Some Proposed Relations Among the Domains of Behavior Analysis

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The present article examines the nature of and relations among the domains of behavior analysis. It first proposes a set of annotated, descriptive criteria to aid in distinguishing the experimental analysis of behavior, applied behavior analysis, and service delivery. It then argues that the experimental analysis of behavior lies at one end of a continuum of behavior-analytic activity, with applied behavior analysis in the middle, service delivery at the other end, and the theoretical-philosophical-conceptual position known as “radical behaviorism” informing the three domains on the continuum. Finally, it argues that clarifying the distinctions among the domains of behavior analysis will help the behavior-analytic community to focus its efforts in training programs and overall support of behavior analysis.

Key words: applied analysis of behavior, experimental analysis of behavior, service delivery

The principal aim of the present article is to examine some relations among the experimental analysis of behavior, applied behavior analysis, and behavior-analytic service delivery. This topic is important for several reasons. For example, the topic bears on the nature of training programs in behavior analysis. To what extent would it be useful for programs to provide balanced training across these three activities? Alternatively, to what extent would it be useful for programs to emphasize one at the expense of the others, and if so, which one? In addition, the topic bears on the requirements for effectively carrying out each kind of behavior-analytic activity. To what extent would it be useful for experimental analysts of behavior to select their research activities on the basis of their immediate, direct possibilities for application in the area of human services? Alternatively, to what extent would it be useful to require that the delivery of behavior-analytic professional ser-

vices conform to the conventional requirements of science, with control groups, multiple baselines, and so on? Finally, the topic bears on how society supports behavior-analytic activities. To what extent would it be useful for society to support only basic research on fundamental principles of behavior and hope that practical applications will just automatically follow? Alternatively, to what extent would it be useful for society to support only those research activities with immediate and direct possibilities for practical applications? To be sure, these sorts of questions have no easy answers, but it makes sense to at least start to address them.

HISTORY AND BACKGROUND

We begin our examination by noting what others have said regarding the nature of and relations among the experimental analysis of behavior, applied behavior analysis, and the delivery of behavior-analytic professional services. The most frequently cited article in the history of the *Journal of Applied Behavior Analysis*, by Baer, Wolf, and Risley (1968), provides a reasonable starting point. Baer et al. defined applied behavior analysis as a legitimate

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research discipline with the following seven dimensions: *applied, behavioral, analytic, technological, conceptually systematic, effective, and capable of generality*. They noted, however, that it was a research discipline that focused on service delivery, rather than on elucidating general principles of behavior, as in the experimental analysis of behavior.

For the next decade or so, basic and applied researchers continued to examine the scientific foundation of applied activity in behavior analysis in great detail. For example, Deitz (1978; see also 1983) suggested that applied behavior analysts decide whether their discipline is primarily (a) a research-based science focused on understanding the effects of interventions, or (b) an application of a technology of behavior focused on doing whatever is necessary to produce a desired outcome. Deitz noted that the emphasis seemed to be shifting from the former to the latter—from *applied* behavior analysis to *applying* behavior analysis, and was therefore shifting de facto to the outcome side of the activity. Deitz concluded that this apparent shift in emphasis was not necessarily bad, but that applied behavior analysts needed to be aware of this apparent shift in emphasis, because it implied a blurring of the distinction between science and practice.

In an important review of the historical development of applied activity in behavior analysis, Birnbrauer (1979) suggested that one model of the relation between research activities and service delivery in behavior analysis was prevalent before 1959. With this first model, some people did basic research, some did applied research, and some delivered professional services, but these activities were separate. Birnbrauer continued by suggesting that a second model was prevalent between the late 1950s and the late 1970s. With this second model, applied research and service delivery were combined. People working in applied areas received training in both basic and ap-

plied research, and there was little to distinguish the different emphases in the discipline. An important issue with this second model was whether applied behavior analysts and service providers received sufficient training in the experimental analysis of behavior to be able to do their jobs effectively.

Birnbrauer (1979) went on to suggest that a third model had emerged by the late 1970s. With this third model, applied behavior analysts were oriented toward research that analyzed the variables controlling an instance of behavior, somewhat like experimental analysts. However, applied behavior analysts were also expected to improve client behavior. In addition, applied behavior analysts deemphasized the aim of establishing the generality of controlling variables in favor of documenting and disseminating a technology. Dissemination took the form of developing treatment “packages” for toilet training, habit reversal, overcorrection methods, and other matters (e.g., see Azrin & Foxx, 1971; Azrin & Nunn, 1973; Barrish, Saunders, & Wolf, 1969; Foxx & Bechtel, 1983; Foxx & Shapiro, 1978; Wolf, Phillips, & Fixsen, 1972). Birnbrauer suggested that by virtue of this third model, behavior analysis had evolved into three distinct domains—basic, applied, and service delivery—something like the model that existed before 1959, and again there was the continuing question of how well applied behavior analysis and service delivery were grounded in scientific principles.

Shortly thereafter, Hayes, Rincover, and Solnick (1980) sought to expand and clarify the original list of criteria by which Baer et al. (1968) defined applied behavior analysis. In addition, Hayes et al. noted an increasing technical drift in applied behavior analysis, as had Deitz (1978) and Birnbrauer (1979). The theme of how well applications were grounded in science was also apparent in Michael’s (1980) presidential address to the Association for Behavior Analysis (ABA), as he lamented the apparent growing lack of

scientific rigor in many activities nominally regarded as behavior analytic, such as applied behavior analysis. Baer's (1981) presidential address the following year countered by pointing out that one of the important characteristics of applied behavior analysis is its problem-solving orientation. This orientation provides a necessary and appropriate balance between scientific analysis and the application of the techniques of a science. Baer emphasized that this balance did not detract from the value of the practical application of the activity in society (see also Baer, 1978). Perhaps in response to growing concerns about professional issues associated with service delivery in applied behavior analysis, Baer, Wolf, and Risley (1987) then revisited the dimensions of applied behavior analysis they had described in 1968 and confirmed that these dimensions were "still prescriptive, and to an increasing extent, descriptive" (p. 313).

More recent publications have continued to address the relation between science and its application in behavior analysis. Mace (1994) suggested that research agendas in the experimental analysis of behavior were disconnected from those in applied behavior analysis, and then offered ideas for reconnecting those agendas for the benefit of both. Johnston (1996, pp. 43–44) took a slightly different approach by stating that research scientists are ordinarily concerned with carrying out a formal analysis to address experimental or explanatory questions about necessary and sufficient conditions. Scientists then express their answers in terms of statements that identify general principles. Johnston noted that practitioners, in contrast with both basic and applied researchers, are ordinarily concerned with delivering an effective service to clients. Consequently, these service providers typically assess the problem behaviors, select appropriate interventions from perceived best practices, adapt the interventions to local circumstances, administer procedures consistent with the technology's require-

ments, and track the results. None of these activities and processes constitute scientific activities in the traditional sense.

Most recently, Hawkins and Anderson (2002) argued that at any point in time, any particular behavior analyst might function as a basic behavior analyst, an applied behavior analyst, and a behavior-analytic practitioner. A behavior analyst might fill one or more of those roles at any given time and perhaps all three roles over the course of a career. Nevertheless, functioning in one role does nothing to denigrate the social or scientific importance of functioning in other roles, and our field would do well to recognize the legitimacy of all three roles. We will return to this important point later in the present review.

In sum, we see that behavior analysts have written a great deal about the relation between science and practice in behavior analysis. As suggested above, this literature engages a wide variety of considerations related to the nature of science, the role of research in science, and professional practice issues. Given that behavior analysts have addressed the nature of research in behavior analysis and that research is integral to science, we continue the present examination by addressing in general terms the purpose of science and research.

THE PURPOSE OF SCIENCE AND RESEARCH

Skinner reviewed the purpose of science and research in several of his writings. For example, Skinner (1969) suggested that

Scientific laws also specify or imply responses and their consequences. . . . As a culture produces maxims, laws, grammar, and science, its members find it easier to behave effectively without direct or prolonged contact with the contingencies of reinforcement thus formulated. . . . The point of science . . . is to analyze the contingencies of reinforcement found in nature and to formulate rules or laws which make it unnecessary to be exposed to them in order to behave appropriately. (pp. 141, 166)

Research is one way for experimenters to come under the control of variables participating in an event, and by so doing, formulate and refine principles that will better inform the prediction and control of events. In this regard, we note that Sidman (1960) identified several reasons why scientists conduct research: (a) to evaluate hypotheses; (b) to indulge the investigator's curiosity about nature; (c) to try out a new method or technique; (d) to establish the existence of a phenomenon; and (e) to explore the conditions under which a phenomenon occurs. The scientific statements that will guide the behavior of others come out of the research activity stimulated by these reasons.

Relevant to any discussion of science and research is communication. Science is a social enterprise. As Skinner noted, one aim of science is to create a verbal product that is communicated to others in the society. The function of this verbal product is to serve as a source of discriminative stimulation, so that these others may interact effectively with contingencies in nature. What then distinguishes an activity as a kind of science, rather than simply service delivery? Presumably, science produces artifacts in the form of reports or statements of generalizable knowledge that will enable others to act effectively without having to personally go through the same experiences. This view is consistent with that of Diamond and Adam (1993), who analyzed the academic work of the professorate and suggested that for that work to be regarded as scholarly research it needs to be discipline related, innovative, replicable, of significant impact (e.g., by adding to the database of generalizable knowledge in the discipline), documented and disseminated, and peer reviewed.

Given the criteria that Diamond and Adam (1993) have identified, we note that basic research in behavior analysis is concerned with abstract specification of fundamental processes: reinforcement, stimulus control, punishment, escape or avoidance, and so on. The

knowledge produced by such endeavors is expressed at an abstract level, without regard to whether one is formally concerned with the behavior of a rat, pigeon, or human. We then note that applied research, in the spirit of Baer et al. (1968), adapts these fundamental processes to solve particular problems, and then informs others of whatever success has been achieved. In this regard, Johnston (1996, p. 40) identified research questions that specifically pertain to applied behavior analysis: (a) What is the nature of the problem? (b) What are the goals of behavior change? (c) What kinds of behavior are of interest? (d) What are their controlling variables? (e) What are the relevant principles and procedures for change? Answers to these questions lead in turn to the following analyses: (f) What are the procedure's overall effects? (g) What are the components of the procedure and their effects? (h) How do the components produce their effects? (i) How can the procedure be improved? In sum, we can state that applied research typically focuses on the problem of how fundamental behavioral principles may be applied to produce desired changes in concrete, socially significant behavior, and then informs others of how the problem has been solved.

Stokes (1997), a highly respected academician, administrator, and science adviser, discussed the role of research in science, and it is useful to examine his position here, even though he was not writing specifically about behavior analysis. Stokes critically examined the view of scientific research outlined earlier by Bush (1946), who formalized the distinction between basic research and applied research. Stokes summarized Bush's distinction in the following terms:

Basic research charts the course for practical application, eliminates dead ends, and enables the applied scientist and engineer to reach their goal with maximum speed, directness, and economy. Basic research, directed simply toward more complete understanding of nature and its laws, embarks upon the unknown, [enlarging] the

realm of the possible. Applied research concerns itself with the elaboration and application of the known. Its aim is to convert the possible into the actual, to demonstrate the feasibility of scientific or engineering development, to explore alternative routes and methods for achieving practical ends. Development, the final stage in the technological sequence, is the systematic adaptation of research findings into useful materials, devices, systems, methods, and processes. (Stokes, 1997, pp. 10–11)

As one who shaped public policy, Stokes was particularly concerned with the implications for public policy of the distinction between basic and applied research. Stokes referred to Bush's view as a one-dimensional *linear model*, according to which basic research gives rise to applied research, which in turn gives rise to practical developments. Stokes further noted that Bush's view was influential in determining governmental support for scientific research in the last half of the 20th century in the U.S. The result was that governmental funding emphasized basic research. The rationale was that unless an applied finding came out of basic research, it was not going to be good enough. Indeed, on the basis of Bush's view, many policy makers tacitly assumed a kind of Gresham's law: Bad applied research would drive out good basic research, unless basic research maintained its primacy (Stokes, 1997).

Stokes (1997) argued that Bush's (1946) view and its derivatives are incorrect, in that the development of scientific and technological knowledge is not one dimensional and linear. Stokes went on to argue that public policy supporting science should not be one dimensional and linear either. Arguing from the history of science, Stokes proposed four quadrants of scientific activity, defined in terms of a 2×2 matrix (Figure 1). As adapted for present purposes, we may say that along one dimension is whether there is high or low concern with fundamental knowledge and the understanding of natural principles. Along the other dimension is whether there is high or low concern with the ultimate use and prac-

Concern with Application	High	Pasteur	Edison
	Low	Einstein	X
		High	Low
		Concern with Fundamental Knowledge	

Figure 1. Four quadrants of scientific activity from Stokes (1997), defined in terms of concern with fundamental scientific knowledge and technological application.

tical application of findings. The quadrant defined by high concern with fundamental knowledge and low concern with application describes pure basic research; an example is Einstein. The quadrant defined by high concern with fundamental knowledge and high concern with application describes one kind of applied research; an example is Pasteur. The quadrant defined by low concern with fundamental knowledge and low concern with application has a less specific purpose than the other quadrants; the aim in this quadrant might be to develop and refine a specific methodology. (Because there is no individual exemplar for this cell, we have simply inserted an X in Figure 1.) The quadrant defined by low concern with fundamental knowledge and high concern with application describes another kind of applied research; an example is Edison.

On the basis of this alternative analysis, Stokes (1997) argued that society would benefit from a public policy based on the two-dimensional nonlinear developmental model. Such a policy would not be driven by the emphasis on pure basic research, as it has been under the influence of Bush's (1946) view. Rather, public policy would support a broader, more balanced range of activities. In other

words, the work of a Pasteur or Edison is just as worthy of society's support as is the work of Einstein.

An interesting issue is the relation between the quadrants proposed by Stokes (1997) and behavior analysis. In principle, the quadrant concerned with developing a methodology does not apply except in specific instances, so we may simply skip devoting much attention to it. On the present view, the quadrant with high understanding and low application seems to correspond most directly to activities in the experimental analysis of behavior. The quadrant with high understanding and high application seems to correspond most directly to activities in the applied analysis of behavior. The interesting case is the quadrant with low understanding and high application. As the exemplar for this quadrant, Edison was clearly more concerned with solving practical problems than disseminating findings in peer-reviewed journal articles about new principles of physics or chemistry. Nevertheless, Edison clearly proceeded according to scientific principles as he developed the lightbulb, and he was not interested in simply writing up case histories of how he changed lightbulbs when they burned out.

Although Stokes (1997) might have been unsympathetic to the following argument in some respects, he might also have agreed that the experimental analysis of behavior lies at one end of a multifeature continuum, with service delivery at the other and applied behavior analysis in the middle. This continuum, anticipated by Birnbrauer (1979) and consistent with the position discussed most recently by Hawkins and Anderson (2002), does not describe the development of the separate activities, or views on how the public might support them, which were the matters with which Stokes was concerned. Rather, it simply describes their status as reasonably mature activities. For example, many behavior analysts would agree that applied behavior analysis as a scientific discipline is not

subordinate to the experimental analysis of behavior, as might be derived from Bush's (1946) view of science. However, placing the three domains on a multifeature continuum implies that in some respects they all share important features or characteristics. In other respects, only adjacent activities share common features or characteristics.

THE PROPOSED CRITERIA

To achieve a more systematic appreciation of the relations among the experimental analysis of behavior, applied behavior analysis, and service delivery, Table 1 proposes a set of 13 criteria by which readers may distinguish these three domains of behavior analysis. The criteria are descriptive, rather than prescriptive or proscriptive. We review them in the sections below.

Principal Activity

The principal activity in both experimental and applied behavior analysis is to carry out research that (a) discovers and disseminates new knowledge or (b) integrates and disseminates existing knowledge. In the experimental analysis of behavior, the research is theory driven, and the knowledge concerns fundamental principles of behavior having the broadest possible generality. By theory, we mean an economical and "formal representation of the data reduced to a minimal number of terms," rather than an "appeal to events taking place somewhere else, at some other level of observation, described in different terms, and measured, if at all, in different dimensions" (Skinner in Catania & Harnad, 1988, p. 77). Basic researchers are capable of moving from their laboratories to analyze socially significant behavior and provide certain professional services. Many have done so, and Skinner himself did so when he applied techniques from the experimental laboratory to the development of teaching machines and programmed instruction. However, to so move is not the modal occurrence.

TABLE 1

A short description of the relations among 13 criteria that distinguish the (a) experimental analysis of behavior, (b) applied behavior analysis, and (c) professional behavior-analytic service delivery

Criteria	Experimental analysis of behavior	Applied behavior analysis	Service delivery
Principal activity	Highest quality theory-driven basic research on fundamental processes	Highest quality applied research on socially significant behavior	Intervention-driven problem solving
Setting	Laboratory	Current social environment	Current social environment
Participants	Any species	Human emphasis	Human emphasis
Target behavior	Representative	Human emphasis	Human emphasis
On what basis are independent variables or interventions selected?	Theoretical contribution ^a	A cure orientation	A cure orientation
Generality and reliability of methods and results	High	High	Adequate to solve problem in identified setting
Interest in disseminating results	High via peer review	High via peer review	Oral tradition
How are effects determined to be meaningful?	Reliable, replicable, under experimental control	Social significance	Social significance
Necessity of being conceptually systematic	High	High	Low
Interest in immediate and direct application of results	Low	High	High
Interest in developing and deploying technology ^b	Low	High	High
Interest in establishing social validity of methods and results	Low	High	High
Main function	Discover or integrate, then disseminate	Discover or integrate, then disseminate	Accomplish desired goals

^a By theory, we mean an economical and formal representation of the data reduced to a minimal number of terms, rather than an appeal to events taking place somewhere else, at some other level of observation, described in different terms, and measured, if at all, in different dimensions. Theories in this sense are statements about organizations of facts.

^b By technology, we mean developing and deploying a systematic body of facts, concepts, and principles that direct and control behavior to a comprehensive, practical, and useful end.

In applied behavior analysis, the research is less theoretically driven, and the knowledge is more concerned with how general, fundamental principles of behavior may be applied to improve socially significant behavior–environment interactions. Applied researchers design their research to identify components of treatment and intervention, why methods work, and whether they can be improved, although applied researchers do not limit their research to

a component analysis. Applied researchers are capable of moving from the social setting to the laboratory to do basic research on fundamental principles, usually with humans as participants, but this sort of move is not the modal occurrence. Many applied researchers also provide professional services, which probably occurs more often than moving to basic research, but service delivery is not a necessary implication of applied research.

Service providers do not ordinarily carry out research—even applied research—in the same sense as do experimental and applied behavior analysts. Service providers engage in an intervention-driven activity that develops, advances, and maintains socially desirable behavior–environment interactions or that reduces socially undesirable or otherwise dysfunctional behavior–environment interactions. In other words, service providers solve problems. Common examples of professional behavior-analytic service providers include teachers, therapists, counselors, social workers, and clinical psychologists. The more severe the behavioral problems, the more likely the service provider will also adopt certain aspects of applied behavior analysis, such as basing decisions about interventions on direct measurements. However, relatively few behavior-analytic service providers will ever formally analyze behavior using controlled conditions that characterize scientific research in its narrow sense, usually because of the nature of their training and the demands of earning a livelihood.

Setting

The characteristic setting for the experimental analysis of behavior is the experimental laboratory, in which conditions can be controlled.

In contrast, applied behavior analysts usually use, and service providers always use, the participant's current social context as the setting. Applied behavior analysts may also employ analogue analysis, and often arrange the experimental setting to best fit the experimental question. Applied researchers may take advantage of whatever controlled conditions are available and relevant in the setting, whereas practitioners must typically solve the problem at hand, independent of how much control they have over prevailing conditions.

Participants

The participants in the experimental behavior analysis can be of virtually any species. There are reasons for studying the behavior of nonhumans in laboratory settings, just as there are reasons for studying the behavior of humans. Most research methods textbooks review these reasons, so we do not need to address them here. We may simply note that both Watson and Skinner recognized that some experimental questions (e.g., those concerning verbal behavior) uniquely concern humans. In contrast, other experimental questions (e.g., those concerning basic behavioral mechanisms) are most efficiently investigated with nonhumans, without the obscuring contamination of widely diverse learning histories and verbal repertoires (e.g., Mace, 1994, p. 530).

The participants in applied behavior analysis and service delivery are usually humans. Service delivery often entails a fee-for-service contractual arrangement with the participant. Possible nonhuman participants and endeavors would include (a) training guide or assistance dogs (or monkeys) for those who are blind or have a disability; (b) pet therapy; and (c) enrichment aimed at animals in zoos. Behavior-analytic activity in the first category entails developing a technology that is applied for the benefit of humans. However, in the other categories, the behavior-analytic activities are principally for the benefit of nonhumans. In all three cases, the behavior-analytic interventions focus on nonhumans.

Target Behavior

The target behavior in the experimental analysis of behavior is taken as “representative.” Its topography is relatively arbitrary, in the sense that eventual conclusions are not intended to be restricted to the specifics of the experimental preparation. Thus, experimental behavior analysts ordinarily select a particular form of behavior because it is convenient to measure by machine

transduction and is relatively nonfatiguing for subjects to repeat, rather than because it reveals something about the specific response topography (e.g., lever pressing by rats, treadle pressing by pigeons, nose poking by rats, key pecking by pigeons, button pushing by humans).

The target behavior for human and nonhuman participants in both applied behavior analysis and service delivery is judged to be socially significant by clients, caregivers, advocates, employers, governments, social service agencies, or according to humanitarian concerns about participant welfare. Often the behavior will be of specific concern to and selected by the participants themselves, except when human participants are low functioning and appropriate third parties contribute to decisions. Similar third-party considerations apply to behavior selection with nonhuman participants. Behavior selection is not driven principally by theoretical issues. In fact, the service provider should let societal or participant needs or welfare drive behavior selection, not theoretical interest.

Basis for Selecting Independent Variables and Interventions

Basic researchers select independent variables based on their theoretical contribution, and the attendant possibilities for the discovery, extension, and integration of general principles of behavior.

Both applied behavior analysts and service providers usually select independent variables and interventions from research-based "best practices." The selection of the independent variables is derived more from a "cure orientation" aimed at improving or enriching the environmental interactions of the participant than from theoretical considerations. Functional assessment is relevant to but not necessary for all applied interventions. Its usefulness is to determine whether existing circumstances modulate manipulations intended to bring about desired goals. Fi-

nally, interventions in applied behavior analysis are heavily influenced by convenience, immediacy of impact, and social validity, more so than with the experimental analysis of behavior, but less so than with service delivery. An important consideration in service delivery is to improve behavior quickly, efficiently, at low cost, directly, with an easy-to-use intervention.

Generality and Reliability of Methods and Results

The generality of the methods and results in both experimental and applied behavior analysis is high (see also Johnston, 1979). With respect to the experimental analyses, this assessment assumes that the methods take into account any unique ways that participants act on their environment. With respect to applied analyses, this assessment assumes that the methods may be applied with similar effectiveness in similar settings.

Service providers clearly need to provide effective interventions in the identified setting. Beyond this requirement, service providers seek interventions that extend the generality of socially significant behavior for the participants, especially across time and settings, because society, their employer, or their clients usually expect generality and reliability, as with any consumer product.

Interest in Disseminating Results

Researchers in both experimental and applied behavior analysis have high interest in dissemination, and view publication as an integral part of the experimental process. The experiment is not finished until the research is submitted for publication, consistent with the conventional peer practices of the discipline. Findings are disseminated on the development of basic principles and their generality for that problem behavior for that individual or group in that context.

Dissemination is relevant for service providers but differs from that for basic

and applied research. Service providers usually have little interest in dissemination through peer-reviewed publication. However, some service providers may have an interest in disseminating their knowledge in the oral tradition, through convention presentations, in-service training, mentoring, and other similar modes of dissemination.

How Are Effects Determined to Be Meaningful?

Researchers in both experimental and applied behavior analysis consider the effects of the independent variable or intervention to be meaningful when experimentation shows the effects to be reliable, replicable, and under experimental control, and when conclusions regarding basic principles are justified according to the conventional peer practices of the discipline.

Additional features of applied behavior analysis and service delivery are that the results need to be large enough to be socially significant, consonant with desired goals of society, and have functional value to the participants.

Necessity of Being Conceptually Systematic

Research in both experimental and applied behavior analysis is highly concerned with being conceptually systematic. A conceptually systematic intervention or application requires an alignment of methods and results with other findings in the database of generalizable knowledge. An alignment permits researchers to organize the new findings into a coherent package that suggests uniformity of process, reveals order, and removes puzzlements. This characteristic is an outgrowth of the concern with fundamental general principles, and allows findings to be organized to fit into a coherent picture that will be of benefit to society at large.

Unlike both applied behavior analysts and experimental behavior analysts, service providers are not central-

ly concerned with being conceptually systematic. The service provider seeks to solve the problem at hand, but the solution need not be related to any other solution. Service providers certainly do not oppose being conceptually systematic, but they do not require it in the same sense as do experimental and applied behavior analysts.

Interest in Immediate and Direct Application of Results

The experimental behavior analyst does not oppose application, but recognizes that basic research need not necessarily produce a direct and immediate practical impact. Unlike experimental analysts, both applied behavior analysts and service providers are strongly interested in interventions and results that do produce an immediate, direct, and practical impact. Indeed, to achieve an effective application is the whole function of the activity.

Interest in Developing and Deploying Technology

By technology we mean developing and deploying a systematic body of facts, concepts, and principles that direct and control behavior to a comprehensive, practical, and useful end (see also Pennypacker & Hench, 1997). As a theory-driven activity, the experimental analysis of behavior is not centrally concerned with developing technology in this sense. As with other characteristics, the experimental behavior analyst does not oppose technology. Rather, the experimental behavior analyst simply places technological concerns after theoretical concerns.

Unlike experimental analysts, both applied behavior analysts and service providers are concerned with deploying a technology that achieves practical goals. This concern follows directly from the interest in applied behavior analysis of dealing with practical problems of behavioral control, and in service delivery of applying convention-

ally recognized best practices in a manner that is efficient with respect to time, energy, and money.

Interest in Establishing Social Validity of Methods and Results

By social validity we mean (a) the social impact of the research, (b) the social appropriateness of the methods, and (c) the social importance of the effects (e.g., Wolf, 1978). As a theory-driven activity, the experimental analysis of behavior is not centrally concerned with social validity in this sense, although it does not oppose social validity. Rather, it simply does not require social validity.

Unlike the experimental analysis of behavior, both applied behavior analysis and service delivery are interested in interventions and results that have high social validity. This concern follows directly from the interest in socially significant behavior in its social setting. Indeed, the whole point of applying behavioral principles in an effort to solve behavior problems is that the intervention and results have high social validity.

Main Function

The main function of the experimental analysis of behavior is to discover and disseminate new knowledge or integrate and disseminate existing knowledge of general principles of behavior.

The main function of applied behavior analysis is to discover, integrate, and disseminate new knowledge consisting of how existing knowledge can be applied to achieve desired goals in identifiable circumstances (e.g., what is improved, what problem solved, with what populations). However, applied behavior analysis should not be limited to researching only existing knowledge. Applied research, just as basic research, can provide certain kinds of statements expressing new knowledge. These statements of new knowledge typically concern generality across set-

tings, subjects, response classes, variables, methods, and processes.

The main function of service providers is to apply existing knowledge and bring about desired goals, rather than to discover, integrate, and disseminate new knowledge of generalized basic principles and theoretical statements.

Overall, basic and applied behavior analysts arrange environments to learn about functions of behavior and then disseminate their findings. In contrast, service providers arrange environments to solve problems by influencing occurrences and nonoccurrences of behavior, independently of disseminating their findings.

THE FOUR DOMAINS OF BEHAVIOR ANALYSIS

To recapitulate, we see the three domains of experimental analysis, applied analysis, and service delivery as lying on a continuum of behavior-analytic activity. The experimental analysis of behavior provides the systematic context for basic research in psychology, both inside the laboratory and out. The experimental analysis of behavior is a scientifically based analysis designed to discover, integrate, and disseminate knowledge about general basic processes and principles that underlie a broad range of behavior. The ratio of time spent to practical problems solved is not a criterion for evaluating success in the experimental analysis of behavior, because this basic science does not strive to solve practical problems in the same way that applied behavior analysis and service delivery do.

The applied analysis of behavior conducts research on the systematic application of behavioral technology and principles to meaningfully improve socially significant behavior outside the laboratory. In short, applied behavior analysis is the only activity that discovers, integrates, and disseminates knowledge about how behavioral processes and principles can be applied to achieve desired, socially sig-

nificant goals. The ratio of time spent to practical problems solved is higher than in the experimental analysis of behavior but lower than in service delivery, because applied research needs to observe scientific research protocols in ways that service delivery does not.

Practitioners then deliver professional services to society at large. Thus, service delivery is not a scientifically based analysis designed to discover, integrate, and disseminate knowledge about how fundamental behavioral processes and principles can be applied to achieve desired socially significant goals, because it is not expected to be. The ratio of time spent to practical problems solved is higher than in basic and applied research, because service delivery does not need to respect scientific research protocols in ways that basic and applied research do.

However, we also note that Hawkins and Anderson (2002) have recently suggested that "We can then identify at least four roles that a behavior analyst might fill: conceptual behavior analyst, basic behavior analyst, applied behavior analyst, and behavior-analytic practitioner. . . . Each of these four roles is an extremely valuable part of behavior analysis, and each deserves full and equal respect" (p. 119; see also Moore, 1999). We agree enthusiastically with Hawkins and Anderson, and believe that the conceptual analysis of behavior can be added to the continuum of three domains as we have described them here in a way that makes sense, resulting in four domains of behavior analysis.

How then does the conceptual analysis of behavior fit in? The conceptual analysis of behavior addresses the philosophical, theoretical issues associated with the subject matter and the methods of behavior analysis. Radical behaviorism provides an underlying philosophical position that guides behavior-analytic activity. The term *radical* implies a thoroughgoing behaviorism, as opposed to other forms of behaviorism that argue that certain psychological phenomena can only be regarded

as inferences on the evidence of publicly observable behavior, if they are given any status at all (Moore, 1999).

Thus, we see the philosophical stance underlying behavior analysis as informing the other three domains. For example, there are clearly philosophical matters related to epistemology and methods that inform the experimental and applied analysis of behavior. These matters are generally designated as a philosophy of science (Moore, 1999). Similarly, there are just as clearly behavior-analytic philosophical matters related to ethics and welfare of clients that inform applied research and professional practice (Krapfl & Vargas, 1977).

As reviewed at the outset of the present article, past discussions about the relations among the domains of behavior analysis have tended to focus on the nature of research in experimental and applied behavior analysis. We view this matter as no longer of grave concern. Any problems about the legitimacy of the respective research agendas have worked themselves out as behavior analysis has evolved, if they ever were genuine problems to begin with. However, what is of concern among the domains of behavior analysis is the growing trend to blur the distinction between (a) applied behavior analysis as a scientifically based research discipline and (b) the delivery of behavior-analytic professional services.

Often this blurring takes the form of attempts to "professionalize" applied behavior analysis. For example, many individuals in applied behavior analysis have vigorously advocated the concept of a professional applied behavior analyst, by writing journal articles, lobbying for the cause, advancing subtle changes in experimental method, and providing certification for applied behavior analysts. The advocates have done their job successfully. The result is that societal recognition of behavior analysis is increasing, as evidenced by the increasing number of members in ABA. Perhaps behavior analysis would

not be as healthy as it is now if these advocates had not been so effective. A great number of parents and school administrators acknowledge the legitimacy of the professional who provides behavior-analytic service delivery. One result of this professional movement is that many applied behavior analysts now receive calls from parents asking for applied behavior analysts to do home therapy with their children. The parents often report that, if potential service providers are not applied behavior analysts, the parents can arrange for consultants to train the potential service providers in applied behavior analysis. Even some state governments and insurance companies now recognize applied behavior analysis as essentially an activity that provides a service.

What is vitally important in our estimation is to distinguish between (a) carrying out and disseminating the results of a scientifically based analysis and (b) delivering a professional service. The function of scientific analyses is to make it easier for others to behave effectively without direct or prolonged contact with the situation thus formulated. Our concern is that such analyses will not be carried out and disseminated, or at least not carried out and disseminated as effectively, if service providers and applied behavior analysts continue to blur the distinction among the domains of the discipline, as the series of papers reviewed at the beginning of the current article suggest is happening.

In contrast, the function of delivering a professional service is to solve a problem, immediately and effectively. Baer (1981) elegantly pointed out the benefits of distinguishing service from science in the following passage:

I am glad that none of my doctors were trained for only one semester in briefly packaged practice techniques, so as to specialize the other seven semesters in the basic physical chemistry that underlies human health and illness. I would like the next person who cuts into me to have practiced that first cut under the eye of a practicum supervisor; I do not care how many hours of physical chemistry must be sacrificed in training

for that to happen. I doubt that it will at all jeopardize the training of analytic medical scientists if our universities also train doctors who are pragmatic rather than analytic, skillful rather than analytic, routinized rather than analytic, and willing to try again if their first remedy fails rather than analytic. I would rather my doctor were all those things rather than analytic, if to be analytic requires my doctor to return to research and get back to basics, at length, while I languish. (p. 88)

Thus, we believe that distinctions among the experimental analysis of behavior, applied behavior analysis, and delivering a professional service need to be formalized, for the advancement of basic science, applied science, and professional application. As Hawkins and Anderson (2002) discussed, the distinctions are not intended to denigrate professional practice and service delivery, for example, by making them second-class citizens when compared with research-oriented experimental or applied behavior analysts. Rather, the distinctions serve to clarify the focus of the respective activities, so that basic research, applied research, and service delivery may flourish on the basis of their own independent contributions.

We recognize that many activities in behavior analysis combine the features of experimentation, application, and service delivery. Consider a university student doing classroom research on reading fluency for a thesis. Such a student is doing applied research, perhaps even a formal applied behavior analysis. However, the student is not an applied researcher or an applied behavior analyst when he or she directs classroom functions other than the thesis, such as managing the class and arranging contingencies for social and academic behaviors. In this nonresearch role, the student is a teacher delivering a service, even though the student uses findings from the experimental analysis of behavior, applied behavior analysis, and other effective practices such as precision teaching and direct instruction to guide teaching. In the role of teacher, the student may also collect data on student performance and learning to help with making instructional

decisions. Nevertheless, in the role of teacher, the student is delivering a service informed by the experimental and applied analysis of behavior, but the delivery of that service is neither the experimental nor the applied analysis of behavior.

In this same vein, the certification standards arising out of important work done by the state of Florida and adopted by the Behavior Analysis Certification Board pertain primarily to professional practice and delivering a professional service rather than the conduct of scientific research, and should presumably be recognized as professionally driven (Moore & Shook, 2001). To carry out research in the experimental analysis of behavior or applied behavior analysis, one consults with an institutional animal care and use committee in the case of nonhuman subjects or an institutional review board for the protection of human subjects in the case of human participants. The artifact describing the research and its professional significance is peer reviewed to determine if it is worthy of entering into the database of generalizable knowledge. All of this is relevant to a science-based research activity, and distinguishes that set of activities from delivering a professional service.

RATIONALE FOR DISTINCTIONS

As outlined above, we argue that the experimental analysis of behavior should not be encumbered by application issues associated with applied research and service delivery. It is not necessary to have immediate and direct application of results for research in the experimental analysis of behavior, although at some point some application of findings will undoubtedly occur, even if indirectly. Moreover, just as engineering needs to stand on the foundation of mathematics, physics, and chemistry, so also does the delivery of essential human services need to stand on the foundation of basic experimen-

tal and applied research in behavior analysis (M. J. Marr, personal communication, November 3, 2001).

Similarly, we argue that professional practice issues associated with service delivery (e.g., certification, legislation, liability) should not encumber the experimental analysis of behavior. Maintaining such distinctions will improve our understanding of science; in particular, how to teach it and support it. In addition, we argue that professional practice issues associated with service delivery should also not encumber applied behavior analysis. The emphasis remains on producing knowledge of how basic processes may be implemented to achieve desired goals.

Finally, we argue that science issues associated with the experimental analysis of behavior and applied behavior analysis should not hamper service delivery. Service providers have little need to be concerned with formally controlled conditions of research, reliability measures, and peer-reviewed publication. Instead, service providers need to solve problems efficiently, directly, and at a reasonable cost in terms of time and money.

SUMMARY AND IMPLICATIONS

We have argued that the domains of basic research, applied research, and service delivery are usefully viewed as lying on a continuum of behavior-analytic activity. We have further argued that the theoretical-philosophical-conceptual stance of radical behaviorism informs the three domains, and that together the activities constitute the four domains of behavior analysis. What are the implications of this view?

Implications for Training Programs

We argue first that distinguishing among the domains of behavior analysis—particularly the experimental analysis of behavior, applied behavior analysis, and service delivery—has implications for training programs. For example, training programs will need to decide what balance to maintain

among the domains and recognize the contribution of each element of the training program to the overall emphasis of the curriculum, whether it is basic, applied, or service delivery. They will also need to clearly define the mission and job description of those who provide the training. Because many training programs combine features of basic research, applied research, and service delivery (and we argue appropriately so), at issue is often the degree or emphasis of particular experiences. If a program trains service providers, presumably the curriculum of that program will still need to emphasize basic principles and processes. However, it may not have as much need for other elements of science, such as control conditions, multiple baseline designs, and so on. As Baer (1981) noted, service-delivery trainees will need exposure to a foundation of genuine basic science and genuine applied science followed by an emphasis on practicum work. However, someone will still need to carry out research on basic principles. This is the domain of the experimental analysis of behavior. In addition, someone will still need to carry out research on application to determine best practices. This is the domain of applied behavior analysis. It may be that someone trained with a background in applied research can then also deliver professional services, but let us not confuse the issue. Although the concern with socially significant behavior links applied behavior analysis in one important respect to service delivery rather than to basic research in the experimental analysis of behavior, applied behavior analysis is not broadly equivalent to service delivery. We argue that the distinctions are important; we should not confuse scientific research with practice, or think that we are supporting research when what we are actually supporting is practice.

Implications for ABA

A second broad implication concerns ABA as a professional society.

To be sure, ABA is sympathetic to and recognizes the need for a professional organization to deal with such professional matters as certification, professional liability, fee structures, third-party payments, and broad legislative action. Readers familiar with the split that developed between the American Psychological Association and the American Psychological Society in the mid-1980s may see familiar themes in the present discussion. At issue is whether ABA should be to a great extent a professional organization that deals with such professional matters. The changes in behavior analysis over the years, documented in the sources reviewed at the outset of the present article, already suggest a distinct trend toward professionalization. This trend leads in turn to an increase in the allocation of resources toward professional issues associated with service delivery. This increase can take many forms—staff time or even the distribution of presentations across the four domains at the annual convention.

A distinct possibility is that unless there is a fairly substantial increase in resources and infrastructure, the increased allocation will be taken from the scientific concerns of experimental and applied analyses. If ABA wants to follow this path, it should make a reasoned, principled, and deliberate decision to do so, with a recognition that the fundamental nature of the association will change. If the association does follow this path, it will still need to take steps to ensure that service delivery will not come to dominate and define socially acceptable agendas and practices in either basic or applied research in behavior analysis. The danger is that if the sheer weight of numbers comes to define behavior analysis in terms of application, and application is then defined in terms of service delivery, an equivalence relation has been established that now equates behavior analysis with service delivery and diminishes any scientific considerations. We fear that socially acceptable priorities, agendas, and practices will come

to slow the advancement of both research discoveries and improvements for service. In particular, we fear that individuals will be busy doing what they think is the science of behavior analysis, but it may not turn out to be science after all, and society will be the worse off for failing to maintain the distinctions among basic science, applied science, and professional practice.

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