JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1993, 26, 269–274 NUMBER 2 (SUMMER 1993)

JEAB, *NOVEMBER '92: WHAT'S IN IT FOR THE* JABA *READER?*

PHILIP N. HINELINE
TEMPLE UNIVERSITY

AND

DAVID P. WACKER
THE UNIVERSITY OF IOWA

A basic researcher usually can supply a story linking his or her experiments to events and concerns outside the laboratory, and is sometimes called upon to do so in proposals to funding agencies or in communicating with academic deans and other colleagues whose training is in other fields. It seems that such linkages are not obvious to most observers—perhaps their plausibility is tenuous if tested against the realities of the wooly world outside the laboratory. Also, basic research questions often have developed out of their own logic, and have elaborated their own priorities and even their own new specialized terms, which may decrease the ease of recognizing their relevance to applied settings. The present essay is an attempt to use a recent issue of *JEAB* as a prompt for discussing some ways in which a few *JEAB* articles might be relevant to *JABA* readers and for trying to sketch some ways in which the research agendas of basic and applied researchers might be brought into closer relation.

The bases for such a relation are quite varied. For example, the lead article, "The influence of preparedness on autoshaping, schedule performance, and choice," by Burns and Malone, should be of interest to readers who teach in conventional psychology or special education departments. These readers will be aware that many general psychology texts have made much of what appear to be special constraints on reinforcement-based learning. Seligman's (1970) term, *preparedness,* is given prominence as identifying, for particular species, special conditionability of particular responses via particular reinforcers, or special potency of particular combinations of discriminative stimulus and primary reinforcer (e.g., pecking responses in pigeons, vocalizations in human infants). Applied behavior analysts may have taken comfort in the fact that such considerations are likely to be of lesser importance for humans than for other species. Nevertheless, the covertly political way in which the concept is given wide prominence (suggesting that reinforcement-based principles lack generality and, thus, are of diminished importance) makes the issue one that touches us all. The bottom line of Burns and Malone's article, comparing birds' pecking of wall-mounted versus floor-mounted response keys, is that the notion of preparedness is problematic. As ground feeders, pigeons could be said to be better "prepared" to acquire a floor-pecking response than a wall-pecking one. Similar reasoning may suggest that floor pecking may be more sensitive to reinforcement schedules. However, Burns and Malone found that wall pecking was acquired more readily than floor pecking, and no differences were observed between responses subject to various schedule conditions. This coincides with observations made by one of the present authors some years ago (Hineline & Harrison, 1972), that particularly conditionable avoidance responses are difficult, if not impossible, to identify purely on the basis of plausible evolutionary arguments, as has often been done on purely post hoc bases.

Preparation of this manuscript was supported by a Research and Study Leave granted to the first author by Temple University. In addition, the gracious hospitality provided by Comunidad de Los Horcones during the writing of the initial draft is greatly appreciated.

Requests for reprints may be addressed to Philip N. Hineline, Department of Psychology, Temple University, Philadelphia, Pennsylvania 19122.

JABA readers will also be aware of analogous criticisms leveled at applied work that is accomplished with clients who are developmentally disabled. The argument appears to be that procedures conducted with certain (disabled) people are not generalizable to other (nondisabled) people. For example, the usefulness of functional analysis as an assessment of severe behavior problems sometimes has been questioned for clients without disabilities, even though several researchers (e.g., Cooper, Wacker, Sasso, Reimers, & Donn, 1990) have provided successful examples. Relative to this essay, the important point is that at both basic and applied levels of research, needless restrictions on our technology are imposed on the basis of conventional wisdom rather than scientific evidence.

Another article that concerns the relation of behavior analysis to mainstream psychology is Bernard Guerin's invited book review, "Behavior analysis and social psychology: A review of Lana's *Assumptions of Social Psychology*." The review tracks recent developments in social psychology and examines ways in which behavior analysis could be made more relevant to that domain; it also identifies reasons why our approach has not received more attention in that area. For example, in social psychology there is increasing dissatisfaction with cognitive accounts of social behavior; the focus has shifted to studying social interactions involving language and nonvocal communication. More extensive experimental and conceptual analyses of verbal behavior should increase the interest of social psychologists in behavior analysis. An important subtheme is based on the fact that Lana's book does take behavior analysis seriously and examines its possibilities as seen from an alternative viewpoint. It is instructive regarding the ways in which behavior analysis can be understood, both discerningly and incompletely, by an author who begins with an essentially sympathetic interest.

These two *JEAB* articles show that there is substantial information in *JEAB*, especially on a conceptual level, that is of interest to applied behavior analysts. Most applied behavior analysts are faced with criticisms about the robustness of their techniques and about the frequent disregard of our principles in other areas of psychology. These concerns are generic to our field and provide a major point of convergence for applied and basic researchers.

External Validity of Laboratory Procedures

Two articles in this *JEAB* issue are concerned with relating reinforcement schedules to contingencies outside the traditional domain of experiments on operant behavior. One of these articles is "Inelastic supply: An economic approach to simple interval schedules," by James Dougan. Dougan's general strategy is not entirely new, for others (e.g., Hursh, 1980; Rachlin, Green, Kagel, & Battalio, 1976) have described sets of contingencies as resembling economic systems. By identifying economic costs with numbers of responses and gains with numbers of reinforcers, these authors (and others more recently) have blended behavior analyses of ratio schedules with economic cost-benefit analyses patterned after the traditional views of supply and demand. Time-based contingencies have seemed less amenable to such analyses, because an organism might allocate behavior to other sources of reinforcement during times when a particular reinforcer is unavailable. Dougan brings time-based schedules within reach of such analyses by inverting the usual cost-benefit ratio. Rather than manipulating price (responses per reinforcer) and looking at quantity consumed (reinforcers earned) as a dependent variable, Dougan manipulated supply (via session length in either time or number of reinforcers or in total time of access to the reinforcers) and examined the resulting "price" that was generated by the organism's responding. Dougan found consistent monotonic decreases in responses per unit reinforcer as reinforcement rate (supply) increased.

To put this into the domain of practical application, one might consider it in relation to McDowell's (1982, 1988) discussions of the implications of the generalized matching law for applied work, and to recent studies extending matching theory to educational settings (Horner & Day, 1991; Martens, Lochner, & Kelly, 1992; Neef, Mace, Shea, & Shade, 1992). In Dougan's study, increased reinforcements per hour in a single-response situation consistently result in the emission of fewer

responses per reinforcer, even though the rate of responding versus rate of reinforcement function goes through an increase followed by a decrease. If one is concerned with amount of behavior per reinforcer, which is of major concern in educational settings, it ought to be of interest to discover whether these same findings apply to the behavior of humans as well as to pigeons.

Davison's article, "Choice between repleting/depleting patches: A concurrent-schedule procedure," is the other article concerned with relating the contingencies of reinforcement schedules to contingencies in nonlaboratory situations. His focus is on situations that have previously been characterized in biological foraging theory (i.e., how animals distribute their behavior among locations with differing food supplies in the wild). Davison notes that operant researchers have shown increasing interest in "whether the result of laboratory-based research in the experimental analysis of behavior can be generalized to behavior in the wild." He goes on to observe that, "the ways in which the natural environment behaves and responds to animal behavior are much more diverse than the procedures traditionally investigated in the laboratory" (p. 445). A potentially important difference between the laboratory and the wild is the rate at which food sources are replenished. Whereas repletion rates in the laboratory are generally constant, food stores in the wild can vary greatly. One of Davison's findings was that increases in repletion rates improved pigeons' sensitivity to concurrent schedules of reinforcement. If this finding holds generally, this may suggest to applied behavior analysts that their clients' responsiveness to reinforcement interventions may be enhanced by increasing the overall availability of reinforcement in a particular setting. There surely are numerous applied situations that involve some of the dynamics of the schedules that Davison devised, as well as other operant simulations of foraging that previously have been described in *JEAB*.

Delay of Reinforcement: Its Various Implications

Delay of reinforcement is uncontested as an empirically important variable for both conceptual and practical concerns. The article by Wilkenfield, Nickel, Blakely, and Poling, "Acquisition of lever-press responding in rats with delayed reinforcement: A comparison of three procedures," provides a crisp discussion of the complexities that surround the arranging of delayed reinforcement. Their experiment confirms and extends the work of Lattal and Gleeson (1990), which indicated that acquisition and maintenance can be reliably achieved with delayed reinforcement as long as the response will consistently come into contact with the consequences.

Although one would have to recognize its limitation to repetitive, easily emitted operants, the Wilkenfield et al. article could be examined for direct extrapolation to situations involving human behavior of social concern. For example, maintenance of treatment effects is, of course, of considerable interest to most *JABA* readers. A potential factor in maintenance failures may be that the short latency to reinforcement characteristic of interventions during acquisition may be relaxed somewhat during maintenance, thus constituting delayed reinforcement. As Wilkenfield et al. reported, delays of certain magnitudes can have suppressive effects on behavior that can counter the strengthening effects of reinforcement. Methods of identifying this delay threshold may improve prospects for designing and monitoring maintenance procedures used in applied interventions.

Delayed reinforcement is also inextricably involved with probability of reinforcement in at least two distinct ways that are relevant to the concerns of applied as well as basic research. First, delayed reinforcers may be less certain, due to the opportunity for extraneous events (or competing organisms) to intervene during the delay. The second is more subtle: A nonreinforced response in a situation of probabilistic consequences can, if it is part of the sequence in which subsequent reinforcers become available, be affected by delayed reinforcers. The logic of this analysis was first proposed by Rachlin, Logue, Gibbon, and Frankel (1986) and is given further examination here by Mazur and Romano in "Choice with delayed and probabilistic reinforcers: Effects of variability, time between trials, and conditioned reinforcers." Their adjusting-delay

procedure, which Mazur has used in a systematic series of previous experiments, is an elegantly clean technique for identifying points of indifference (i.e., equal preference) between immediate probabilistic versus delayed outcomes. Variants of this procedure might well be adopted in applied settings to assess tolerance for delay or intermittency.

Mazur and Romano's results clearly show that preference for a probabilistic outcome is strongly affected by the nature of the variability of that outcome as well as its mean value. When the probabilistic alternative was constituted by a rectangular distribution of delays—equally spaced and sampled equally often, although unpredictably—the fixed delay at indifference (as assessed by the adjusting procedure) was much greater than when the distribution corresponded more closely to a constant probability of reinforcement from moment to moment. Another finding contradicting previous studies was that inserting stimuli within the delay period that were *not* similar to the stimuli correlated with reinforcement increased the birds' preferences for the probabilistic outcomes. However, in other studies, this procedure of partitioning links in a chained schedule has improved tolerance for delay, a finding with the same potential for application. Consider the tolerance for delay required of dental patients as they undergo a sequence of treatments during a given office visit. If the beneficial effects of partitioning have generality, tolerance may be increased by moving patients to different locations or positions following each dental procedure, such that progress through the chain is readily discriminable. In any event, both basic and applied analyses with humans are needed to determine whether, or in what circumstances, partitioning chains improves or diminishes tolerance for delay of reinforcement.

Assessment of Instructions in Experiments

Finally, the article by Perone and Kaminski, "Conditioned reinforcement of human observing behavior by descriptive and arbitrary verbal stimuli," should have interest for both basic and applied behavior analysts. One of its concerns is the extent to which verbal instructions or other descriptions can substitute for *direct* exposure to contingent environmental events. Another of its issues concerns the circumstances (if any) under which stimuli can reinforce responses when they are correlated only with *absence* of primary reinforcement. A key comparison in their experiments was between discriminative stimuli, presented on a computer monitor, that were designed to prompt rule-governed repertoires that human subjects typically bring to the experiment. It is difficult to improve upon the authors' own summary of a key result that reconciles the differing results that have been obtained in two different laboratories (those of Fantino and Case and those of Baron and Perone):

> [When] the discriminative stimuli were descriptions of the stimulus–reinforcer relations . . . an S− stating that "At this time NO SCORES can be earned" was relatively ineffective as a reinforcer of observing. Instead, most subjects preferred an uncorrelated stimulus stating that "Some of this time scores are TWICE AS LIKELY as normal, and some of this time NO SCORES can be earned." This result replicates findings from Fantino and Case's laboratory. [In contrast, when] the stimuli bore an arbitrary relation to monetary reinforcement, an S− stating that "the current status of the program is: B" was preferred over an uncorrelated stimulus stating the "current status . . . is: either A or B." This result supports Perone and Baron's (1980) finding that a stimulus correlated with extinction can reinforce human observing. (p.573)

Interestingly, then, the key difference between results from the two laboratories seems not to hinge directly on the difference in procedure, whereby Fantino and his colleagues used group designs and gave the subjects only an hour or so of exposure to experimental conditions, whereas Perone and Baron used extended exposures for each subject in within-subject designs. Rather, the important difference seems to be the extent to which preexperimental verbal repertoires were used in place of discriminative repertoires generated within the ex-

periment itself. Of course, one probably cannot engender the relevant repertoires without each subject receiving extended exposure to each experimental condition.

This experiment and its discussion surely raise an issue of applied concern: It is unavoidable—and probably desirable, to the extent that we can integrate them into the conceptual account on which the rest of an intervention is based—to implement behavioral procedures partly through verbal instructions. This, of course, depends upon the subject/client's having acquired repertoires of instruction following prior to the intervention or experiment. It often will be difficult to distinguish between behavior that is primarily rule governed, or occasioned by the verbal instructions, and that which is attributable to direct behavior–environment interactions within the experimental or instructional/interventional setting. It is only the latter interactions that are directly involved in most interventions. Thus, an adequate account of instruction-based interventions must include the role of verbal behavior. Skinner, of course, delineated functional categories of verbal behavior that are useful for this. Zettle and Hayes's (1982) introduction of the terms *pliance* and *tracking* as special categories of a listener's behavior provides a useful elaboration for coordinating the instructor/experimenter's written or spoken mands and tacts with the client/subject's functional categories of behavior. In addition, Cerutti (1990) has provided the beginnings of a more explicit rubric for relating the principles of instructional control to more traditionally studied behavioral principles.

However, at this point, even if we distinguish conceptually between these various functional categories of instruction-related behavior, we do not have adequate techniques for teasing apart the various, often multiply determined and overlapping, types of relations that are embedded in discriminative stimuli that are statements in ordinary language. Although this kind of conceptual concern may, up to now, have been more typical of basic than of applied behavior analyses, the settings in which the crucial distinctions might be developed as an orderly, systematic interrelated set are probably those of the applied domain. In metaphorical terms, the applied settings, in which a practical degree of behavioral control has been achieved, provide a terrain intermediate between the highly regularized laboratory and the jungle of contingencies that are found further afield. Teasing apart the behavior that is attributable to verbally instructed repertoires remains a very difficult but most important challenge, one that is especially worthy of the combined efforts of basic and applied researchers. This, then, leads us to elaborate on the suggestions provided earlier. It may be that applied researchers can identify settings in which the combining of rule-governed and contingency-shaped behavior might best be studied.

In this essay we attempted to provide several examples of the possible applied context of some basic studies appearing in *JEAB*, with occasional linkages to some recent research appearing in *JABA*. We see much convergence between the literature appearing in these two journals and hope this essay provides some basis for others to seek this convergence.

REFERENCES

Cerutti, D. T. (1990). Discrimination theory of rule-governed behavior. *Journal of the Experimental Analysis of Behavior, 51,* 259–276.

Cooper, L., Wacker, D., Sasso, G., Reimers, T., & Donn, L. (1990). Using parents as therapists to evaluate appropriate behavior of their children: Application to a tertiary diagnostic clinic. *Journal of Applied Behavior Analysis, 23,* 285–296.

Hineline, P. N., & Harrison, J. F. (1978). Lever-biting as an avoidance response. *Bulletin of the Psychonomic Society, 11,* 223–226.

Horner, R., & Day, H. (1991). The effects of response efficiency on functionally equivalent competing responses. *Journal of Applied Behavior Analysis, 24,* 719–732.

Hursh, S. R. (1980). Economic concepts for the analysis of behavior. *Journal of the Experimental Analysis of Behavior, 34,* 219–238.

Lana, R. E. (1991). *Assumptions of social psychology: A reexamination.* Hillsdale, NJ: Erlbaum.

Lattal, K. A., & Gleeson, S. (1990). Response acquisition with delayed reinforcement. *Journal of Experimental Psychology: Animal Behavior Processes, 16,* 27–39.

Martens, B., Lochner, D., & Kelly, S. (1992). The effects of variable-interval reinforcement on academic engagement: A demonstration of matching theory. *Journal of Applied Behavior Analysis, 25,* 143–151.

McDowell, J. J. (1982). The importance of Herrnstein's mathematical statement of the law of effect for behavior therapy. *American Psychologist, 37,* 771–779.

McDowell, J. J. (1988). Matching theory in natural human environments. *The Behavior Analyst, 11,* 95–109.

Neef, N., Mace, F. C., Shea, M., & Shade, D. (1992). Effects of reinforcer rate and reinforcer quality on time allocation: Extensions of matching theory to educational settings. *Journal of Applied Behavior Analysis, 25,* 691–700.

Rachlin, H., Green, L., Kagel, J. H., & Battalio, R. C. (1976). Economic demand theory and psychological studies of choice. In G. H. Bower (Ed.), *The psychology of learning and motivation* (Vol. 10, pp. 129–154). New York: Academic Press.

Rachlin, H., Logue, A. W., Gibbon, J., & Frankel, M. (1986). Cognition and behavior in studies of choice. *Psychological Review, 93,* 33–45.

Seligman, M. E. P. (1970). On the generality of the laws of learning. *Psychological Review, 77,* 406–418.

Zettle, R. D., & Hayes, S. C. (1982). Rule-governed behavior: A potential theoretical framework for cognitive-behavioral therapy. In P. Kendall (Ed.), *Advances in cognitive behavioral research and therapy* (Vol. 1, pp. 73–118). New York: Academic Press.

Received February 25, 1993
Final acceptance March 5, 1993
Action Editor, F. Charles Mace