Fifty Years Later: Comments on the Further Development of a Science of Verbal Behavior

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Fifty years after the publication of Skinner's *Verbal Behavior*, some possibilities for the future of Skinner's "science of verbal behavior" are considered. Specifically, certain areas of development or advancement are examined which might be of special importance to the expansion and influence of the functional analysis of verbal behavior. One critical task for the influence of the field, for example, involves the removal of an obstacle; namely, the remarkably persistent and wholly inappropriate influence of Chomsky's polemic of 1959. Strategies for neutralizing this influence are explored. In looking at the future advancement of the field, a case is offered for broadening the domain of verbal behavior research to include a variety of complex verbal phenomena. Skinner's original work and more recent systematic treatments provide an important framework for the analysis of verbal behavior, but there is still room for, and a need for inductively oriented, empirically based research programs that transcend specific interpretive or theoretical treatments. Such programs, under the guidance of the practices of radical behaviorism and effective behavior-analytic methodology, might provide additional lines of development and progress for the analysis of verbal behavior.
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In a previous paper (Leigland, 2001), I offered a modest assessment of progress toward Skinner's conception of "a science of verbal behavior" (e.g., Skinner, 1945, 1957). On this fifty-year anniversary of the publication of Skinner's (1957) *Verbal Behavior*, I here offer an equally modest update on that progress in light of continuing developments in behavior analysis, recent developments in other fields, the effects of a continuing impediment to the development of a science of verbal behavior (or at least the recognition of developments by those outside behavior analysis), and a suggestion regarding the expansion of sources of research programs in the field of verbal behavior.

Verbal behavior is undoubtedly the most important and conspicuous behavioral characteristic of humans in relation to other species. From planning a trip to the grocery store, to the development of new cultural practices, to genocide, the influence of verbal relations are seen virtually everywhere in human affairs. It is arguably the most important field for the future of behavior analysis (e.g., Hayes, Barnes-Holmes, & Roche, 2001; Leigland, 2001). Further, if the field of behavior analysis is ever to become a growing and thriving presence in academia (e.g., in psychology departments), it must become a viable, competing alternative to cognitive theory and research, nearly all of which is directly or indirectly related to verbal behavior. This in turn would mean the growth of basic behavior-analytic research programs in verbal behavior (which, unlike many other areas of inquiry, is in a unique systematic position for the associated development of useful applications based on that research). While such developments would require considerable time and effort, opportunities may be arising for the promotion of a functional analysis of verbal behavior.

Obstacle

First, it may be time to reconsider a familiar and persistent obstacle to the promotion of a behavior-analytic verbal behavior program. The impact of Chomsky's (1959) review of Skinner (1957) appears undiminished after nearly fifty years. In fact, the notion that Chomsky's review somehow "destroyed" Skinner's analysis seems to have moved beyond conventional wisdom to the status of one of the foundational axioms of Western Civilization. No hard data will be offered here in support of this statement, but recent stories abound of (for example) editors of major psychology journals who refuse to

consider a manuscript on verbal behavior simply because Chomsky had already shown Skinner's program to be unworkable. In a story recounted elsewhere (Leigland, 2006), I recently received a book on "classic readings" in the history of psychology, and noticing a paper by Watson I turned to the section on "Learning" to see if any of Skinner's contributions had been included, and instead found only one paper listed under the heading of "Learning". The inclusion of Chomsky's review here was particularly absurd, given that the "review" was an ignorant and dismissive indictment of virtually all of the learning perpectives of the day coming out of experimental psychology (including those of mediational neobehaviorists like Clark Hull's S-R Behavior Theory).

It might be possible to point to a few subtle indications that a general reassessment of Chomsky's review may be in preparation. For example, I have noticed in teaching General Psychology for many years that the "Language" chapter in general psychology textbooks rarely make any reference to Chomsky's review (or Skinner's book), even when recounting the recent history of the study of language. Throughout the 1980s, by comparison, the Legend of Chomsky's Review appeared to be required reading, a revolutionary advance in the study of language. In the fascinating book, *The Linguistic Wars* (1993) detailing the rise and fall of Chomsky's theories and influence in linguistics, linguist R. A. Harris described in lurid prose the ways in which Chomsky's review laid waste to Skinner's analysis of verbal behavior, but added (albeit in a footnote) a reference to the excellent reply to Chomsky's review by MacCorquodale (1970), where he also noted its relative lack of influence. Hopes for a general reassessment were raised following the discovery of Skinner's *Verbal Behavior* by linguistic historiographer Julie Tetel Andresen (1990). Having known of the book and Chomsky's review for many years, Andresen became the first linguist to have actually read and studied Skinner's book, yet her sophisticated and positive assessment has not reached a wide audience.

It is proposed here that despite continuing advances in the functional analysis of verbal behavior, difficulties will be encountered in achieving influence outside of behavior analysis until the influence of Chomsky's review is addressed directly. Strategies for neutralizing the influence of a polemic with such cultural momentum is a matter of discussion and planning, perhaps at the level of an organization such as the Association for Behavior Analysis, but it would probably require nothing short of an organized and coordinated campaign. A series of articles or edited books might be a place to start, addressing such themes as the types or classes of errors that appeared in Chomsky's review regarding the technical vocabulary of behavior analysis, radical behaviorism, the goals and scope of Skinner's interpretations, and so on. Such writings could build upon and extend the original treatment by MacCorquodale (1970).

Another theme might emphasize the relative fates and fortunes of Chomsky's and Skinner's approaches in their respective areas. Psychologists, philosophers, and others are often shocked to find that Chomsky's linguistic theories have virtually disappeared from linguistics (Harris, 1993; see also Schoneberger, 2000; although a general nativistic orientation remains popular; e.g., Pinker, 1994), while Skinner's functional analysis of verbal behavior and newer formulations with origins in that work (e.g., Hayes, Barnes-Holmes, & Roche, 2001), as well as related behavior-analytic research (e.g., Sidman, 1994) have continued to grow. Such themes could also emphasize the effective applications derived from Skinner's analysis in the acquisition of verbal repertoires in various treatment populations (e.g., Sautter & LeBlank, 2006).

Opportunities

Opportunities for the promotion and development of the functional analysis of verbal behavior may also be found in the changing fortunes of the nativistic assumptions that have dominated linguistics since the time of Chomsky's influence and beyond (e.g., Pinker, 1994). Of course, the pragmatic perspective of radical behaviorism does not exclude the consideration of phylogenetic contingencies and variables in the development of verbal (or any other) behavior, but that same pragmatic orientation emphasizes the role of ontogenetic contingencies in verbal interactions (e.g., Baum, 2005). In recent

years, the deeply-entrenched rejection of any significant role of "learning" processes in language development has been challenged on several fronts, and from individuals and research programs outside of behavior analysis. For example, philosopher Fiona Cowie's (1999) *What's Within?: Nativism Revisited* is a wide-ranging critical assessment of a variety of nativistic arguments in linguistics (for a review, see Schoneberger, 2005).

Much of the fuel driving the reassessment of linguistic nativism has come (perhaps with irony, from the perspective of a behavior analyst) from cognitivist research programs. One such program is Jeff Elman's connectionist simulation program in the Department of Cognitive Science at the University of California, San Diego. In a series of fascinating studies (some of which were presented in an Invited Address at the 2006 meeting of the Association for Behavior Analysis), Elman and his colleagues have shown, using relatively simple artificial neural network simulations, that stochastic input is sufficient to produce sophisticated verbal output of various types previously thought to be "unlearnable". The following summary from Lewis and Elman (2001) is illustrative:

> The objective here was to demonstrate the necessity of taking into account--amidst a growing body of evidence that children use it--the stochastic information in child-directed speech. To be convincing we have taken on Chomsky's celebrated argument that structure-dependence must be a principle of UG [Chomsky's innate-based Universal Grammar]; have been careful to avoid providing the network with input that could be controversial with respect to its availability; and have represented the input in a way that encodes no grammatical information beyond what can be determined by its statistical regularities. This thus substantially under-represents actually available to children (since contextual cues, phonological similarity, and other sources of information are abstracted away), and so the fact that a neural network generalizes to make the correct predictions, from data modeled in this way, shows that learnability claims based on a non-stochastic model of the input must be reassessed. (p. 10)

Elman's research makes use of a network level that simulates the effects of cumulative input history (Elman, 1990), and this special characteristic combined with the dynamic developmental interplay between input, the effects of history, and "feedback" from a responsive environment provide what could be plausibly characterized as a simulation of the effects of contingencies of reinforcement on the development of some very sophisticated properties of verbal behavior, and all of this in the absence of any sort of "innate" rules, symbols, or encoded "language of mind" (for an introduction to this research, see e.g., Elman, 1990, 2004, 2005; Lewis & Elman, 2001; many of Elman's papers are available online at: http://crl.ucsd.edu/~elman/publications.html).

Another area of research which may present behavior analysts with opportunities is the cognitivist field generally characterized as language development. A recent paper by Dale and Spivey (2006) summarized some this research in the introduction to their analysis of "syntact coordination" of children and caregivers in ordinary conversation. The following series of quotations provide a sampling of the studies cited, and communicate both the basic research questions and the relevance of the findings to behavior analysts:

> *…some early work [on child-caregiver verbal interaction] sought to identify the* ***social or structural cues*** *for aiding the child's language development….*
> *Hirsh-Pasek, Treiman, and Schneiderman (1984) conducted an early analysis of interaction between 40 mother-child pairs demonstrating* ***differential maternal responding contingent on the grammaticality of the child's utterance****.*
> (Dale & Spivey, 2006, p. 392; emphasis added)

> *Goldstein and colleagues (Goldstein, King, & West, 2003; also Bloom, Russell, & Wassenberg, 1987) recently* ***demonstrated experimentally*** *that* ***maternal responses contingent on infant vocalization increase the quantity and quality of those vocalizations****. Maternal modeling contingent on vocalization contributes to the complexity of these vocalizations within an individual interaction….*
> *Tamis-LeMonda and Bornstein (2002) also demonstrated, in* ***extensive analysis*** *of mother-child interactions,* ***that maternal responses that consistently and closely follow a child's utterances correlate strongly with later language development****. These timely caregiver interactions perhaps provide clues that, as grammar learning proceeds, there might also be a process of syntactic coordination.*
> (Dale & Spivey, 2006, pp. 393-394; emphasis added)

> *More recently, research has suggested that* ***caregivers issue contrastive responses to a child's ungrammatical utterances****, serving to model how a structure is used and as evidence that the child has erred (Chouinard & Clark, 2003; Saxton, 2000)….*
> ***Statistical input*** *and* ***contingent responses*** *in a conversation, if effective,* ***shape the language of both the child and caregiver toward "syntactic coordination****."*
> (Dale & Spivey, 2006, pp. 392-393; emphasis added)

As the authors conclude in one of the passages above that "there might also be a process of syntactic coordination," the emphasized sections of the quotations would indicate to behavior analysts that familiar, ubiquitous, and important interactive processes are indeed at work. The descriptions are clearly indicating the operation of differential reinforcement and the process of differentiation, along with the special case of the latter process, shaping (the differential reinforcement of successive approximations; a term that even appears, apparently by non-technical, metaphorical coincidence, in the final sentence; e.g., Catania, 1998), as applied by caregiver and child in interlocking social contingencies of reinforcement in the natural environment, where the development of verbal behavior is being observed in real time.

Such areas of research might present opportunities for behavior analysts in the sense that the arguments and empirical findings emerging from such sources support the findings and interpretations of a behavior-analytic view of verbal behavior. One type of opportunity might be for behavior analysts to join the scientific conversations in these fields, providing historical context, neutralizing common misconceptions, clarifying technical terms and concepts, showing the relevance of empirically-based behavioral processes, suggesting new lines of basic research, illustrating possible applications, and so on. Another opportunity might be found in using such research, some which involves very detailed and extensive analyses of directly observed and recorded verbal behavior, to generate new lines of basic research in the functional analysis of verbal behavior. Bringing similar research themes into the systematic perspective of radical behaviorism might yield surprising and powerful new directions.

Theoretical and Inductive Approaches to Verbal Behavior Research

Within the field of behavior analysis, study of verbal behavior is a diverse and complex enterprise. The functional analysis of verbal behavior began, of course, with Skinner's (1957) original interpretive work, a systematic treatment of the verbal domain. In recent years, however, alternative systematic treatments and accompanying lines of research have arisen. These newer formulations may be viewed, for the most part, as extensions of Skinner's analysis in combination with the research methods and findings that originally grew out of Sidman's (e.g., 1994) analysis of equivalence relations. Thus we find alternative systematic treatments for the field of verbal behavior (which include, in at least one case, an alternative definition of the term, "verbal behavior"; e.g., Leigland, 1997).

In what follows, a brief case will be made for two types of research programs in verbal behavior. One type constitutes the majority of verbal behavior research today; that is, research that is derived from or is based upon one or another of the available systematic treatments, which will be called here the "theoretical approach". The other type, which will find promotion here as a growing addition to the first type, is research that is free of any particular systematic treatment, but which deals with important basic and/or applied questions, falls within the systematic scientific perspective of radical behaviorism, and makes use of recognizable behavior-analytic research methodology. This latter type of research program will be called here the "inductive approach."

First, a very brief word about the terms themselves. The term "theory" may be controversial in behavior analysis, just as "induction" is controversial in science generally. In the present discussion the former term will refer only to empirically based, systematic treatments formulated by behavior analysts with relatively broad applicability to the field of verbal behavior (so defined). The latter term will refer to research that arises primarily out of a specific basic or applied research questions, perhaps derived from previous empirical findings, which is of interest, not because of its relation to any larger systematic treatment, but rather because of the demonstrated order and/or practical use that is found in such a complex subject matter.

Theoretical Treatments The various systematic explanatory or interpretive accounts of verbal behavior are complex and, in most cases, somewhat controversial. The goal here is to identify examples of such accounts for the purposes of illustrating their role in generating programmatic research in verbal behavior. For example, Skinner's (1957) original and extensive interpretation of verbal behavior in terms of contingencies of reinforcement has served as the basis of a growing trend in applied and basic research, especially in treatment populations such as developmental disabilities, autism, and other clinical populations (e.g., Sautter & LeBlank, 2006).

As noted above, Sidman's (e.g., 1994, 2000) remarkable program of research marked a turning point in how complex "symbolic" relations might be conceptualized and analyzed within a behavior-analytic framework. The demonstration of the occurrence or "emergence" of untrained conditional and reversible ("derived") relations among networks of arbitrary stimuli in the formation of equivalence classes had clear relevance to extensive "symbolic" functions of stimuli that went beyond the "signaling" functions of discriminative stimuli as previously studied. Although the basic phenomena of equivalence relations and derived relational phenomena had been described clearly in Skinner (1957), Sidman's research marked the beginning of a new and powerful empirical front in the analysis of such phenomena.

Although Sidman had developed his own systematic position regarding equivalence relations and the role of reinforcement contingencies in their formation (e.g., Sidman, 2000), this research also served as the starting point for other, more general systematic treatments of the relations between equivalence phenomena and verbal behavior. The most ambitious of these theoretical systems is Relational Frame Theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001). RFT views equivalence relations as but one type of abstract and generalized relational operant. These relational operants, termed relational frames, are viewed as the product of a history of multiple-exemplar training, and within RFT are included as the primary defining characteristic of verbal behavior. Thus RFT constitutes a behavior-analytic attempt to provide an integration of the phenomena of verbal behavior with a new broadly-based technical analysis of derived relational phenomena. While RFT has generated a considerable amount of interesting critical discussion (e.g., Barnes-Holmes & Hayes, 2003; Galizio, 2003; Hayes & Barnes-Holmes, 2004; Palmer, 2004), it has also generated a great deal of research (e.g., Hayes, et al., 2001; Hayes & Barnes-Holmes, 2004).

Two other examples of theoretical treatments with potentially broad applicability in the verbal domain are Horne and Lowe's Naming Theory (1996, 1997) and Lowenkron's elegant concept of Joint

Control (e.g., 1984, 1998, 2006a, 2006b). These formulations, like those listed above, serve as important sources of programs of basic and applied empirical research on the phenomena and processes of verbal behavior.

Inductive approaches to Verbal Behavior Research Although systematic ("theoretical") treatments of verbal behavior have been productive guides for research, important and productive empirical research questions may arise from various alternative sources. This latter "inductive" approach, in which research questions are not tied to any specific theoretical system, was an important characteristic of the early research in the experimental analysis of behavior (e.g., Ferster & Skinner, 1957; Skinner, 1938; for discussions, see Bjork, 1993; Skinner, 1956, 1979, 1989). Skinner's early views of science had been strongly influenced by the writings of Francis Bacon and Ernst Mach (e.g., Smith, 1995). Bacon's advocacy of an inductive approach to science has been often misunderstood (e.g., Urbach, 1987), but had its roots in Bacon's skepticism of established authority and entrenched culturally-laden preconception regarding nature. Bacon's general view was to let nature guide the scientist regarding what was important, how it worked, how it was related to other natural phenomena, and (with emphasis) how it could be put to practical use. It might be said today that Bacon's, and Skinner's, views of science and the exploration of nature emphasized direct contact with natural contingencies and a skepticism regarding the influence of the rules of "conventional wisdom" of cultural traditions (e.g., Skinner, 1953, 1956; Leigland, 1997).

In the current, very generic conception of inductive research, empirical questions often arise directly from exploratory basic research, the development of new research methods, or from new areas of applied science. A question may arise, however, as to the sense in which such work constitutes behavior-analytic research, if it is unrelated to any of the current behavior-analytic conceptions and systems of verbal behavior. In other words, if the verbal behavior research is not under the influence of behavior-analytic theoretical perspectives, in what sense is it a functional analysis of verbal behavior?

The answer comes not from theory, but from the overarching systematic perspective of behavior analysis; that is, from radical behaviorism. The growing literature of radical behaviorism (e.g., Catania & Hineline, 1996; Chiesa, 1994; Lattal, 1992; Leigland, 1992, 1997b; Moore, 2008; Smith, 1986; Todd & Morris, 1995) is complex, but a few things might be said about verbal behavior research under the guidance of radical behaviorism. For example, behavior analysts working from differing systematic perspectives regarding verbal behavior would agree with Skinner's (e.g., 1945, 1953, 1957) pragmatic, functional-analytic approach to verbal behavior; that is, analyzed as interactive behavioral phenomena in the context of contingencies of reinforcement. There would also be agreement about an emphasis upon single-subject research (adapted to social contingencies), the direct observation and measurement of behavior, experimental control, direct and systematic replication, the possibility of extensions to applied science, and so on. Further, no matter how feverishly devoted a researcher might be to a particular systematic viewpoint, whether Skinner's (1957) original analysis or Relational Frame Theory, for example, it would be difficult to argue with the ultimate Skinnerian inductive dictum, the search for order (e.g., 1953, 1956).

Prominent examples of such induction-based verbal behavior programs are not difficult to find. Some of the systematic formulations noted earlier began as empirically-based, induction-oriented research programs, such as Sidman's program investigating equivalence relations, and Lowenkron's development of the concept of Joint Control (for information on the early development of these programs, see Sidman, 1994, and Lowenkron, 1984). Indeed, Skinner's (1957) original analysis of verbal behavior was a direct extension of his own, archetypal induction-oriented research program carried out at Harvard in the 1930s (Skinner, 1938).

To these we may add Moerk's (e.g., 1983, 1992) brilliant reanalysis of Brown's (e.g., 1973) data from the latter's famous study of language development. Moerk's work represents an especially fortuitous case of inductive research, as his reanalysis of Brown's data led him first to conclude that the data were rich in the interactive effects of context and consequences, which in turn led him eventually to the one field which had the tools for studying such interactions; namely, behavior analysis.

Another prominent example of socially relevant, inductively-oriented research in verbal behavior is Hart and Risley's (1995) influential study of differences in the social and economic circumstances and experiences of children and how such differences affect the development of verbal behavior. This work has been cited often by cognitivists such as Elman (e.g., 2001) as one source of evidence of the richness and importance of experience and learning in the development of language.

Overview and Conclusions

Behavior analysis was once (and perhaps still is; e.g., Hergenhahn, 2005) viewed as an anti-theoretical field of science, but of course the objection was to one type of theorizing, now all but universal in mainstream cognition and experimental psychology (e.g., Leigland, 1997; Skinner, 1950, 1969). In the analysis of verbal behavior, empirically-based, non-reductive systematic formulations with the potential for broad applicability provide a theoretical diversity that generates both basic and applied research programs, as well as ongoing critical discussion of a wide range of empirical, methodological, and conceptual issues. Both the research and the critical discussion are of great value to the continued development of such an important and complex domain of research.

In looking to areas of continued development in the analysis of verbal behavior, current systematic treatments provide a productive and continuing basis for research on, for example, (a) applications of verbal behavior technology (much of which is based on Skinner's, 1957, *Verbal Behavior*), and (b) the analysis of complex "symbolic" verbal relations (nearly all of which has arisen from the systems that deal with equivalence relations and derived relational phenomena). Other research areas that might benefit from the expansion of induction-oriented, exploratory research would include (but would obviously not be limited to) (c) studies in the early development of verbal behavior (e.g., Fiorile & Greer, 2007; Luciano, Gomez Becerra, & Rodriguez Valverde, 2007), (d) the analysis of real-time verbal interactions (e.g., Dale & Spivey, 2006; Leigland, 1989b, 1996a), and (e) the functional analysis of ordinary language practices (e.g., Leigland, 1989a, 1996b).

As a complement to current and future "theoretical" systems which attempt to bring a degree of order to the immensely complex field of verbal behavior, it is also likely that all areas of basic and applied research in this field would benefit from creative new variations in behavior-analytic methodology, measurement, and the formulation of empirical questions. Clearly Skinner was envisioning a variety of complex and advanced areas of research in his references to "a science of verbal behavior" (e.g., Skinner, 1945, 1957), as seen in the follow quotation from a later chapter in *Verbal Behavior* (1957):

> One of the ultimate accomplishments of a science of verbal behavior may be an empirical logic, or a descriptive and analytical scientific epistemology, the terms and practices of which will be adapted to human behavior as a subject matter. (p. 431)

This passage, as with much of the material in the later chapters of *Verbal Behavior*, are a challenge to those who seek to develop a fully-functioning science of verbal behavior, a scientific analysis as sophisticated, useful, and fascinating as befitting the subject matter itself.

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