

A Citation Analysis of the Influence on Research of Skinner's *Verbal Behavior*

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The influence of Skinner's *Verbal Behavior* on the generation of verbal behavior research was examined in a citation analysis that counted the citations of the book from January 1957 to August 1983 and described the fields in which the citations occurred. In a subsequent content analysis, citations were classified as directly influenced by the book if they selected at least one of Skinner's classes of verbal behavior for empirical examination. Directly influenced citations were sorted as descriptive, applied, or basic. The total number of citations of the book (836), the increasing annual number of citations, and the range of fields in which the book has been cited are evidence of its broad influence. However, empirical investigations employing at least one of Skinner's classes of verbal behavior are only a small proportion (31/836) of the citations. Of this small proportion an even smaller number constitutes experimental analyses (19/836). The small proportion of empirical studies suggests that *Verbal Behavior* is primarily cited for reasons other than as source material for research hypotheses in the study of verbal behavior. Some speculations are offered to account for the book's limited influence on research.

In 1957 Skinner published *Verbal Behavior*, in which he described how language, previously the exclusive domain of anthropologists, linguists, and philosophers, might be conceptualized within the framework of the analysis of behavior. Skinner wrote that verbal behavior was sufficiently different from other behavior to warrant special treatment. Its uniqueness lay in the role played by the mediation of others in its generation, maintenance, and control (Skinner, 1957, p. 2).

Publication of the book preceded the existence of a body of data consistent with the description provided. Indeed, Skinner's writing was in part prompted by his belief that there was an absence of data precisely because no conception of verbal

behavior existed to direct research and to promote an understanding of the controlling variables. *Verbal Behavior* was written to provide that conception because it was Skinner's contention that behavior analysis offered a productive framework for the study of verbal behavior.

What is the extent to which *Verbal Behavior* has functioned as an impetus for research in the 27 years since its publication? Documentation of such an influence would permit the inference that *Verbal Behavior* has or has not led to the empirical examination of verbal behavior. The purpose of this study was to assess this heuristic influence. Tangentially, it was also possible to gauge the book's general influence.

Numerous measures can be employed as indicators of the influence of a specific work. One measure of general influence is the number of subsequent references in which a work is cited (Garfield, 1979; Margolis, 1967; Myers, 1970). A measure of specific influence is the amount of research generated in response to or as a result of a work (Smith, 1981). These measures were used to examine both the general influence of *Verbal Behavior* and its specific influence on research.

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Citation Analysis

Citation analysis is a growing collection of methods that employ the citation of a reference as a dependent variable in the study of relations between references, authors, or disciplines. As a measure of influence, citation analysis may be particularly informative because it is an unobtrusive, nonreactive measure. As a dependent variable, a citation is a bit of information that does not require a response from an author about the influence of one work on another (Smith, 1981).

Counting the citations of a particular work is one type of citation analysis that has developed since the advent of widespread computer use and the publication of extensive indices such as *Social Science Citation Index (SSCI)* and *Science Citation Index (SCI)*. Citation counts have been used to evaluate the influence of journals on particular fields (e.g., Bufardi & Nichols, 1981; Small, 1981; White & White, 1977), to investigate research trends in the field of behavior analysis (e.g., Dean, 1980; Hayes, Rincover, & Solnick, 1980; Pierce & Epling, 1980), to trace the publication of research articles culminating in scientific breakthroughs (e.g., Garfield, 1979; Imre, 1979; Small, 1976), and to provide information relevant to the productivity of university faculty (Garfield, 1983a, 1983b).

Garfield (1983b) has provided data on the total number of citations of every article indexed in *SCI* between 1961 and 1980. These data constitute a comparative base from which to make statements about the relative influence of any work contained in that index. Because *Verbal Behavior* is listed in *SCI*, the total number of citations it received from 1961 to 1980 can be compared with the total number of citations of other works during the same period. This information can aid in recognizing references of greater relative influence.

The validity of citation data as measures of influence has been examined from several different perspectives (e.g., Clark, 1957; Lawani, 1977; Myers, 1970). For example, Clark (1957) found that the

variable most highly correlated with the number of times an author was mentioned by a group of psychologists as influential to the field was the number of citations of that author's work ($r = .67$). Moreover, there is a relation between number of citations of a work and being awarded the Nobel prize (Cole & Cole, 1967; Garfield, 1970). Cole and Cole (1967) counted the number of citations in the 1965 volume of *SCI* of work by people who won the Nobel prize between 1958 and 1965. The average number of citations to their work was 58. In contrast, the average number of citations of all references indexed in *SCI* during that year was 5.5. Only 1.08% of the references listed in the 1965 volume of *SCI* received 58 or more citations (Cole & Cole, 1967).

There is some evidence to suggest that authors' citation choices may be based in part on the accessibility of particular cited references and the visibility of the cited author (Smith, 1981). Thus, total number of citations alone may not reflect the specific influence of a reference such as *Verbal Behavior* on a citing author's work. Additional analyses are needed before statements about the specific nature of *Verbal Behavior's* influence can be made. One type of citation analysis appropriately used to answer questions about influence is content analysis (Smith, 1981). This analysis requires examination of each citing reference to answer particular questions (e.g., Chubin & Moitra, 1975; Frost, 1979; Oppenheim & Renn, 1978). Without such an analysis, little can be said about the nature of a work's influence on any particular reference. Content analyses are conducted to avoid the assumption that, for a particular question, all citing references are equal (Smith, 1981).

Verbal Behavior's Influence on Research

It has been stated that *Verbal Behavior* has not led to the publication of research designed to test the descriptions set forth in the book (e.g., Knapp, 1980; MacCorquodale, 1969; Segal, 1977). Al-

though based on expert familiarity with the relevant literature, such statements are impressions rather than documentation of some measure of influence. One type of data from which inferences about the influence of *Verbal Behavior* can be drawn is citation data.

Some portion of the total number of citations of *Verbal Behavior* is likely to be what Margolis (1967) refers to as "noise," that is, articles that cite *Verbal Behavior* but treat it in only a cursory manner. Sundberg and Partington (1982) have noted that such articles exist. In the process of collecting a reference list of articles relevant to *Verbal Behavior*, they attempted to screen out articles only superficially related to the book, delineating the following criterion for inclusion: "An article or book must [have] represent[ed] either a positive or constructive discussion or development of some aspect of Skinner's *Verbal Behavior*" (p. 3). If the article was of an empirical nature, it must have cited *Verbal Behavior* and "some aspect of the paper [must have] centered around the application of a feature of Skinner's book (e.g., mand training, development of an autoclitic repertoire)" (p. 3). These criteria were general enough that Sundberg and Partington had to interpret what the authors of a particular work intended and to judge the contribution of a reference to an understanding of verbal behavior. In the present study, the criteria for categorizing references as related directly to the examination of *Verbal Behavior* largely eliminated interpretation of author intent or judgment regarding contribution. By using clear and simple criteria, we hoped to identify those articles in which the influence of *Verbal Behavior* led to the empirical utilization of constructs provided in the book.

Identification of References

A count of the number of published works citing *Verbal Behavior* was obtained by searching *SSCI*, *SCI*, *Psychological Abstracts*, *Current Index to Journals in Education*, *Resources in Education*, *Dissertation Abstracts Inter-*

national, *Conference Papers Index*, *Language and Language Behavior Abstracts*, and *Smithsonian Science Information Exchange*. The search parameters were defined by the publication dates of the indices examined and the journals, projects, and papers contained in those indices. Additional citations were identified by reviewing the bibliographies of references examined in this study. The only criterion for a reference's inclusion in this preliminary count was a citation of *Verbal Behavior*. No indication of the magnitude of influence of Skinner's book on any particular reference should be inferred because of its inclusion in this count.

Categorization of References by Discipline

The references citing *Verbal Behavior* were sorted into categories according to discipline. The first source for determining the category in which a reference would be placed was the title of the book or journal in which it was located. In most cases, a title included the name of the professional field in which the reference was published. If the title of the journal or book did not clearly indicate a professional field, then the decision was based on the reference's title.

Content Analysis of References

References or abstracts of references were content analyzed to establish the manner in which *Verbal Behavior* had been cited. A reference was classified as directly influenced by *Verbal Behavior* if the author(s) stated that one or more of six independent response classes (i.e., intraverbals, mands, tacts, textual behavior, echoics, or autoclitics) was either a dependent, independent, or observational variable. After classification, those references directly influenced by *Verbal Behavior* were annotated and sorted into three categories based on the nature of the research. Those three categories of studies were descriptive, applied, and basic. Descriptive studies cited *Verbal Behavior*, utilized at least one of Skinner's

(1957) six response classes as an empirical variable, and collected observational data. Typically, verbal responses of subjects were recorded and components of three-term contingencies were described. Applied analyses cited *Verbal Behavior*, utilized at least one of Skinner's (1957) response classes as dependent or independent variables, manipulated independent variables, and focused on the improvement of the subject's behavior. Basic analyses cited *Verbal Behavior*, utilized at least one of Skinner's (1957) response classes as dependent or independent variables, manipulated independent variables, and focused on identifying controlling relations rather than improving a subject's behavior.

RESULTS

Identification of References

A total of 836 references citing *Verbal Behavior* was counted in the literature from January 1957 to August 1983.¹ Figure 1 depicts the number of *Verbal Behavior* citations by year. These data show an increase across years in the number of citations of *Verbal Behavior*.

The majority of the references were found in *SCI* and *SSCI*. *SSCI* was used to collect references published between 1966 and 1983 because at the time of writing, earlier volumes of *SSCI* were not in print. *SCI* was in print so citations of *Verbal Behavior* were checked therein from 1957 to 1983. Because so many of the references included in the count were found in *SSCI*, a break in the abscissa of Figure 1 was placed between 1965 and

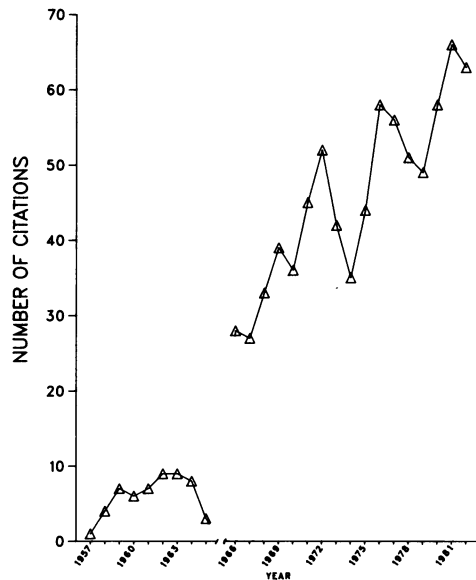


Figure 1. Frequency of *Verbal Behavior* citations by year. The break in the abscissa between 1965 and 1966 indicates introduction of *SSCI*, from which most citations were obtained.

1966. The smaller citation numbers before 1966 may relate to the absence of a social science index. There are likely to be more undiscovered references prior to 1966 than after. Thus, the results of this search yield a conservative total of the number of citations of *Verbal Behavior* by writers in various fields.

Categorization of References by Discipline

In the sort of the references by discipline, eight categories emerged: psychology/psychiatry, speech/language, education, sociology, child/human development, philosophy, medicine/biological science, and anthropology. Those that did not relate to any of the foregoing were placed in a miscellaneous category. Figure 2 presents the number of citations of *Verbal Behavior* by category. The majority of references citing the book were in a few disciplines such as psychology (451), speech and language (136) and ed-

¹ See NAPS Document no. 04221 for 112 pages of annotated bibliography of the 31 studies that used a response class described in *Verbal Behavior* as a dependent, independent or observational variable and a list of the 836 citing references from ASIS/NAPS, Microfiche Publications, P.O. Box 3513, Grand Central Station, New York, NY 10163. Remit in advance \$4.00 for microfiche copy or for photocopy, \$32.35. All orders must be prepaid. Outside the U.S. and Canada, add postage of \$4.50 for the first 20 pages and \$1.00 for each 10 pages of material thereafter. \$1.50 for microfiche postage.

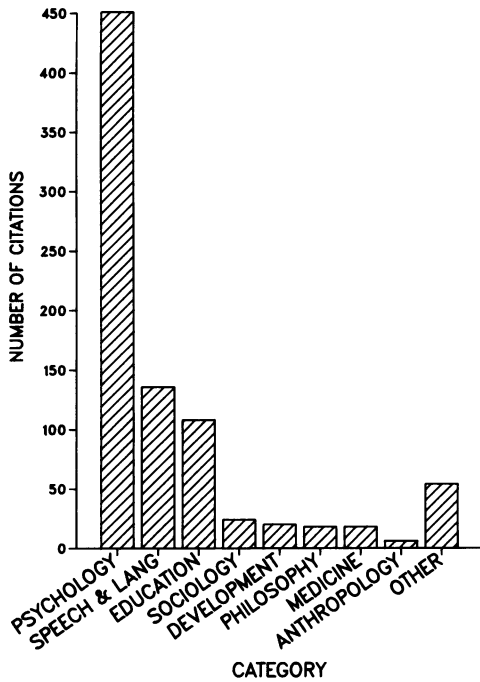


Figure 2. Number of *Verbal Behavior* citations categorized by discipline.

ucation (108), with the others distributed in the remaining areas. Fewer than 30 citations were discovered in any one field other than psychology, speech/language, and education.

Content Analysis of References

Thirty-one of the 836 references citing *Verbal Behavior* utilized at least one of the six response classes described by Skinner in the manner previously defined. Of these 31 studies, 12 were classified as descriptive (Table 1). Six of the descriptive studies reported observations of verbal interactions between dyads: four between parents and children (Gutmann & Rondal, 1979; Horner & Gussow, 1972; Huret & Bar, 1971; Marshall, Hegrenes, & Goldstein, 1973); one between supervisors and employees (Holvoet, Keilitz, & Tucker, 1975); and one between attendants and residents in an institution (Veit, Allen, & Chinsky, 1976). Frequencies of responses in some or all of Skinner's (1957) verbal response classes were reported in each. One study presented tape recorded syllables to subjects and measured the accuracy of echoics (Bricker, 1967). Others reported subjects' tacts in response to textual stimuli (Lahren, 1978); proportions of mands, tacts, intraverbals, and echoics in immediate and delayed reported thoughts (Martin & Crawford, 1976); categories of stimuli and verbal responses and frequencies of verbal operants in psychotherapy and discussion groups (McLeish & Martin, 1975); and probabilities of gestural and vocal intraverbals on language subtests

TABLE 1

Studies that used a response class described in *Verbal Behavior* as a dependent, independent, or observational variable

Descriptive	Applied	Basic
Bricker (1967)	Ayllon and Kelly (1974)	Boe and Winokur (1978a)
Gutmann and Rondal (1979)	Hung (1980)	Boe and Winokur (1978b)
Holvoet et al. (1975)	McDowell (1968)	Eisenberg and Delaney (1970)
Horner (1967)	Nelson and Evans (1968)	Ferster and Hammer (1966)
Horner and Gussow (1972)	Peine et al. (1970)	Israel (1960)
Huret and Bar (1971)	Reynolds and Risley (1968)	Lane and Schneider (1963)
Lahren (1978)	Rosenthal et al. (1969)	Matheny (1968)
Marshall et al. (1973)	Sapon (1969)	Neville (1968)
Martin and Crawford (1976)	Simic and Bucher (1980)	Wenrich (1964)
McLeish and Martin (1975)	Williams (1978)	
Poon and Butler (1972)		
Veit et al. (1976)		

(Poon & Butler, 1972). A factor analytic study by Horner (1967) examined the correlations between subtests of the Parsons Language Sample (PLS) and subtests of the Illinois Test of Psycholinguistic Abilities. This study was included because data collected with the PLS are data on mands, tacts, and intraverbals.

Ten of the thirty-one studies included in the annotated bibliography were classified as applied analyses (Table 1). All studies in this category manipulated either antecedent stimuli (McDowell, 1968), consequent stimuli (Ayllon & Kelly, 1974; Nelson & Evans, 1968; Reynolds & Risley, 1968), or both (Hung, 1980; Peine, Gregersen, & Sloane, 1970; Rosenthal, Underwood, & Martin, 1969; Sapon, 1969; Simic & Bucher, 1980; Williams, 1978). Percentage, frequency, length, or accuracy of verbal responses in one or more of Skinner's (1957) verbal response classes was the dependent variable in all cases.

The remaining nine studies directly influenced by *Verbal Behavior* were considered basic analyses (Table 1). Specific antecedent stimuli were manipulated and the frequency or accuracy of responses in one or more verbal response classes was the dependent variable in four of these studies. Boe and Winokur (1978b) measured the frequency of echoics in response to target words used by interviewers. Israel (1960) presented textual stimuli and assessed the accuracy of subjects' textual responses. Matheny (1968) measured the frequency of an autistic child's dysfunctional echoics in response to teacher mands, and Neville (1968) examined textual responses following each of three pre-reading practice procedures. Boe and Winokur (1978a) measured the percentage of echoics occurring under dialogue and monologue conditions. The remaining four studies in this category involved manipulations of both antecedent and consequent stimuli and measured rate or accuracy of tacts, echoics, or textual responses (Eisenberg & Delaney, 1970; Ferster & Hammer, 1966; Lane & Schneider, 1963; Wenrich, 1964).

DISCUSSION

There are many ways to measure the influence of a work on subsequent research. Two measures of the influence of *Verbal Behavior* examined in this study were the number of citations of the book since its publication and the number of references from that group of citations that utilized the book's constructs empirically. The validity of each of these measures of influence can be examined separately. First, let us consider use of number of citations of *Verbal Behavior* as a measure of its influence and secondly, the efficacy of content analysis in gauging one influence of the book.

Number of References as a Measure of Influence

This study began with the assumption that the citation of *Verbal Behavior* implied that the concepts Skinner presented in the book were important to the development of an idea, topic, or research project. One reason for citing a particular work is to credit its author(s) for their contribution to this development (Garfield, 1965). Although citation choice may not always be thoughtful, it is rarely capricious (cf. Smith, 1981). To the extent that citations are made with care, tallying the number of citations of *Verbal Behavior* provides a general measure of the book's influence.

Knowledge of typical citation totals provides a comparative base from which statements about relative influence can be made. Garfield (1983b) counted the number of times references listed in *SCI* were cited between the years of 1961 and 1980. More than half of these references were cited five times or fewer in that period. Similar information about number of citations of references in *SSCI* was not found. Only a portion of the citations to *Verbal Behavior* (312/836) was located in *SCI*. Even though *SCI* indexes fewer behavioral/psychological journals than *SSCI*, only 2.5% of the articles indexed in *SCI* had citation totals as high or higher than the 312 citations of *Verbal Behav-*

ior. Comparatively, *Verbal Behavior* has a very high citation total.

Notwithstanding its relatively strong position based on this comparison, care needs to be taken in inferring the general influence of *Verbal Behavior* from these data alone. Different fields typically cite references at different rates (Lawani, 1977), and the relatively high number of citations of *Verbal Behavior* could merely reflect higher citation rates of authors in the social sciences. Thus, inferences drawn from these data regarding the book's general influence need to be cautiously held.

Analysis of Verbal Behavior's Direct Influence on Research

Although the foregoing suggests that *Verbal Behavior* has a high citation total, a simple count provides no information about the influence of *Verbal Behavior* on research. A content analysis is necessary to answer questions about this heuristic influence. The results of that analysis show that a total of 31 references adopted constructs presented in the book as empirical variables. Those 31 references constituted only 3.7% of all the references to *Verbal Behavior* documented in this study. Nineteen of the 31 references (2.3% of all collected references) experimentally manipulated some variable, and none was replicated. Therefore, although *Verbal Behavior's* general influence may be substantial, the same can not be said for one potential heuristic influence. As suspected by Knapp (1980), MacCorquodale (1969), and Segal (1977), only a limited amount of empirical research has been conducted as a result of the book's presence.

To explore the adequacy of our criteria for categorizing references as directly related to *Verbal Behavior*, the extent to which references were included in or excluded from the 31 categorized as directly influenced by *Verbal Behavior* can be considered. For example, one study was included in which 1 of 19 dependent variables was described as a mand (Rosenthal

et al., 1969). Because none of the other dependent variables was taken from *Verbal Behavior*, the heuristic import of the book to that study appears limited. Its inclusion suggests the liberal nature of the criteria.

Alternately, a study could have selected a dependent or independent variable other than one of the six described by Skinner (1957), and still have been directly influenced by *Verbal Behavior*. Initial attempts to sort references showed how easily the distinction between direct and indirect influence blurred if simple, clear criteria were not used. For example, if reinforcement procedures were used to increase the frequency of a subject's target words, and *Verbal Behavior* was cited in the discussion section, was the nature of this hypothetical study directly influenced by a reading of *Verbal Behavior*? Possibly so, but such studies were excluded from the 31 considered directly influenced. Therefore, while the criteria effectively minimized inferences about the influence of *Verbal Behavior* on referencing authors, they may also have resulted in the exclusion of research that was directly influenced by *Verbal Behavior*. Yet it is difficult to understand how such research could be directly influenced by the book but fail to cast dependent and independent variables in the book's terms.

It is also possible that as an impetus of empirical research, *Verbal Behavior* is being "obliterated" (Garfield, 1977). According to Garfield (1983b), a work is effectively obliterated when it is "so well integrated into a field's body of knowledge that scholars neglect to cite [it] explicitly any longer" (p. 10). In this instance, evidence of obliteration would be provided by references that do not cite *Verbal Behavior* yet employ one of Skinner's six response classes as an empirical variable. For example, in empirical work by Rogers-Warren and Warren (1980) an independent variable is identified as a mand, but *Verbal Behavior* is not cited. Had *Verbal Behavior* been cited, the reference would have been included in the group considered directly influenced by

Verbal Behavior. Data collected for this study cannot be used to make inferences about the obliteration of *Verbal Behavior* because the procedures were not designed to locate studies such as Rogers-Warren and Warren (1980). Yet the possibility of obliteration must be considered because the existence of such references would suggest a greater influence on research by *Verbal Behavior* than does the outcome of the present study.

The criteria used in this study to identify articles directly influenced by *Verbal Behavior* were selected for two reasons. First, a low level of inference was required to decide whether or not the criteria were met. *Verbal Behavior* either was or was not cited and one of the six response classes either was or was not used. Secondly, the criteria were liberal in that there were only two requirements for being classified as directly influenced by the book. Although use of these criteria may not have correctly identified every article directly influenced by *Verbal Behavior*, the data produced are nevertheless one measure of the book's direct influence.

Speculation on the Paucity of Verbal Behavior Research

There are several possible reasons why there has not been more research directly influenced by *Verbal Behavior*. First, Skinner provided behavior analysts with new concepts explained within a familiar framework. With exceptions (e.g., Michael, 1982a) behavior analysts rarely introduce new topics in the absence of data; instead behavior analysts may tend toward inductive reasoning (Meehl, 1950). Thus the stage may have been set inadvertently to examine the concepts in *Verbal Behavior* via formal hypothesis testing (deductive reasoning)—something behavior analysts are not accustomed to (Bachrach, 1962; Sidman, 1960).

Secondly, for those not familiar with the principles of behavior analysis—such familiarity presumed to be a necessary condition to begin research on the book's concepts—both the concepts and prin-

ciples constitute a formidable body of knowledge that must be mastered prior to conducting meaningful research (MacCorquodale, 1969).

Third, unanswered questions regarding appropriate methodology for the study of verbal behavior may also hamper research efforts. According to MacCorquodale (1970), Skinner has pointed out that verbal behavior "is the product of the convergence of many concurrent and interacting variables in the natural environment, which does not sustain the experimental separation and detection of the relevant component variables" (p. 85). The implication is that verbal behavior may disappear the moment one attempts its empirical examination and this implication is patently discouraging. Although instances of innovative methodologies exist (e.g., Catania, 1980; Whitehurst, 1972), they are few.

Two other occurrences may also contribute to methodological confusion. One is the slight modification of Skinner's (1957) as yet unverified descriptions of verbal relations (e.g., McLeish & Martin, 1975; Michael, 1982b; Place, 1982). For example, Place (1982) has suggested the terms synmands, syntacts, semmands and semtacts to distinguish between phrases that can be labeled mand or tact based on syntax and phrases that must be labeled based on their semantics. A second occurrence is the continuing debate regarding appropriate units of analysis (e.g., Place, 1981; MacCorquodale, 1970). These kinds of occurrences may be self-perpetuating and may detract from research.

Another possible explanation exists for the small amount of research directly influenced by *Verbal Behavior*. The book was written as an exercise in interpretation, the point of which was to demonstrate the power of empirically based constructs in providing plausible explanations of verbal behavior. In retrospect, it appears that this approach has not led to the analysis of verbal behavior. It may be that exercises in interpretation in general do not influence research, or that this one in particular has not.

There are at least two levels at which *Verbal Behavior* may be evaluated. One may consider either the extent to which it has led to verbal behavior research or whether the description of verbal behavior provided is adequate. Both questions are open to empirical examination. The data collected in this study provide information directly relevant to the first question, and indirectly relevant to the second. To date, it cannot be said that *Verbal Behavior* has led to extensive verbal behavior research. We may therefore conclude that the second question has been largely unaddressed. The presence of 836 citations argues against the notion that the book has been overlooked. With respect to overall number of citations *Verbal Behavior* qualifies as an important work. Yet the small amount of empirical work influenced by it restricts the generality of the previous statement as related to this heuristic function.

For whatever reasons, *Verbal Behavior* has not provided a conception that has led to the empirical examination and explanation of verbal behavior. If the past is a predictor of the future there is no reason to suspect that it will eventually do so. However, for the future viability and completeness of behavior analysis as a science of *all* behavior, verbal behavior research and the eventual explanation of verbal behavior are necessary, with or without *Verbal Behavior*.

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