reinforcement alone.

The purpose of the present study was to devise a stimulus-control shaping technique that would bring the child's behavior under the control of the conditional relation between the sample and comparison stimuli. The thematic match-to-sample procedure is one in which the sample and comparison stimuli are

not physically identical, but are from a class or category already familiar to the subjects through everyday encounters. One example would be figures relating to holidays or sports (a Santa Claus and Christmas tree, or a football and baseball glove).

Four preschool-aged children were trained on identity and thematic match-to-sample tasks. Once children mastered either or both of these tasks, depending on their experimental condition, they were exposed to arbitrary match-to-sample training. Children who had learned only identity match-to-sample showed no signs of acquisition on the arbitrary match-to-sample task. After only 2 to 5 sessions, 2 of the children who were trained on identity and then thematic match-to-sample were able to master the arbitrary match-to-sample task. Mastery of identity and then thematic match-to-sample may constitute stimulus-control shaping (McIlvane & Dube, 1992). The identity match-to-sample step may be too different from the arbitrary task to facilitate learning. It may be that thematic training provided the subjects with an intermediate step to help establish control by the relation between the sample and comparison stimuli, even when the stimuli are physically dissimilar. Instead of changing the actual physical appearance (Zygmunt et al., 1992), the relation between the sample and comparison stimuli was gradually changed.

Through the use of these procedures, children

are better able to learn arbitrary matching-to-sample without explicit verbal instructions. This fact may lead to studies that address the questions surrounding human and nonhuman differences on equivalence tests. Some may argue that thematic matching-to-sample is still a verbal manipulation because of the subject's previous history with the stimuli, and thus continues to put nonhuman subjects at a disadvantage in studies of equivalence. It would be interesting, therefore, to see a thematic match-to-sample procedure designed for nonhuman subjects like pigeons or monkeys, using natural categories such as food and nonfood items (i.e., sticks and rocks). If, after extensive training with more "conceptual" relations, nonhumans still did not show equivalence patterns, additional support might be provided for the importance of language, or other uniquely human attributes, in the formation of equivalence classes.

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SAY-DO CORRESPONDENCE: A VERBAL OPERANT ANALYSIS

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Behavior-analytic interpretations of verbal behavior often lack substantial empirical support, and empirical studies of communicative behavior often have been conducted without the guidance of a rigorous conceptual analysis. The literature on say-do correspondence training provides an example of the latter. Verbal behavior is integral to the notion of correspondence, yet researchers in this area typically do not analyze their subject matter in terms of Skinner's (1957) functional analysis of verbal behavior. Application of the functional categories to correspondence may reveal a better understanding of the relations being studied.

The term correspondence refers to a relation between verbal and nonverbal behavior. For the

relation to be called correspondence, the nonverbal behavior emitted must match or correspond to a verbal report about the nonverbal behavior. In say-do correspondence, the verbal report precedes the nonverbal behavior. Say-do correspondence may be viewed as following through with what one promised.

Much of the research on say-do correspondence has been conducted in the absence of a rigorous conceptual analysis. Only recently have researchers begun to question the nature of correspondence and acknowledge that they have overlooked the important question of how correspondence develops (Deacon & Konarski, 1987; Stokes, Osnes, & Guevremont, 1987). Several camps have developed, each offering

a different account of the relationship between saying and doing. The three most prevalent accounts view correspondence as self-regulation, a behavior chain, or rule-governed behavior.

The original and most pervasive account of say-do correspondence is consistent with the initial goal of correspondence training: verbal self-control. Within this account, the initial verbalization is viewed as a discriminative stimulus for the forthcoming nonverbal behavior (Baer, 1990; Stokes et al., 1987). It is assumed that the nonverbal behavior will come under the control of the temporally remote verbal statement rather than current events in the environment.

A second view, which has received little attention, explains say-do correspondence in terms of a behavior chain. Paniagua and Baer (1982) defined the links of the say-do chain as a promise, a series of intermediate behaviors leading from the promise to its fulfillment, and the nonverbal behavior which fulfills the promise. These authors suggested that reinforcement can be presented at various links in the say-do chain to develop correspondence.

A third account, which is growing in popularity, describes say-do correspondence as rule-governed behavior. It is suggested that subjects receiving correspondence training form a rule such as, "To get the (*reinforcer*), I have to do what I say" (Deacon & Konarski, 1987, p. 399). Thus, the nonverbal response comes to correspond to the verbal response as a result of some rule. If correspondence does not result, presumably the subject generated an incorrect rule or no rule at all.

The results of research of all three of these camps remain inconsistent and fail to support any one particular account. Baer (1990) states that further study will likely resolve these issues; however, three decades of research have revealed little about the nature of correspondence and what subjects learn during training. Perhaps a reinterpretation of correspondence is necessary before continuing its empirical investigation.

An alternative analysis can be derived from Baer and Detrich's (1990) explanation of correspondence in terms of tacting future events. Baer and Detrich proposed that "say" responses tact private events

that are concomitants or precursors of the "do" responses. In other words, the response, "I will play with the doll at free time" may be equivalent to the response, "This is how I typically feel when I am playing with the doll." It is difficult, however, to imagine an empirical test of this proposal.

Another possibility is that "say" responses tact external controlling variables rather than private events. The conditions under which the current verbalization is emitted may resemble past conditions under which the nonverbal behavior was emitted (Skinner, 1957). If this is true, it should be possible to improve say-do correspondence in part by improving the relevant tact repertoire.

The traditional conceptualizations of correspondence force a functional relation that has not been demonstrated. It seems likely that the verbal and nonverbal behaviors in say-do correspondence are under the control of different stimuli. Explaining say-do correspondence in terms of Skinner's self-tacting of future events may prove useful in clearly identifying the subject matter of correspondence and yielding more fruitful research.

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CONFERENCE PRESENTATION ABSTRACTS

**The Acute Effects of Marijuana on Human
Aggressive Responding Under
Highly Provoking Conditions**

Melanie Alfred, Donald M. Dougherty,
John D. Roache, and Don R. Cherek
The University of Texas
Houston Health Science Center

Five male subjects currently using marijuana were recruited into this study. The © Point Subtraction Aggression Paradigm (PSAP), which operationally defines an aggressive response as the delivery of an aversive stimulus to another person was used. The PSAP provided subjects with two response options: (1) a non-aggressive option: responding on button A to accumulate points exchangeable for money; and (2) an aggressive option: responding on button B to subtract points from another subject's counter. Aggressive responding was initiated by subtracting points from the subject's counter and attributing these point subtractions to another subject. Subjects were maintained under placebo marijuana cigarette conditions until all responding stabilized. Subjects then smoked a high potency marijuana cigarette (3.55% THC) on eight separate occasions with intervening placebo days. Subjects were studied under four conditions involving low and/or high provocation before and after smoking. Under low provocation conditions before and after smoking, either slight increases or no changes in aggressive responding were observed. Under high provocation conditions after smoking 3.55% THC cigarettes, substantial decreases in aggressive responding were observed. The effects of marijuana on human aggressive responding may depend upon current provoking conditions.

Association for Behavior Analysis, Chicago, IL, May, 1993

**Aggressive Responding of Violent and non-
Violent Male Parolees
Under Laboratory Conditions**

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Laboratory studies of human aggressive responding have struggled with the issue of external validity for many years. Does human aggressive responding occurring under laboratory conditions have any relationship to aggressive behavior outside the laboratory? This study sought to compare aggressive responding among male parolees of Harris County. Subjects were assigned to a violent or non-violent group based upon their criminal record and the Brown History of Violence Questionnaire. Aggressive and non-aggressive (point-maintained) responding were recorded using an Apple II GS version of the © Point Subtraction Aggression Paradigm (PSAP). This methodology operationally defines an aggressive response as the delivery of an aversive stimulus to another person. The PSAP provides subjects with two response options: (1) a non-aggressive option-responding on Button A to accumulate points exchangeable for money (10 cents = 1 point), and (2) an aggressive option-responding on Button B which results in the subtraction of points from another subject's counter. Aggressive responding was initiated by subtracting points the subject has accumulated on his counter and attributing these point subtractions to another subject. Violent parolees responded more frequently on the aggressive response option under conditions of low provocation than parolees in the non-violent group.

Association for Behavior Analysis, Chicago, IL, May, 1993

ERRATUM

"Equivalence Class Formation Via Common Reinforcers: The Role of Naming" by Celso Goyos, Fall, 1992. The last line beginning on page 35 should read "Correct selections of A1, B1, C1, and D1 were followed by R1 (a yellow token), and correct selections of A2, B2, C2, and D2 were followed by reinforcer R2 (a red token)."

The Effects of Methylphenidate on
Aggressive Responding of ADHD Children
under Laboratory Conditions

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Melanie Alfred, and Charles Casat
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Houston Health Science Center

Performance tests are typically used to evaluate the effects of drugs in Attention Deficit Hyperactivity Disorder (ADHD) children. We initiated studies with ADHD children to evaluate the effects of a therapeutic drug (methylphenidate) on objective measures of aggressive responding under controlled laboratory conditions. ADHD children (8-11 yr) currently taking methylphenidate were recruited into the study, and participated 4 days. Children skipped their morning dose of methylphenidate and participated in two blocks of sessions. Each block consisted of one 25-min session using the © Point Subtraction Aggression Paradigm, one 20-min session of the Continuous Performance Task and one session of a matching-to-sample task. After the first block of sessions, the child swallowed one capsule which contained placebo, 0.3 or 0.6 mg/kg methylphenidate and waited for 30 minutes. After the second block of sessions, the child swallowed a second capsule which contained the normal methylphenidate dose or placebo. Preliminary results indicate that methylphenidate produced a dose-related decrease in aggressive responding and a dose-related increase in non-aggressive responding. One child did not decrease aggressive responding following a methylphenidate dose, and this child is not responding favorably to methylphenidate outside the laboratory.

Association for Behavior Analysis, Chicago, IL, May, 1993.

The Effects of Marijuana on Progressive-Interval
Schedule Performance in Humans

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Five human subjects were recruited to study progressive-interval schedule (PI) responding and

the effects of marijuana smoking on their steady-state behaviors. All schedules had two components: progressive-interval and fixed-interval (reinforcer-delivery) components. In the first component, the interval length began at 20 s and increased either geometrically or arithmetically on each subsequent interval. After the interval's temporal requirement elapsed, a button-press response produced the second component. In the second component, a total of five reinforcers (money added to the subject's counter) were available on a fixed-interval 20-s schedule. (The magnitude of these reinforcers was varied on some schedules.) After five reinforcers had been delivered the schedule returned to its initial component. The following relationships were found: (1) Subject's post-reinforcement pauses closely matched the temporal requirements on successive intervals, and marijuana had no effect on the duration of these pauses; (2) subject's rates of responding during successive progressive-interval components rapidly decreased to low rates of responding after the first few progressions, and marijuana suppressed these response rates; and (3) when the magnitude of the reinforcers was at its highest value subject's rates of responding were higher and post-reinforcement pauses were shorter.

Association for Behavior Analysis, Chicago, IL, May, 1993.

The Effects of Both the Probability and Magnitude
of Reinforcers on Human's Choices
to Compete or Not to Compete

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We studied human subject's choices to earn monetary reinforcers either by competing with a fictitious opponent or by not competing. To do this we modified Buskist's (e.g., *J. Exp. Anal. Beh.*, 47, 145-158, 1987) competitive fixed-interval schedule to include another option, a noncompetitive fixed-interval schedule. Values for each of these schedules were 30 s and 60 s, respectively. While on either schedule, for approximately 2 min, the opportunity for a reinforcer became available after the interval's duration had elapsed; the subject's first response after the reinforcer became available produced it. Under noncompeting conditions, reinforcers were always available after

the interval had elapsed. Under competing conditions, reinforcers were available intermittently based on a predetermined probability (either .25, .50, or .75) of delivery. In addition to the probability of payoff, we also manipulated the magnitude of reinforcers. Preliminary results indicate that most subjects show strong preferences to earn reinforcers while competing, even when the density of reinforcers in this option is half that available in the noncompeting alternative.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Restricted Control by Multi-element Stimuli:
Issues in Measurement, Remediation,
and Interpretation

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In situations where discriminative stimuli are complex, individuals with developmental limitations may exhibit control by a limited number of stimulus elements. This characteristic has been referred to as stimulus overselectivity or restricted stimulus control. This presentation compared conditional and nonconditional discrimination procedures for determining the extent to which the elements of complex stimuli control responding in individuals with mental retardation. The paper described efforts to develop new remedial techniques to increase the number of stimulus elements that exert control, and presented data to illustrate this development. The techniques include extensions of traditional methods for broadening stimulus control as well as extensions of methods that have been effective with less-complex discriminations. One procedure, for example, for delayed matching to sample with complex sample stimuli incorporates a differential observing response that verifies discrimination of each sample element prior to the delay. The presentation also described recent technological developments that make precise, real-time recording of eye movements practical in individuals with moderate to severe mental retardation.

Gatlinburg Conference on Research and Theory in MR/DD, Gatlinburg, TN, April, 1993.

Self-Control in Adult Humans:
Effects of Food Preferences

L. B. Forzano and A. W. Logue
State University of New York College at Brockport

This experiment examined the effects of reinforcer preference, in particular, food preference on adult human females' choice behavior in a self-control paradigm. Self-control was estimated using points exchangeable for juice as the reinforcer. Subjects demonstrated significantly less self-control in conditions in which subjects had a higher preference for the juice received as the less delayed, smaller amount reinforcer than for the juice received as the more delayed, larger amount reinforcer. The results demonstrate that subjects' food preferences can influence self-control for food reinforcers.

Eastern Psychological Association, Arlington, VA, April, 1993.

Self-Control in Preschool Age Children:
Effects of Food Preferences

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Self-control has been defined as the choice of a more delayed, larger amount of reinforcement over a less delayed, smaller amount of reinforcement, and impulsiveness as the opposite. Several researchers have found that preschool-age boys tend to demonstrate impulsiveness. However, much of this research has used the same type of reinforcer for both response alternatives, despite the fact that reinforcer preference has been shown in a variety of experiments to significantly influence choice behavior. The present experiment used six 3-year-old males to explore the effects of food preference on preschoolers' choice behavior in a self-control paradigm. Boys showed a higher proportion of responses for more delayed, larger amount reinforcers when those choices resulted in receipt of the most preferred food as compared to when those choices resulted in the least preferred food. Further, boys chose the less delayed, smaller amount reinforcers significantly more often when only those choices, as opposed to both choices resulted in preferred food. Conversely, they chose the more delayed, larger amount reinforcers significantly more often when only those choices, as opposed to both

choices, resulted in preferred food. The results demonstrate that subjects' food preferences can influence self-control for food reinforcers.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Equivalence Class Formation Via Common Reinforcers: The Role of Naming (II)

Celso Goyos and Cybelli Lavoie
Federal University of San Carlos

Three studies were designed as an attempt to investigate how stimulus-specific reinforcement procedures interact with naming to form and expand stimulus equivalence classes. Seven four-to-five year old children were taught identity matching with nonspecific reinforcement. Next, generalized identity tested for reflexivity, and arbitrary matching coupled with stimulus specific reinforcement were introduced. The relationships A1-B1-R1, A2-B2-R2, and C1-D1-R1, C2-D2-R2 were taught. R1 and R2 were yellow and red tokens, exchangeable for edibles and toys, respectively. Tests to verify the formation of stimulus-reinforcer relations and equivalence were introduced next. Three of four subjects passed both the stimulus-reinforcer and the equivalence tests and the one who failed stimulus-reinforcer tests also failed equivalence. In a second study, one subject who passed equivalence received arbitrary training with CD stimuli reversed. Thus, the relationships C1-D1-R2 and C2-D2-R1 were taught, followed by stimulus-reinforcer and equivalence tests. The results showed that the subject reversed neither the stimulus-reinforcer relations, nor the equivalence classes. In a third study, the same subject received verbal training in the presence of the sample stimulus only. She was reinforced to say the words "yellow" and "red" in the presence of A1, B1, C2, D2 and A2, B2, C1, D1, respectively. Reversed performance in stimulus-reinforcer relations and reversed equivalence were immediately observed as a result of verbal training. The results of these studies, therefore, replicated our previous findings and added further evidence to the notion that verbal behavior can be a precursor for stimulus-reinforcer relations and equivalence relations.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Stimulus Class Formation, Stimulus-Reinforcer Relations, and Auditory Visual Relations

Celso Goyos and Cybelli Lavoie
Federal University of San Carlos

Four two-member abstract stimulus sets were used to teach arbitrary matching with stimulus-specific reinforcement to seven preschool children. Selections of B1 and B2 in the presence of A1 and A2 were followed by yellow and red tokens, respectively. Yellow and red tokens were exchanged for different reinforcers. Selections of D1 and D2 in the presence of C1 and C2 were followed by yellow and red tokens, respectively. Next, in probe tests, five children showed formation of two ABCD classes, but not stimulus-reinforcer relations, and two, showed neither stimulus classes nor stimulus-reinforcer relations. The five subjects who formed stimulus-classes were then taught auditory-visual relations, matching the words "yellow" and "red" to E1 and E2, respectively. Nonspecific reinforcement followed correct selections. Probes showed emergence of two ABCDE classes for three subjects, who were introduced to yet another novel auditory-visual relation: matching "fifi" to F1 and "toto" to F2. Stimulus class tests showed class expansion (ABCDEF) for two subjects. The overall results showed that all subjects, including the ones who passed the stimulus class formation tests, failed to show stimulus-reinforcer relations. The stimulus classes were expanded as a function of auditory-visual relationships trained with the reinforcers' names. The classes were also expanded to include stimuli as a function of novel auditory-visual relationships. Thus far, our results support the notion that in conditional discriminations with stimulus-specific reinforcement the subjects may have to name the stimuli so that equivalence and class expansion can be shown.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Nonverbal Tests of Short-Term Visual Memory in Autism: Some Preliminary Data

Gina Green
E. K. Shriver Center, New England Center for Autism, and Northeastern University

Microscopic abnormalities have been found in the limbic systems of individuals with autism. Nonver-

bal learning and memory tasks that have proven sensitive to damage and underdevelopment in those brain structures were employed in a pilot study with three youths with autism: (a) Delayed nonmatching-to-sample (DNMS) with trial-unique stimuli—A novel stimulus (sample) is presented on each trial. After a brief delay, that same stimulus and another novel stimulus are presented as comparisons. Responses to comparisons that do not match the sample are reinforced. Recognition memory is tested by increasing the delay; (b) Delayed spatial alternation (DSA)—Subjects learn to alternate responding between two identical stimuli in different left-right positions with a brief delay between trials. Memory is challenged by increasing the delay; (c) Simple visual discrimination—Two nonidentical stimuli are presented simultaneously on repeated trials. Responses to one stimulus are reinforced, while responses to the other stimulus are not reinforced. Unlike DNMS and DSA, simple discrimination performances are not impaired by limbic system damage. Performances of two of three autistic subjects were consistent with limbic system damage or underdevelopment: Difficulty learning the DNMS and DSA tasks at short delays (5 seconds); deteriorating DNMS and DSA performances at longer delays (10, 30, 60, and 120 seconds) and relative facility with simple discriminations.

Gatlinburg Conference on Research and Theory in MR/DD, Gatlinburg, TN, April, 1993.

Four Procedures for Identifying Positive Reinforcers for Persons of Differing Abilities

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J. C. Owens, E. Serpick, and T. Kerschner
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Empirical reinforcer identification is essential for effective reinforcement procedures. This project exemplified four procedures that were used to identify reinforcers in relatively little time. These were a Concurrent Operants Instructed Assessment, which used a reversal design to examine the effect of contingent preferred stimulus presentation on two operants; Single Operant Instructed Assessment, which used a withdrawal design to examine the effect of contingent preferred stimulus presentation on one

operant; Zone Discrimination Reinforcer Assessment, which used a reversal design to examine the effect of contingent preferred stimulus access on presence or absence from particular areas; and a Competing Responses Reinforcer Assessment, which used a withdrawal design to examine the effect of preferred stimulus access on self-stimulatory behavior. The Instructed Assessments followed straight-forward reinforcement and extinction contingencies, while the Zone Discrimination and Competing Responses Assessment Procedures were based on matching research. The Concurrent Operants Instructed Assessment required 39 minutes for completion. The remaining procedures required from 17 to 27 minutes. Given that each of these procedures produced a similar practical result (i.e., identification of one reinforcer), the Single Operant Instructed Assessment, Zone Discrimination Assessment, and Competing Responses Assessment Procedures were more efficient than the Concurrent Operants Procedure. Choice of procedure should be considerate of the subject's capabilities. The Instructed Assessments appear best suited for persons who exhibit some compliance and are physically capable of performing the required tasks. The Zone Discrimination Assessment is suited for persons who are ambulatory, but who do not readily exhibit compliance skills or have verbal deficits. Finally, the Competing Responses Assessment appears suited for persons for whom persistent stereotypy precludes practical implementation of compliance-based procedures.

Association for Behavior Analysis, Chicago, IL, May, 1993.

The Effects of Mission-Specifying Instructions on Preference in a Self-Control Choice Task

Cloyd Hyten, Mark P. Reilly, and Andrea Peuster
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In the initial orienting instructions prior to experimental sessions, experimenters often explain the task, the mechanical procedures, and the payment system to subjects. Sometimes experimenters tell subjects that their job is to earn points, or to earn as many points as they can. These "mission-specifying" instructions may inadvertently influence preference in self-control choice tasks. In some previous self-con-

trol experiments in which subjects have shown a tendency to maximize reinforcer amount regardless of delay, mission-specifying instructions telling them to earn as many points as possible have been part of the orienting instructions. The purpose of this experiment was to examine the possibility that these instructions modulate preference. Subjects were given different mission-specifying instructions (telling them to maximize points, minimize delays, or nothing about their mission) as part of the general orienting instructions explaining a self-control task involving choice between a larger delayed monetary reinforcer or a smaller, immediate reinforcer. Consistent with the instructions, subjects receiving the maximization instructions exhibited strong self-control preference, almost all of those receiving delay minimization instructions showed impulsive preference at long delay values, and preferences were mixed among subjects who were given no mission-specifying instructions. These findings show that mission-specifying instructions can influence preference in choice tasks. Researchers should avoid mission-specifying instructions that tell subjects to maximize points in self-control experiments.

Association for Behavioral Analysis, Chicago, IL, May, 1993.

The Place of Natural Contingency Analyses in Behavioral Research

J. M. Johnston
Auburn University

At a theoretical level, the influence of natural contingencies is well respected in behavior analysis. However, this respect is often not matched with appropriate treatment of natural contingencies in research and applied endeavors. The requirements of experimental analysis are usually interpreted as mitigating against the study of behavior-environment contingencies in natural settings. Although issues of experimental control must be respected, it is nevertheless possible to collect appropriate data under uncontrived conditions in order to guide experimental agendas. Furthermore, sound experimental research regarding the role of natural contingencies can also be conducted under some field conditions. In clinical contexts, measurement and modification of natural contingencies has recently experienced renewed interest under the guise of functional analysis, driven

partly by the aversives controversy. However, the service orientation of clinical work discourages true experimental analyses of the influence of natural contingencies, so little may be learned by such applications. The presentation considers the value of understanding how behavior works in uncontrived settings and how such research might be encouraged.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Basic and Applied Research: Bifurcation or Continuum?

J. M. Johnston
Auburn University

This presentation focuses on how the discipline's conceptions of basic and applied research have historically encouraged an inappropriate bifurcation in place of what should be a continuum. The evolution of basic and applied behavior analytic research was driven by different interests, and the conception of each research agenda contributed to omitting what in other natural science disciplines is considered experimental research driven by applied questions and problems. The presentation will redefine what is now called applied behavior analysis into its research and service components, thereby identifying the missing "middle" in the behavior analytic enterprise. It is argued that separating applied research from service interests permits a broader and more analytically sound consideration of research questions prompted by basic research findings and applied issues and needs. The consequences of such a separation for graduate training and other personnel issues is also discussed.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Trained Creativity in the Equivalence Paradigm: A New Proposal for Emergent Performances

P. Scott Lawrence, R. Andrew Mitchum,
and Richard L. Shull
University of North Carolina at Greensboro

After 20 years of research in stimulus equivalence and related conditional discrimination phenomena,

disagreement continues about "where equivalence comes from." Some argue that the capacity to show emergent stimulus control is a product of human evolutionary contingencies, others that human, verbal histories converge with training to construct new behavior. A neglected viewpoint is that simpler, more universal behavioral processes can converge with the circumstances of training to provide all that is necessary for emergent performances to occur. An account of the stimulus equivalence process is presented using contingencies on observing and perception implicit in conditional discrimination training. Training contingencies may set up private events as precurent behavior which supports the final selection response; when new relations are tested, these events remain available to bias responding under ostensibly ambiguous circumstances. Implications are discussed for the analysis of the equivalence phenomenon, interpretation of existing data, divergent training procedures, related emergent performances, and directions for future research in generative conditional discrimination paradigms.

Association for Behavioral Analysis, Chicago, IL, May, 1993.

Self-Control, Impulsivity, and Drug Abuse

A. W. Logue

State University of New York at Stony Brook

There are two ways in which self-control and impulsiveness may be related to drug abuse. Drug abuse may be an example of impulsiveness, or drug abuse may cause impulsiveness (or both). There has been very little experimental research on the possible effects of impulsiveness on drug abuse, and on the possible effects of drug abuse on impulsiveness. This presentation focused on an experiment that investigated the effects of chronic exposure to cocaine on rats' self-control for food. The results showed that the cocaine significantly decreased the rats' self-control. Thus it is possible that drug abuse may increase general impulsiveness, but concluding this would require more research with different self-control and drug administration procedures.

Association for Behavior Analysis, Chicago, IL, May, 1993.

The Construction of Cognitive Functions from Behavioral Relations

Barry Lowenkron

California State University, Los Angeles

Generalized abstract performances in humans, of the sort typically ascribed to cognition, depend on the control of behavior by relations between stimuli so that one stimulus may specify another. The problem of cognition is thus a problem in stimulus control. But the response to this problem from the behavioral perspective has been limited, and as a result behavior analysis has not yet dealt with this most important class of behaviors: those typically ascribed to intelligence and thought. Certainly, this is at least in part a result of the fact that the S^D is seen to control the rate of a response, but not the selection of a specific stimulus. In the S^D account, stimulus selection is a by-product of the control of response rate. This paper illustrates how stimulus control of response topography may serve as the basis of stimulus selection. Recent research has shown that training pairs of S^D s, so that they jointly control a common verbal response topography, produces a pattern of behavior with several fundamentally important properties. First, by jointly controlling a common topography, one stimulus may now directly and simply specify another. Secondly, the behavior pattern thus established is highly generalizable, and thirdly, the behavior pattern interacts with other behavior to produce increasingly abstract performances. As a result, performances typically attributed to the intercession of cognitive functions, may be fully accounted for by their construction from specifiable elements of behavior.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Language Competency and Performance on
Discrimination and Relational Learning Tasks:
Some Possible Relationships

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and Lawrence T. Stoddard

Behavioral Sciences Division
E. K. Shriver Center for Mental Retardation, Inc.

A major research issue is the relationship between developing language competency and performance in other domains of cognitive functioning (attending, learning, remembering, etc.). Two relationships must be considered. First, how does the developing language repertoire influence performance on tasks not obviously related to language? For example, responses to laboratory learning tasks (e.g., relational discriminations, schedules of reinforcement) may change with increases in mental age and in the size and complexity of the language repertoire. Second, how is language development influenced by developments in other aspects of cognitive functioning? For example, is the capacity for learning equivalence relations an important prerequisite for language development? We have examined relationships between language competency and performance on nonverbal discrimination and relational learning paradigms. We analyzed assessment data for some 60 individuals with moderate and severe retardation, about a third of whom had very limited language skills. We describe relationships involving variables such as Peabody Picture Vocabulary Test scores, performance on a word learning ("fast mapping") test, and results of several other discrimination tests. In general, verbal competency was correlated with nonverbal discrimination learning. We also analyzed results from 60 normally developing two- and three-year-old children. We asked why these children, in the midst of extraordinarily rapid language learning, are often reported to do poorly with apparently simple discriminations in laboratory situations. Our study demonstrated virtually instantaneous discrimination learning even in very young children. We argue that apparent mismatches in verbal and nonverbal competency may instead reflect measurement procedures that fail to recognize how language-related tasks may direct attention and stimulus classification.

Gatlinburg Conference on Research and Theory in
MR/DD, Gatlinburg, TN, April, 1993

Stimulus Control Shaping at 30: Some Old Prob-
lems and New Solutions

William J. McIlvane, Richard W. Serna,
and Joanne B. Kledaras

Behavioral Sciences Division
E. K. Shriver Center for Mental Retardation, Inc.

Seminal research in the mid-1960s demonstrated that programs of graduated stimulus change could teach new discrimination performances rapidly and with few or no errors to very young children, people with severe intellectual disabilities, and nonhuman species. This "stimulus control shaping" research established the groundwork for building a technology of nonverbal instruction appropriate for individuals who do not respond well to verbal methods; recent progress developing this technology is noteworthy. The research also established the need for theoretical analyses to describe adequately the processes involved in stimulus control transfer and discrimination learning in general. Positive early accomplishments, however, have not been followed up, perhaps because they were inspired by learning theories that are not very influential today. The stalled theoretical analyses of stimulus control transfer are a problem not only for basic behavioral science; applied research is denied a natural source of inspiration and innovation.

Our presentation reviewed the history of stimulus control shaping research and examined how its questions were framed. Theoretical issues uncovered by application-oriented research were neither made fully explicit nor adequately resolved. Recent research from our laboratories using novel stimulus control shaping methods is beginning to address these issues. New technology makes it feasible to pursue basic and applied research programs that were daunting only a few years ago. Our short-term goal is to examine stimulus control transfer in terms of other relatively advanced analyses of stimulus generalization, stimulus classes, and conceptual categories. The long-term goal is to render stimulus control shaping less of an art and more of a technology with a clear scientific basis.

Gatlinburg Conference on Research and Theory in
MR/DD, Gatlinburg, TN, April, 1993

A Census of the Last 10 Years of Human Operant Research

Marcus Nedelmann, Donald M. Dougherty, and
Melanie Alfred
The University of Texas
Houston Health Science Center

Ten years ago, Buskist and Miller (1982, *The Behavior Analyst*, 5, 137-141) conducted a census of human operant behavior (HOB) and concluded that the "experimental analysis of human behavior has thus far fallen short of Skinner's 'active prosecution of a science of behavior,' (p. 141)." In this paper, we conducted a similar census of the HOB literature in which we describe the trends during the 10 years which have passed since the time of the original census. We found that within the past 10 years the percentage of HOB reports has increased from approximately 5-10% to 30-40% of all published reports in *The Journal of the Experimental Analysis of Behavior*, the primary outlet for HOB reports. In fact, during 1990 HOB reports accounted for more than 44% of all data-based reports in *JEAB*. Other journals (including *The Psychological Record*, *Animal Learning & Behavior*, and *Learning & Motivation*) have also shown similar increases in the number of HOB reports. Other factors in which we characterized included: subject, area, and citation analyses. Our most important conclusion is that these last 10 years, HOB has seen dramatic increases in both interest and representation in *JEAB*.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Selection Between Two Comparisons Depending on the Relation Among Two Samples

Luis Antonio Pérez-González
University of Oviedo, SPAIN

Adults and one 11-year-old girl were trained, using a matching-to-sample procedure, to pick stimulus B1 in the presence of stimulus A1, B2 in the presence of A2 and B3 in the presence of A3 (the A-B relation). In the same way, they were trained to pick Q1 in the presence of P1, Q2 in the presence of P2, and Q3 in the presence of P3 (the P-Q relation). Afterwards, one stimulus in Set A and another stimulus in Set B appeared together as samples, and

stimuli X1 and X2 were the comparisons. Responses to X1 were reinforced if the two stimuli in the sample had been related in the previous training (i.e., A1 and B1), and responses to X2 were reinforced if the two samples had not been related (i.e., A1 and B2). This was the A-B-X relation. Then a test was made in which a stimulus of Set P and another of Set Q were the samples, and X1 and X2 were the comparisons. The subjects picked X1 when the samples were P1 and Q1, P2 and Q2, and P3 and Q3; and they picked X2 in the presence of the other six sample combinations (i.e., P1-Q2, P1-Q3, P2-Q1, P2-Q3, P3-Q1, and P3-Q2) after being tested with the B-A and the Q-P symmetrical relations.

Association for Behavior Analysis, San Francisco, CA, May, 1992

Can a Cluster of Conditional Stimuli be a Rule?

Luis Antonio Pérez-González
University of Oviedo, SPAIN

First, the A-B and P-Q relations were trained. Afterwards, one stimulus in Set A and another stimulus in Set B appeared together as samples, and stimuli X1 and X2 were the comparisons. Responses to X1 were reinforced if the two stimuli in the sample had been related in the previous training (i.e., A1 and B1), and responses to X2 were reinforced if the two samples had not been related (i.e., A1 and B2). This was the A-B-X relation. Then a test was made in which a stimulus of Set P and another of Set Q were the samples, and X1 and X2 were the comparisons. The adults who were tested selected X1 when the two samples were in the same class and selected X2 when the two samples were in a different class. Subjects who showed emergence of the P-Q-X relation, were trained with two new pairs of stimuli C and D and the comparisons X1 and X2. Responses to comparisons X were reinforced in the same way as the A-B-X relation. Then, the emergence for the C-D relation was successfully tested. Afterwards, the C-D-X relation was reversed and the C-D relation was tested again, but the selected comparisons were the same. Then, a training session was conducted with new stimuli in which sequences of E-F-X followed by E-F were randomly mixed with sequences of the reversed E-F-X followed by the reversed E-F. Then the former test

with C and D was conducted again. Now, responses to the C-D test depended on the relation (C-D-X or reversed C-D-X) just trained before. So, the C-D-X relation accomplished the function of a rule for the four-term contingency of C-D.

Association for Behavior Analysis, San Francisco, CA, May, 1992

Effects of Triazolam and Caffeine, Alone and in Combination, on Human Operant Performance

Craig R. Rush, Stephen T. Higgins, Warren K. Bickel, John R. Hughes, and Jill Goldberg
University of Vermont

The acute effects of triazolam (0, 0.375, and 0.75 mg/70kg) and caffeine (0, 250 and 500 mg/70kg), administered alone and in combination, were assessed in human volunteers (N=9) responding under a multiple schedule of repeated acquisition and performance of response chains. In each component of the multiple schedule, subjects completed a response sequence using three keys on a response panel. In the acquisition component, a new sequence was learned each time the subject did the task. In the performance condition, the response sequence always remained the same. Triazolam administered alone increased percent errors and decreased rates of responding in both conditions as an orderly, graded function of dose. The effects of triazolam on percent errors were selective in that larger magnitude effects were observed in the acquisition versus performance condition. The effects of caffeine alone were of small magnitude and variable across subjects. Combining triazolam and caffeine resulted in significantly less disruption than observed with triazolam alone. These findings are consistent with prior studies that investigated the effects of commonly used benzodiazepines (e.g., lorazepam) in combination with caffeine and further indicate that triazolam's behavioral profile is similar to that of other benzodiazepine compounds.

Association for Behavior Analysis, Chicago, IL, May, 1993.

Stimulus Control Shaping and Auditory Discrimination Learning in Individuals with Severe Intellectual Disabilities

Richard W. Serna, Lawrence T. Stoddard,
and Laura Becker

Behavioral Sciences Division
E. K. Shriver Center for Mental Retardation, Inc.

In contrast to the extensive study of stimulus control shaping in visual discrimination learning, very little research has examined shaping with auditory discriminations. One reason for this relative neglect is technological: Manipulating certain critical features of auditory stimuli has been difficult without expensive equipment and substantial technical expertise. Recently available computer hardware and software, however, makes it possible to overcome the technological problems with digital recording and editing techniques. With this technology, we have begun to create auditory stimulus control shaping programs that are analogous to those found to be effective with visual stimuli. This presentation describes our methodology and presents illustrative initial findings with individuals with severe intellectual limitations. One study established the first instances of differential auditory control by spoken words in two subjects who were previously able only to discriminate the presence vs. absence of any word. A partial-word duration fading procedure gradually introduced a novel stimulus by presenting increasing portions of the acoustical wave. A second study transferred auditory stimulus control from one spoken word to another. Increasing portions of a novel word were superimposed onto lessening portions of a word that was already discriminated. These data demonstrate the feasibility and potential utility of an auditory stimulus control shaping methodology. They also suggest directions for further research that may determine optimal methods for auditory stimulus control shaping.

Gatlinburg Conference on Research and Theory in MR/DD, Gatlinburg, TN, April, 1993.

Effects of Nicotine on Cooperative Responding in Abstinent Male Smokers

R. Spiga, R. H. Bennett, J. Schmitz, D. R. Cherek,
and M. Broitman
University of Texas
Houston Health Science Center

The effects of nicotine and ad libitum smoking on human cooperative responding in abstinent male smokers were examined. Subjects attended daily and participated in three 30-minute sessions. Expired carbon monoxide (CO) levels were measured when the subject arrived. Subjects were permitted to participate and paid a fee only if this expired CO was less than 10 ppm. Subjects who abstained on average for 15 hours met the 10 ppm criterion. After the first daily session abstinent subjects smoked ad lib, received either 0, 2, or 4 mg of nicotine gum or abstained from smoking. During episodes occurring at random times, RT 240 s, throughout a session concurrently available cooperative and independent responses were maintained by points exchangeable for money on a concurrent RI60 s RI60 s schedule of reinforcement. Increases from the first session in proportion of cooperative responses, cooperative response rate, and time allocated to the cooperative, response option were significantly greater following ad lib smoking and acute administration of 4 mg nicotine gum.

Association for Behavior Analysis, Chicago, May, 1993.

Studies in Human Drug Self-Administration: Methadone

R. Spiga, J. Grabowski, P. B. Silverman,
and R. A. Meisch
University of Texas
Houston Health Science Center

The relative reinforcing effects of different concentrations of methadone were systematically investigated by examining the effects of response requirement on human self-administration of methadone across a range of concentrations. Methadone maintenance patients stabilized at a dose of 80 mg per day were recruited as subjects.

Completing a response requirement of 32, 64, or 128 responses (fixed ratio, FR32, FR64, or FR128) on one button dispensed 10 ml of drug solution. Completing the equivalent response requirement on a second button dispensed 10 ml of vehicle. The frequency of deliveries were limited so that subjects could not ingest more than the daily methadone dose. The concentration of methadone solution dispensed was 0.108, 0.054, and 0.027 mg/ml. The unconsumed methadone dose was administered 30 minutes post-session. Deliveries and amount of methadone consumed decreased as an orderly function of drug concentration. This procedure provides an important model examining behavioral mechanisms of methadone dose ingestion and deprivation in patients.

Association for Behavior Analysis, Chicago, IL, May, 1993.

An Analysis of Restricted Stimulus Control in Simultaneous and Delayed Matching to Complex Samples

Robert Stromer & William V. Dube
Behavioral Sciences Division
E. K. Shriver Center for Mental Retardation, Inc.

We examined the discriminative performances of subjects with moderate and severe mental retardation on an identity matching-to-sample task that presented complex, two-element sample stimuli. On each trial, subjects were required to select a comparison stimulus that matched one of the sample elements. Accuracy scores were relatively high under simultaneous matching conditions but declined under delayed matching conditions. This finding suggests problems of restricted stimulus control attributable to the requirements of the two conditions: Simultaneous matching required discriminative control by only one sample element whereas delayed matching required control by the two sample elements. Upon closer examination, the decline in matching accuracy appeared to reflect selective losses of conditional control by sample stimuli and shifts in control to features of the comparison stimulus displays. Some results also suggested that certain instances of apparent restricted stimulus control may be due to difficulties in remembering two stimuli rather than the typical interpretation of limited observation. In general, the results suggest improved analytic techniques for

clarifying the nature of restricted stimulus control in matching to complex samples. The identity matching to sample baseline, for example, permits one to verify that the subject can in fact distinguish one form from another; the delayed matching format allows one to study restricted stimulus control with successively presented stimuli that have been discriminated from one another in the past. The methodology thus may produce richer, more easily interpretable results than that based on simple simultaneous or successive discrimination procedures.

Gatlinburg Conference on Research and Theory in MR/DD, Gatlinburg, TN, April, 1993.

Simple Discrimination Accuracy and Propranolol Dose in Retarded Subjects

Dean C. Williams, James A. Haugh, and
Kathryn J. Saunders

University of Kansas - Parsons Research Center

Two adult males learned simple discriminations while receiving propranolol (Inderal) to control episodic aggression. Measures were taken at different times relative to oral administration corresponding to one and two half-life periods as estimated from the known pharmacodynamics of propranolol. For Subject JR, measures were also taken at doses of 40 mg, 20 mg and 0 mg. Subject JR had mild retardation; and received 30 mg of fluphenazine per day throughout the study. Subject RG had severe retardation. The tasks consisted of learning simple discriminations of geometric shapes. Subjects responded by touching the stimuli on a computer monitor. Subject RG was exposed to two tasks sequentially. The first required him to touch a single stimulus presented in one of nine positions and the second was to learn a new two-choice, simultaneous discrimination each day. Accuracy on both tasks decreased with time since drug administration. Subject JR learned 12 intermixed two-choice simple discriminations each session. Errors decreased more rapidly within sessions and overall accuracy was higher during sessions conducted 3.5 hr after drug administration than in sessions conducted 8 hr after drug administration. A similar function was found when the dose of propranolol was reduced from 40 mg to 20 mg and from 20 mg to 0 mg. There was no difference in

performance at the different session times at 0 mg indicating that the performance changes were due to the time course of drug bloodlevels.

Association for Behavior analysis, Chicago, IL, May, 1993.

Functional Class Formation after Repeated Shifts in Contingencies for Simple Simultaneous Discriminations

Dean C. Williams and Kathryn J. Saunders
University of Kansas - Parsons Research Center

Luis Antonio Pérez-González
Universidad de Oviedo

Sidman, Wynne, Maguire, & Barnes (1989, *JEAB*, 52, 261-274) reported functional class formation after the S+ and S- functions of two groups of three stimuli were repeatedly reversed within a two-choice simple discrimination format (i.e., when A1, B1, and C1 were S+, A2, B2, and C2 were S-, and vice versa). Eventually, exposure to reversed contingencies for one class member altered responding to the other members. One interpretation is that these procedures directly trained the tested performances via delayed arbitrary matching, given that any S+ could follow any other S+ on consecutive trials. This possibility was precluded in the present study by training the simple discriminations in an invariant order and then testing with an altered order. This was done within two sets of simple discriminations. The two sets had one simple discrimination in common, making further tests across the two sets possible. Both sets included 4 three-choice simple discriminations. A trial consisted of all 4 discriminations presented one at a time; the correct selection for the first was prompted. If A1 was correct, so were B1, C1, and D1; if A2 was correct, so were B2, C2, and D2, etc. First, Set 1 and Set 2 discriminations were trained and tested independently. Then, tests that included discriminations from both sets were conducted. One subject, a man with mild retardation, has completed the protocol. All tests showed highly accurate performance. Thus, emergent performances can be demonstrated within these repeated reversal procedures.

Association for Behavior Analysis, Chicago, IL, May, 1993.

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GRANTS AWARDED TO EAHB SIG MEMBERS

Grant Title: Community Intervention Trial to Prevent Youth Drug Use

Principal Investigators: Dennis V. Ary and Anthony Biglan, Oregon Research Institute

Agency: National Institute on Drug Abuse

Dates: 09/30/91 to 08/31/96

Amount: \$706,445 (09/01/92 to 08/31/93)

The project will evaluate the effects of a community intervention to reduce adolescent drug use and will augment and extend the community intervention project to prevent youth tobacco use funded by the National Cancer Institute. It will expand the intervention to include mobilizing community leaders and organizations to modify social conditions which influence youth to use other drugs. Research supports the proposition that to achieve substantial reductions in drug use requires changes in parenting skills and school practices. The project would expand and restructure the NCI project task forces on (a) parenting, (b) media, (c) screening/recruitment of high risk youth, and (d) focusing on community reduction of risk factors for youth drug use. To achieve risk reduction, this project would create two additional task forces, one to implement more effective practices in schools, and one to improve community support for high-risk youth and families. This project will use the NCI-funded evaluations using cross-sectional and longitudinal surveys of 7th and 9th graders plus assessments of parenting and teaching practices, plus measurements of community efforts to affect the social environment for high-risk youth and families. The study will examine relationships between the social context for youth drug use and other problem behaviors. Finally, it will evaluate the effect of parent training for high-risk families. It is expected to be a model for community interventions to prevent youth drug use in small communities.

Grant Title: Community Intervention to Reduce Adolescent Tobacco Use

Principal Investigators: Anthony Biglan, Dennis V. Ary, Edward Lichtenstein, & Russell Glasgow, Oregon Research Institute

Agency: National Cancer Institute

Dates: 09/01/84 to 04/30/95

Amount: \$1,095,915 (05/01/92 to 04/30/93)

The project will evaluate the effects of a community intervention to reduce adolescent tobacco use. Sixteen small communities will be randomly assigned to receive a community intervention plus a school-based prevention program, or to receive the school program alone. The intervention is designed to mobilize community leaders and organizations to try to reduce tobacco experimentation, prevent experimenters from becoming regular users, and encourage users to quit. To promote adolescent nonuse of tobacco, task forces will (a) conduct media campaigns, (b) increase parental skills and efforts, (c) increase adolescent screening and counseling, (d) reduce access to tobacco and situations to use it, and (e) increase incentives for adolescents to be tobacco free. Intervention effects will be evaluated using cross-sectional and longitudinal surveys of 7th and 9th graders. The study will also examine the effects of the community intervention on efforts of organizations and leaders. Psychometric properties of measures of community efforts will be examined in the process. Finally, the study will examine the relationship between adolescent exposure to influences not to use tobacco and their attitudes, intentions and actual use. Repeated testing over 3 years of 7th and 9th graders will help achieve this. This will be the first randomized control trial of a community intervention to affect adolescent tobacco use. It will provide information about how such interventions will affect communities and will contribute to developing methods to measure health activities. It will contribute to our understanding of how to influence adolescent tobacco use.

Grant Title: Social Competence and Prevention of High Risk Sexual Behavior

Principal Investigators: Anthony Biglan, Dennis V. Ary, Russell Glasgow, and John Noell, Oregon Research Institute

Agency: National Institute of Mental Health

Dates: 04/01/90 to 03/31/95

Amount: \$506,296 (04/01/92 to 03/31/93)

This research will identify and then remediate adolescent decisional and social skills related to sexual behaviors which place them at risk for sexually transmitted diseases (STDs), including HIV infection.

Phase I will involve two samples of sexually active adolescents and two samples of professionals who work with sexually active adolescents. Phase I will develop a set of socially valid assessment procedures to pinpoint specific situations, decisional processes, and social skills associated with a high-risk sexual behavior. Phase 2 will use these procedures to identify individually relevant decisional and social skills and provide a brief prescriptive intervention to help adolescents avoid high-risk sexual behaviors. This intervention will be conducted and evaluated in STD clinics with adolescents who have previously had at least one STD. The entire project will be guided by recent theoretical models of social competence emphasizing the importance of both cognitive and behavioral skills, and will use assessment approaches and intervention procedures found to be effective with other adolescent problem behaviors.

Grant Title: Self-Control in Adult Humans: Effects of Food Preferences

Principal Investigator: L. B. Forzano, State University of New York College at Brockport
Agency: SUNY College at Brockport Summer Faculty/Student Research Program

Dates: 06/93 to 06/94

Amount: \$3,800

The objective of this research is to examine the effects of reinforcer preference, in particular, food preference on adult human females' choice behavior in a self-control paradigm. The results of a previous experiment suggest that humans' food preferences can influence their self-control for food reinforcers. The results of that research are limited due to the inability of the apparatus to deliver two different reinforcers to the subject during the experiment. Therefore the reinforcers were points exchangeable for the differently preferred juices delivered at the end of the experiment. However, it has been demonstrated that the time in which the reinforcers are delivered affects the degree of self-control demonstrated. In the present research, subjects will choose between two differently preferred juices which they can receive during the experiment. It will then be possible to directly examine the effects of only humans' food preferences on self-control for food reinforcers.

Grant Title: Effects of Verbal Behavior Manipulations on Conditional Discrimination Procedures

Principal Investigator: Celso Goyos, Federal University of S. Carlos, BRAZIL

Agency: FAPESP (Brazil)

Dates: 04/93 to 03/94

Amount: \$11,000

The main objective of this project is to further investigate the effects and interactions of verbal behavior and equivalence class formation with preschool children. It is assumed that the origin of verbal behavior in equivalence studies lies in the procedural features used in conditional discrimination training, and the studies will attempt to map out when and how they begin to originate. Thus, data collection and analysis of on-going verbal behavior during the course of conditional discrimination training and equivalence testing are important features of this project. A few studies have shown that stimulus-specific reinforcement procedures give rise to verbal behavior which interferes in equivalence formation. Therefore, one specific line of investigation will consist of applications of stimulus specific reinforcement procedures to establish equivalence. Another investigative line will analyze the role of verbal behavior in procedures to establish generalization and expansion of equivalence, such as single sample-multiple comparison, and multiple-sample and single comparison.

Grant Title: Methadone Self-Administration: A Behavioral Pharmacological Analysis

Principal Investigator(s): John Grabowski and Ralph Spiga, University of Texas-Houston Health Science Center

Agency: National Institute of Drug Abuse, DA 7943

Dates: 07/01/92 - 06/30/95

Amount: \$367,230

Methadone is commonly used in the treatment of opiate dependence. Behavioral effects of methadone dosing procedures and of combined drug intake are not well understood. The characteristics of therapeutic drug ingestion provide a unique opportunity to elucidate these issues through

systematic examination of oral drug taking in a controlled laboratory setting. The proposed studies will examine the effects of work requirements, drug concentration, time since last dosing session, and "pretreatment" dosing with methadone or diazepam on methadone self-administration. Subjects will be patients (males, females, including minorities) stabilized on methadone. They will be asked to attend regular daily sessions. These will take place in a controlled, automated, human laboratory environment. Meeting response, or "work" requirements will result in delivery of a small fraction of the individual's daily methadone dose. Successive completions of work requirements will produce successive drug deliveries. We will examine the effect on methadone self-administration of (a) increasing the work requirement on drug deliveries and investigate these requirements in relation to drug concentration delivered; (b) increasing the time between sessions on the work output; (c) administering a portion of the total daily dose before the self-administration session; and finally, (d) administering doses of diazepam prior to sessions. These studies, in combination, will provide a better understanding of (a) behavior of human methadone self administration, (b) reinforcing properties of methadone under a wide variety of conditions, (c) effects of methadone administered across a range of conditions, and (d) the relationship between methadone self-administration and use of other abused drugs. The research will provide a unique and important link between traditional clinical findings and other laboratory work. It will also clarify long standing assumptions about therapeutic and illicit drug taking in this patient population.

Grant Title: Survey and Analysis of Detection Dog Training Sites
 Principal Investigators: L.J. Myers and J.M. Johnston, Auburn University
 Agency: U.S. Department of Treasury
 Dates: 10/92 to 09/93
 Amount: \$23,144

Canines are widely used among federal, state, and local law enforcement agencies to detect explosives, illegal drugs, and contraband. This contract involves traveling to five of the leading detection dog training facilities in the USA and other countries to survey the details of dog and handler training methods so as to write a report analyzing these findings.

Grant Title: Determination of Canine Olfactory Thresholds
 Principal Investigators: L.J. Myers and J.M. Johnston, Auburn University
 Agency: U.S. Department of Treasury
 Dates: 10/92 to 09/93
 Amount: \$316,000

There is inadequate information about the olfactory capabilities of dogs used for detection work. In particular, although there is some research concerning absolute olfactory thresholds for a variety of substances, the methods by which these data have been obtained involve an innate response matched with electroencephalography. This contract calls for using operant laboratory methods to extend these initial findings by determining the absolute thresholds for certain substances.

Grant Title: Effects of Drugs of Abuse on Human Cooperative Responding
 Principal Investigator: Ralph Spiga, University of Texas-Houston Health Science Center
 Agency: National Institute of Drug Abuse, DA 0633
 Dates: 07/01/90 to 06/30/95
 Amount: \$510,304

Drugs of abuse affect human aggressive and conversational behavior. However, the effects of these drugs on human cooperative responding remains to be examined. This proposal describes a free-operant laboratory procedure for examining the effects of caffeine, diazepam, ethanol and nicotine on human cooperative responding. In the proposed studies cooperative behavior will be established and maintained by experimental contingencies that schedule two periods. During one period, subjects working alone can earn points exchangeable for money by pressing a button. During the other period, ostensibly initiated by another person paired with the subject, subjects can either work with the other person or work independently. Working with the other person, the cooperative responses, will be maintained by points exchangeable for money added simultaneously to the subject's and the fictitious partner's counter. Both counters will be visible to the subject. Working independently, the noncooperative option, will be maintained by points exchangeable for money being added only to the subject's counter. Experiments will also examine drug effects on cooperative exchanges initiated by the subject. These experiments extend the study of drug effects on human social behavior to cooperative behavior, a behavior vital to the functioning of the human social work groups.

RECENT PUBLICATIONS OF EAHB SIG MEMBERS*

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