

Sources Cited Most Frequently in the Experimental Analysis of Human Behavior

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We conducted an analysis of the sources cited most frequently in primary empirical reports in the experimental analysis of human behavior (EAHB) published in four journals between 1990 and 1999. Citation patterns suggest that modern EAHB is topically focused and relatively independent of both animal operant research and human research conducted outside of behavior analysis.

Key words: human behavior, citation analysis

Because many psychologists interested in human behavior tend to discount findings obtained from animals, the long-term scientific credibility of the experimental analysis of behavior may depend, in part, on a sustained and comprehensive effort in the human laboratory. The experimental analysis of human behavior (EAHB) traces its roots at least to the pioneering work of Lindsley (e.g., 1956), but has gained coherence as a research emphasis fairly recently, as evidenced by the approaching 20th anniversaries of several important milestones in the development of EAHB. These include the founding of the Association for Behavior Analysis EAHB Special Interest Group in 1982 (Johnston, 1983), the first call in the *Journal of the Experimental Analysis of Behavior (JEAB)* for an emphasis on human research (Nevin, 1982), the appearance of the first broad census of EAHB research (Buskist & Miller,

1982), and the publication of an influential special issue of *The Psychological Record* devoted exclusively to EAHB (Buskist, 1983).

During much of its history, EAHB has played a relatively minor role in the experimental analysis of behavior (e.g., see Lattal & Perone, 1998a; Perone, 1985). Hyten and Reilly (1992) reported an increase in the rate of publication of EAHB research, but much remains to be understood about this trend (e.g., Dougherty, 1994), and it makes sense to continue to assess the current health and future prospects of EAHB. For example, EAHB has undoubtedly grown, but into what? This question has been raised in analyses of publication trends (e.g., Dougherty, 1994) and in spirited conceptual discussions about the field (e.g., Baron, Perone, & Galizio, 1991), which we supplement here with an evaluation of citation patterns in recent EAHB publications.

Citations can be complimentary or critical, substantive or superficial, but in the aggregate they indicate what people are reading and discussing. To

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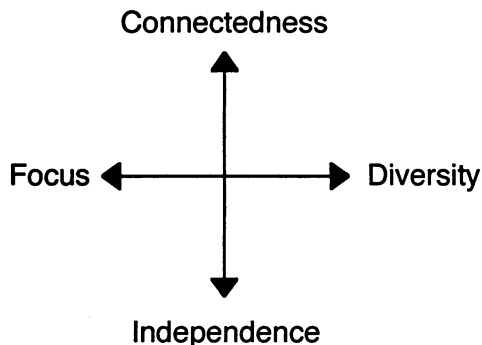


Figure 1. Two dimensions along which scientific disciplines can vary. See text for explanation.

estimate what people are reading and discussing in EAHB, we completed an exhaustive citation analysis of articles reporting new data and emphasizing human operant behavior published from 1990 to 1999 in four periodicals, the *Journal of the Experimental Analysis of Behavior* (*JEAB*, $n = 116$ articles), *The Psychological Record* (*TPR*, $n = 130$), *The Analysis of Verbal Behavior* (*TAVB*, $n = 37$), and the *Experimental Analysis of Human Behavior Bulletin* (*Bulletin*, $n = 35$).¹ We recorded the works cited in the reference sections of these articles, omitting self-citations, and determined those that were cited most frequently. Appendix A lists the sources ($N = 98$) that were cited at least 10 times, or once per year on average.

In interpreting these citation data, it may be helpful to consider two dimensions along which scientific fields can vary (Figure 1). First, a field can be diverse (i.e., it can address many different topics) or highly focused (addressing a restricted number of topics). Second, a field can be broadly connected (influenced by, and influential to, other research areas), or it can be relatively independent (little interaction with other research areas). No val-

ue judgment is inherent in the endpoints of these continua. Focus can imply narrowness (in which topical breadth simply is not valued), or it can reflect disciplinary maturity (i.e., theoretical refinement has revealed only a few fundamental research questions, and the skills needed to answer them have become highly specialized). Similarly, independence can imply insularity (in which the value of external input is unrecognized or unappreciated) or it can reflect the natural distinctions among phenomena (e.g., specialists in thermodynamics and social psychology rarely interact, but for good reason). Thus, the dimensions identified in Figure 1 do not speak directly to the health and well-being of a field. Rather, they prompt a consideration of the context in which a field seeks to contribute, and in this way may guide inferences about a field's current status.

Five Citation Trends

Our citation data reveal five patterns that may be relevant to the dimensions illustrated in Figure 1. First, Appendix A consists mostly of analyses of human behavior. Among primary empirical reports cited ($n = 71$), only five (about 7%) reported data from nonhumans. Among other sources ($n = 27$), all but three addressed issues in human behavior primarily or exclusively. Perone (1985) observed that, in the years 1972 to 1983, human articles in *JEAB* tended to cite primarily human papers. Our data indicate that the pattern continues.

Second, among primary empirical reports listed in Appendix A, only 10 (about 14%) were published before 1980. This outcome is interesting because operant research articles in general—at least those published in *JEAB*—tend to have an unusually long citation half-life (i.e., they are cited long after publication; e.g., Garfield, 1989²).

¹ The *Mexican Journal of Behavior Analysis*, founded some 25 years ago (e.g., Lattal, 1999), also publishes EAHB studies, but we were unable to locate all of the issues relevant to our analysis.

² See also http://www.envmed.rochester.edu/wwwvgl/seab/history/jeab_highly_cited.htm.

Third, Appendix A shows remarkable thematic consistency. Based on casual inspection, we attempted to place each of the sources listed in Appendix A into broad content categories. To accommodate hybrid emphases, some sources were placed into more than one category. Six sources were not categorized because they focused on general methodological or theoretical issues (e.g., Green & Swets, 1966; Skinner, 1953). We found that a majority of the sources addressed issues in stimulus control ($n = 66$), followed by verbal and social behavior ($n = 32$), reinforcement and punishment processes ($n = 22$), and choice and preference ($n = 2$). Among stimulus control sources, most pertained to the recent boom in stimulus equivalence research that has been documented in surveys of publication trends (Dougherty, 1994). Our citation data suggest that interest in stimulus equivalence has supplanted interest in other topics. For example, among the sources listed in Appendix A, 60% (6 of 10) of the pre-1980 empirical sources addressed the interactions between instructions and reinforcement schedules, compared to 15% (9 of 61) of those dated 1980 or later.³

Fourth, there is considerable overlap in citation patterns for different periodicals. Appendix B lists the sources cited in at least 10% of the articles surveyed in each journal ($n \cong 15$ per journal). *JEAB* and *TPR*, which contributed the most articles (and, thus, the most citations), had many preferred sources in common. The other two journals drew relatively often upon sources not listed in Appendix A or commonly cited in *JEAB* or *TPR*, but possibly for different reasons in the two cases. In *TAVB*, many of the preferred sources addressed issues unique to the study of verbal behavior, and thus can be assumed to reflect the journal's special-

ized mission. By contrast, in the *Bulletin*, most of the preferred sources were thematically related to the stimulus control sources that predominated in *JEAB* and *TPR*. Many, for example, addressed either stimulus equivalence or other issues (e.g., restricted stimulus control) important to the use of conditional discrimination procedures with developmentally disabled individuals, an agenda which often subsumes stimulus equivalence. Overall, it appears that empirical articles in three of the four journals surveyed were heavily influenced by similar kinds of sources.

Fifth, Appendix A encompasses mostly friendly sources. Among the 16 most-cited books, 15 focused explicitly on behavior analysis or operant behavior. Among the most-cited journal articles, more than half ($n = 54$) appeared in *JEAB*, and another sizable number ($n = 12$) appeared in various journals that regularly publish behavior-analytic work (e.g., *TPR* and *The Behavior Analyst*). No other journal contributed more than two of the top sources.

Focus Versus Diversity

Considered individually, each of the patterns just described can support multiple interpretations. Considered collectively, four of these patterns illustrate the extent to which EAHB investigators have emphasized stimulus control issues (particularly stimulus equivalence) in recent years. The majority of the most-cited sources were relevant to equivalence, and this pattern tended to be consistent across journals. Not surprisingly, the empirical sources in Appendix A are relatively recent (because stimulus equivalence research was not published extensively before the early 1980s), and these sources focused primarily on human behavior (because stimulus equivalence remains to be demonstrated unambiguously in nonhumans; e.g., Dube, McIlvane, Callahan, & Stoddard, 1993).

Typically speaking, modern EAHB

³ It is worth noting that another six (about 10%) of the sources dated 1980 or later address the possibly analogous role of verbal influence on stimulus equivalence.

appears to be quite focused. Whether this is comforting or alarming may depend on one's vantage point. For example, behavior analysis has been much influenced by Skinner's (1956) celebration of inductive research: "When you run into something interesting, drop everything else and study it" (p. 223). This is good advice for individuals, and with respect to stimulus equivalence, many appear to have taken it. But what of the broader discipline? Quite possibly, a field's diversity is key to transcending the long-term vagaries of job markets, funding opportunities, and public interest. From this perspective, the degree to which EAHB has focused on stimulus equivalence and related issues may be troubling.

Another lens through which to view the present data is one's perspective on the general mission of EAHB. Some argue that the field is best suited to explicating "uniquely human phenomena," whereas others stress the contributions of EAHB to a more general science of behavior (e.g., Baron et al., 1991; Perone, 1985). According to the former view, verbal, social, and "cognitive" phenomena should take center stage (e.g., Hake, 1982), and extensive experimental analyses of nonhuman behavior may be justifiably viewed as tangential. According to the latter view, topical emphases in EAHB should represent those of the experimental analysis of behavior in general, and investigations of human behavior should make contact with the broader corpus of behavior science research.

Many people consider both missions to be essential. From this perspective, the recent emphasis on stimulus control has many positive features. Although some aspects of the performances under study may be "uniquely human," researchers have not entirely ignored basic animal research (four of the five sources in Appendix A that incorporated primary animal data are directly relevant to stimulus equivalence). Moreover, there is little doubt that stimulus equivalence research has

had an impact on general stimulus control theory (e.g., Zentall & Smeets, 1996). At the same time, EAHB remains a minor contributor to several other important research areas in the experimental analysis of behavior. Consider the broad area of choice and preference, which was lightly represented in our citation analysis. The number of choice studies conducted with human subjects pales by comparison to the number conducted with nonhumans, and some very basic issues about human choice remain to be settled, including the extent to which humans are sensitive to reinforcement differentials as predicted by the matching law (Kollins, Newland, & Critchfield, 1997).

Independence Versus Connectedness

As a community, EAHB researchers frequently cite each other's work. This is not entirely surprising. Much has been accomplished in the short history of EAHB, and it would be difficult for a new investigator to contribute meaningfully without drawing on the accumulated methodological and theoretical wisdom of the field (e.g., see Lattal & Perone, 1998b). Nevertheless, it is fair to ask whether researchers outside of EAHB—who conduct the bulk of human psychological research—may have accomplished anything worthy of attention in EAHB. For example, investigators who are struggling to develop methods for studying verbal behavior (e.g., Leigland, 1998) might profit from examining the efforts of psycholinguistic researchers, who have invested much effort toward the laboratory measurement of phenomena such as self-editing (e.g., Van Wijk & Kempen, 1987). Early in the last century, Skinner apparently found so little of value in scientific psychology that he sought to remake the discipline rather than participate in the status quo (Skinner, 1976). Do EAHB investigators, as a community, retain Skinner's perspective? Or is there another expla-

nation for the homogeneity of source publications represented in Appendix A?

If sources from outside behavior analysis have had little impact on recent EAHB research, what about the converse? Little is known about the extent to which EAHB publications have influenced work appearing outside our target journals. Given concerns about the waning influence of behavior analysis in the broader discipline of psychology (e.g., Skinner, 1987), this may be the metric of greater importance. Although the relevant citation analyses remain to be conducted, we predict that the numbers will not be encouraging. Differing styles of theory development and experimentation may preclude much interest by other psychologists in the recent growth of EAHB (e.g., see Hayes, Hayes, & Reese, 1988, for a discussion of problems involving competing worldviews). The fact that Appendix A encompasses mostly behavior analysis sources leaves open the question of whether EAHB researchers are addressing topics of interest to psychology as a whole. If they are not, then behavior analysts might expect to be increasingly marginalized among psychologists interested in human behavior. It is unsettling to note, for example, a decrease in *JEAB*'s percentile ranking of citation impact among social science journals (cf. Garfield, 1989, to "Journal Citation Reports on CD-ROM," 1998) during roughly the same period in which human articles came to comprise a substantial portion of its pages (Hyten & Reilly, 1992). EAHB researchers may not be responsible for this outcome, but neither have their efforts, however substantial in terms of publication counts, prevented it.

REFERENCES

- Baron, A., Perone, M., & Galizio, M. (1991). Analyzing the reinforcement process at the human level: Can application and behavioristic interpretation replace laboratory research? *The Behavior Analyst*, *14*, 95–105.
- Buskist, W. F. (1983). Introduction. *The Psychological Record*, *33*, 451–456.
- Buskist, W., & Miller, H. L. (1982). The analysis of human operant behavior: A brief census of the literature: 1958–1981. *The Behavior Analyst*, *5*, 137–141.
- Dougherty, D. M. (1994). The selective renaissance of the experimental analysis of human behavior. *The Behavior Analyst*, *17*, 165–168.
- Dube, W. V., McIlvane, W. J., Callahan, T. D., & Stoddard, L. T. (1993). The search for stimulus equivalence in nonverbal organisms. *The Psychological Record*, *43*, 761–778.
- Garfield, E. (Ed.). (1989). SSCI journal citation reports. *Social Sciences Citation Index 1988 Annual* (Vol. 6). Philadelphia: Institute for Scientific Information.
- Green, D. M., & Swets, J. A. (1966). *Signal detection theory and psychophysics*. New York: Wiley.
- Hake, D. F. (1982). The basic-applied continuum and the possible evolution of human operant social and verbal research. *The Behavior Analyst*, *5*, 21–28.
- Hayes, S. C., Hayes, L. J., & Reese, H. W. (1988). Finding the philosophical core. A review of Stephen C. Pepper's *World Hypotheses: A Study in Evidence*. *Journal of the Experimental Analysis of Behavior*, *50*, 97–111.
- Hyten, C., & Reilly, M. P. (1992). The renaissance of the experimental analysis of human behavior. *The Behavior Analyst*, *15*, 109–114.
- Johnston, J. M. (1983). EAHB Special Interest Group: A brief history. *Experimental Analysis of Human Behavior Bulletin*, *1*, 1.
- Journal citation reports on CD-ROM [Computer software]. (1998). Philadelphia: Institute for Scientific Research.
- Kollins, S. K., Newland, M. C., & Critchfield, T. S. (1997). Human sensitivity to reinforcement in operant choice: How much do consequences matter? *Psychonomic Bulletin and Review*, *4*, 208–220. (Erratum: *Psychonomic Bulletin and Review*, *4*, 431)
- Lattal, K. A. (1999). Where in the world is *Revista Mexicana de Analisis de Conducta*? *Mexican Journal of Behavior Analysis*, *25*, 279–289.
- Lattal, K. A., & Perone, M. (1998a). The experimental analysis of human operant behavior. In K. A. Lattal & M. Perone (Eds.), *Handbook of research methods in human operant behavior* (pp. 3–14). New York: Plenum.
- Lattal, K. A., & Perone, M. (Eds.). (1998b). *Handbook of research methods in human operant behavior*. New York: Plenum.
- Leigland, S. (1998). The methodological challenge of the functional analysis of verbal behavior. *The Analysis of Verbal Behavior*, *15*, 125–127.
- Lindsley, O. R. (1956). Operant conditioning methods applied to research in chronic schizophrenia. *Psychiatric Research Reports*, *5*, 118–139.
- Nevin, J. A. (1982). Editorial. *Journal of the Experimental Analysis of Behavior*, *37*, 1–2.
- Perone, M. (1985). On the impact of human operant research: Asymmetrical patterns of

- cross-citation between human and nonhuman research. *The Behavior Analyst*, 8, 185-189.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.
- Skinner, B. F. (1956). A case history in scientific method. *American Psychologist*, 11, 221-233.
- Skinner, B. F. (1976). *Particulars of my life*. New York: McGraw-Hill.
- Skinner, B. F. (1987). Whatever happened to psychology as the science of behavior? *American Psychologist*, 42, 780-786.
- Van Wijk, C., & Kempen, G. (1987). A dual system for producing self-repairs in spontaneous speech: Evidence from experimentally elicited corrections. *Cognitive Psychology*, 19, 403-440.
- Zentall, T. R., & Smeets, P. M. (Eds.). (1996). *Stimulus class formation in humans and animals*. Amsterdam: Elsevier.

APPENDIX A

Sources most often cited (at least once per year) in experimental analyses of human behavior published in four journals between 1990 and 1999. Self-citations were excluded from the analysis. The left column shows the total number of citations of each source. Shown in parentheses following each reference is the number of citations, respectively, in the *Journal of the Experimental Analysis of Behavior*, *The Psychological Record*, *The Analysis of Verbal Behavior*, and *Experimental Analysis of Human Behavior Bulletin*. (JEAB = *Journal of the Experimental Analysis of Behavior*, TPR = *The Psychological Record*)

Citations	Source
73	Sidman, M., & Tailby, W. (1982). Conditional discrimination vs. matching-to-sample: An expansion of the testing paradigm. <i>JEAB</i> , 37, 5-22. (27-43-2-1)
54	Skinner, B. F. (1957). <i>Verbal behavior</i> . Englewood Cliffs, NJ: Prentice Hall. (14-13-25-2)
47	Wulfert, E., & Hayes, S. C. (1988). Transfer of a conditional ordering response through conditional equivalence classes. <i>JEAB</i> , 44, 411-439. (19-22-2-4)
45	Devany, J. M., Hayes, S. C., & Nelson, R. O. (1986). Equivalence class formation in language-able and language-disabled children. <i>JEAB</i> , 46, 243-257. (15-27-1-2)
39	Sidman, M. (1971). Reading and auditory-visual equivalences. <i>Journal of Speech and Hearing Research</i> , 14, 5-13. (17-19-1-2)
38	Sidman, M. (1990). Equivalence relations: Where do they come from? In D. E. Blackman & H. Lejeune (Eds.), <i>Behaviour analysis in theory and practice: Contributions and controversies</i> (pp. 93-114). Hillsdale, NJ: Erlbaum. (15-22-0-1)
36	Bush, K. M., Sidman, M., & de Rose, J. (1989). Contextual control of emergent equivalence relations. <i>JEAB</i> , 51, 29-45. (18-15-1-2)
34	Sidman, M. (1986). Functional analysis of emergent verbal classes. In T. Thompson & M. D. Zeiler (Eds.), <i>Analysis and integration of behavioral units</i> (pp. 213-245). Hillsdale, NJ: Erlbaum. (12-19-2-1)
33	Saunders, R. R., Saunders, K. J., Kirby, K. C., & Spradlin, J. E. (1988). The merger of equivalence classes by unreinforced conditional section of comparison stimuli. <i>JEAB</i> , 50, 145-162. (12-17-1-3)
32	Baron, A., & Galizio, M. (1983). Instructional control of human operant behavior. <i>TPR</i> , 33, 495-520. (15-14-3-0)
32	Sidman, M., Kirk, B., & Willson-Morris, M. (1985). Six-member stimulus classes generated by conditional-discrimination procedures. <i>JEAB</i> , 43, 21-42. (16-16-0-0)
30	Hayes, S. C. (1991). A relational theory of stimulus equivalence. In L. J. Hayes & P. N. Chase (Eds.), <i>Dialogues on verbal behavior</i> (pp. 19-40). Reno, NV: Context Press. (10-15-2-3)
29	Matthews, B. A., Shimoff, E., Catania, A. C., & Sagvolden, T. (1977). Uninstructed human responding: Sensitivity to ratio and interval contingencies. <i>JEAB</i> , 27, 453-467. (13-13-3-0)
28	Galizio, M. (1979). Contingency-shaped and rule-governed behavior: Instructional control of human loss avoidance. <i>JEAB</i> , 31, 53-70. (10-13-4-1)
27	Saunders, R. R., Wachter, J. A., & Spradlin, J. E. (1988). Establishing auditory stimulus control over an eight-member equivalence class via conditional discrimination procedures. <i>JEAB</i> , 49, 95-115. (11-16-0-0)

APPENDIX A

Continued

Citations	Source
27	Sidman, M., Wynne, C. K., Maguire, R. W., & Barnes, T. (1989). Functional classes and equivalence relations. <i>JEAB</i> , 53, 261–274. (10-14-1-2)
26	Catania, A. C., Matthews, B. A., & Shimoff, E. (1982). Instructed versus shaped human verbal behavior: Interactions with nonverbal responding. <i>JEAB</i> , 38, 233–248. (15-9-0-0)
25	Lazar, R. M., Davis-Lang, D., & Sanchez, L. (1984). The formation of visual stimulus equivalences in children. <i>JEAB</i> , 41, 251–266. (11-11-2-1)
25	Shimoff, E., Catania, A. C., & Matthews, B. A. (1981). Uninstructed human responding: Sensitivity of low-rate performance to schedule contingencies. <i>JEAB</i> , 36, 207–220. (10-12-3-0)
25	Sidman, M. (1994). <i>Equivalence relations and behavior: A research story</i> . Boston: Authors Cooperative. (10-10-2-3)
25	Skinner, B. F. (1953). <i>Science and human behavior</i> . New York: Macmillan. (11-11-3-0)
22	Dugdale, N., & Lowe, C. F. (1990) Naming and stimulus equivalence. In D. E. Blackman & H. Lejeune (Eds.), <i>Behaviour analysis in theory and practice: Contributions and controversies</i> (pp. 115–138). Hillsdale, NJ: Erlbaum. (4-13-3-1)
22	Fields, L., Verhave, T., & Fath, S. (1984). Stimulus equivalence and transitive associations: A methodological analysis. <i>JEAB</i> , 42, 143–157. (13-9-0-0)
22	Sidman, M., Rauzin, R., Lazar, R., Cunningham, S., Tailby, W., & Carrigan, P. (1982). A search for symmetry in the conditional discrimination of rhesus monkeys, baboons, and children. <i>JEAB</i> , 37, 23–44. (10-10-1-1)
21	Gatch, M. B., & Osborne, J. G. (1989). Transfer of contextual stimulus function via equivalence class development. <i>JEAB</i> , 51, 369–378. (10-10-0-1)
21	Skinner, B. F. (1969). <i>Contingencies of reinforcement</i> . New York: Appleton-Century-Crofts. (12-5-4-0)
20	Fields, L., & Verhave, T. (1987). The structure of equivalence classes. <i>JEAB</i> , 48, 317–332. (8-12-0-0)
20	Hayes, S. C. (1986). The case of the silent dog—verbal reports and the analysis of rules. A review of Ericsson and Simon's <i>Protocol Analysis: Verbal Reports as Data</i> . <i>JEAB</i> , 45, 351–363. (10-6-4-0)
20	Hayes, S. C., Kohlenberg, B. S., & Hayes, L. J. (1991). The transfer of specific and general consequential functions through simple and conditional equivalence relations. <i>JEAB</i> , 56, 119–137. (8-12-0-0)
20	Lazar, R. M. (1977). Extending sequence-class membership with matching to sample. <i>JEAB</i> , 27, 381–392. (9-10-0-1)
20	Lowe, C. F. (1979). Determinants of human operant behavior. In M. D. Zeiler & P. Harzem (Eds.), <i>Advances in the analysis of behavior: Vol. 1. Reinforcement and organization of behavior</i> (pp. 159–192). New York: Wiley. (11-9-0-0)
20	Sidman, M., Willson-Morris, M., & Kirk, B. (1986). Matching-to-sample procedures and the development of equivalence relations: The role of naming. <i>Analysis and Intervention in Developmental Disabilities</i> , 6, 1–20. (9-10-0-1)
19	de Rose, J. C., McIlvane, W. J., Dube, W. V., Galpin, V. C., & Stoddard, L. T. (1988). Emergent simple discrimination established by indirect relation to differential consequences. <i>JEAB</i> , 50, 1–20. (6-11-0-2)
19	Hayes, S. C., Brownstein, A. J., Haas, J. R., & Greenway, D. E. (1986). Instructions, multiple schedules, and extinction: Distinguishing rule-governed from schedule-controlled behavior. <i>JEAB</i> , 46, 137–147. (10-6-3-0)
19	Weiner, H. (1969). Controlling human fixed-interval performance. <i>JEAB</i> , 12, 349–373. (11-9-0-0)
19	Wulfert, E., Dougher, M. J., & Greenway, D. E. (1991). Protocol analysis of the correspondence of verbal behavior and equivalence class formation. <i>JEAB</i> , 56, 489–504. (9-9-1-0)
18	Hayes, S. C., Brownstein, A. J., Zettle, R. D., Rosenfarb, I., & Korn, Z. (1986). Rule-governed behavior and sensitivity to changing consequences of responding. <i>JEAB</i> , 45, 237–256. (12-6-0-0)
18	Saunders, R. R., & Green, G. (1992). The nonequivalence of behavioral and mathematical equivalence. <i>JEAB</i> , 57, 227–241. (8-8-1-1)

APPENDIX A

Continued

Cita- tions	Source
18	Spradlin, J. E., Cotter, V. W., & Baxley, N. (1973). Establishing a conditional discrimination without direct training: A study of transfer with retarded adolescents. <i>American Journal of Mental Deficiency, 80</i> , 555-561. (10-7-1-0)
18	Sigurdardottir, Z. G., Green, G., & Saunders, R. R. (1990). Equivalence classes generated by sequence training. <i>JEAB, 53</i> , 47-63. (5-11-1-1)
17	Fester, C. B., & Skinner, B. F. (1957). <i>Schedules of reinforcement</i> . New York: Appleton-Century-Crofts. (6-10-1-0)
17	Hayes, S. C., & Hayes, L. J. (1989). The verbal action of the listener as a basis for rule-governance. In S. C. Hayes (Ed.), <i>Rule-governed behavior: Cognition, contingencies, and instructional control</i> (pp. 153-190). New York: Plenum. (6-7-2-2-)
17	Lazar, R. M., & Kotlarchyk, B. J. (1986). Second-order control of sequence-class equivalence in children. <i>Behavioural Processes, 13</i> , 205-215. (6-10-0-1)
17	Steele, D., & Hayes, S. C. (1991). Stimulus equivalence and arbitrarily applicable relational responding. <i>JEAB, 56</i> , 519-555. (7-7-1-2)
16	Catania, A. C. (1992). <i>Learning</i> (4th ed.). Upper Saddle River, NJ: Prentice Hall. (includes citations of previous editions) (4-4-6-0)
16	Cerutti, D. T. (1989). Discrimination theory of rule-governed behavior. <i>JEAB, 51</i> , 259-276. (7-4-5-0)
15	Bentall, R. P., Lowe, C. F., & Beasty, A. (1985). The role of verbal behavior in human learning: II. Developmental differences. <i>JEAB, 43</i> , 165-181. (8-7-0-0)
15	Carrigan, P. F., & Sidman, M. (1992). Conditional discrimination and equivalence relations: A theoretical analysis of control by negative stimuli. <i>JEAB, 58</i> , 183-204. (7-6-0-1)
15	Fields, L., Adams, B. J., Verhave, T., & Newman, S. (1990). The effects of nodality on the formation of equivalence classes. <i>JEAB, 53</i> , 345-358.
15	Harrison, R. J., & Green, G. (1990). Development of conditional and equivalence relations without differential consequences. <i>JEAB, 54</i> , 225-237. (9-5-1-0)
15	Lynch, D. C., & Green, G. (1991). Development and cross-modal transfer of contextual control of emergent stimulus relations. <i>JEAB, 56</i> , 139-154. (4-10-0-1)
15	Sidman, M. (1987). Two choices are not enough. <i>Behavior Analysis, 22</i> , 11-18. (10-4-0-1)
15	Sidman, M., & Cresson, O., Jr. (1973). Reading and crossmodal transfer of stimulus equivalences in severe retardation. <i>American Journal of Mental Deficiency, 77</i> , 515-523. (10-5-0-0)
14	Ericsson, K. A., & Simon, H. A. (1984). <i>Protocol analysis: Verbal reports as data</i> . Cambridge, MA: MIT Press. (8-4-2-0)
14	Saunders, K. J., Saunders, R. R., Williams, D. C., & Spradlin, J. E. (1993). An interaction of instructions and training design on stimulus class formation: Extending the analysis of equivalence. <i>TPR, 43</i> , 725-744. (5-9-0-0)
14	Schusterman, R. J., & Kastak, D. (1993). A California sea lion (<i>Zalophus californianus</i>) is capable of forming equivalence relations. <i>TPR, 43</i> , 823-839. (4-9-0-1)
14	Stromer, R., & Stromer, J. B. (1990). The formation of arbitrary stimulus classes in matching to complex samples. <i>TPR, 40</i> , 51-66. (3-9-2-0)
14	Vaughan, W. (1988). Formation of equivalence sets in pigeons. <i>Journal of Experimental Psychology: Animal Behavior Processes, 14</i> , 36-42. (8-5-0-1)
13	Baron, A., & Menich, S. R. (1985). Reaction times of younger and older men: Effects of compound samples and a prechoice signal on delayed matching-to-sample performances. <i>JEAB, 44</i> , 1-14. (6-5-1-1)
13	Lippman, L. G., & Meyer, M. E. (1967). Fixed interval performance as related to instructions and to subjects' verbalizations of the contingency. <i>Psychonomic Science, 8</i> , 135-136. (7-4-2-0)
13	McIntire, K. D., Cleary, J., & Thompson, T. (1987). Conditional relations by monkeys: Reflexivity, symmetry, and transitivity. <i>JEAB, 47</i> , 279-285. (7-5-0-1)
13	Wetherby, B., Karlan, G. R., & Spradlin, J. E. (1983). The development of derived stimulus relations through training in arbitrary-matching sequences. <i>JEAB, 40</i> , 69-78. (2-10-1-0)
12	Green, D. M., & Swets, J. A. (1966). <i>Single detection theory and psychophysics</i> . New York: Wiley. (7-2-3-0)

APPENDIX A

Continued

Citations	Source
12	Harzem, P., Lowe, C. F., & Bagshaw, M. (1987). Verbal control in human operant behavior. <i>TPR</i> , 28, 405–423. (5-7-0-0)
12	Hayes, S. C. (1989). Nonhumans have not yet shown stimulus equivalence. <i>JEAB</i> , 51, 385–392. (5-7-0-0)
12	Hayes, L. J., Thompson, S., & Hayes, S. C. (1989). Stimulus equivalence and rule following. <i>JEAB</i> , 52, 275–291. (8-4-0-0)
12	Kennedy, C. H., & Laitinen, R. (1988). Second-order conditional control of symmetric and transitive stimulus relations: The influence of order effects. <i>TPR</i> , 38, 437–446. (5-6-0-1)
12	Kohlenberg, B. S., Hayes, S. C., & Hayes, L. J. (1991). The transfer of contextual control over equivalence classes through equivalence classes: A possible model of social stereotyping. <i>JEAB</i> , 56, 505–518. (3-9-0-0)
12	LeFrancois, J. R., Chase, P. N., & Joyce, J. H. (1988). The effects of a variety of instructions on human fixed-interval performance. <i>JEAB</i> , 49, 383–393. (5-5-2-0)
12	Mackay, H. A., & Sidman, M. (1984). Teaching new behavior via equivalence. In P. H. Brooks, R. Sperber, & C. McCauley (Eds.), <i>Learning and cognition in the mentally retarded</i> (pp. 493–513). Hillsdale, NJ: Erlbaum. (3-8-1-0)
12	Rosenfarb, I. S., Newland, M. C., Brannon, S. E., & Howey, D. S. (1992). Effects of self-generated rules on the development of schedule-controlled behavior. <i>JEAB</i> , 58, 107–121. (5-7-0-0)
12	Stromer, R., McIlvane, W. J., & Serna, R. W. (1993). Complex stimulus control and equivalence. <i>TPR</i> , 43, 585–598. (3-8-1-0)
11	Barnes, D., & Keenan, M. (1993). A transfer of functions through derived arbitrary and nonarbitrary stimulus relations. <i>JEAB</i> , 59, 61–81. (5-6-0-0)
11	Baron, A., Kaufman, A., & Stauber, K. A. (1969). Effects of instructions and reinforcement-feedback on human operant behavior maintained by fixed-interval reinforcement. <i>JEAB</i> , 12, 701–712. (8-3-0-0)
11	Bentall, R. P., Dickins, D. W., & Fox, S. R. (1993). Naming and equivalence: Response latencies for emergent relations. <i>Quarterly Journal of Experimental Psychology. B, Comparative & Physiological Psychology</i> , 46B, 187–214. (7-4-0-0)
11	Cumming, W. W., & Berryman, R. (1965). The complex discriminated operant: Studies of matching-to-sample and related problems. In D. I. Mostofsky (Ed.), <i>Stimulus generalization</i> (pp. 284–330). Stanford, CA: Stanford University Press. (2-6-0-3)
11	de Rose, J. C., McIlvane, W. J., Dube, W. V., & Stoddard, L. T. (1988). Stimulus class formation and functional equivalence in moderately retarded individuals' conditional discrimination. <i>Behavioural Processes</i> , 17, 167–175. (4-7-0-0)
11	Dube, W. V., Green, G., & Serna, R. W. (1993). Auditory successive conditional discrimination and auditory stimulus equivalence classes. <i>JEAB</i> , 59, 103–114. (4-7-0-0)
11	Dube, W. V., McIlvane, W. J., Mackay, H. A., & Stoddard, L. T. (1987). Stimulus class membership established via stimulus-reinforcer relations. <i>JEAB</i> , 47, 159–175. (6-5-0-0)
11	Eikeseth, S., & Smith, T. (1992). The development of functional and equivalence classes in high-functioning autistic children: The role of naming. <i>JEAB</i> , 58, 123–133. (2-6-0-3)
11	Fields, L., Reeve, K. F., Adams, B. J., & Verhave, T. (1991). Stimulus generalization and equivalence classes: A model for natural categories. <i>JEAB</i> , 55, 305–312. (7-4-0-0)
11	Green, G., Sigurdardottir, Z. G., & Saunders, R. R. (1991). The role of instructions in the transfer of ordinal functions through equivalence classes. <i>JEAB</i> , 55, 287–304. (5-6-0-0)
11	Hayes, S. C., & Hayes, L. J. (Eds.). (1992). <i>Understanding verbal relations</i> . Reno, NV: Context Press. (2-8-0-1)
11	Hayes, S. C., Devaney, J. M., Kohlenberg, B. S., Brownstein, A. J., & Shelby, J. (1987). Stimulus equivalence and the symbolic control of behavior. <i>Mexican Journal of Behavior Analysis</i> , 13, 361–374. (4-7-0-0)
11	Markham, M. R., & Dougher, M. J. (1993). Compound stimuli in emergent stimulus relations: Extending the scope of stimulus equivalence. <i>JEAB</i> , 60, 529–542. (4-5-1-1)

APPENDIX A

Continued

Citations	Source
11	Matthews, B. A., Catania, A. C., & Shimoff, E. (1985). Effects of uninstructed verbal behavior on nonverbal responding: Contingency descriptions versus performance descriptions. <i>JEAB</i> , <i>43</i> , 155–164. (4-5-2-0)
11	Skinner, B. F. (1974). <i>About behaviorism</i> . New York: Knopf. (4-3-4-0)
11	Wright, A. A., Cook, R. G., Rivera, J. J., Sands, S. F., & Delius, J. D. (1988). Concept learning by pigeons: Matching-to-sample with trial-unique video picture stimuli. <i>Animal Learning & Behavior</i> , <i>16</i> , 436–444. (3-8-0-0)
10	Baron, A., Perone, M., & Galizio, M. (1991). Analyzing the reinforcement process at the human level: Can application and behavioristic interpretation replace laboratory research? <i>The Behavior Analyst</i> , <i>14</i> , 95–105. (6-4-0-0)
10	Dougher, M. J., Augustson, E., Markham, M. R., Greenway, D. E., & Wulfert, T. (1994). The transfer of respondent eliciting and extinction functions through stimulus equivalence classes. <i>JEAB</i> , <i>62</i> , 331–351. (2-6-1-1)
10	Dube, W. V., McIlvane, W. J., Maguire, R. W., Mackay, H. A., & Stoddard, L. T. (1989). Stimulus class formation and stimulus reinforcer relations. <i>JEAB</i> , <i>51</i> , 65–76. (5-5-0-0)
10	Kennedy, C. H. (1991). Equivalence class formation influenced by the number of nodes separating stimuli. <i>Behavioural Processes</i> , <i>24</i> , 219–245. (4-6-0-0)
10	Logue, A. W., Peña-Correal, T. E., Rodriguez, M. L., & Kabela, E. (1986). Self-control in adult humans: Variation in positive reinforcer amount and delay. <i>JEAB</i> , <i>46</i> , 159–173. (7-3-0-0)
10	Millar, A., & Navarick, D. J. (1984). Self-control and choice in humans: Effects of video game playing as a positive reinforcer. <i>Learning & Motivation</i> , <i>15</i> , 203–218. (4-6-0-0)
10	Pilgrim, C., & Galizio, M. (1995). Reversal of baseline relations and stimulus equivalence: I. Adults. <i>JEAB</i> , <i>63</i> , 225–238. (6-4-0-0)
10	Schwartz, B. (1982). Reinforcement-induced behavioral stereotypy: How not to teach people to discover rules. <i>Journal of Experimental Psychology: General</i> , <i>111</i> , 23–59. (1-8-1-0)
10	Shimoff, E., Matthews, B. A., & Catania, A. C. (1986). Human operant performance: Sensitivity and pseudosensitivity to contingencies. <i>JEAB</i> , <i>46</i> , 149–157. (9-1-0-0)
10	Spradlin, J. E., & Saunders, R. R. (1986). The development of stimulus classes using match-to-sample procedures: Sample classification versus comparison classification. <i>Analysis & Intervention in Developmental Disabilities</i> , <i>6</i> , 41–58. (3-7-0-0)

APPENDIX B

Sources cited most frequently (omitting self-citations) in experimental analyses of human behavior published in each of four journals from 1990 to 1999. Sources shown were cited in at least 10% of articles surveyed, yielding 14 to 17 sources per journal. Shown for each journal are the rank order among the top sources and the raw number of citations. Sources are arranged in order of overall citation frequency. (*JEAB* = *Journal of the Experimental Analysis of Behavior*, *TPR* = *The Psychological Record*, *TAVB* = *The Analysis of Verbal Behavior, Bulletin* = *Experimental Analysis of Human Behavior Bulletin*, T = tie)

Source	<i>JEAB</i>		<i>PR</i>		<i>TAVB</i>		<i>Bulletin</i>	
	Rank	No.	Rank	No.	Rank	No.	Rank	No.
Sidman and Tailby (1982)	1	27	1	43				
Skinner (1957)	10	14	14T	13	1	25		
Wulfert and Hayes (1988)	2	19	3T	22			1T	4
Devany et al. (1986)	6T	15	2	27				
Sidman (1971)	4	17	5T	19				
Sidman (1990)	6T	15	3T	22				
Bush et al. (1989)	3	18	10T	15				
Sidman (1986)	13T	12	5T	19				
Saunders et al. (1988, 50)	13T	12	7	17			3T	3
Baron and Galizio (1983)	6T	15	12T	13				
Sidman et al. (1985)	5	16	8T	16				
Hayes (1991)			10T	15			3T	3
Matthews et al. (1977)	11T	13	14T	13				
Galizio (1979)			14T	13	7T	4		
Saunders et al. (1988, 49)			8T	16				
Sidman et al. (1989)			12T	14				
Catania et al. (1982)	6T	15						
Shimoff et al. (1981)					3T	5		
Dugdale and Lowe (1990)			14T	13				
Fields et al. (1984)	11T	13						
Skinner (1969)	13T	12			7T	4		
Hayes (1986)					7T	4		
Hayes et al. (1986, 45)	13T	12						
Catania (1992)					2	6		
Cerutti (1989)					7T	4		
Sidman (1994)							3T	3
Cumming and Berryman (1965)							3T	3
Eikeseth and Smith (1992)							3T	3
Skinner (1974)					7T	4		
Saunders and Spradlin (1989)							3T	3
Dixon (1977)							3T	3
Allen and Fuqua (1985)							3T	3
Bickel et al. (1984)							3T	3
Litrownik et al. (1978)							1T	4
Bickel et al. (1986)							3T	3
Cox and D'Amato (1982)							3T	3
Michael (1982)					7T	4		
Michael (1985)					3T	5		
Michael (1988)					3T	5		
Watkins et al. (1987)					3T	5		
Bijou and Baer (1965)					7T	4		
Caroll and Hesse (1987)					7T	4		
Dube et al. (1991)							3T	3
Hall and Sundberg (1987)					7T	4		
Lamarre and Holland (1985)					7T	4		
Schlinger (1995)					7T	4		

REFERENCE INFORMATION FOR SOURCES NOT LISTED IN APPENDIX A

- Allen, K. D., & Fuqua, R. W. (1985). Eliminating selective stimulus control: A comparison of two procedures for teaching mentally retarded children to response to compound stimuli. *Journal of Experimental Child Psychology*, 25, 71-79.
- Bickel, W. K., Richmond, G., Bell, J., & Brown, K., (1986). A microanalysis of the controlling stimulus-response relations engendered during the assessment of stimulus overselectivity. *TPR*, 36, 225-238.
- Bickel, W. K., Stella, M. E., & Etzel, B. C. (1984). A reevaluation of stimulus overselectivity: Restricted stimulus control or stimulus control hierarchies? *Journal of Autism and Developmental Disorders*, 14, 137-157.
- Cox, J. K., & D'Amato, M. R. (1982). Matching to complex samples by monkeys (*Cebus apella*): Shared attention or generalization decrement? *Journal of Experimental Psychology: Animal Behavior Processes*, 8, 209-225.
- Bijou, S. W., & Baer, D. M. (1965). *Child development: Vol. 2. Universal stage of infancy*. Englewood Cliffs, NJ: Prentice Hall.
- Caroll, R., & Hesse, B. E. (1987). The effect of alternating mand and tact training on the acquisition of tacts. *TAVB*, 5, 55-65.
- Dixon, L. S. (1977). The nature of control of spoken words over visual stimulus selection. *JEAB*, 27, 433-442.
- Dube, W. V., McDonald, S. J., McIlvane, W. J., & Mackay, H. A. (1991). Constructed-response matching to sample and spelling instruction. *Journal of Applied Behavior Analysis*, 24, 305-317.
- Hall, G., & Sundberg, M. (1987). Teaching mands by manipulating conditioned establishing operations. *TAVB*, 5, 41-53.
- Lamarre, J., & Holland, J. G. (1985). The functional independence of mands and tacts. *JEAB*, 43, 5-19.
- Litrownik, A. J., McInnis, E. T., Wetzel-Pritchard, A. M., & Filipelli, D. L. (1978). Restricted stimulus control and inferred attentional deficits in autistic and retarded children. *Journal of Abnormal Psychology*, 87, 554-562.
- Michael, J. (1982). Skinner's elementary verbal relations: Some new categories. *TAVB*, 1, 1-3.
- Michael J. (1985). Two kinds of verbal behavior and a possible third. *TAVB*, 3, 1-3.
- Michael, J. (1988). The establishing operation and the mand. *TAVB*, 6, 3-9.
- Saunders, K. J., & Spradlin, J. E. (1989). Conditional discrimination in mentally retarded adults: The effects of training the component simple discriminations. *JEAB*, 52, 1-12.
- Schlinger, H. D. (1995). *A behavior-analytic view of child development*. New York; Plenum.
- Watkins, C. L., Pack-Teixeira, L., & Howard, J. S. (1987). Teaching intraverbal behavior to severely retarded children. *TAVB*, 7, 69-81.