Quantified Trends in the History of Verbal Behavior Research

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The history of scientific research about verbal behavior research, especially that based on *Verbal Behavior* (Skinner, 1957), can be assessed on the basis of a frequency and celeration analysis of the published and presented literature. In order to discover these quantified trends, a comprehensive bibliographical database was developed. Based on several literature searches, the bibliographic database included papers pertaining to verbal behavior that were published in the *Journal of the Experimental Analysis of Behavior*, the *Journal of Applied Behavior Analysis*, *Behaviorism*, *The Behavior Analyst*, and *The Analysis of Verbal Behavior*. A nonbehavioral journal, the *Journal of Verbal Learning and Verbal Behavior* was assessed as a nonexample comparison. The bibliographic database also included a listing of verbal behavior papers presented at the meetings of the Association for Behavior Analysis. Papers were added to the database if they (a) were about verbal behavior, (b) referenced B.F. Skinner's (1957) book *Verbal Behavior*, or (c) did both. Because the references indicated the year of publication or presentation, a count per year of them was measured. These yearly frequencies were plotted on Standard Celeration Charts. Once plotted, various celeration trends in the literature became visible, not the least of which was the greater quantity of verbal behavior research than is generally acknowledged. The data clearly show an acceleration of research across the past decade. The data also question the notion that a "paucity" of research based on *Verbal Behavior* currently exists. Explanations of the acceleration of verbal behavior research are suggested, and plausible reasons are offered as to why a relative lack of verbal behavior research extended through the mid 1960s to the latter 1970s.

Ever since B.F. Skinner published *Verbal Behavior* in 1957 it has been a continuing source of controversy. One of the many controversies concerns the amount and type of scientific research the book has engendered. The book is often chided for not encouraging lines of empirical research. Typically, various authors have noted a relative lack, or paucity, of such research work (e.g., McPherson, Bonem, Green, & Osborne, 1984; Spradlin, 1985; Hall & Sundberg, 1987; Oah & Dickinson, 1989). Indeed, given the attention focused on this relative lack, its factuality seems axiomatic. It has become part of the behavior analytic lore to say *"Verbal Behavior* has generated relatively little empirical research." This, or a similar statement, is repeated again and again. We nod and accept this conclusion, usually without hesitation, and without examining the actual historical record.

But is the assertion about a relative lack of research true? If so, what is the nature of that truth? That is, is it as true now as it was a decade ago, two decades ago, or three decades ago? Is it true in any significant sense from the time of publication of Skinner's book? That is, how is "relative" defined? In addressing these questions, the present research finds that (a) there was indeed very little of such research at one time, but that (b) this is no longer so, (c) a relative lack has not been the case for at least a decade, (d) the notion of "relative" lack is misleading, (e) there are clear reasons why the quantity of such research has accelerated over time, and (f) the reasons usually given to explain the early "relative lack" are wrong and do not explain why there would have been a dearth of such research. The purposes of the present

paper are to document a more complete assessment of verbal behavior research conducted by behaviorists by way of examining quantitative trends in the literature, and then examining reasons why the trends would develop as well as explain the early paucity of research based on *Verbal Behavior*.

THE VERBAL BEHAVIOR RESEARCH DATABASE

Citation Analysis Caveats

A contemporary examination of verbal behavior research would follow the recent reviews by Oah and Dickinson (1989) and McPherson et al. (1984). They reviewed much of the work that has been conducted under the auspices of Skinner's analysis. To their credit, they discovered publications outside the behavior analytic mainstream, where behavioral researchers might not think of investigating. They omitted, however, some of the early work published in the first several volumes of the *Journal of the Experimental Analysis of Behavior (JEAB)*. Also, they did not consider presentations at the conventions of the Association for Behavior Analysis (ABA). These omissions may have been oversights, but they could also have been the result of the method used to conduct the analysis.

A citation analysis would be one method of approaching the problem of how much work has been based on *Verbal Behavior*. Oah and Dickinson (1989) formally base their assertion about a lack of Skinnerian verbal behavior research on the citation analysis conducted by McPherson et al. (1984). A citation analysis displays how often a work has been cited by others. The usual way of doing this is to consult a computer database, which is what McPherson et al. (1984) did. Yet, computer databases ought to be approached with a healthy skepticism. They often contain errors, omit data, lack proper keywords, introduce false keywords, lack pertinent cross references, and contain other problems. They are useful as a starting point for research, but not

as the basis for research, as I have learned by experience.

To their credit, McPherson et al. acknowledge some of the shortcomings of the databases. As they point out, an article or book that cites *Verbal Behavior* does not mean it has anything to do with Skinner's book. Further, the works containing the citations might not be scientific research. Some of the citations would be in works critical of Skinner's science. At best a gross impact of Skinner's work could be apprehended, but a computer search will not reveal the actual trends of research that ensued.

As part of the present research, PsycLit and PsycInfo were consulted. These are computer databases versions of *Psychological Abstracts*, an important source of references. I discovered several egregious problems with these computer databases, however. When I recently consulted PsycLit, I discovered that the database did not contain a single reference to the journal *The Analysis of Verbal Behavior*. A keyword search under "verbal behavior" failed to find a number of articles dealing with verbal behavior that I had found already in the *Journal of the Experimental Analysis of Behavior*. A search of PsychInfo on Compuserve in December of 1991 also failed in these same ways, with the most notable absent data again being the omission of *The Analysis of Verbal Behavior* journal from the database. Thus, the most significant journal to behaviorists interested in Skinner's analysis of verbal behavior is not to be found in the computer databases of *Psychological Abstracts*.

I had discovered in the early 1980s that these computer databases omit references to valuable behavioral research. The computer databases of *Psychological Abstracts*, for example, do not have references to the *Journal of Precision Teaching*. Thus, the approach in the present research was to not rely on the computer databases, but instead, build up a database by hand, by actually going through the journals and examining articles directly.

A Reference Search Methodology

The problems and inadequacies of available computer databases become apparent to anyone who uses them frequently. This seems especially the case if the objective is to obtain a precise, accurate, and thorough accounting of the literature. Thus, the strategy followed here has been to examine every issue of the principal behavior analytic journals, article by article. An exhaustive search was conducted with the *Journal of the Experimental Analysis of Behavior*, the *Journal of Applied Behavior Analysis*, *Behaviorism*, *The Behavior Analyst*, and *The Analysis of Verbal Behavior*. In addition, the convention program guides of the meetings of the Association for Behavior Analysis were examined. Finally, to assess one clear non-example of behaviorism, the same type of search was conducted with the *Journal of Verbal Learning and Verbal*

Table 1

Keywords used in searching for verbal behavior relevant articles in the *Journal of Applied Behavior Analysis*.

Academic behavior	Prayer
Academic response	Programmed Instruction
Adjectival inflections	Rate of Speech
Adjectives	Reading
Arithmetic	Reading comprehension
Articulation	Reversal behavior
Articulation training	Sentence
Complimenting behavior	Sight words
Conversation	Speech
Conversational behaviors	Spelling
Conversational skills	Suttering
Deaf	Syntax
Digit reversal	Telegraphic speech
Education	Verbal behavior
Expressive language	Verbal conditioning
Generative	Verbal contingencies
Grammar	Verbal mediation
Greeting Responses	Verbal production
Handwriting	Verbal training
Imitation	Verbs
Language	Vocal pitch
Mathematics	Voice operated relay
Picture naming behavior	Word emphasis
Plurals	Writing

Journal of Applied Behavior Analysis. (1977). Cumulative index volumes 1-10 (1968-1977). Supplement to Winter, 1977.

Behavior. This is what I did, on again and off again, over a nearly 10 year period.

The basic methodology was quite simple: I first consulted the indices of the behavioral journals to find keywords that relate to verbal behavior. There are many keywords that apply, and some of these are shown in Table 1.

The next step was to pull the issues of the journals off the shelf and begin examining them. The articles containing the applicable keywords were found. Their abstracts were read, and their reference lists scanned for the familiar "Skinner, B.F. (1957)...." Articles were then tallied, with tally marks made on data sheets if the article cited Skinner's book and if it was about verbal behavior. This was the approach in the first search through the journals.

As I searched through the journals I began realizing that the search procedure was inadequate. I happened to examine articles that were not covered by the keywords, and found (1) references *to Verbal Behavior* and (2) articles that were clearly about verbal behavior but had not been keyworded in a way that would allow them to be found. Thus, a second search through the same set of journals was conducted, this time with each article in each issue being examined. This updated search ended in 1984.

After a couple of years had passed, I returned to the earlier searches. The tally sheets did not contain the actual references. Thus I embarked on a third search of the behavioral journals, this time writing down the complete references of the articles that cited Skinner's book or were about verbal behavior. The reliability with the earlier search was over 95%. A list of verbal behavior references resulted.

A couple of years later I began working on an early version of this paper, based on what I had discovered. In the earlier searches I had discovered several classes of articles:

(a) many of the articles deal with the subject matter of verbal behavior, but do not reference Skinner's book or use his conceptual framework;

(b) many of the articles that reference Skinner's

book do not deal in any significant way with verbal behavior;

(c) some of the articles both deal with the subject of verbal behavior and also cite Skinner's book, but do not use his conceptual framework;

(d) a few of the articles reference the book, deal with verbal behavior, and do make use of Skinner's analysis; and

(e) a few articles seemed to not only be about verbal behavior and reference and use the analysis in the book, but also seemed to extend that analysis in some way.

As a result of these observations, I conducted a fourth search through the journals, this time reexamining the reliability of the earlier searches, noting which articles used Skinner's analytic framework, and which seemed actually to extend the analysis. This time, the references were entered into a Hypercard database of my own creation.[1] The reliability with the earlier search was over 99% agreement.

The next step was to sort the Hypercard database into chronological order. This permitted the number of articles published per year to be easily counted. A count per year is a frequency. The yearly frequencies were next charted on semi-logarithmic Standard Celeration Charts, which are useful for showing trends, and from which celerations can be projected.[2] Celeration is the next derivative from frequency, and in the present research celeration is defined as number of articles published per year per half decade.

Counting Convention Papers

I have counted 772 sessions at the annual meetings of the Association for Behavior Analysis (ABA) dealing with verbal behav-

[1]The hypercard stacks comprising the database are available from the author as shareware. ASCII text file versions and hardcopy printouts are also available.

[2]Data are presented in this paper on semi-logarithmic charts that are similar to standard celeration charts. In the *Handbook of Graphic Presentations* — the definitive source for graphs and charts — Schmid (1954) demonstrates that semi-log charts have all the advantages of add-subtract charts without the disadvantages. The principal advantage is in the better illustration of proportional relationships and changes thereto. Note: Though various constraints prohibit publication of actual standard celeration charts in this journal, the actual standard charts are available from the author.

ior from 1975 through 1991. Convention program guides were used for the counts. Included in the counts were sessions (a) coded as VRB, (b) sessions clearly about verbal behavior (mentioning these keywords in the title), and (c) sessions that were de facto about verbal behavior, though not coded as such in the program guides. This latter category included papers dealing with a variety of topics, including reading, writing, academic behavior, conversation skills, echolalia, and language.

Since the only sources for making the counts were the ABA convention program guides, this was a limitation. Session titles and key codes should be fairly reliable indicators. Sessions that might have been explicitly based on Skinner's analysis were less easy to determine with absolute certainty. Criteria for making the determination included (a) whether the title explicitly referred to *Verbal Behavior*, (b) whether the title included terminology from *Verbal Behavior* (mands, tacts, autoclitics), (c) whether sessions were papers that were later published, or (d) whether sessions and meetings were officially sponsored by the Verbal Behavior Special Interest Group. There is every reason for believing that the total of 123 sessions represents an under count.

A Note on Reliability

A review of this paper criticized the lack of "interobserver agreement." There was no interobserver agreement, though, as I noted, there was high agreement from search to search. But consider this issue scientifically, not dogmatically. Johnston and Pennypacker (1980) demolished the absurdity and illogic that undergirds the necessity of interobserver agreement. There is no scientific basis for such a practice, though Lindsley (1990) noted that the actual reason might be to justify hiring more than one graduate assistant. But these criticisms can be set aside. Consider that the raw data, the journal articles, are not ephemeral behavioral events that momentarily exist and then vanish. Anyone, at any time, can consult the exact same database.

To be sure, there could be some discrep-

ancies, but these would not result from faulty observation. Rather they would result either from (a) a disagreement about the definition of verbal behavior and what qualifies as such, and (b) the actual lack of a hard and fast boundary between verbal behavior and other types of operant behavior. As Vargas (1988) notes, verbal behavior shares many characteristics with other operant behavior.

The functional definition of verbal behavior provided by Skinner (1957) served as one guiding criterion. Formal definitions were not excluded, especially if they made sense from the basis of Skinner's definition. Thus, an article about "arithmetic behavior" would be included because doing arithmetic problems is a form of intraverbal behavior. An article on reading would be included because the behavior clearly includes textual behavior. The point of the research was to be non-judgmental, and to assess what actually applies. Using the same definitions and the same database, other researchers should be able to replicate the findings discussed here, and replication captures the essence of science (Sidman, 1960).

THE HISTORY OF VERBAL BEHAVIOR RESEARCH

Early Verbal Behavior Research

When *Verbal Behavior* was published in

Table 2

Articles relevant to verbal behavior research in early *JEAB* (1958-64).

The operant control of verbal behavior:

Keller, (1958)	Holland, (1958)
Flanagan, Goldiamond, & Azrin, (1958)	Lindsley, (1959)
Hargreaves & Starkweather, (1959)	Starkweather, (1960)
Lane, (1960)	Azrin, Holz, Ulrich, & Goldiamond, (1961)
Starkweather, & Langsley, (1961)	Shearn, Sprague, & Rosenweig, (1961)
Staats, Staats, Schutz, & Wolf, (1962)	Levin, & Shapiro, (1962)
Goldiamond, (1962)	Cross & Lane, (1962)
Lane, & Shinkman, (1963)	Kapostins, (1963)
Cassotta, Feldstein, & Jaffe, (1964)	Lane (1964)
Staats, Finley, Minke, & Wolfe, (1964)	

The operant control of animal vocalizations:

Lane, (1961)	Salzinger, Waller, & Jackson (1962)
Molliver, (1963)	Kaplan, & Kaplan, (1963)

Programmed instruction:

Ferster, (1960a)	Ferster, (1960b)
Holland, (1960)	Cook, (1960)
Alexander, & Gilpin, (1961)	Barlow, Gilpin, Hedberg, & Palmer, (1961)
Holland, & Porter, (1961)	Gilpin, (1962)
Schutz, & Whittemore, (1962)	Goldiamond, (1964)

Note: Table 1 represents an exhaustive list of articles.

1957 it represented the culmination of over 20 years of work by B.F. Skinner. Parts of this work were released earlier in the William James Lectures in 1947. And some of the concepts and terminology were published by Keller and Schoenfeld (1950). Nevertheless, 1957 stands as the watershed year in which the radical behavioral analysis of verbal behavior was formally presented. Commentators address how much research this book has stimulated, not how much was based on the earlier presentations.

Approximately a year later the *Journal of the Experimental Analysis of Behavior (JEAB)* began publishing. From the first issue verbal behavior articles appeared. Many of these were not within Skinner's paradigmatic framework, but they all were within a basic operant paradigm.

As shown in Table 2, this early *JEAB* research divided into three main research themes: (a) the operant control of verbal behavior (e.g., Shearn, Sprague, & Rosenzweig, 1961), (b) the operant control of animal vocalizations (e.g., Salzinger, Waller, & Jackson, 1962), and (c) programmed instruction (e.g., Holland, 1960). The articles on programmed instruction apply because instruction is mainly an activity of shaping and changing verbal repertoires, primarily intraverbal. As an additional note, the very first article in issue 1 of volume 1 of *JEAB* was an article by Fred Keller on the teaching of Morse code, behavior which certainly falls within Skinner's framework as a codic relation.

As might be imagined from the identification of the three research themes, much of this early work was not cast within the *Verbal Behavior* paradigm in any explicit sense. Of the 33 articles dealing with some aspect of verbal behavior, only 6 referenced Skinner's book. There were some exceptions, however, most notably the article by Goldiamond (1962) that dealt with textual behavior entirely within the *Verbal Behavior* framework. This article stands as one of the first attempts to follow-up explicitly on Skinner's analysis. In any case, all of the early work formed a reasonably coherent body of literature united into

several distinct research themes, and contained both empirical reports and technical notes about apparatus. The apparatus appears antiquated by today's standards, but the directions it pointed towards remain intriguing. What was lacking in this early set of publications were conceptual and theoretical analyses, as well as reviews of Skinner's book and Chomsky's (1959) notorious review. Sadly, much of this early work is rarely cited (e.g., out of the 65 articles published in the first eight volumes of *The Analysis of Verbal Behavior* there are only two reference citations to the early *JEAB* articles).

The Research "Drought"

The early flurry of verbal behavior research in *JEAB* spanned the years 1958-1964. This activity essentially ended before
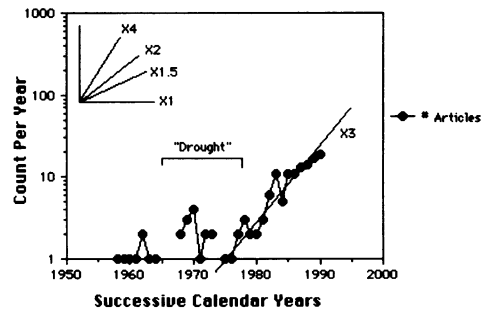

Fig. 1. Yearly frequencies and celerations of articles both (1) about verbal behavior and (2) that reference *Verbal Behavior* in the *Journal of the Experimental Analysis of Behavior*, the *Journal of Applied Behavior Analysis*, and *The Analysis of Verbal Behavior*, combined. Note: On a semi-logarithmic chart, zeros are indicated by discontinuities in the data.

1965. The lack of published work in the succeeding years probably gave rise to all the commentary about a relative lack or paucity. I have labeled this drop off in activity a "research drought." Evidence of the "drought" is readily visible in Figure 1, which displays yearly frequency and celeration data. From 1965 and for the next several years there were no papers in *JEAB* that dealt with verbal behavior, and very few that cited Skinner's book. For example, in 1966 of the 113 articles published in *JEAB*, none dealt with verbal behavior. One article that year referenced *Verbal Behavior*, though it was not about verbal

behavior per se (Skinner, 1966). The "drought" lasted into the 1970s.

The Research Acceleration

As with real droughts, the verbal behavior research drought eventually ended. In the latter half of the 1970s the pace of both discussion and empirical investigation increased. More scientific work in the area was being conducted. More outlets for sharing the work, such as journals and conferences, came into being. More organized promotion of research also appeared. As a result, research projects came along which followed in the footsteps of the early *JEAB* pioneers. The increase in verbal behavior research is also documented in Figure 1, which displays the overall tabulation of such publications. In subsequent Figures (2-6) the yearly frequencies of articles are broken down by journal and convention presentations, as well as by other criteria.

Figure 2 shows the yearly frequencies of (a) total articles published per year in *JEAB*, (b) the number of articles per year in *JEAB* that can be categorized as dealing with some aspect of verbal behavior (including both those articles that cite Skinner's book and those that do not), and
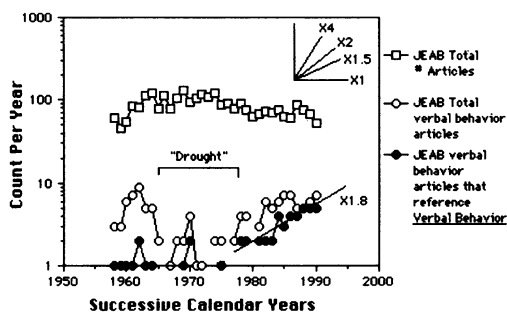

Fig. 2. Yearly frequencies and celerations of (1) total number of articles published per year, (2) number of articles per year dealing with verbal behavior, and (3) number of articles per year dealing with verbal behavior that also reference *Verbal Behavior* in the *Journal of the Experimental Analysis of Behavior*.

(c) the number of articles dealing with verbal behavior *and* citing the book. Since 1978 there has been a definite acceleration trend in this third category of X1.8 articles per 5 years (X1.8 is read as "times 1.8"; celeration values are symbolized with multi-

plication or division signs). A X1.8 celeration approximates doubling. If this overall celeration trend continues, then by the middle of the 1990s there should be about 10 articles per year in *JEAB* that are about verbal behavior and which also cite Skinner's book. A more conservative estimate projects that there would be somewhere between this value and the current rate of five per year. Also note that on Figure 2 the "drought" lasting from the mid 1960s to the mid 1970s is visible.

Figure 3 shows data pertaining to the *Journal of Applied Behavior Analysis (JABA)*. To a radical behaviorist these data are less encouraging, because the rate of papers both dealing with verbal behavior and which also cite the book has never strayed higher than two per year. Curiously, most of those two-per-year frequencies were in
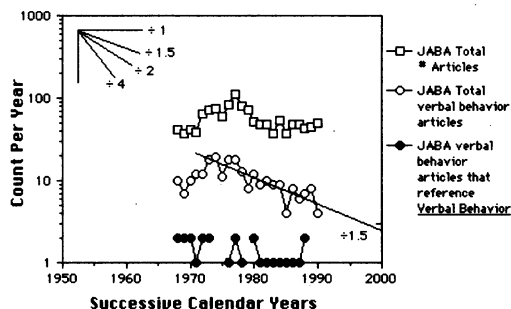

Fig. 3. Yearly frequencies and celerations of (1) total number of articles published per year, (2) number of articles per year dealing with verbal behavior, and (3) number of articles per year dealing with verbal behavior that also reference *Verbal Behavior* in the *Journal of Applied Behavior Analysis*.

the first six years of *JABA*. Also noteworthy is the deceleration of articles dealing with the subject of verbal behavior. From a peak of 19 in 1974 the number decelerated to a spread of between four to eight per year over the past half dozen years. If this trend continues, by the end of the decade *JABA* will be publishing only between two and three articles per year dealing with verbal behavior. As a side note, it should be clear that the ratio of papers dealing with verbal behavior that also cite Skinner's book compared to the total number of papers dealing with verbal behavior is increasing. But this is an effect of the

decelerating trend of the latter quantity, not because authors are citing Skinner more often.

Figure 4 shows the number of articles published per year in the journal *The Analysis of Verbal Behavior (AVB)*. These data contain the most dramatic celeration
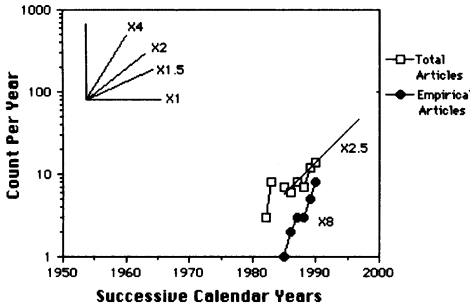

Fig. 4. Yearly frequencies and celerations of (1) total number of articles published per year, and (2) number of empirical studies published per year in the journal *The Analysis of Verbal Behavior.* Note that the celeration of this latter quantity is X8 per five years.

trends: X1.2 per five years overall, and X2.5 per five years since 1986. Projection of this latter celeration trend indicates that by the year 2000 there should be around 100 articles published per year in this journal. This estimate probably overshoots what will happen, however, since at least 10 successive frequencies are needed to make an accurate projection on a Standard Celeration Chart. A more conservative estimate projects between 20 to 60 articles per year in the journal by the end of the decade. The attainment of these outcomes is, of course, contingent on a host of variables, including production costs, number of subscribers, number of articles submitted, and distribution of the editorial responsibilities.

Figure 5 shows data from the *Journal of Verbal Learning and Verbal Behavior* (renamed more appropriately as the *Journal of Memory and Language* in 1985). These data were included as a non-example of the situation in the primary behavioral journals. The total number of references to *any* works by B.F. Skinner has been at zero per year for most of the journal's history. Most interesting, however, has been the steep deceleration trend in the number of articles per year that reference

works by Noam Chomsky. The frequency of these articles divided by 2.8 per five years from 1974 through 1984. Authors in a principal psychology journal dealing with verbal behavior and language were citing Chomsky less and less often.
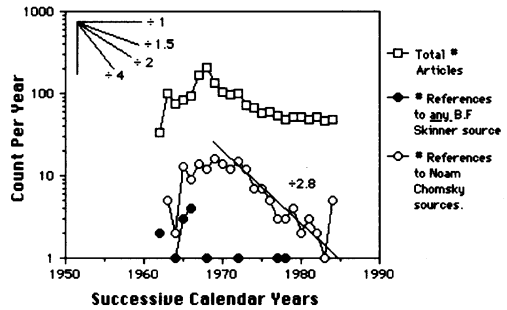

Fig. 5. Yearly frequencies and celerations of (1) total number of articles published per year, (2) number of reference citations per year to any works by B.F. Skinner, and (3) number of reference citations per year to any works by Noam Chomsky in the *Journal of Verbal Learning and Verbal Behavior.*

Research Lines and Threads

The existing verbal behavior research has been of major scientific significance regardless of whether one persists in terming the whole body of work as scant or not. Oah and Dickinson (1989) point out that many of the published research papers in *JEAB, The Analysis of Verbal Behavior*, and occasionally elsewhere, are direct extensions of Skinner's analysis. Accordingly, our understanding of verbal behavior within this context has been modified and extended by this empirical work.

Articles such as those by Boe and Winokur (1978) and by Simic and Bucher (1980) heralded the resumption of empirical work cast within the framework of *Verbal Behavior*. These articles and many others initiated what can be termed lines of research. An alternate term is research threads, which metaphorically describes how the lines of research "weave in and out," occasionally giving rise to semi-independent lines.

The empirical work now has covered virtually all of the major categories of elementary verbal operants, as well as other important parts of Skinner's analysis. Table 3 lists some of these studies by verbal oper-

Table 3

Some first and second order verbal behavior research.

Verbal Operant Class Extensions

Researchers & Year:	Verbal Operant Class:
Boe & Winokur (1978)	ECHOICS
Goldiamond (1962)	TEXTUALS
Lee & Pegler (1982)	TEXTUALS & TRANSCIPTS
Simic & Bucher (1980)	MANDS
Yamamoto & Mochizuki (1988)	MANDS
Lamarre & Holland (1985)	MANDS & TACTS
Watkins, Pack-Teixteira, & Howard (1989)	INTRAVERBALS & TACTS
Chase, Johnson, & Sulzer-Azaroff (1985)	INTRAVERBALS
Howard & Rice (1988)	AUTOCLITICS
Twyman (1991, May)	AUTOCLITICS

Other Research Extensions

Researchers & Year:	Research Area:
Lee (1981)	Speaker and Listener
Lodhi & Greer (1989)	Speaker and Listener
Lowe, Beasty, & Bentall (1983)	Reinforcement Schedules
Hyten & Chase (1991)	Self-editing

Note: The Table is not meant to be an exhaustive listing, but rather to be illustrative of the variety and scope of recent verbal behavior research.

ant class or by other research area (the Table is not meant to be exhaustive, but rather illustrates the scope of the research). The studies listed and others can be arranged into various research lines. Researchers now are able to consult this research. They can then pursue problems and questions identified in the published reports rather than rely exclusively on Skinner's book as a source of research. By following up on the pioneering efforts of those who publish research extensions, a coherent body of work ensues. In addition, researchers now have some experimental designs and procedures to emulate and thus to shape into better methodologies. The groundwork for enhancing the sophistication of the measurement has been laid.

Mands and tacts. An example of an emerging research thread is the one dealing with the relationship between mands and tacts. As a starting place a researcher could replicate Lamarre and Holland's (1985) findings. One could then extend such work parametrically by using different independent variable values, or even different independent variables. Several studies have now followed-up exploration of the mand-tact relationship. For example, Carroll and Hesse (1987) studied the effects of mand and tact training on the acquisition of tacts, and cited the Lamarre and Holland (1985) study. A study by Stafford, Sundberg, and Braam (1988) followed, and lent more support to the functional independence of mands and tacts as different verbal operants. This study in turn was followed by a research article by Sundberg, San Juan, Dawdy, and Argüelles (1990), which elaborated upon these differences and considered the relationship to intraverbals. In a somewhat independent

Table 4

Recent papers dealing with autoclitics.

Authors & Year:

Catania (1980).

Dloughy (1986, May).

Skutella (1987, May).

Kienlen (1988, May).

Howard & Rice (1988).

Lodhi & Greer (1989)

Exum, Osborne, & Phelps (1990, May).

Vargas, E.A. (1991b).

Twyman (1991, May).

Note: The Table is not necessarily an exhaustive listing.

branch of this thread, de Freitas Ribero (1989) and Baer and Detrich (1990) have also explored the mand-tact relationship. These latter two articles do not cross reference the other work, however.

Autoclitics. Another interesting research thread has been emerging recently. This one deals with autoclitics (see Table 4). Some of these papers are discussion articles (e.g., Vargas, E.A., 1991b), whereas others are empirical efforts (e.g., Howard & Rice, 1988; Twyman, 1991, May). Collectively, the papers in this thread have established a line of research pertaining to autoclitics.

DISCUSSION

Explaining the Research Acceleration

In the years following the onset of the publication "drought" several key events occurred that possibly formed some of the necessary conditions for the growth in the research.

JABA. The first significant event was the founding of the *Journal of Applied Behavior Analysis* in 1968 (see Figure 3). Some radical behaviorists might not consider *JABA* to be a key event in the development of verbal behavior research. To the extent that attention is focused only on that research within Skinner's paradigm the consideration is warranted. The journal, however,

became a substantial source for reports of verbal behavior research that were clearly behavioral, though not radical behavioral. But neither was the work explicitly and totally cognitive. The focus was on behavior, usually that which was socially significant. The experimental designs were mainly single-subject. From the resulting data there arises more of a chance of reinterpreting the research in terms of Skinner's framework than would be the case for articles in the *Journal of Verbal Learning and Verbal Behavior*. In addition, some of the *JABA* work may have touched upon problems so as to facilitate later research. That is, the *JABA* articles may have helped frame research problems, clarify solutions, and suggest investigatory strategies. Finally, a large variety of verbal behavior research threads were developed. These are lines of research that can be followed by those interested in applying Skinner's analysis.

MacCorquodale reviews. The book reviews published by Kenneth MacCorquodale in the *Journal of the Experimental Analysis of Behavior* were a second set of events (MacCorquodale, 1969, 1970). These papers probably hold their greatest value in their teaching impact. Issues and problems were clarified, and Chomsky's (1959) objections to Skinner's framework deftly handled. More importantly, however, were the alternative explanations of Skinner's concepts. *Verbal Behavior* is large, and difficult for many to learn. Further, the book was an initial foray into the behavioral analysis of verbal behavior, and thus included unfamiliar terminology. By addressing these issues using the somewhat different approach of reviews, MacCorquodale's articles may have explained Skinner's framework in a way that was easier for many to understand it. In any event, the reviews restored *Verbal Behavior* to the limelight, if only briefly.

Behaviorism. A third significant event that helps explain the research acceleration was the creation of the journal *Behaviorism* in 1972. The orientation of this journal toward philosophical discussion broadened the forum for conceptual and theoret-

ical analyses (the journal was never intended to be a repository for empirically-based research reports). Indeed, the very first article in the first issue dealt with verbal behavior (Catania, 1972). Some of the commentary in *Behaviorism* if nothing else considered the implications of Skinner's analysis and possibly suggested some worthwhile research questions and feasible new methodologies (e.g., Neuringer, 1981). Skinner's book contains many potential topics of research, but these ideas may be embedded in the discussion so as not to be immediately obvious (although, note that Sundberg (1991) has identified 301 research topics from the book). The function of conceptual and theoretical discussions, then, could be to expand upon the research ideas, to formulate important research questions, clarify problems, and raise new problems and issues about verbal behavior. This may foster empirical investigation, although there seems to be little citation of the *Behaviorism* commentary in the empirical research that has developed.

ABA. A fourth significant event promoting the research acceleration was the founding of the Association for Behavior Analysis (ABA) in 1975 (originally as MABA, the Midwestern Association of Behavior Analysis; see Peterson (1978) for the early history of ABA). The importance of this organization must not be underemphasized. Indeed, it may have been crucial to the increase in verbal behavior research. A science is always a community of people; a verbal community to put it in Skinnerian terms. A verbal community promotes communication and instruction.[3] In the case of scientific communities the communications that are promoted and shared are about scientific research. ABA provided an open and hospitable forum for people interested in verbal behavior to meet and exchange information. From 1975 through 1991 over 770 papers dealing with verbal behavior have been presented at the ABA conventions (Figure 6). Of these, at least 123 (16%) can be identified unambiguously as sessions coming within the Skinnerian paradigm, or of promoting it.
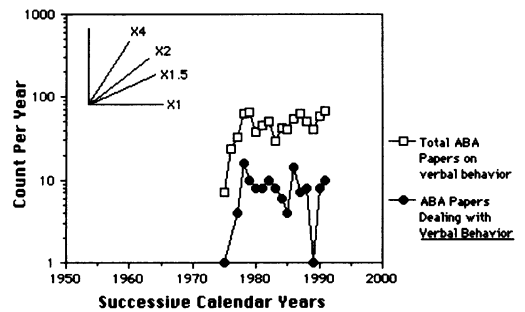

Fig. 6. Yearly frequencies and celerations of (1) total number of papers and sessions dealing with verbal behavior and (2) number of papers and sessions dealing with verbal behavior and *Verbal Behavior* presented at conventions of the Association for Behavior Analysis.

Are convention presentations illegitimate as scholarly resources, as some might contend? Is considering them as being part of the archival database of a science unjustifiable? Such contentions are probably spurious. Permanent scientific societies have been meeting ever since the Royal Society (more properly known as the Royal Society for the Improvement of Natural Knowledge) was founded in 1660 (Mason, 1962). Since that time papers have been read at the meetings of that society and a multitude of other scientific societies; papers that in many instances have contributed to the development of the sciences. The Association for Behavior Analysis has qualified, at least partly, as a scientific society. At every convention many of the sessions describe experimental or applied research, or entertain theoretical considerations.

Of course, presentations are more ephemeral than are publications, and often are not rigorously screened. Also, presentations often are not published for a variety of reasons. This does not countermand their legitimacy for scholarly purposes. Presentations often attain permanency in a variety of ways. Copies of a paper can be kept, notes can be taken by audience members, sessions can be audio taped or video

[3]Nearly every year at ABA there have been one or more workshops teaching Skinner's analysis. My own first exposure to *Verbal Behavior* came from a "mini course" taught by Jack Michael, Norm Peterson, and A.C. Catania at the 1977 MABA meeting (Michael, Peterson, & Catania, 1977, May).

taped, and so on. Audio taped sessions can be transcribed. In all these situations, what bestows scholarly legitimacy is the effect on the verbal behavior of others. Colloquially we say "information is exchanged." Behaviorally, the verbal stimuli that comprise a presentation could be sufficient to occasion sequelic intraverbal responses among members of the audience. Informally, we call these "new ideas." The verbal responses occasioned by a paper could be about (a) new research ideas, (b) extensions of the research presented, (c) extensions of earlier research, and (d) new problems that may not yet have been addressed in a public forum. Certain presentations also could serve possibly as establishing operations that "motivate" others to pursue similar research.

For all of these aforementioned reasons the formation of ABA probably has helped foster verbal behavior research and interest. We learn how others carried out their research. The scientific communication is valid. Any complete historical assessment of the trends in any kind of scientific activity, including verbal behavior research, should consider relevant convention presentations. They must be considered as part of the archival database of the science, and the yearly frequencies of presentations helps to indicate the quantity of ongoing research.

Verbal Behavior SIG. As mentioned, ABA has been a scientific and professional organization that assembles the members of the behavioral verbal community in an annual meeting. A fifth crucial event that furthered the increase in verbal behavior research was the establishment within ABA of the Verbal Behavior Special Interest Group in 1977 (Sundberg, 1983). This has been a group that has had as its mission the promotion of the scientific exploration of verbal behavior and the sharing of methods and findings. Quite probably, this formal organization has had a synergistic effect and helped spur such research.

For example, our understanding of what is studied is affected by how research is conducted. A recurring problem in the study of verbal behavior, as Oah and Dickinson (1989) and others correctly indicate, has centered on methodology. The effects of single independent variables are difficult to isolate and study. Early attempts toward solving such a problem might therefore be methodologically crude. As Skinner (1948, p. 275) has related, this crudeness in method and measurement is not necessarily bad. One must begin somewhere if one's verbal behavior is to come under stimulus control of the particular subject matter—in this case verbal behavior. The initially crude methods and measures provide a starting point from which subsequent refinements are selected. The important point is to get started. A forum such as ABA in general, and the Verbal Behavior Special Interest Group in particular, facilitates the exchange of suggestions about methodological issues. For example, helpful suggestions can be solicited—this sometimes occurs in the discussions following presentations.

The Analysis of Verbal Behavior. A sixth event significant to the increase in verbal behavior research was the establishment in 1982 of a new behavioral journal devoted exclusively to verbal behavior; namely, *The Analysis of Verbal Behavior* (originally titled as *VB News*). This journal publishes both theoretical and empirical articles. Further, it expands the available forums to which behaviorists can submit papers. The existence of these forums—journal, convention, and special interest group—cannot be downplayed as independent variables affecting the growth of research. Removing one or more of these forums would likely result in a decrease in the frequency of either presentations or publications, or both. This kind of decrease happened to Precision Teaching when the *Journal of Precision Teaching* suspended publication from 1986 to 1990 (Eshleman, 1990).

Teaching verbal behavior. A seventh important factor affecting growth of research would be the ongoing efforts to teach Skinner's analysis. Several behavior analysts teach courses one or more times a year in which *Verbal Behavior* is used. Not all of these individuals can be named here,

because not everyone is known who actually teaches courses on verbal behavior using Skinner's book. Recently, I was pleased to learn that John O. Cooper at The Ohio State University was teaching such a course, for example. We all know that Jack Michael at Western Michigan University has been teaching verbal behavior for many years. R. Douglas Greer has clearly taught Skinner's analysis well if the presentations of his students at ABA is any indication. In my own graduate program I was fortunate to have several courses about verbal behavior taught by Ernest A. Vargas at West Virginia University.

These courses are often a first point of contact with Skinner's analysis. One might hear of it in other courses but not study it in depth. In the courses on verbal behavior, however, the problems and issues are laid out, the terminology and framework learned, and scientific research and extensions studied. In the courses taught by Ernest A. Vargas, for example, not only was Skinner's book studied in depth, but the verbal behavior research published in *JEAB* was learned as well.

Not every student who attends a course on verbal behavior is going to pursue verbal behavior research. But it takes only a few individuals to get interested in order to get a substantial quantity of research underway.

Research begets research. Once "ground is broken," so to speak, others can follow up on previously published research. Procedures can be improved upon. New independent variables can be tested. New values of previously tested independent variables can be manipulated parametrically. A common occurrence of all scientific research is that new questions and new problems are raised even while answers to older questions are found. The early research sets precedents, lends authenticity to research, and justifies research proposals that refer back to it.

Why Was There a "Paucity"?

While a paucity of verbal behavior research no longer exists, clearly there was a low frequency of publications dealing with the *Verbal Behavior* analysis at one time. Oah and Dickinson (1989, p. 53) rhetorically ask why researchers "neglected" Skinner's book. In attempting to answer this question they appeal to Skinner's (1978) explanations of (a) the lack of operant analyses among traditional language researchers, and (b) the sustained popularity of mentalistic explanations in the culture at large. Neither of these explanations offer a completely satisfactory answer, and a more plausible set of explanations comprises a more likely reason.

The lack of operant analyses among traditional language researchers would not explain the lack of articles dealing with verbal behavior in *behaviorist* journals. The lack of such analyses, though, could explain such dearth outside of behavior analysis. Consider that traditional language researchers are not inclined to read *JEAB* or *JABA* or other behavioral journals, let alone submit papers to them. This fact becomes crystal clear in articles published in the *Journal of Verbal Learning and Verbal Behavior (JVLVB)*. A principal psychology publication, this journal covers much of the same domain as the analyses of verbal behavior carried out by behaviorists. As Eshleman and Vargas (1988) listed in Table 1 of their article, the language researchers who published in *JVLVB* referenced *Verbal Behavior* a mere 5 times out of 1,839 articles published from 1962 through 1984. This journal is outside behavior analysis and barely references Skinner. The articles in *JVLVB* qualify as "traditional" language research.

But why would there be any expectation that "traditional" language researchers would embrace Skinner's analysis? They are not likely to be fluent in the science of human behavior that Skinner developed. What little they know is likely to be misinformed. In any event, they show precious little evidence of knowing Skinner's analysis or of being interested in it. We should not expect operant analyses to come from traditional language researchers. Language research is a different discipline. To the extent they deal with behavior at all, they do so from a paradigm other than the

selection by consequences paradigm of Skinner.

Some might consider the behavioral language research in *JABA* to qualify as "traditional." This issue is more complicated. Have these researchers been interested in language per se? If their research is any indication, by all appearances they have been interested in human behavior first and foremost. Their data are behavioral. Their procedures have changed behavior. Their work clearly has originated in an operant paradigm. A paper in *JABA* by Haring, Roger, Lee, Breen, and Gaylord-Ross (1986) claims that the "pragmatic analyses" about language published in *JABA* are "consistent with Skinner's (1957) theoretical account of verbal behavior in that it stresses a functional, as opposed to a structural analysis of language use" (p. 159).

The complicating factor is that many of the verbal behavior articles in *JABA* offer explanations couched in "traditional" terminology. Thus, we find "expressive and receptive language" being discussed. These kinds of explanations and descriptions hail from a scientific paradigm much different from Skinner's. The paradox, then, is a behavioral journal with operant roots using the language and conceptual framework of "traditional" language research. Does this make the *JABA* researchers "traditional" language researchers? Referring to them as such may not be fair. Not only is the adjective "traditional" often pejorative when spoken by academicians and educators, but if it applies at all it applies to the psychologists and linguists who publish in psychology journals such as the *Journal of Verbal Learning and Verbal Behavior*. A more appropriate characterization of the *JABA* research would be to suggest that their research occupies a position somewhere between cognitivism and radical behaviorism. Their conceptual framework might be cognitive, but their procedures and data are clearly in the behavioral domain. A better question, then, might be to ask why behavioral researchers have studied verbal behavior but pull in cognitive explana-

tions.

The argument about the popularity of mentalistic explanations in the general culture is somewhat more defensible than wondering why "traditional" language researchers did not adopt Skinner's analysis. Members of the behavioral community grew up in such a culture. They have been embedded within it. But they also have built their own scientific verbal community, one that uses terminology unlikely to be found in the general culture. They speak of "operants," "contingencies of reinforcement," "shaping," "fixed ratio schedules," "response cost," and so on. None of these terms or explanations are mentalistic. The question begged by the "popularity of mentalistic explanations" notion is why operant researchers by and large failed to pursue verbal behavior research within Skinner's paradigm. Presumably, people trained to study operant behavior are less prone toward accepting explanatory fictions, inner causes, homunculi, and free will than either traditional language researchers or members of the general public.

If the failure of "traditional" language researchers to adopt Skinner's analysis is not an answer, and if the sustained popularity of mentalism in the general culture is not an answer, what might explain the dearth of verbal behavior research from the mid 1960s to the latter 1970s? Some of the explanations that follow have been dealt with before, at least in part, but never together nor with the same documentation. Briefly, the more likely reasons for a paucity of verbal behavior research are (a) the small number of people who learned Skinner's analysis, (b) the lack of empirical data in the text, (c) the actual philosophical dispositions of behavioral researchers, (d) the existence of competing research interests, (e) the operation of financial contingencies, (f) the size of the radical behavioral community, and (g) the nature of time lags whenever scientific innovations occur.

Learning the analysis. As many of us who have read the book know, Skinner's analysis is both innovative and complex. The book requires some understanding of the

basic science of human behavior for it to be completely sensible. Thus, one probably should have studied *Science and Human Behavior* (Skinner, 1953), *The Behavior of Organisms* (Skinner, 1938), and perhaps a number of other works beforehand. Ideally, one also would have taken some formal courses in behavior analysis, including laboratory courses, before tackling the book. Shaping a rat by hand gives one an "intuitive" feel for selection by consequences. One probably needs to understand selection by consequences for *Verbal Behavior* to be fully comprehended.

If people fail to read the book they are not going to be knowledgeable about it. They are also very unlikely to pursue research based on it. If people read only the first few chapters they may acquire a superficial understanding of it, but they probably will not acquire fluent intraverbal repertoires with respect to the analysis. These people also are not likely candidates for developing research based on Skinner's analysis. Indeed, if the teaching of the book contributed to the growth of subsequent research, then the lack of such teaching and learning would help explain why there was not more. In short, we can posit that some behavioral researchers never read the book. Others may have learned some superficial aspects of it. If they thus lack the behavior is it reasonable to expect them to behave? It would be unreasonable to expect such individuals to conduct their work under the auspices of Skinner's framework.

No data in verbal behavior. Skinner's book is not itself a research and data text. It differs from both *The Behavior of Organisms* (Skinner, 1938) and *Schedules of Reinforcement* (Ferster & Skinner, 1957) in this capacity. No cumulative records are to be found in *Verbal Behavior*. The conceptual and interpretive nature of the book, and attendant lack of tables and charts, probably steered a few operant researchers away. This possibility is actually difficult to document. Perhaps behaviorists are wary of revealing this as a reason for not using *Verbal Behavior*. Ogden Lindsley (1991), however, has on more than one occasion criticized Skinner's book for its lack of data. He has characterized the book as "data void." This is about as close to an admission as is likely to be found. Lindsley's admission was in a paper that he submitted to the new *Journal of Behavioral Education*. Curiously, it was edited out of the published version, and exists only in the draft. In a conversation Lindsley (personal communication, December, 1991) suggested that this commentary had been "censored," not edited. Ironically, therefore, the one written instance of Lindsley's reason was not published and thus remains not easily documented by others.

Actual philosophical dispositions. A third reason why operant researchers "neglected" Skinner's book may be that some of them were not philosophically disposed toward the analysis. This relates to the popularity of mentalistic explanations, and the persistence of such. The term "behaviorist" masks some important differences among those calling themselves by that name. As E.A. Vargas (1991a) and J.S. Vargas (1991) identified, different kinds of "behaviorism" default into two completely different paradigms, "transformational" and "selectionistic." Those who stick to a transformational paradigm are probably less likely to build on the *Verbal Behavior* analysis than are, say, radical behaviorists who follow a selectionist paradigm.

Other research interests. The researchers back in the 1960s and 1970s held plenty of interests in behavior. They were interested in schedules of reinforcement, the matching law, conditioned reinforcement, aversive control, discrimination, generalization, the effects of drugs, and many other aspects of behavior. In operant research there has been no shortage of research problems. A person has only so much time, and if one is fascinated more by pursuing implications of the matching law or of schedules, for example, it is not clear how that person is "neglecting" the study of verbal behavior.

Financial contingencies. The research interests of behaviorists are not capricious. Economic contingencies play a big role

governing the type of research pursued. Many behavior analysts live from grant to grant, or work for public or private agencies mandated to provide service. The funding agencies are not particularly interested in promoting Skinner's analysis. They have no investment in it, nor any special commitment to it.

A review of the articles in *JEAB* in the 1960's reveals a majority of the research projects to be grant sponsored. The principal granting agencies were the National Science Foundation, NIMH, NIH, the U.S. Public Health Service, the military (e.g., the Office of Naval Research), NASA, and various other funding sources. Many projects were also funded by pharmaceutical companies. In 1962, for example, 46 publications specified grant support, whereas 31 did not (and of those 31, some of the researchers worked for pharmaceutical companies or for the military directly). In 1963, 71 articles were grant supported, while 34 were not.

The importance of these data ought to be clear. At the very least a grant restricts a researcher's freedom. The funding agencies have the money that researchers need to survive. The funding agencies with the money are sought out. Grants are proposed in a way to increase the odds of funding, which means the proposal will correspond to the agency's interests and agenda. Once funded, the researcher will pursue the research as stipulated in the grant. Only a foolish operant researcher would have taken money from a pharmaceutical company, for example, and spent it instead on exploring the relationship between mands and tacts.

The controlling nature of sponsored research has yet to be fully apprehended, though Lindsley (1992) has demonstrated how such funding can lead to the demise of behavioral research and technology. What has yet to be studied is the extent to which the financial contingencies put scientists into contact with contingencies that alter the verbal behavior of those scientists. More than likely, the operative selection principle controlling the verbal behavior of the researcher, then, is to speak the language of those who dispense the funds. That language is the mentalistic vernacular characteristic of the culture, and refined somewhat by cognitive psychology. But consider how this differs from the "popularity of mentalistic explanations" explanation: Verbal communities reinforce approximations to their language and punish deviations.

It may be difficult enough to get something "behavioral" funded, let alone something that is totally incomprehensible to the larger culture. In short, if there is no money for verbal behavior research it will not get done. What money is made available may be dispensed contingent upon research terminology and procedures that match the language and agendas of the funding agencies.

Size of the radical behavioral community. The people most likely to generate research based on Skinner's analysis are radical behaviorists. Perhaps we can wonder why more of them did not develop such research. But that makes sense only if there are many radical behaviorists. There are not many. Radical behaviorists are becoming a minority viewpoint within the Association for Behavior Analysis. Verbal communities maintain themselves and grow only as long as the members are successful in replicating their verbal repertoires in the repertoires of their students. The radical behavioral community has grown, but remains small. As of 1992, it may still be feasible for one radical behaviorist to be personally acquainted with all other radical behaviorists alive. If the "paucity" of verbal behavior research is considered in light of the size of the radical behavioral community, then perhaps it stands less as a paucity than as a major achievement. In short, it may be a wonder that so much verbal behavior research exists!

Cultural time lags. A time lag does not explain anything. It does describe, however. The history of science is replete with them. R. Buckminster Fuller (1981) has discussed the time lags between inventions and their adoption, some of which can be quite long. Kuhn (1962) has observed that

whenever there are paradigm shifts in science the resulting time lags in shifting to the new paradigm are not unusual. Plate tectonics was introduced as an explanation for geological phenomena decades before the science of geology shifted over to it.

Kuhn (1962) also observed that the history of paradigm shifts suggests that the older verbal communities never are the likely ones to pursue research on the basis of the new paradigm. In this consideration, then, expecting "traditional" language researchers to conduct research out of *Verbal Behavior* is rather akin to expecting theologically-oriented natural philosophers to act as Darwinians and study biology from the paradigm of natural selection. Skinner's analysis of verbal behavior represents a paradigm shift, and we should have expected some time lag to occur.

SUMMARY

Clearly, research in verbal behavior using and extending B.F. Skinner's selectionist paradigm is growing. New growth builds on previous efforts. The field expands. New areas of research interest and exciting new methodologies hold promise of expanding the quantity of research even further.

We promote mythology if we continue to assert that Skinner's analysis has prompted a lack of research. Assessing the quantity of research from such a "relativistic" perspective is the wrong approach. Perhaps such a "relativistic" viewpoint comes from the same contingencies that move behavior analysts to measure behavior using percent and to eschew and forget about frequency. If we actually plot the frequency and celeration of verbal behavior research, without making meaningless comparisons of it to other kinds of behavioral research, we find a solid acceleration trend upward. Enough frequency data exists so that reliable projections of that trend can be computed. If the present trend continues, in another decade or two the complaint might be that there is too much verbal behavior research for one person to get a handle on!

In any case, looking only at the amount of research done ignores a much more substantial point. The significance of research is not determined solely by quantity, but also by quality. A single research project could hold far more significance than a dozen "studies" conducted under the publish-or-perish contingency.

Finally, in looking back at verbal behavior research and declaring that a paucity exists, we reveal our prejudices and frustrations. We would like to see more. We would like to have our colleagues pick up and read Skinner's book, get excited by it, and plunge into analyses of mands, tacts, intraverbals, and autoclitics. Realistically, however, they are unlikely ever to do that. We may have to realize that only behaviorally trained people who have read *Verbal Behavior* are going to assume the mantle and move the field forward. This means us, not "traditional" language researchers. This also means that we need to continue to teach radical behaviorism and *Verbal Behavior*, and how the analysis really is a paradigm shift. Beyond this, moving the field forward means apprehending the actual pace of growth in research, and appreciating what developing a science means. We can examine and build upon the growth in the field as it has unfolded over the past decade, or we can continue to trouble ourselves about paucities. As they say, to a pessimist the glass of water is half empty, but to an optimist it is half full. In our case, the glass surely contains water and the drops are beginning to rain into it.

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