The Behavior Analyst 2013, 36, 73–107 No. 1 (Spring)

A Study in the Founding of Applied Behavior Analysis Through Its Publications

Edward K. Morris
University of Kansas

Deborah E. Altus
Washburn University

Nathaniel G. Smith
University of Kansas

This article reports a study of the founding of applied behavior analysis through its publications. Our methods included hand searches of sources (e.g., journals, reference lists), search terms (i.e., *early*, *applied*, *behavioral*, *research*, *literature*), inclusion criteria (e.g., the field's applied dimension), and (d) challenges to their face and content validity. Our results were 36 articles published between 1959 and 1967 that we organized into 4 groups: 12 in 3 programs of research and 24 others. Our discussion addresses (a) limitations in our method (e.g., the completeness of our search), (b) challenges to the validity of our methods and results (e.g., convergent validity), and (c) priority claims about the field's founding. We conclude that the claims are irresolvable because identification of the founding publications depends significantly on methods and because the field's founding was an evolutionary process. We close with suggestions for future research.

Key words: applied behavior analysis, history, publications, priority claims, method, evolutionary epistemology

Behavior analysis is a field, a discipline, and a practice. As a field, it comprises the discipline and the practice, both named *behavior analysis*. As a discipline, it comprises at least two sciences and their philosophy. Its basic science is the *experimental analysis of behavior*. Its philosophy is *radical behaviorism*. Its applied science is *applied behavior analysis*.[1] In this article, we address the founding of applied behavior analysis as a science, not the founding of behavior analysis as a practice. The latter has its own founding (see, e.g., Birnbrauer, 1979; J. M. Johnston & Shook, 1987). We begin with some historical context.[2]

Setting aside the long past of behavior analysis in Greek naturalism, the Scientific Revolution, and the Enlightenment (Day, 1998; Smith, 1992), its short history began in late 19th-century and early 20th-century United States. Among the participating factors were the progressive and pragmatic American culture (O'Don-

We thank Christy Alligood and Chris Newland for questions that sharpened our analysis, Sam Leigland and Jay Moore for answering queries about Skinner (1945b), Don Routh and Rod Wellens for archival materials and comments, Megan Hafen for research on the origins of time-out, and the journal's reviewers for having us clarify our focus. Earlier versions of the manuscript were presented at the meetings of the Southeastern Association for Behavior Analysis, October 11, 2012, and the Behavior Analysis Association of Michigan, February 21, 2013.

Correspondence may be sent to the first author at the Department of Applied Behavioral Science, 4001 Dole Human Development Center, University of Kansas, 1000 Sunnyside Avenue, Lawrence, Kansas 66045 (e-mail: ekm@ku.edu).

[1] Its other sciences include behavioral syntheses and simulations[7] (Epstein, 1984) and translational research (Mace & Critchfield, 2010).

[2] Although the *field* of behavior analysis comprises the discipline and practice of behavior analysis and the *discipline* comprises, at least, the experimental analysis of behavior, applied behavior analysis, and radical behaviorism, we refer to *applied behavior analysis* as a field for brevity's sake, although we distinguish it from the field of behavior analysis more generally. The two fields should not be conflated.

nell, 1985); evolutionary biology, including studies in comparative psychology and animal behavior (Boakes, 1984); general physiology, including studies of biological functioning (Pauly, 1987b); psychological systems, including functionalism and classical behaviorism (Heidbreder, 1933); universities, including Harvard, Minnesota, and Indiana (e.g., Hearst & Capshew, 1988); scientists (e.g., Jacques Loeb; Pauly, 1987a), mentors (e.g., William Crozier; Hackenberg, 1995), and individuals (e.g., B. F. Skinner, 1976, 1979); and publications.

Although the first publication in the discipline's basic science was Skinner's (1930) dissertation, ''On the Conditions of Elicitation of Certain Eating Reflexes'' (see Iversen, 1992), its founding publication (founding and first publications are not necessarily the same) was *The Behavior of Organisms: An Experimental Analysis* (Skinner, 1938; see ''A Celebration of *The Behavior of Organisms* at Fifty,'' 1988; T. Thompson, 1988). In it, Skinner advanced a science of instrumental, operant, or purposive behavior (not reflexes) as his subject matter.

As for the founding *and* first publication in the discipline's philosophy of science, it was Skinner's (1945b) article, ''The Operational Analysis of Psychological Terms'' (Leigland, 1996; Moxley, 2001; see Day, 1969; Malone, 2009, p. 492; Pear, 2007, p. 134). In it, he made three contributions. First, he named the philosophy of his science *radical behaviorism,* because everything psychological is behavioral, where *radical* means ''root'' or ''thoroughgoing.'' Second, he incorporated private events into his system as behavior, that is, as more functional relations between responses and stimuli. And third, he analyzed psychological terms such as *consciousness, will,* and *feeling* as verbal behavior occasioned by behavior, that is, behaving consciously, willfully, and with feeling. The terms were not referents to hypothetical constructs independent of behavior that putatively explained behavior (e.g., consciousness, will, feeling; Moore, 2008; Schneider & Morris, 1987; Skinner, 1989b).

Skinner's basic science and philosophy of science had antecedents, of course. His subject matter was presaged by Edward Thorndike's (1898) law of effect (Chance, 1999). His research methods were grounded in Claude Bernard's (1865/1927), Jacques Loeb's (1912), and Ivan Pavlov's (1927) methods in biology, behavior, and the nervous system, respectively (Hackenberg, 1995; T. Thompson, 1984). His philosophy of science was based on Francis Bacon's (1624/1942, 1620/1960) and Ernst Mach's (1897/1959, 1883/1960) empirical, inductive approaches to science and theory (Marr, 1985; Smith, 1996). These antecedents notwithstanding, Skinner's 1938 and 1945b publications are widely regarded as the founding publications in the discipline's basic science and its philosophy, although we qualify this claim later.

As for the antecedents of applied behavior analysis, several early publications are commonly cited. These include Mary Cover Jones's (1924) article, ''A Laboratory Study of Fear: The Case of Peter,'' which reported eliminating a young boy's fear of rabbits through, in part, Pavlovian-based systematic desensitization (Kazdin, 1978, pp. 130–134; see Jones, 1974); Mowrer and Mowrer's (1938) article, ''Enuresis: A Method for Its Study and Treatment,'' which reported reducing children's nocturnal enuresis with their Hullian-based ''bell-and-pad'' method (Kazdin, 1978, pp. 137–140; see Mellon & McGrath, 2000); and Paul Fuller's (1949) article, ''Operant Conditioning of a Vegetative Human Organism,'' which reported increasing the arm movement of a comatose patient through reinforcement (see Boyle & Greer, 1983).

Although these publications reported applied research and behavioral applications, they are not generally regarded as the field's founding publications because they were not consistent enough with Baer, Wolf, and Risley's (1968) dimensions of applied behavior analysis. Fuller's (1949) publication, however, was transitional. It was possibly the first published applied research on human behavior that conceptualized the behavior as "operant."[3] He conveyed this in his title and placed his study in the operant literature. He concluded, "Perhaps by beginning at the bottom of the human scale, the transfer from rat to man can be effected" (p. 590; see Hake, 1982).[4]

Within a decade, the transfer was being effected. Basic operant research was being conducted with humans, for instance, Sid Bijou's studies of reinforcement with typically developing children (e.g., Bijou, 1955, 1957; see Morris, 2012) and Ogden Lindsley's related studies with adult psychiatric patients (e.g., Lindsley, 1956; Lindsley, Hobika, & Etsten, 1961; see Rutherford, 2003). Some applied research analyzed socially important behavior but not behavior that was immediately important to its participants (e.g., Azrin & Lindsley's 1956 study of children's cooperation). Other applied research analyzed behavior that was important to its participants in order to understand it, albeit not to improve it (e.g., Flanagan, Goldiamond, & Azrin's 1958 analysis of the operant properties of adult stuttering). Still other applied research analyzed behavioral applications that improved behavior (e.g., Williams's 1959 report of reducing a young boy's bedtime tantrums through extinction).

This history notwithstanding, the founding of applied behavior analysis through its publications has not been systematically studied, although it has been reviewed (e.g., Kazdin, 1978) and analyzed (e.g., Rutherford, 2009). Moreover, the publications are subject to conflicting priority claims (see, e.g., Goodall, 1972; Kazdin, 1978). For these reasons, we undertook this study of the field's founding or, if that proved futile, then a study of the nature of its founding. It is organized by (a) a method section that describes our search method, search terms, and inclusion criteria, as well as challenges to their validity; (b) a results section that identifies the publications we included and excluded; and (c) a discussion section that addresses limitations in our study, challenges to its validity, and our conclusion that identification of the field's founding publications is irresolvable. We close with suggestions for further research.

CAVEATS

We begin with several caveats. First, we undertook this study with no a priori theories, hypotheses, or predictions about the field's founding publications or the nature of its founding, but we had hunches. Our purpose was empirical and inductive: to identify the publications. Second, although we identify founding publications, we do not review them chronologically. As will be shown, our conclusion precludes that. Third,

[3] Prior to Fuller's publication, Skinner had taken up applications. In "Baby in a Box" (Skinner, 1945a), he integrated materials science with his scientific outlook on infant health and behavior (Benjamin & Nielson-Gammon, 1999). In *Walden Two* (Skinner, 1948), he offered a fictional extension of operant principles to community practices (Altus & Morris, 2004). And, in "Pigeons in a Pelican" (Skinner, 1960), he described efforts during World War II to teach pigeons to guide simulated missiles to precise destinations (see Capshew, 1996). For a review of his contributions to applied behavior analysis, see Morris, Smith, and Altus (2005).

[4] Skinner's (1953) book, *Science and Human Behavior,* was also transitional. It has been viewed as "the main factor responsible for the development of the area called behavior modification" (Michael, 1980, p. 364; see also Marr, 2003, p. 311). As such, it fathered the field of applied behavior analysis (Morris et al., 2005, pp. 111–114).

our historiography is not a narrative history. Its methods, results, and discussion are the bases of narratives that come later. Fourth, identification of the publications proved to be difficult because of the field's multiple foundings, conflicting priority claims, and myriad incidental factors. As a result, we address limitations and challenges to our study at length. This is sometimes tedious in detail and repetitive in style, but it is necessary for clarity's sake, especially when our conclusions differ from received views.

METHOD

We hand-searched four sources: (a) primary sources, mainly journals (e.g., *Journal of the Experimental Analysis of Behavior* [*JEAB*]); (b) secondary sources, including books on behavior modification and applied behavior analysis (e.g., Bandura, 1969), edited books of original chapters (e.g., Krasner & Ullmann, 1965), books, chapters, and articles on the field's history (e.g., Kazdin, 1978), and early reviews of the literature (e.g., Grossberg, 1964); (c) tertiary sources, including edited books of mainly reprinted articles (hereafter, "books of reprinted publications"; e.g., Ulrich, Stacknik, & Mabry, 1966),[5] trade books on behavior modification (e.g., Hilts, 1974), and articles in the popular press (e.g., Goodall, 1972); and (d) the reference sections in all the foregoing. In our search, we sought publications that met our inclusion criteria for the terms *early* (not *earliest*), *applied, behavioral, research*, and *literature*.

Our search method, search terms, and inclusion criteria were selective, of course, which challenges their validity. In psychometrics, these are challenges to their face and content validity (Anastasi & Urbina, 1997; Kazdin, 2003; Shadish, Cook, & Campbell, 2002). In our study and in psychometrics, the assessment of face and content validity is similar: They are descriptive, not statistical. Still, these challenges from psychometrics are more analogous than direct, but we appropriate the analogy nonetheless because the challenges are informative. We begin with our search method and search terms and their face validity, and then address our inclusion criteria and its content validity.

Search Method and Search Terms

As for our search method, we did not conduct a systematic review of the literature (see Higgins & Green, 2008). Our study was not a review of research methods and results for discerning what works. We also did not search the PubMed or PsycINFO databases. Although our terms *early* (i.e., a specific date) and *literature* (i.e., a type of publication) were well suited for culling publications from these databases, our other terms (*applied*, *behavioral*, and *research*) were not. They were so broad that we would have had to hand-search most of the literature anyway. So, we used standard hand-search methods from the start for the five terms that characterized the literature we sought to identify (on hand searches, see Fink, 2005; C. Hart, 2001).

Face Validity

Face validity is "not … what the test actually measures, but … what it appears superficially to measure" (Anastasi & Urbina, 1997, p. 117), that is, "the extent to which a measure appears to assess the construct of interest" (Kazdin, 2003, p. 359). This is analogous to the extent that our search method and terms appeared to be capable of identifying the founding publications. Being "standard" is evidence of our search method's face validity. "Char-

[5] These books reprint not only articles but also chapters, technical reports, original contributions, revisions of articles, previously unpublished manuscripts, conference presentations, and colloquia.

acterizing'' the literature is evidence of our search terms' face validity.

Inclusion Criteria

Content validity is the extent to which ''the test content … covers a representative sample of the behavior domain to be measured'' (Anastasi & Urbina, 1997, p. 114–115), that is, of ''the relation of the items to the concept underlying the measure'' (Kazdin, 2003, p. 359). This is analogous to the extent that our inclusion criteria were related to the field's founding publications. In particular, our criteria were consistent with Baer et al.'s (1968) article, ''Some Current Dimensions of Applied Behavior Analysis.'' It was a ''citation classic'' in the social science citation literature (Baer, 1982; see Garfield, 1977), was the most cited publication of the *Journal of Applied Behavior Analysis* (*JABA*; Laties & Mace, 1993), and was ranked atop the ''essential behavior-analytic journal articles and books'' by *JABA* editorial board members (Saville, Beal, & Buskist, 2002, p. 30). Our inclusion criteria, however, were not restricted to Baer et al.'s dimensions, which we describe next along with their content validity.

The early literature. Our inclusion criterion for the *early* literature was publications prior to 1968, that is, prior to the inception of *JABA*, in which context the term *applied behavior analysis* was coined (Risley, 2006; Wolf, 1993).[6] This excluded all of *JABA*'s publications (e.g., Baer et al., 1968) and post-1967 publications in *JEAB* (e.g., Touchette, 1968), in books of reprinted publications (e.g., O'Leary & O'Leary, 1972), and in edited books (e.g., Neuringer & Michael, 1970), as well as post-1967 books themselves; books of reprinted publications (e.g., Sloane & MacAulay, 1968), edited books (e.g., Bijou & Ribes-Inesta, 1972), and authored books (e.g., Kanfer & Phillips, 1970).

As for the content validity of our inclusion criterion for *early*, our criterion was to ''prior to 1968'' because *JABA's* inception presumed that suitable research existed for submission, review, and publication. It did. When the possibility of publishing *JABA* was first formally discussed by the Society for the Experimental Analysis of Behavior (SEAB) on April 6, 1967, Nate Azrin was asked to look into its viability. Vic Laties (1987) reported that ''Azrin … conducted a telephone survey of about a dozen likely contributors of hard-data articles and found that they were at least 23 manuscripts that would be promised to the new journal if it were started'' (p. 505). Baer et al. (1968) later noted, ''Such applications have appeared in recent years. Their current number and the interest they create apparently suffice to generate a journal for their display'' (p. 91). We respected the date of *JABA*'s publication as *one* endpoint in the field's founding.

The applied literature. Our inclusion criterion for the applied literature was publications that are consistent with Baer et al.'s (1968) description of the ''applied'' dimension of applied behavior analysis:

> The label applied is not determined by the research procedures used but by the interest in which society shows in the problems being studied. In behavioral application, the behavior, stimuli, and/or organism under study are chosen based on their importance to man and society [hereafter *society*], rather than on their importance to theory. (p. 92)

[6] The terms *behavior analysis* and *behavior analyst* are seemingly based on the term *applied behavior analysis*. We do not find them before 1968, but thereafter they were used in the context of applications (e.g., Goldiamond, 1973), most obviously at the 1974 Drake Conference on Professional Issues in Behavior Analysis (Wood, 1975c). The published conference proceedings contain such terms and phrases as ''behavior analysis procedures and programs'' (Wood, 1975b, p. xvii), ''the field of behavior analysis'' (Wood, 1975a, p. xiii), ''a profession called behavior analysis'' (Malott, 1975, p. 39), and the ''behavior analyst'' (Sulzer-Azaroff, Thaw, & Thomas, 1975, pp. 52, 57).

A page later, they added, "The primary question in the evaluation of applied research is: how immediately important is the behavior … to [the] subject" (p. 93, hereafter, the *participant*).

Our inclusion criterion, however, was more restrictive. First, it required that the behavior not only had to be important to society (e.g., creativity), but also to the participants (e.g., stuttering). Second, it required that the behavior not only had to be analyzed in what Baer et al. (1968) called "applied research" (p. 92), for instance, on a behavior's operant properties (e.g., reinforcibility), but also that the behavior had to be improved in what they called "behavioral applications" (p. 92; see Azrin, 1977). This latter requirement is consistent with Baer et al.'s description of the field's "effective" dimension: "The theoretical importance of a variable is usually not at issue. Its practical importance, specifically its power in altering behavior enough to be socially important, is the essential criterion" (p. 96).

These criteria excluded several classes of publications, among them (a) basic research in the experimental analysis of nonhuman behavior, beginning with Skinner's research through 1967 (see Honig, 1966); (b) analyses and syntheses (or simulations)[7] of socially important nonhuman behavior in laboratory settings (e.g., anxiety in rats and cooperation in pigeons; Estes & Skinner, 1941; Skinner, 1962; see Epstein, 1984); (c) basic research in the experimental analysis of human behavior (i.e., human operant behavior; e.g., Bijou, 1955; Gewirtz & Baer, 1958; Lindsley, 1956; see Rutherford, 2003); (d) analyses and syntheses of socially important human behavior in laboratory settings (e.g., cooperation and competition; Azrin & Lindsley, 1956; D. J. Cohen, 1962); (e) analyses and syntheses of human behavior that is important to the participants in laboratory settings (e.g., stuttering, Flanagan et al., 1958; thumb sucking, Baer, 1962; body tics, Barrett, 1962; and self-destructive behavior, Lovaas, Freitag, Gold, & Kassorla, 1965); (f) analyses and syntheses of human behavior that is important to society, conducted in applied settings (e.g., the arm movement of a comatose patient, Fuller, 1949); and (g) analyses and syntheses of human behavior that is important to the participants, conducted in applied settings (e.g., psychiatric symptoms in institutions, Ayllon, Haughton, & Hughes, 1965). In other words, our criterion for *applied* excluded research that was not a behavioral application.

As for the content validity of our inclusion criterion for *applied*, our criterion was restricted to behavioral applications because they were the field's distinguishing characteristic. Even though Baer et al.'s (1968) applied dimension included applied research that was not a behavioral application (e.g., on behavior's operant properties; see Birnbrauer, 1979; Deitz, 1983; J. M. Johnston, 1996), behavior analysis would not have become a practice without its application.

The behavioral literature. Our inclusion criterion for the behavioral literature was publications consistent with Baer et al.'s (1968) description of the "conceptual systems" dimension of applied behavior analysis: "The field … will probably advance best if the published descriptions of its procedures are not only precisely technological, but also strive for relevance to principle" (p. 96). Although Baer et al. did not specify a

[7] A behavioral synthesis is both a process and a product. As a process, it is the production or creation of more complex behavior out of its less complex components, the latter having been discerned through experimental analyses or behavioral interpretations. As a product, a synthesis is the result of this process (Catania, 2013, pp. 465, 468). A behavioral simulation is also a process and a product, but it may be simple or complex and synthesized or not. It is a model of behavior based on behavior as a subject matter (e.g., animal simulations of human cognition, human simulations of psychiatric disorders) or on nonbehavioral subject matter (e.g., computer simulations; see Epstein, 1984).

particular system, it was Skinner's. They referred only to operant principles, specifically, to operant reinforcement and stimulus control (see Skinner, 1938, 1953). They did not refer to Ivan Pavlov's (1927) classical conditioning, Edwin Guthrie's (1935) contiguity theory, Edward Tolman's (1932) purposive behaviorism, or Clark Hull's (1943) drive-reduction learning theory. When publications drew from those systems, however, we included those in which Skinner's science was the basis for their applications (i.e., operant procedures). This was also the science on which Baer's, Wolf's, and Risley's doctoral training was based (see, e.g., Gewirtz & Baer, 1958; Risley, 1964; Wolf, 1963).

This criterion excluded the behavior therapy literature based on Pavlov's and Hull's systems (see, e.g., Jones, 1924; Mowrer & Mowrer, 1938; Salter, 1961; Wolpe & Lazarus, 1966), even though Pavlov's science was (and is) included in behavior analysis (see, e.g., Keller & Schoenfeld, 1950, pp. 1–35; Skinner, 1953, pp. 45–58), as were (and are) Pavlovian-based therapies (Martin & Pear, 2002, pp. 339–353; Miltenberger, 2008, pp. 541–563; see Skinner, 1988).[8] We did not exclude Staats's system (known as social, psychological, and paradigmatic behaviorism; e.g., Staats, 1975, 1981), which is a somewhat eclectic ''learning theory'' (Staats, 1957) that included descriptive concepts that tended toward explanatory constructs (e.g., the reification of behavioral repertoires; e.g., personality; see Plaud, 1995). We did not exclude it because, first, it was published after 1967 and second, because his early applications were based on Skinner's science.

As for the content validity of our inclusion criterion for *behavioral*, our criterion was Skinner's conceptual system, because this was the field's system from the start. For instance, in a June 30, 2012, search for the terms *Pavlov, classical,* and *respondent* in *JABA*'s abstracts at SEAB's website (http://seab.envmed. rochester.edu/society/), we found 348 articles, but only three of them reported research based on Pavlov's system (i.e., Hansen, 1979; Kelley, Jarvie, Middlebrook, McNeer, & Drabman, 1984; Whitehead, Lurie, & Blackwell, 1976). Of the publications we identified in the field's founding, only three drew from systems other that Skinner's, for instance, Pavlov's and Hull's (i.e., Neale, 1963; Hewett, 1964, 1965). We included them, however, because their applications were based on Skinner's science.

The research literature. Our inclusion criterion for the research literature was publications consistent with Baer et al.'s (1968) description of the ''analytic'' dimension of applied behavior analysis, which required ''a believable demonstration of the events that can be responsible for the occurrence or nonoccurrence of that behavior. An experimenter has achieved an analysis of behavior when he can exercise control over it'' (pp. 93–94). They then described two means of achieving a believable demonstration: reversal and multiple baseline designs.

Our inclusion criterion, however, was both more and less restrictive than Baer et al. (1968). It was more restrictive in requiring reports of data on the behavior of individuals, not data aggregated across them (i.e., on the behavior of groups). It was less restrictive in not requiring displays of data in research designs, only that the results were based on direct observation and were reported objectively (i.e., quantitative descriptions based on direct observation; e.g., Isaacs,

[8] Although contemporary textbooks on behavior modification include behavior therapy (e.g., Martin & Pear, 2002, pp. 339–353; Miltenberger, 2008, pp. 541–563), those on applied behavior analysis often do not (e.g., Cooper et al., 2007; Fisher, Piazza, & Roane, 2011; Mayer, Sulzer-Azaroff, & Wallace, 2012; but see Chance, 1998, pp. 363–396).

Thomas, & Goldiamond, 1960; Zimmerman & Zimmerman, 1962).

Overall, these criteria excluded several additional classes of publications, among them reports of (a) purely descriptive research (see Bijou, Peterson, & Ault, 1968), but we found none, perhaps because of Baer et al.'s (1968) admonition that "nonexperimental analysis is a contradiction in terms" (p. 92), although this is not an admonition today (R. H. Thompson & Borrero, 2011); (b) qualitative research (e.g., DeMyer & Ferster's 1962 account of teaching social behavior to children with autism); (c) behavioral interpretations (e.g., Ayllon, Haughton, & Osmond's 1964 interpretation of chronic anorexia); and (d) research methods and apparatus (e.g., Ferster & DeMyer's 1962 research preparation for analyzing the behavior of children with autism).

As for the content validity of our inclusion criterion for the *research* literature, our criterion was more restrictive than Baer et al. (1968) in requiring data on the behavior of individuals because the behavior of groups is rarely representative of those of individuals. In addition, group data conceal within- and between-individual variability that is the science's purpose to control (Baer, 1977; J. M. Johnston & Pennypacker, 2009; Sidman, 1960). Data on the behavior of individuals was integral to Skinner's system, as well as *JEAB*'s purview: "A journal primarily for the original publication of experiments relevant to the behavior of individual organisms" (seab.envmed.rochester.edu/society/). Although Baer et al. addressed only data on individual behavior (e.g., pp. 91, 93–95), they did not preclude group data and neither did (or does) *JABA*: "[*JABA*] is primarily for the original publication of experimental research involving applications of the analysis of behavior to problems of social importance" (seab.envmed.rochester.edu/society/). The hallmark of applied behavior analysis, however, is individual behavior for the reasons stated above and because individual behavior is necessary for the development of effective applications (see Bailey & Burch, 2002, p. 4; Cooper, Heron, & Heward, 2007, p. 4; J. M. Johnston & Pennypacker, 2009, pp. 23–24; Kennedy, 2005, p. 12ff).

Our criterion was less restrictive than Baer et al. (1968) in not requiring experimental designs because the designs were being formalized while the field was being founded (Risley, 1997, 2005, 2006). If we had required those designs, we would have excluded at least seven publications, one of them in *JEAB* (i.e., Zimmerman & Zimmerman, 1962) and two that were reprinted in the majority of the pre-1968 books of reprinted publications (i.e., Isaacs et al., 1960; Zimmerman & Zimmerman, 1962). This criterion, however, did not mean that we included purely descriptive research. All of the publications were behavioral applications.

The literature. Our inclusion criterion for the literature was original reports of research in peer-refereed journals. This was (and is) *JABA's* purview: *JABA* "is primarily for the original publication of reports of experimental research involving applications of the experimental analysis of behavior to problems of social importance" (seab.envmed.rochester.edu/society/).

This criterion excluded several more classes of publications, among them reports in (a) the popular press (e.g., *Psychology Today*, established in 1967); (b) conference proceedings (e.g., of the American Psychological Association [APA]); and (c) newsletters, for instance, APA's *Division 25 Recorder* (established in 1965), which was the newsletter of APA's Division 25 for the Experimental Analysis of Behavior (established in 1964), now the Division for Behavior Analysis (1998 to the present), and the *AABT Newsletter* (established in 1966), which was the newsletter of the

Association for the Advancement of Behavioral Therapies (established in 1966), now for the Association for Behavioral and Cognitive Therapies (2005 to the present), but we found none. The criterion also excluded (d) publications in nonrefereed journals (e.g., *Psychological Reports*; e.g., Goldiamond, 1965); (e) publications in books of reprinted publications (e.g., Keller, 1963, reprinted as Keller, 1966); (f) chapters in edited books (e.g., Ferster, 1965); (g) books of reprinted publications (e.g., Staats, 1964b); (h) edited books (e.g., Krasner & Ullmann, 1965); and (i) authored books (e.g., Staats & Staats, 1963; see Drash & Freeman, 1973), as well as trade publications.

As for the content validity of our inclusion criterion for the *literature*, our criterion was consistent with the functions of peer-refereed journals. These are (a) to examine and verify new knowledge, (b) to certify priority claims and disputes about the knowledge, and (c) to establish and convey a scientist's credibility and merit (see Garvey & Griffith, 1971; Griffith & Miller, 1971; see Grantham, 2011; Kronick, 1976; Meadows, 1979; on the history of scientific journals). Moreover, in restricting publications to peer-refereed journals, we generally insured that they underwent more rigorous peer review than other publications and, as a result, were higher in quality and thus more likely to be founding.

Conclusion. This section has described our search method, search terms, and inclusion criteria for identification of the early applied behavioral research literature. They were selective, of course (any method, terms, and criteria would be), but they were not subjective. We strived toward Baer et al.'s (1968) "technological dimension," such that "a typically trained reader could replicate [our] procedure well enough to produce the same results" (p. 95). Our method, terms, and criteria were also not arbitrary. Our method was a standard hand-search method, and our terms characterized the publications we sought to identify. Both had face validity, given our purpose. Our inclusion criteria were consistent with Baer et al.'s dimensions but were not restricted to them. If they had been, we would have included publications that did not exemplify the field's distinguishing characteristics (e.g., applied research that was not a behavioral application) and excluded those that could not exemplify those characteristics because they were in the process of being formalized (e.g., research designs). Our criteria had content validity, given our purposes.

JABA articles. Finally, we searched for publications in the first volume of *JABA* that met our inclusion criteria for the terms *applied*, *behavioral*, *research*, and the *literature*. This allowed us to compare the early applied behavioral research literature with that first formally identified as *applied behavior analysis* by virtue of the latter's being published in *JABA*.

RESULTS

We identified 36 publications in the founding of applied behavior analysis, which we organize into four groups. These were four articles published in Ayllon's first program of research, two in Staats's first program, six in Wolf's first two programs, and 24 other publications. We describe these groups below, as well as publications we excluded.

The Early Applied Behavioral Research Literature

Ayllon's publications. During a 1958 summer internship at Saskatchewan Hospital in Weyburn, Saskatchewan, Canada, Ted Ayllon began a program of research (1958–1961) with adult psychiatric patients. It yielded eight publications between 1959 and 1965; we included four of them. The first was Ayllon and Michael's (1959) report of reducing the "persistent problem behavior" of psychiatric pa-

tients (e.g., psychotic talk, hoarding, refusal to self-feed) by training hospital personnel to use operant procedures (e.g., reinforcement, extinction). The three other publications were Ayllon and Haughton's (1962) report of increasing mealtime attendance and eating; Ayllon's (1963) report of decreasing stealing food, hoarding towels, and wearing excessive clothing; and Ayllon and Haughton's (1964) report of decreasing nonorganic psychiatric complaints.

We excluded Ayllon et al.'s (1964) report of chronic anorexia (a behavioral interpretation); Ayllon's (1965) report of increasing mealtime attendance and eating (a chapter); Ayllon et al.'s (1965) report of symptomatic behavior (applied research, not a behavioral application); and Haughton and Ayllon's (1965) reprint of Ayllon et al. (1965) (a chapter and applied research, not a behavioral application).

Staats's publications. By 1958, Art Staats had developed operant procedures for teaching reading and, in 1959, began a program of research with children and adolescents at Arizona State University that ended at the University of Wisconsin in 1966. It yielded nine publications between 1962 and 1970; we included two of them. The first was Staats and Butterfield's (1965) report of improving the vocabulary, amount of reading, and reading level of a ''culturally deprived juvenile delinquent'' with a token reinforcement system and reading curriculum and, concomitantly, improving his classroom behavior (e.g., fewer disruptions). The second was Staats, Minke, Goodwin, and Landeen's (1967) replication of this program with 18 junior high school youths, many with disabilities, by ''subprofessional therapy-technicians'' (e.g., adult volunteers).

We excluded Staats's (1968a) report of his research preparation (methods and apparatus, published after 1967); Ryback and Staats's (1970) and Staats, Minke, and Butts's (1970) replications of Staats and Butterfield (1965) and Staats et al. (1967; published after 1967); Staats, Staats, Schultz, and Wolf's (1962), Staats, Finley, Minke, and Wolf's (1964), and Staats, Minke, Finley, Wolf, and Brooks's (1964) reports of reading (applied research, not behavioral applications); and Staats's (1964a, 1965) reviews of this research (identical chapters).

Wolf's publications. In 1962, Mont Wolf began two programs of research at the University of Washington (1962–1964). They yielded eight publications between 1964 and 1967; we included six of them.

The first program was begun in July and used operant procedures to improve the severe problem behavior of a young boy with autism named Dicky. It yielded two publications; we included both. The first was Wolf, Risley, and Mess's (1964) report of reducing Dicky's institution-based temper tantrums, bedtime and mealtime problems, and throwing his eyeglasses by shaping wearing the glasses, increasing appropriate verbal behavior, and training his parents to apply the procedures. The second was Wolf, Risley, Johnston, Harris, and Allen's (1967) extension of this program to reduce Dicky's school- and home-based tantrums, slapping himself, and pinching others and to improve his personal and social behavior (e.g., toilet training, mutual play).

In his second program, Wolf used differential teacher attention to improve nursery school children's social and motor behavior. It yielded six publications; we included four of them. These were Allen, Hart, Buell, Harris, and Wolf's (1964) report of reducing isolate play and increasing social play; Harris, Johnston, Kelley, and Wolf's (1964) report of reducing ''regressed'' crawling; B. M. Hart, Allen, Buell, Harris, and Wolf's (1964) report of reducing operant crying and increasing appropriate verbal behavior; and M. K. Johnston, Kelley, Harris, and Wolf's

(1966) report of increasing gross motor play and walking. We excluded Harris, Wolf, and Baer (1964, 1967) because they were identical reviews of this research.[9]

Other articles. In addition to the above 12 publications, we included 24 others: Williams (1959); Isaacs et al. (1960); Zimmerman and Zimmerman (1962); Neale (1963); Sherman (1963, 1965); Ayllon and Azrin (1964, 1965); Hewett (1964, 1965); Bensberg, Colwell, and Cassel (1965); Birnbrauer, Wolf, Kidder, and Tague (1965); Metz (1965); Straughan, Potter, and Hamilton (1965); Wahler, Winkel, Peterson, and Morrison (1965); Cook and Adams (1966); Giles and Wolf (1966); Hawkins, Peterson, Schweid, and Bijou (1966); Lovaas, Beberich, Perloff, and Schaeffer (1966); Baer, Peterson, and Sherman (1967); Blake and Moss (1967); Jensen and Wosmack (1967); O'Leary and Becker (1967); and Risley and Wolf (1967a).

JABA Articles

Four of the 26 articles in the first volume of *JABA* did not meet our inclusion criteria. They were applied research (i.e., analyses or syntheses) on behavior important to society and, in two cases, important to the participants, but they were not behavioral applications. These were Brigham and Sherman's (1968) report of generalized verbal imitation in preschool children; Guess, Sailor, Rutherford, and Baer's (1968) report of generative plural morpheme use by a girl with severe intellectual disabilities; R. F. Peterson's (1968) report of generalized motor imitation in a girl with intellectual disabilities; and Schroeder and Holland's (1968) report of operant eye movements in college students using a signal-detection procedure.

DISCUSSION

Given our methods, we identified 36 publications in the founding of applied behavior analysis. In our discussion, we address two of our study's limitations, two more challenges to its validity, and our conclusion that identifying the field's founding publications is irresolvable because of their dependence on method and the nature of the field's founding.

Limitations

Among our study's limitations, one is that we studied the field's founding only through its publications and not through other methods. Another limitation is whether we identified all the founding publications we could have identified.

Publications versus other methods. As for the first limitation, we could have studied the field's founding through at least two other methods.

First, we could have studied its founding through its founders. This would have entailed census, survey, and interview methods. These methods, however, have liabilities. They include quantitative and qualitative measures of unknown reliability and validity and can be biased (e.g., response, representativeness, and interviewer biases; Fowler, 2009).

For instance, although census methods could be used to identify the field's most prolific early applied behavioral researchers (see, e.g., Ball, 2011), some of the founders may have participated, contributed, and been influential in other ways than publishing, for instance, by encouraging and inspiring their colleagues, disseminating and promoting their colleagues′ research, and securing and administering grant funding (e.g., Sid Bijou and Jack Michael; see "Behavioral Roots of

[9] We excluded a successor to this program of research: Risley and Wolf's studies of children with echolalia (one of these children was Dicky). Of this program's publications, we would have included only Risley and Wolf (1967a). We would have excluded Risley and Wolf (1966, 1967b) because they were identical reprints of the same presentation (Risley & Wolf, 1964) and Risley and Wolf (1968) because it was published after 1967.

JABA's Editors and Associate Editors," 1993; Goodall, 1972, pp. 58, 61; O'Donohue, Henderson, Hayes, Fisher, & Hayes, 2001).[10]

Surveying and conducting interviews with the authors of the publications we identified (e.g., Ayllon, Azrin, Birnbrauer, Giles, Hawkins, Michael, Sherman, Staats, Wahler) are subject to the foregoing liabilities, as well as the vagaries of recalling events that occurred a half-century ago. Biases may also occur due to disciplinary proclivities (who counts as a behavior analyst); institutional allegiances (university affiliations); intellectual loyalties (mentors); and collegial relationships (colleagues).

Studying the field's founding through its founders can also devolve into "great person" history that casts founders as the free, self-actional agents of their actions (Boring, 1927, 1950). Agency of this sort is antithetical to behavior analysis (Skinner, 1971, 1989a) and is tempered in the "new" history of science, which emphasizes context over great persons, no matter how great their genius (Furumoto, 1989).

Second, we could have studied the field's founding through its institutions (see Kazdin, 1978, pp. 246–273). These include university departments, for instance, the Department of Psychology at Arizona State University, known in the 1960s as "Fort Skinner in the Desert" (Goodall, 1972, p. 59; Wolf, 2001, p. 290), or the Department of Human Development and Family Life at the University of Kansas, whose faculty members were known as "the Kansas Mafia" (Goodall, 1972, p. 132). Institutions also include research and training centers and institutes, for instance, the Institute for Child Development at the University of Washington (1955–1965). And they include journals, for instance, *JABA*. Studying departments, centers, and institutions, however, is also subject to the foregoing liabilities, and the existence of journals presumes that a field has already been founded.

Ideally, we would have used all of these methods and others, for instance, cultural analyses (see Rutherford, 2009), especially analysis of the "technological imperative" of the American culture at mid-20th century (see Smith, 1992; Woodward, 1996). Collectively, however, they were beyond our resources (e.g., time, money, and acumen). So, we selected just one method: identification of the field's founding publications with objective search terms and inclusion criteria. The terms and criteria were, to a degree, selective. This invites challenges to the validity of our methods and results, which we discuss below.

Completeness. A second limitation of our study is whether our methods identified all the publications they were meant to identify. We doubt it. At the beginning of our search, we quickly identified 18 of our eventual 36 publications, among them, those in Ayllon's, Staats's, and Wolf's research programs. As we progressed, we continued to identify occasional publications, but less frequently; they also had less frequent priority claims. Moreover, the names of the publications' authors became less familiar (e.g., Adams, Blake, Cook, Hewett, Jensen, Moss, Neale, Straughan, Wosmack), and the journals became less mainstream in psychology (e.g., *The Reading Teacher*). We stopped searching when we submitted this manuscript to *The Behavior Analyst*. Presumably, publications we subsequently failed to identify would have been even less familiar, less mainstream, and less "founding." As a result, they likely would not have influenced our conclusion. This was borne out by publications we later found that met our criteria (e.g., Allen & Harris, 1966; Burchard & Tyler, 1965;

[10] As Wood (1975a) wrote of Michael, "The field of behavior analysis would unquestionably exist and function as an important social resource without Jack, but it probably would have taken longer and it certainly would be a lot duller" (p. xiv).

Patterson, Jones, Whittier, & Wright, 1965).

CHALLENGES

The challenges to the validity of our methods and results are also drawn from psychometrics: convergent and discriminant validity. These largely comprise construct validity (see Anastasi & Urbina, 1997; Kazdin, 2003; Shadish et al., 2002). Unlike face and content validity, the assessment of convergent and discriminant validity in psychometrics is statistical (e.g., validity coefficients), whereas in our study it is again descriptive. Nonetheless, the analogy from psychometrics is again similar enough to be informative.

Convergent Validity: The Included Publications

Convergent validity is the extent to which "a test correlates highly with other variables with which it should theoretically correlate" (Anastasi & Urbina, 1997, p. 129), that is, "the extent to which two measures assess similar or related constructs" (Kazdin, 2003, p. 359). This is analogous to the extent that the publications we identified correlate with those identified through other methods. One other method is independent assessments of the publications we identified, both qualitative and quantitative.

Qualitative assessments include priority claims about the field's founding publications. We originally sought these in several sources, among them (a) popular press articles (e.g., Goodall, 1972); (b) four books and chapters on the field's history (Kazdin, 1978, 1982; Krasner, 1990; Rutherford, 2009); (c) three early reviews of the literature (Gelfand & Hartmann, 1968; Grossberg, 1964; Leff, 1968); (d) three trade books (Hilts, 1974; London, 1969; Packard, 1977); (e) autobiographical chapters and articles (e.g., Bijou, 1996; Risley, 2001; Wolf, 1993); (f) biographical chapters and articles (e.g., Risley, 1997); and (g) obituaries (e.g., Lutzker, 2008; Risley, 2006). In reviewing these publications, we discovered still other assessments in other publications, which we included (see, e.g., Bailey & Burch, 2002; Birnbrauer, 1979; Cooper et al., 2007; Goodall, 1973; Kazdin, 1977).

Quantitative assessments include citations, reprintings, and inclusions (see Tables 1 and 2). These comprised (a) citations in the four books and chapters on the field's history, in the three early reviews of the literature, and in the three trade books; (b) reprintings in the five pre-1968 books of reprinted publications (i.e., Bijou & Baer, 1967; Malott, Whaley, & Ulrich, 1967; Staats, 1964b; Ullmann & Krasner, 1965; Ulrich et al., 1966);[11] and (c) inclusion in two books of abstracted articles (Bugelski, 1975; Willis & Giles, 1976). Bugelski (1975) referred to those he included as "creative, provocative, innovative, and seminal" (p. vii). Willis and Giles (1976) referred to theirs as among the "pioneer studies," among the "early reports that are now classics" (p. ix), and "some of the most original and/or well-executed studies available" (p. vii).[12]

Ayllon's publications and program. The qualitative assessments of Ayllon and Michael (1959) described it as "the first [applied] behavior analytic paper" (Birnbrauer, 1979, p. 15),

[11] We excluded two books of reprinted publications: (a) Eysenck's (1964) *Experiments in Behavior Therapy: Readings in Modern Methods of Treatment of Mental Disorders Derived from Learning Theory* because it reprinted mainly nonbehavioral publications, for instance, applications of hypnosis, objective and rational psychotherapy, and behavior therapy (e.g., reciprocal inhibition, guided imagery) and (b) Verhave's (1966) *The Experimental Analysis of Behavior: Selected Readings* because it reprinted mainly nonapplied publications. The applied research articles it reprinted were not behavioral applications (e.g., Greenspoon, 1955).

[12] We excluded Hock's (2012) *Forty Studies that Changed Psychology*. It included Pavlov (1927), Watson and Rayner (1920), Skinner (1948), and Wolpe (1961), but no publications we identified as being among the founding publications in applied behavior analysis.

TABLE 1

Quantitative Assessments: Ayllon, Staats, and Wolf

Articles	Histories	Early reviews	Trade press	Early reprinted	Bugelski abstracts	Willis and Giles abstracts
Ayllon (1963)	2	1		2		1
Ayllon and Haughton (1962)	2	2		1		
Ayllon and Haughton (1964)	2					
Ayllon and Michael (1959)	4	2		4		
Staats and Butterfield (1965)						
Staats et al. (1967)						
Allen et al. (1964)	3	1		2		
Harris et al. (1964)	3	1		4		
B. M. Hart et al. (1964)	1	1		2		
M. K. Johnston et al. (1966)	1	1				
Wolf et al. (1967)	1					
Wolf et al. (1964)	4	2		3		

Note. Number of times cited or included.

TABLE 2

Quantitative Assessments: Other Articles

Articles	Histories	Early reviews	Trade press	Early reprinted	Bugelski abstracts	Willis and Giles abstracts
Ayllon and Azrin (1964)	1			1		
Ayllon and Azrin (1965)	4					
Baer et al. (1967)						
Bensberg et al. (1965)		1				
Birnbrauer et al. (1965)	1					
Blake and Moss (1967)						
Cook and Adams (1966)		1				
Giles and Wolf (1966)						
Hawkins et al. (1966)			1			1
Hewett (1964)		1				
Hewett (1965)		1				
Isaacs et al. (1960)		1		3		1
Jensen and Wosmack (1967)						
Lovaas et al. (1966)		1				
Metz (1965)		1				
Neale (1963)		1				
O'Leary and Becker (1967)	2					1
Risley and Wolf (1967)						
Sherman (1963)	1			3		
Sherman (1965)	1	1				
Straughan et al. (1965)		1				
Wahler et al. (1965)		1				
Williams (1959)		2	1	3	1	1
Zimmerman and Zimmerman (1962)	1	2		3		

Note. Number of times cited or included.

"probably mark[ing] the birth of applied behavior analysis" (Goodall, 1973, p. 65), having "sparked [the] applied behavior movement" (Goodall, 1972, p. 58), and a "seminal study" (Goodall, 1972, p. 61; see also Bailey & Birch, 2002, p. 5; Mace & Critchfield, 2010, p. 300). More recently, it has been called "the first application of behavioral principles" (Kennedy, 2005, p. 20), "what many consider the first example of ABA" (Lerman, Iwata, & Hanley, 2013, p. 81), and the publication to which "applied behavior analysis … can be traced (Cooper et al., 2007, p. 14). It is also referred to as "the pioneering applied behavioral study" and "the model for applied research" (Wolf, 2001, p. 289), and "a now classic article" (Rutherford, 2009, p. 68). Ayllon and Haughton (1962) has also been described as "seminal" (Mace & Critchfield, 2010, p. 300).

Early assessments of Ayllon's research program described it as "ingenious" (Goodall, 1972, p. 56) and one of the "most influential extensions [of operant techniques] to clinical populations" (Kazdin, 1978, p. 256; see also Kazdin, 1977, p. 26), the "two programs of research [that] exerted a powerful influence on the evolution of applied behavior analysis" (Kazdin, 1978, p. 273), and the "two research programs [that] provided particular impetus for extensions of operant techniques," an "especially important" one (Kazdin, 1982, p. 23). It also encouraged "more extensive and larger-scale applications" (Kazdin, 1982, p. 23), among them Ayllon and Azrin's (1968) token economy program at Anna State Hospital. In later assessments, Ayllon's research program was called "unprecedented" (Risley, 2001, p. 267), "groundbreaking" (Risley, 2005, p. 279), and "innovative" (Risley, 2006, p. 73).

The quantitative assessments of Ayllon's publications are presented in Table 1. Ayllon and Michael (1959), for instance, was the most reprinted of the publications we identified.

Staats's publications and programs. We found no early assessments of Staats and Butterfield (1965) or Staats et al. (1967). Staats's research program, however, was cited as one of the four early "extensions of operant conditioning" (Kazdin, 1982, p. 22), along with Lindsley's, Bijou's, and Ferster's, but these were applied research rather than behavioral applications. More recently, Staats has been credited with inventing time-out and "the token reinforcer (token economy) system" (Cloninger, 2000, p. 279; Strauss, 2006; see Staats, 2012, p. 34). More specifically, Staats et al. (1962) has been described as "the first to utilize a back-up reinforcement system in a reading discrimination program" (Krasner, 1990, p. 15). Also, Staats credits himself with founding "the field of child behavior analysis" (www2.hawaii.edu/~staats/clinical.htm; see also Staats, 1994, 1996). These claims, though, are not well supported in the literature and are sometimes disputed (e.g., Plaud, 1995; Rutherford, 2009, p. 168), but resolving them is beyond the scope of our study.[13,14,15] The quantitative assessments of Staats's publications are presented in Table 1.

[13] As a vernacular term and a practice, the origin of *time-out* lies in the mid-1800s, when it meant both a break from work and an official break in sporting events. As a practice in the modern sense, its lineage surely antedates behavior analysis. Parents likely have sent their children to bedrooms as a consequence of problem behavior since children have had bedrooms. The first published behavior-analytic use of the term and the procedure was in the experimental analysis of behavior. Ferster and Skinner (1957, pp. 34–36, 734) included it in their glossary and described its arrangement; Ferster (1957) used it as an aversive stimulus. The first published use of the term and practice in applied behavior analysis seems to have been Wolf et al. (1964), who cited Ferster and Appel (1961) on the use of the term and procedure. For their practice, they put Dicky in his room contingent on his temper tantrums. We have no evidence to dispute Staats's claim that he used

caption continued on next page

Wolf's publications and programs. At the University of Washington in the mid-1950s, Bijou reoriented his research and training program for children with and without disabilities from a Hullian-based conceptual system to a Skinnerian-based system (1955–1965). Bijou's Institute for Child Development was subsequently described as "a top-flight center of application of behavioral techniques to problems of children" (Goodall, 1972, p. 58; see Lutzker, 2008). It was where applied behavior analysis was being established (Lutzker, 2008). Its research program has been cited as the other of the "two programs of research [that] exerted a powerful influence on the evolution of applied behavior analysis" (Kazdin, 1978, p. 273), "by far the … most influential application of operant techniques with children" (Kazdin, 1978, pp. 260–264; see also, p. 268), and one of "two research programs [that] provided particular impetus for extensions of operant techniques" Kazdin, 1982, p. 23), one that "exerted considerable impact" (p. 23). It was "especially important because of the range of the applications across settings, the number of projects reported, and their dramatic and carefully demonstrated effects on child behavior" (Kazdin, 1982, p. 23). Wolf's research programs were among these applications and projects.

Early assessments of Wolf's research on Dicky's severe problem behavior described Wolf et al. (1964) as "one of the earliest and most influential cases" in clinical applications (Kazdin, 1977, p. 28) and "an extremely influential report" (Kazdin, 1978, p. 268; see also Kazdin, 1982, p. 23). It was later referred to as "the premier study of behavior modification" (Risley, 1997, p. 378; see also Risley, 2001, p. 269), the "initial study" in the behavioral treatment of children with autism (Sundberg & Michael, 2001, p. 698), a "classic study" (Rutherford, 2009, p. 57), and one of the "five early studies that shaped applied behavior analysis" (Michael, 2004). It was the first of the only two social science citation classics among the publications we identified (see Wolf, 1983).

Assessments of Wolf's research on preschool teachers' attention to children's classroom behavior have been relatively recent. They have been referred to as "landmark" (Risley, 1997, p. 378) and "the first real-life discovery of the power of social attention" (Risley, 1997, p. 377; see also Risley, 2005, p. 280, 2006). Wolf's research methods have been described as "groundbreaking: direct observation, interobserver reliability checks, repeated measurement baselines, systematic alteration of the natural environment, reversal, and multiple-baseline 'single-subject' experimental designs" (Risley, 2006, p. 73; see also Risley, 1997,

---

the term and the practice earlier in raising his daughter and influenced its use by Wolf et al. (Staats, 2012, pp. 34, 228; Strauss, 2006; http://www2.hawaii.edu/~staats/contributions.htm). However, he apparently did not use the term in print until 1968 (Staats, 1968b, pp. 345–346). Thus, although he may have been the first behaviorist to use the term and the practice in applied behavior analysis, priority claims in science are usually credited to first publications rather than first unpublished uses.

[14] Token reinforcer systems, rather than programs, had been used in earlier research with chimpanzees (Cowles, 1937; Wolfe, 1936), some by behavior analysts (e.g., Kelleher, 1957a, 1957b). Staats claimed to have developed the "first token-reinforcement system in behavior modification studies" in 1959 (Staats et al., 1970, p. 332), followed by their report in publications (e.g., Staats et al., 1962; Staats, Finley, et al., 1964; Staats, Minke, et al., 1964). However, like Ferster and DeMyer's (1961, 1962) use of tokens to analyze the behavior of children with autism, this was applied research rather than behavioral application. As for token economies, their antecedents lay outside behavior analysis (e.g., in early 1800s English and American schools; see Kazdin & Pulaski, 1977; Ravitch, 1974). Their first behavioral application may have been Ayllon and Haughton's (1962) establishment of pennies as reinforcers for social behavior, soon after which reports of token economies burgeoned (e.g., Ayllon & Azrin, 1964, 1965, 1968; Birnbrauer & Lawler, 1964; Birnbrauer et al., 1965; Lent, 1968; O'Leary & Becker, 1967; Staats & Butterfield, 1965; Staats et al., 1967).

[15] As for the field of child behavior analysis, it was begun by Bijou in 1955 (Kazdin, 1978, pp. 260–264, 268, 273, 1982; Morris, 2012).

p. 378, 2005, p. 280); as setting "the parameters of applied behavior analysis" (Risley, 2001, p. 267); and coming "to define applied behavior analysis" (Risley, 2005, p. 281). These studies were the other four of the "five early studies that shaped applied behavior analysis" (Michael, 2004). Of these, Allen et al. (1964) was the second of the two social science citation classics among the publications we identified (see Allen, 1983). Quantitative assessments of Wolf's publications are presented in Table 1.[16]

Other articles. As for the other 24 publications, only four received qualitative assessments. Ayllon and Azrin (1965) was described as "seminal" (Mace & Critchfield, 2010, p. 300), "the first report of token program in a psychiatric hospital" (Krasner, 1990, p. 15), and a report of "the first comprehensive token *economy*" (Rutherford, 2009, p. 64).[17] Their token economy program was "a landmark in the development of applied behavior analysis" (Kazdin, 1978, p. 260) and "commonly regarded as one of the most significant achievements to date in human-behavior control" (Goodall, 1972, p. 56). Hawkins et al. (1966) was called a "pioneer study in training parents to modify their children's behavior" (Goodall, 1972, p. 60). And, O'Leary and Becker (1967) was referred to as "the first use of a token reinforcement program to control a large class (n = 17) of emotionally disturbed children" (Krasner, 1990, p. 16). Quantitative assessments of these and the other articles are presented in Table 2.

Discriminant Validity: The Excluded Publications

Discriminant validity is the extent to which "a test does not correlate significantly with variables from which it should differ" (Anastasi & Urbina, 1997, p. 129), that is, the extent to which "the measures show little or no correlation with measures with which they are not expected to correlate" (Kazdin, 2003, p. 359). This is analogous to the extent to which the publications we excluded should have excluded. Although excluded, they did participate in, contribute to, and influence the field's founding. We address this tension, as follows.

Early. Our inclusion criterion for the *early* literature excluded publications after 1967, including Baer et al. (1968) and all other *JABA* publications, even though the journal was arguably involved in the field's founding. As Kazdin (1978) noted,

> Recognition of [the differences between basic and applied research] led to the formal acknowledgment of applied behavior analysis as a separate research entity. This development is best marked by the appearance of the *Journal of Applied Behavior Analysis* in 1968. The journal not only provided a publication outlet for applied research but also defined the domain and characteristics of applied behavior analysis. (p. 305)

In *JABA*'s review process, Wolf, the journal's first editor, significantly shaped the initial submissions and publications (Risley, 1997, p. 379, 2005, p. 284). Thus, they participated in the field's founding; many of them contributed to its growth and dissemination; and some were influen-

[16] In considering these assessments, two caveats are warranted. First, Risley may have been partial to Wolf's publications. He and Wolf were close colleagues and collaborators at Washington (1962–1964) and then at Kansas (1965–1982). However, Risley's assessments of Ayllon's research were also compelling (he called it "unprecedented"; Risley, 2001, p. 267) as were Wolf's assessments of Ayllon and Michael (1959). He called it "the pioneering applied behavioral study" and "the model for applied research" (Wolf, 2001, p. 289). Second, although not as closely associated with Wolf, the authors of the present article are a faculty member who overlapped with him at the University of Kansas (Morris), a Kansas graduate who took courses from him (Altus), and a current Kansas graduate student (Smith).

[17] The reprint of Ayllon and Azrin (1964) in Malott et al. (1967) was not from *JEAB*, where it was published, but from an unpublished "investigation" (Malott et al., p. 139).

tial (Kazdin, 1978; Rutherford, 2009). For instance, Bijou et al.'s (1968) integration of descriptive and applied research was, as Bijou (2001) noted, one of his two publications to have "the greatest impact on psychologists and students" (p. 117). And, of course, Baer et al.'s (1968) article profoundly influenced subsequent submissions and publications. Notwithstanding the participation, contribution, and influence of these publications, *JABA*'s publication presumed that the field had already been founded (Baer et al., 1968; Laties, 1987).

Applied. Our inclusion criterion for the *applied* literature excluded several classes of publications that ranged from basic research in the experimental analysis of nonhuman behavior (see Honig, 1966) to applied research on human behavior that was important to its participants but was not application (e.g., Ayllon et al., 1965). Still, these publications participated in the field's founding; many of them contributed to its growth and dissemination; and some were influential (Kazdin, 1978; Rutherford, 2009).

First, basic research with nonhumans was the foundation of the field's conceptual system. As Baer et al. (1968) noted, striving for "relevance to principle … can have the effect of making a body of technology into a discipline rather than a collection of tricks" (p. 96). Applied behavior analysis quickly became a science unto its own. Second, basic research with humans with and without disabilities replicated and extended the nonhuman research, making the field more relevant to principle and the principles more relevant to application. And third, applied research on behavior that was important to society and their participants, but that was not a behavioral application, contributed to the plausibility that the basic principles were involved in the development and maintenance of those behaviors (e.g., Greenspoon, 1955; Lovaas et al., 1965). They also influenced publications we identified as founding. As Bijou noted of Ferster and DeMyer's human operant research (e.g., Ferster & DeMyer, 1961, 1962), "If it hadn't been for Charlie's program on autistic children, which I visited several times, I don't know that we'd have dared to arrange a program with a severely disturbed child like Dicky" (Krasner, 1977, p. 593). This was Wolf's first program of research. As influential as these classes of publications were, however, they were not *applied* behavior analyses.

Behavioral. Our inclusion criterion for the *behavioral* literature excluded publications whose procedures were based on conceptual systems other than Skinner's. Still, these publications participated in the field's founding; many of them contributed to its growth and dissemination; and some were influential (Kazdin, 1978; Rutherford, 2009). Pavlov's and Hull's sciences, for instance, were foundational to behavior therapies that presaged applied behavior analysis (Kazdin, 1978, pp. 119–185). Moreover, several pioneering applied behavior analysts were trained in other conceptual systems, for instance, Bijou in the Hullian tradition (Bijou, 2001; see Morris, 2012), which may still have influenced the use of their systems to understand and improve the human condition (e.g., Mowrer, 1960). As significant as Pavlov's and Hull's systems were, however, they were not foundational to applied *behavior* analysis.

Research. Our inclusion criterion for the *research* literature excluded several classes of publications, among them qualitative research, behavioral interpretations, and descriptions of research methods and apparatus. Still, these publications participated in the field's founding; many of them contributed to its growth and dissemination; and some were influential (Kazdin, 1978; Rutherford, 2009). For instance, reports of qualitative research (e.g., DeMyer & Ferster,

1962) may have been an impetus for quantitative research (e.g., applications for children with autism; e.g., Wolf et al., 1964). Behavioral interpretations (e.g., Ayllon et al., 1964) may have suggested controlling variables that might be altered in applications (e.g., variables in eating disorders; e.g., Ayllon & Haughton, 1962; Ayllon & Michael, 1959).[18] And, reports of research methods and procedures (e.g., Staats, 1968a) may have influenced those used in applications (e.g., token systems; e.g., Wolf et al., 1964). Indeed, some made contributions that warranted inclusion in early reviews of the literature (e.g., Bandura, 1969) and its later histories (see Kazdin, 1978; Rutherford, 2009). As influential as these publications were, however, they were not applied behavior *analyses*.

Literature. Our inclusion criterion for the *literature* excluded still additional classes of publications, among them original reports of research in non-peer-refereed journals, chapters in edited books, books of reprinted publications, edited books, and authored books. However, they too participated in the field's growth and dissemination; many of them contributed to its founding; and some were influential (Kazdin, 1978; Rutherford, 2009). For instance, some made contributions that warranted inclusion in early books (e.g., Bandura, 1969), later histories (e.g., Kazdin, 1978; Rutherford, 2009), and reprinted publications. As Kazdin (1978) noted,

> In the mid 1960s, several important books on behavior modification appeared in the United States, including … *Human Learning: Studies Extending Conditioning Principles to Complex Behavior* (1964) edited by Staats, *Research in Behavior Modification* (1965) edited by Krasner and Ullmann, *Case Studies in Behavior Modification* (1965) edited by Ullmann and Krasner. … Ullmann and Krasner's *Case Studies* appears to have been particularly influential. (p. 203).

As influential as these publications were, however, they were not the *literature* that was applied behavior analysis.

Conclusion

The convergent and discriminant validity of our methods and results notwithstanding, we aver that the publications we included and excluded were not different in kind, only in degree. Their differences lie in the degree to which we included the seven dimensions of applied behavior analysis and the degree to which our criteria were consistent with them. Many of the publications we excluded included some of the dimensions and were consistent with some of our criteria. More to the point, however, the kind versus degree distinction fails for reasons that priority claims about the field's founding publications fail, to which we now turn.

PRIORITY CLAIMS

In the history of science, priority *claims* concern the assignment of credit for discoveries, inventions, and foundings, whereas priority *disputes* concern disagreements about those claims. Disputes typically arise in the context of multiple independent discoveries (Merton, 1942), that is, the same or similar discoveries, inventions, and foundings made by different scientists (Boring, 1927, 1950; Merton, 1942, 1957, 1961). In the natural sciences, for instance, priority disputes include the discovery of evolution through natural selection, the invention of the telescope, and the founding of modern chemistry (see Ogburn & Thomas, 1922). In psychology, they include the discovery of classical conditioning, the invention of psychoanalysis, and the founding of the first research laboratory in the U.S. (see Simonton, 1979, p. 387). In behavior analysis,

[18] Although the publication dates belie any influence on the later publication by the earlier publications, publication dates do not always correspond to the dates when research was conducted.

they include the discovery of the operant (Konorski & Miller, 1937, or Skinner, 1935, 1937; see Iversen, 1992), the invention of teaching machines (Pressey, 1926, or Skinner, 1958; see Benjamin, 1988), and the founding of applied behavior analysis.

In applied behavior analysis, priority claims about the multiple founding publications were seen in the independent assessments of the publications we identified. More than one was claimed to be the founding or first publication or a cognate thereof (e.g., groundbreaking, seminal). Given the multiple publications and the differences in degree (not kind) between those we included and excluded, we conclude that the priority claims are largely irresolvable for two reasons. The first concerns methodology: Identification of the field's founding publications depends significantly on method. The second concerns the nature of the field's founding: It was a process. We address these reasons, as follows.

Dependence on Method

The dependence of the field's founding publications on method is illustrated by Williams's (1959) article, "The Elimination of Temper Tantrums by Extinction Procedures." Among the publications we identified as founding, it was the arguably the founding publication because it was the first publication, if *first* means *founding,* which it need not. Although published the same year as Ayllon and Michael (1959), Williams's submission was received by the *Journal of Abnormal and Social Psychology* (*JASP*) on October 1, 1958, whereas Ayllon and Michael's (1959) was received by *JEAB* on September 21, 1959 (nearly a year later). Williams's publication appeared in *JASP*'s September, 1959, issue, whereas Ayllon and Michael's appeared in *JEAB*'s October, 1959, issue (a month later). This makes Williams's article the field's founding publication among those we identified. However, if our inclusion criteria for identification of the early applied behavioral research literature had been different, Williams would have been neither the first nor the founding publication. We offer three cases.

First, if our inclusion criterion for *applied* had been consistent with Baer et al.'s (1968) description of the applied dimension as applied research on behavior that was important to the participants but was not a behavioral application, then Williams (1959) would not be the founding publication. At least one such applied article was published earlier (Flanagan et al.'s, 1958, analysis of stuttering). Moreover, if our inclusion criterion for *applied* had been consistent with Baer et al.'s description of the applied dimension as applied research on behavior that is important to society but is not a behavioral application, then at least two other such articles were published even earlier, among them, Greenspoon's (1955) analysis of verbal behavior and Azrin and Lindsley's (1956) analysis of children's cooperation.

Second, if our inclusion criterion for *research* had been more consistent with Baer et al.'s (1968) description of the analytic dimension, then again Williams (1959) would not be the founding publication. Ayllon and Michael (1959) would be; they used an AB design in one of the five studies, whereas Williams used none (just two extinction curves). As noted above, however, Williams was not alone. Seven of the other 34 publications used no design (e.g., Jensen & Wosmack, 1967), and one of them was published in *JEAB* (Zimmerman & Zimmerman, 1962). Moreover, if we had been even more consistent with Baer et al., then Sherman (1965) would be the founding publication. It was the first to use an ABA design. And, had we been still more consistent with Baer et al., B. M. Hart et al. (1964) would have been the founding

publication. It used an ABAB design, albeit graphed as cumulative records. The first to graph an ABAB design using conventional methods was Wolf et al. (1964). The first to graph a multiple baseline design using conventional coordinates was Metz (1965). Overall, in addition to Williams, five other publications we identified were not *analytic* according to Baer et al.'s description (Cook & Adams, 1966; Hewett, 1964, 1965; Jensen & Womack, 1967; Sherman, 1963).

Third, if our inclusion criteria had included Baer et al.'s (1968) *behavioral* dimension, which required quantitative reports of interobserver agreement, then neither Williams (1959) nor Ayllon and Michael (1959) would be the founding publication. Allen et al. (1964) would be; they reported interobserver agreement. Williams (1959) and Ayllon and Michael (1959) did not, nor did 28 other publications we identified (e.g., Isaacs et al., 1960; Wolf et al., 1967).

Independent Assessments

This dependence on method may also explain variations in the assessments of the publications we identified. For example, some claimed that Ayllon and Michael (1959) was "the first [applied] behavior analytic paper," "sparked [the] applied behavior movement," "probably mark[ed] the birth of applied behavior analysis," was "the pioneering applied behavioral study." Others claimed that Wolf's research was "groundbreaking" and "landmark" and set "the parameters of applied behavior analysis" and came "to define applied behavior analysis." No assessments claimed that Williams (1959) was a founding or first publication or a cognate thereof, although it was included by both Bugelski (1975) and Willis and Giles (1976).[19] It may have received no priority claims because the claimants used more restrictive inclusion criteria than ours.

The claimants may also have been influenced by incidental factors, some formal, others informal. Among the formal factors may have been that (a) Ayllon and Michael's (1959) article was 12 pages long, whereas Williams (1959) was just 1 page long; (b) Ayllon and Michael reported five studies, whereas Williams reported just one; (c) Ayllon and Michael was part of a sustained program of research, whereas Williams was not (but see Williams, 1962); and (d) Ayllon and Michael was published in *JEAB*, whereas Williams was not.[20]

Among the informal factors may have been (a) disciplinary proclivities: Ayllon and Michael were behavior analysts, whereas Williams was an eclectic neobehaviorist (see, e.g., Carr & Williams, 1957; Williams, Tallarico, & Tedeschi, 1960); (b) institutional allegiances: The University of Houston, Arizona State University, and the University of Washington had behavior-analytic faculty, staff, and students, whereas Williams's institution, the University of Miami,

[19] Williams's 1984 vita lists 88 publications in which his 1959 article was "reprinted in whole or in part" between 1962 and 1984. He notes on his vita that the article was one of "the 123 most important studies in the history of the psychology of learning" (see Bugelski, 1975) and one of "116 great experiments in behavior modification" (see Willis & Giles, 1976). It also lists Williams as the "chairperson" or "cochairperson" on Ed Malagodi's 1965 master's thesis, "Some Effects of Intermittently Pairing a Neutral Stimulus with a Primary Reinforcing Stimulus" and on his 1967 dissertation, "Second-Order Chained and Tandem Schedules of Token Reinforcement in the Rat." We thank Rod Wellens for retrieving and sending us Williams's vita.

[20] In an e-mail to the first author, Don Routh, now retired from the University of Miami, wrote, "As far as I know, that Williams paper you know about is the only one of his that is at all famous" (Donald Routh, personal communication, September 29, 2012).

had none (Routh, 2002);[21] (c) intellectual loyalties: Ayllon and Wolf collaborated with leading behavior analysts of the day, among them, Azrin, Bijou, and Michael, whereas Williams did not; and (d) personal relationships among behavior analysts: Ayllon's and Wolf's adviser was Jack Michael, whereas Williams's adviser was Eckhard Hess at the University of Chicago, who was known for his research on imprinting (e.g., Hess, 1958). When priority claims depend significantly on method, then incidental factors may be influential in advancing priority claims.

Research programs. Not only does the identification of the founding publications depend significantly on method, so too does the identification of founding research programs. If, again, *founding* means *first,* then Ayllon's was the field's founding program. Its first publication was in 1959 (Ayllon & Michael, 1959), whereas Wolf's was in 1964 (Harris, Johnston, Kelley, & Wolf, 1964). However, if we had included Baer et al.'s (1968) *behavioral* dimension among our inclusion criteria, then Wolf's would have been the founding program. Allen et al. (1965) reported interobserver agreement data; Ayllon did not.

This dependence on method may also explain variations in the assessments of the programs we identified. Some claimed that Ayllon's program was "groundbreaking," and others made the same claim for Wolf's. Some claimed that Ayllon's was "ingenious," "unprecedented," and "innovative," and others claimed that Wolf's was a "landmark" and "pioneering." None, however, claimed that Staats's research program was founding or first or a cognate thereof.

First publications and programs. As we have noted, a field's first publication need not be its founding publication. Whereas the first publication would be, literally, the earliest publication, the founding publication would be the seminal, defining, or classic publication. Among founding publications, the first publication is easy to identify. It is the first on an interval scale of months or years. On this account, Williams (1959) was the first publication in applied behavior analysis. However, just as with founding publications, first publications are also dependent on method. Ayllon and Michael (1959) might be the first publication, given its greater consistency with Baer et al.'s (1968) analytic dimension, but then so might Allen et al. (1964), given its consistency with the behavioral dimension. Likewise, although Ayllon's research program is the first program among those we identified, Wolf's first program might be the first, given its greater consistency with Baer et al.'s *analytic* dimension.

In summary, the first reason why priority claims about the founding publications are irresolvable concerns methodology: Their identification depends significantly on method (or, at least, on our method).

Founding as a Process

A process. The second reason why the priority claims are irresolvable is the nature of the field's founding. It was a process. This is supported by two of our earlier points. First, the differences between the publications we included and excluded were differences in degree rather than kind.

[21] In his unpublished manuscript, "Psychology at the University of Miami: 1927–2002," Don Routh (2002) wrote that "the first Director of Experimental Psychology in the department in 1959–1960 was Carl Williams. Williams originally came to the university as an instructor in 1950 before he completed his PhD at the University of Chicago in 1951. After this he was promoted through the ranks, becoming professor in 1963 and reaching emeritus status in 1984. Williams published papers on such topics as probability learning, often in collaboration with Raymond D. Hartley, before and after Hartley moved from Miami to Memphis State University" (p. 27).

Second, the publications we excluded still participated in, contributed to, and influenced the field's founding. As Lerman et al. (2013) recently noted, "Tracing the emergence of ABA before 1968 is arbitrary because the borders separating basic, translational, and applied research are fluid" (p. 81), that is, a process.

An evolutionary process. Not only was the field's founding through its publications a process, it was arguably a nonrandom cumulative process. That is, some variations in its publications were retained over time, among them variations in its analytic and behavioral dimensions. This makes the field's founding not just a process, but an evolutionary process; this is supported by two other earlier points.

First, between 1930 and 1967, the experimental analysis of behavior became increasing relevant to applied behavior analysis. This is evident in changes in (a) the contingencies of reinforcement (from simple to complex); (b) the reinforcers and discriminative stimuli used in nonhuman research (from food pellets to drugs as reinforcers); (c) the typicality of nonhuman participants (from typical laboratory rats to those bred for maze brightness and dullness); (d) the behavior of nonhuman participants (from bar pressing to anxiety); (e) the species of the participants (from rats to humans); (f) the reinforcers and discriminative stimuli used in human research (from lights to photographs of humans as discriminative stimuli); (g) the typicality of human participants (from typically developing children to adults with psychiatric disorders); (h) the behavior of humans (from bar pressing to verbal behavior); (i) human behavior important to the participants (from verbal behavior to stuttering); and (j) the research settings (from operant chambers to institutional settings).[22]

Second, between 1959 and 1967, the publications we identified became increasingly inclusive of and consistent with Baer et al.'s (1968) seven dimensions. Which of the seven dimensions were necessary for a publication to be a founding publication and to what degree depends on the dimensions and the degree. Not even Baer et al. were entirely prescriptive about this. For instance, in evaluating whether a study was an applied behavior analysis, they wrote, "a study which purports to be an applied behavior analysis … must be *applied*, *behavioral*, and *analytic*. In addition, it should be *technological*, *conceptually systematic*, and *effective*, and it should display some generality" (p. 92). *Musts* and *shoulds* are different prescriptions. The *musts* make the applied, behavioral, and analytic dimensions necessary for a study to be an applied behavior analysis, whereas the *shoulds* make the technological, conceptually systematic, effective, and generality dimensions neither necessary nor sufficient.

In any event, the nonrandom, cumulative relevance, inclusion, and consistency of applied research and behavioral applications with the dimensions of applied behavior analysis support not only the nature of the field's founding as a process but also as an evolutionary process.[23]

[22] Our focus on human behavior in the evolution of applied behavior analysis is not meant to dismiss applied behavior analysis with nonhumans. It is a vibrant part of the field. However, little or no such analyses were published until after the field was founded. For reviews, see Bloomsmith, Marr, and Maple (2007), Edwards and Poling (2011), and Frothman and Ogden (1992) (Christy Alligood, personal communication, November 13, 2012).

[23] Even after *JABA* was founded, the field has continued to evolve. For instance, assessments of social validity include not only the social importance of the behavior (i.e., the applied dimension) and the social significance of its effects (i.e., the effective dimension), but now also the social appropriateness of behavioral applications (Wolf, 1978). In addition, the behavioral dimension now often includes interobserver agreement on independent variables in what is called treatment integrity (see L. Peterson, Homer, & Wonderlich, 1982).

Selection by consequences. In the philosophy of science, nonrandom, cumulative "conceptual change" in theories and knowledge is referred to as *evolutionary epistemology*. Although it is agnostic in its account of the change, evolutionary epistemology usually offers selectionist accounts based on variation, selection, and retention of scientific practices and their products (Campbell, 1974; Popper, 1972; Toulmin, 1972), some of them sympathetic to behavior analysis (e.g., D. L. Hull, 1988, 2001; see D. L. Hull, Langeman, & Glenn, 2001). Not only is science an evolutionary process in this sense, but so too is technology (see Basalla, 1988; Hughes, 2011; Petroski, 1992), including behavioral technology. Moreover, beyond science and technology, universal Darwinism (Dawkins, 1983) and universal selection theory (Cziko, 1995) hold that all nonrandom, cumulative change in biology, behavior, and cultural practices is subject to selectionist accounts.

An evolutionary account of the founding of applied behavior analysis through its publications requires explanations of (a) variations in the publications (e.g., in their reports of the field's dimensions); (b) the selection of variations in the dimensions (e.g., in reports of dimensions that were increasingly consistent with Baer et al.'s, 1968, descriptions of them); and (c) the retention of those variations in the dimensions (see Rider, 1991; contra. Marr, 1991, on evolutionary analogies for changes in behavior analysis). Ultimately, of course, a selectionist account will have to address the coevolution and selection of the field's science and technology (see Lattal, 2008). Offering this account, however, is beyond the scope of our study. We sought only to identify the founding publications or, if that proved futile, to describe the nature of the field's founding.

Evolution or revolution. Although we have observed that the founding of applied behavior analysis through its publications was an evolutionary process, other fields might have arisen from singular, revolutionary publications. Among the often-cited examples are Nicolaus Copernicus's (1543/1976) *On the Revolutions of the Heavenly Spheres*, Isaac Newton's (1687/1803) *Principia Mathematica*, and Charles Darwin's (1859) *On the Origin of Species* in astronomy, physics, and evolutionary biology, respectively.

The historiography of science, however, is divided over whether singular publications are revolutionary or evolutionary. Revolutionary accounts view them as discontinuous from earlier publications (e.g., I. B. Cohen, 1985; Kuhn, 1962), whereas evolutionary accounts view them as continuous (e.g., D. L. Hull, 1988; Laudan, 1977; see Batts & Crawford, 1991). In the latter, putative revolutions are simply accelerated processes of change (see Eldredge & Gould, 1972, on punctuated equilibria). Given that the behavior-analytic account of cultural change is evolutionary and selectionist (Skinner, 1981), then so too, presumably, is its account of scientific change. Science is a cultural practice. Its products, among them publications, are selected by consequences.

Although Skinner's selectionist account is not unique in the philosophy of science, behavior analysis offers a conceptual innovation that might be. Putative revolutions are not only accelerated processes of change, but also, perhaps, scientific cusps. We borrow the concept of *cusps* from the behavior-analytic approach to development (its concept of *behavioral cusps*) that accounts, in part, for discontinuities in behavioral development (e.g., stages; see Bosch & Hixon, 2004; Rosales-Ruiz & Baer, 1997).

Scientific cusps include discoveries and inventions that offer (a) opportunities to expand and transform behavioral repertoires, as well as to acquire new ones (e.g., scientific,

social, and cultural repertoires with respect to research designs, research management, and cultural competence); (b) opportunities to encounter new, transformed, and expanded environments (e.g., in nature, society, and cultures at large with respect to subject matter, applications, and research support); (c) opportunities to discover new reasons and motivation for conducting research and pursuing applications (e.g., new problems of individual, social, and cultural importance); and (d) opportunities to contact new contingencies that strengthen the expanded, transformed, and new repertoires (e.g., improvements in experimental control for improvement of the human condition). Some of the founding publications in applied behavior analysis might be cusps of this sort, but this awaits further study.

The evolution of behavior analysis. Our conclusion that the founding of applied behavior analysis was an evolutionary process requires that we qualify a claim we made in our introduction. We claimed that Skinner's (1938) book, *The Behavior of Organisms*, and his 1945b article, "The Operational Analysis of Psychological Terms," were the founding publications in Skinner's basic science and its philosophy, respectively. Our qualification: Just as the founding of applied behavior analysis was an evolutionary process, so too were these founding publications.

Skinner (1956) made this point about his science in "A Case History in Scientific Method," in which he described the founding of his science as a process of change in his behavior and the products thereof (e.g., experimental control, apparatus). Not until the 1960s, however, did he systematically describe the selectionist parallel between the reinforcement of operant behavior and the natural selection of species. Both are selected by consequences (Skinner, 1966). And, not until the 1980s did he systematically describe the selectionist parallels among species, operant behavior, and cultural practices. All three evolve, selected by consequences (Skinner, 1981). Today, a small literature on Skinner's development as a scientist and a systematist suggests that his 1938 book and 1945b article were also the products of practices selected by consequences (e.g., Coleman, 1991; Iversen, 1992; Moxley, 1992, 1997, 2001). Thus, his publications were not revolutionary in his own work but were continuous with it, even if they seemed revolutionary in psychology at the time (and more so today).

FUTURE RESEARCH

Given the limitations of our study, further research on the founding of applied behavior analysis is warranted, through both its publications and other methods. Other methods include those we addressed earlier (e.g, identification of the field's founders and founding institutions and consideration of its cultural context). As for its founding publications, further research could analyze the references cited therein. This might reveal something about the field's earlier foundations. Citation analyses of the publications we identified could be conducted. This might provide more insight into their influence from today's perspective. Futhermore, the consistency of the publications with Baer et al.'s (1968) seven dimensions of applied behavior analysis could be rated and ranked. This might yield additional insight into their importance and further inform a selectionist account of the field's founding as a process. For the moment, though, we have the results of this study.

REFERENCES

Allen, K. E. (1983). The week's citation classic. *Current Contents*, *38*, 22.

Allen, K. E., & Harris, F. R. (1966). Elimination of children's excessive scratching by training the mother in reinforcement procedures. *Behaviour Research and Therapy*, *4*, 79–84.

Allen, K. E., Hart, B. E., Buell, J. S., Harris, F. R., & Wolf, M. M. (1964). Effects of social reinforcement on isolate behavior of a nursery school child. *Child Development*, *35*, 511–518.

Altus, D. E., & Morris, E. K. (2004). B. F. Skinner's utopian vision: Behind and beyond *Walden Two*. *Contemporary Justice Review*, *7*, 267–286.

Anastasi, A., & Urbina, S. (1997). *Psychological testing* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Ayllon, T. (1963). Intensive treatment of psychotic behaviour by stimulus satiation and food reinforcement. *Behaviour Research and Therapy*, *1*, 55–61.

Ayllon, T. (1965). Some behavioral problems associated with eating in chronic schizophrenic patients. In L. P. Ullmann & L. Krasner (Eds.), *Case studies in behavior modification* (pp. 73–77). New York, NY: Holt, Rinehart and Winston.

Ayllon, T., & Azrin, N. H. (1964). Reinforcement and instructions with mental patients. *Journal of the Experimental Analysis of Behavior*, *7*, 327–331.

Ayllon, T., & Azrin, N. H. (1965). The measurement and reinforcement of behavior of psychotics. *Journal of the Experimental Analysis of Behavior*, *8*, 357–383.

Ayllon, T., & Azrin, N. H. (1968). *The token economy: A motivational system for therapy and rehabilitation*. New York, NY: Appleton-Century-Crofts.

Ayllon, T., & Haughton, E. (1962). Control of the behavior of schizophrenic patients by food. *Journal of the Experimental Analysis of Behavior*, *5*, 343–352.

Ayllon, T., & Haughton, E. (1964). Modification of symptomatic verbal behaviour of mental patients. *Behaviour Research and Therapy*, *2*, 87–97.

Ayllon, T., Haughton, E., & Hughes, H. B. (1965). Interpretation of symptoms: Fact or fiction? *Behaviour Research and Therapy*, *3*, 1–7.

Ayllon, T., Haughton, E., & Osmond, H. O. (1964). Chronic anorexia: A behaviour problem. *Canadian Psychiatric Association Journal*, *9*, 147–154.

Ayllon, T., & Michael, J. (1959). The psychiatric nurse as behavioral engineer. *Journal of the Experimental Analysis of Behavior*, *2*, 323–334.

Azrin, N. H. (1977). A strategy for applied research: Learning based but outcome oriented. *American Psychologist*, *32*, 140–149.

Azrin, N. H., & Lindsley, O. R. (1956). The reinforcement of cooperation between children. *Journal of Abnormal and Social Psychology*, *52*, 100–102.

Bacon, F. (1942). New Atlantis. In G. D. Haight (Ed.), *Essays and New Atlantis* (pp. 243–302). New York, NY: Black. (Original work published 1624)

Bacon, F. (1960). *The new organon* (F. H. Anderson, Ed.). Indianapolis, IN: Bobbs-Merrill. (Original work published 1620)

Baer, D. M. (1962). Laboratory control of thumbsucking by withdrawal and re-presentation of reinforcement. *Journal of the Experimental Analysis of Behavior*, *5*, 443–455.

Baer, D. M. (1977). Perhaps it would be better not to know everything. *Journal of Applied Behavior Analysis*, *10*, 167–172.

Baer, D. M. (1982). The week's citation classic. *Current Contents*, *46*, 14.

Baer, D. M., Peterson, R. F., & Sherman, J. A. (1967). The development of imitation by reinforcing behavioral similarity to a model. *Journal of the Experimental Analysis of Behavior*, *10*, 405–416.

Baer, D. M., Wolf, M. M., & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, *1*, 91–97.

Bailey, J. S., & Burch, M. R. (2002). *Research methods in applied behavior analysis*. Thousand Oaks, CA: Sage.

Ball, L. C. (2011). Genius without the ''Great Man'': New possibilities from the historian of psychology. *History of Psychology*, *15*, 72–83.

Bandura, A. (1969). *Behavior modification*. New York, NY: Holt, Rinehart, and Winston.

Barrett, B. H. (1962). Reduction in rate of multiple tics by free operant conditioning methods. *Journal of Nervous and Mental Disease*, *135*, 187–195.

Basalla, G. (1988). *The evolution of technology*. New York, NY: Cambridge University Press.

Batts, B., & Crawford, L. L. (1991). Problematic progress: A review of Laudan's *Progress and Its Problems* and *Science and Values*. *Journal of the Experimental Analysis of Behavior*, *55*, 337–349.

Behavioral roots of *JABA*'s editors and associate editors. (1993). *Journal of Applied Behavior Analysis*, *26*, 540–541.

Benjamin, L. T. (1988). A history of teaching machines. *American Psychologist*, *43*, 703–712.

Benjamin, L. T., & Nielson-Gammon, F. (1999). B. F. Skinner and psychotechnology: The case of the heir conditioner. *Review of General Psychology*, *3*, 155–167.

Bensberg, G. J., Colwell, C. N., & Cassel, R. H. (1965). Teaching the profoundly retarded self help activities by behavior shaping techniques. *American Journal of Mental Deficiency*, *69*, 674–679.

Bernard, C. (1927). *An introduction to the study of experimental medicine* (H. C. Green, Trans). New York, NY: Henry Schuman. (Original work published 1865)

Bijou, S. W. (1955). A systematic approach to an experimental analysis of young children. *Child Development*, *26*, 161–168.

Bijou, S. W. (1957). Patterns of reinforcement and extinction in young children. *Child Development*, *28*, 47–54.

Bijou, S. W. (1996). Reflection on some early events related to behavior analysis of child development. *The Behavior Analyst*, *19*, 49–60.

Bijou, S. W. (2001). Child behavior therapy: Early history. In W. T. O'Donohue, D. A. Henderson, S. C. Hayes, J. E. Fisher, & L. J. Hayes (Eds.), *A history of the behavioral therapies: Founders' personal histories* (pp. 105–124). Reno, NV: Context Press.

Bijou, S. W., & Baer, D. M. (Eds.). (1962). *Child development: Readings in experimental analysis*. New York, NY: Appleton-Century-Crofts.

Bijou, S. W., Peterson, R. F., & Ault, M. A. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis*, *1*, 175–191.

Bijou, S. W., & Ribes-Inesta, E. (Eds.). (1972). *Behavior modification: Issues and extensions*. New York, NY: Academic Press.

Birnbrauer, J. S. (1979). Applied behavior analysis, service and the acquisition of knowledge. *The Behavior Analyst*, *2*, 15–21.

Birnbrauer, J. S., & Lawler, J. (1964). Token reinforcement for learning. *Mental Retardation*, *2*, 275–279.

Birnbrauer, J. S., Wolf, M. M., Kidder, J. D., & Tague, C. E. (1965). Classroom behavior of retarded pupils with token reinforcement. *Journal of Experimental Child Psychology*, *2*, 219–235.

Blake, P., & Moss, T. (1967). The development of socialization skills in an electively mute child. *Behaviour Research and Therapy*, *3*, 349–356.

Bloomsmith, M. A., Marr, M. J., & Maple, T. L. (2007). Addressing nonhuman primate behavior problems through the application of operant conditioning: Is the human treatment approach a useful model? *Applied Animal Behaviour Science*, *102*, 205–222.

Boakes, R. (1984). *From Darwin to behaviourism: Psychology and the minds of animals*. New York, NY: Cambridge University Press.

Boring, E. G. (1927). The problem of originality in science. *The American Journal of Psychology*, *39*, 70–90.

Boring, E. G. (1950). Great men and scientific progress. *Proceedings from the American Philosophical Society*, *94*, 339–351.

Bosch, S., & Hixson, M. D. (2004). The final piece to a complete science of behavior: Behavior development and behavioral cusps. *The Behavior Analyst Today*, *5*, 244–254.

Boyle, M. E., & Greer, R. D. (1983). Operant procedures and the comatose patient. *Journal of Applied Behavior Analysis*, *16*, 3–12.

Brigham, T. A., & Sherman, J. A. (1968). An experimental analysis of verbal imitation in preschool children. *Journal of Applied Behavior Analysis*, *1*, 151–158.

Bugelski, B. R. (1975). *Empirical studies of the psychology of learning*. Indianapolis, IN: Hackett.

Burchard, J., & Tyler, V. (1965). The modification of delinquent behavior through operant conditioning. *Behaviour Research and Therapy*, *2*, 245–250.

Campbell, D. T. (1974). Evolutionary epistemology. In P. S. Schilpp (Ed.), *The philosophy of Karl R. Popper* (pp. 412–463). LaSalle, IL: Open Court.

Capshew, J. H. (1996). Engineering behavior, Project Pigeon, World War II, and the conditioning of B. F. Skinner. In L. D. Smith & W. R. Woodward (Eds.), *B. F. Skinner and behaviorism in American culture* (pp. 128–150). Bethlehem, PA: Lehigh University Press.

Carr, R. M., & Williams, C. D. (1957). Exploratory behavior in three strains of rats. *Journal of Comparative and Physiological Psychology*, *50*, 621–623.

Catania, A. C. (2013). *Learning* (5th ed.). Cornwall-on-Hudson, NY: Sloan.

A celebration of *The Behavior of Organisms* at fifty. (1988). *Journal of the Experimental Analysis of Behavior*, *50*, 277–354.

Chance, P. (1998). *First course in applied behavior analysis*. Long Grove, IL: Waveland.

Chance, P. (1999). Thorndike's puzzle boxes and the origins of the experimental analysis of behavior. *Journal of the Experimental Analysis of Behavior*, *72*, 433–440.

Cloninger, S. C. (2000). *Theories of personality: Understanding persons* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Cohen, D. J. (1962). Justin and his peers: An experimental analysis of a child's social world. *Child Development*, *33*, 697–717.

Cohen, I. B. (1985). *Revolution in science*. Cambridge, MA: Harvard University Press.

Coleman, S. R. (1991). From critic to theorist: Themes in Skinner's development from 1928 to 1938. *Journal of Mind and Behavior*, *12*, 509–534.

Cook, C., & Adams, H. E. (1966). Modification of verbal behavior in speech deficient children. *Behaviour Research and Therapy*, *4*, 265–271.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River, NJ: Pearson.

Copernicus, N. (1976). *On the revolutions of the heavenly spheres* (A. M. Duncan, Ed., Trans.). Newton Abbot, England: David & Charles. (Original work published 1543)

Cowles, J. T. (1937). Food-tokens as incentives for learning in chimpanzees. *Comparative Psychology Monographs*, 14, No. 71.

Cziko, G. (1995). *Without miracles: Universal selection theory and the second Darwinian revolution*. Cambridge, MA: MIT Press.

Darwin, C. (1859). *On the origin of species by means of natural selection*. London: Murray.

Dawkins, R. (1983). Universal Darwinism. In D. S. Bendall (Ed.), *Evolution from molecules to men* (pp. 403–425). Cambridge, England: Cambridge University Press.

Day, W. F. (1969). On certain similarities between Wittgenstein and Skinner. *Journal of the Experimental Analysis of Behavior*, *12*, 489–606.

Day, W. F. (1998). The historical antecedents of contemporary behaviorism. In R. W. Rieber & K. Salzinger (Eds.), *Psychology: Theoretical-historical perspectives* (2nd ed., pp. 301–352). New York, NY: Academic Press.

Deitz, S. M. (1983). Two correct definitions of "applied." *The Behavior Analyst*, *6*, 105–106.

DeMyer, M. K., & Ferster, C. B. (1962). Teaching new social behavior to schizophrenic children. *Journal of the American Academy of Child Psychiatry*, *1*, 443–461.

Drash, P. W., & Freeman, B. J. (1973). *Behavior modification, behavior therapy, and operant conditioning: An historical survey and a bibliography of books in print, 1900–1972*. Baltimore, MD: Behavioral Information and Technology.

Edwards, T. L., & Poling, A. (2011). Animal research *in the Journal of Applied Behavior Analysis*. *Journal of Applied Behavior Analysis*, *44*, 409–412.

Eldredge, N., & Gould, S. J. (1972). Punctuated equilibria: An alternative to phyletic gradualism. In T. J. M. Schopf (Ed.), *Models in paleobiology* (pp. 82–115). San Francisco, CA: Freeman Cooper.

Epstein, R. (1984). Simulation research in the analysis of behavior. *Behaviorism*, *12*, 41–59.

Estes, W. K., & Skinner, B. F. (1941). Some quantitative properties of anxiety. *Journal of Experimental Psychology*, *29*, 390–400.

Eysenck, H. J. (Ed.). (1964). *Experiments in behavior therapy: Readings in modern methods of treatment of mental disorders derived from learning theory*. Oxford, England: Pergamon Press.

Ferster, C. B. (1957). Withdrawal of positive reinforcement as punishment. *Science*, *126*, 509.

Ferster, C. B. (1965). Classification of behavioral pathology. In L. Krasner & L. P. Ullmann (Eds.), *Research in behavior modification* (pp. 6–26). New York, NY: Holt, Rinehart and Winston.

Ferster, C. B., & Appel, J. B. (1961). Punishment of S^{Δ} responding in match to sample by time out from positive reinforcement. *Journal of the Experimental Analysis of Behavior*, *4*, 45–56.

Ferster, C. B., & DeMyer, M. K. (1961). The development of performances in autistic children in an automatically controlled environment. *Journal of Chronic Diseases*, *13*, 312–345.

Ferster, C. B., & DeMyer, M. K. (1962). A method for the experimental analysis of the autistic child. *American Journal of Orthopsychiatry*, *32*, 89–98.

Ferster, C. B., & Skinner, B. F. (1957). *Schedules of reinforcement*. Englewood Cliffs, NJ: Prentice Hall.

Fink, A. (2005). *Conducting research literature reviews*. London, England: Sage.

Fisher, W. W., Piazza, C. C., & Roane, H. S. (Eds.). (2011). *Handbook of applied behavior analysis*. New York, NY: Guilford.

Flanagan, B., Goldiamond, I., & Azrin, N. H. (1958). Operant stuttering: The control of stuttering behavior through response-contingent consequences. *Journal of the Experimental Analysis of Behavior*, *1*, 173–177.

Fowler, F. J. (2009). *Survey research methods* (4th ed.). Thousand Oaks, CA: Sage.

Frothman, D. L., & Ogden, J. J. (1992). The role of applied behavior analysis in zoo management: Today and tomorrow. *Journal of Applied Behavior Analysis*, *25*, 647–652.

Fuller, P. R. (1949). Operant conditioning of a vegetative human organism. *Journal of Psychology*, *62*, 587–590.

Furumoto, L. (1989). The new history of psychology. In I. S. Cohen (Ed.), *The G. Stanley Hall lecture series* (Vol. 9, pp. 7–34). Washington, DC: American Psychological Association.

Garfield, E. (1977). Introducing *Citation Classics*: The human side of scientific papers. *Current Contents*, *1*, 5–7.

Garvey, W. D., & Griffith, B. C. (1971). Scientific communication: Its role in the conduct of research and creation of knowledge. *American Psychologist*, *26*, 349–362.

Gelfand, D. M., & Hartmann, D. P. (1968). Behavior therapy with children: A review and evaluation of research methodology. *Psychological Bulletin*, *69*, 204–215.

Gewirtz, J. L., & Baer, D. M. (1958). The effect of brief social deprivation on behaviors for a social reinforcer. *Journal of Abnormal and Social Psychology*, *56*, 49–56.

Giles, D. K., & Wolf, M. M. (1966). Toilet training institutionalized, severe retardates: An application of operant behavior modification techniques. *American Journal of Mental Deficiency*, *70*, 766–780.

Goldiamond, I. (1965). Self-control procedures in personal behavior problems. *Psychological Reports*, *17*, 851–868.

Goldiamond, I. (1973, November). A diary of self-modification. *Psychology Today*, *7*, 95–101.

Goodall, K. (1972, November). Shapers at work. *Psychology Today*, *6*(6), 53–62, 132–138.

Goodall, K. (1973, January). This little girl won't interact with other little girls and she crawls around a lot. *Psychology Today*, *7*(1), 65–72.

Grantham, G. (2011). The institutionalization of science in Europe, 1650–1850. In P. W.

Rhode, J. L. Rosenbloom, & D. E. Weiman (Eds.), *Economic evolution and revolution in historical time* (pp. 51–85). Stanford, CA: Stanford University Press.

Greenspoon, J. (1955). The reinforcing effect of two spoken sounds on the frequency of two responses. *American Journal of Psychology*, *68*, 409–416.

Griffith, B. C., & Miller, A. J. (1971). Networks of informal communication among scientifically productive scientists. In C. E. Nelson & D. K. Pollack (Eds.), *Communication among scientists and engineers* (pp. 125–140). Lexington, MA: Heath.

Grossberg, J. M. (1964). Behavior therapy: A review. *Psychological Bulletin*, *62*, 73–88.

Guess, S., Sailor, W., Rutherford, G., & Baer, D. M. (1968). An experimental analysis of linguistic development: The productive use of the plural morpheme. *Journal of Applied Behavior Analysis*, *1*, 297–306.

Guthrie, E. R. (1935). *The psychology of learning*. New York, NY: Harper and Brothers.

Hackenberg, T. D. (1995). Jacques Loeb, B. F. Skinner, and the legacy of prediction and control. *The Behavior Analyst*, *18*, 225–236.

Hake, D. F. (1982). The basic-applied continuum and the possible evolution of human social and verbal research. *The Behavior Analyst*, *5*, 21–28.

Hansen, G. D. (1979). Enuresis control through fading, escape, and avoidance training. *Journal of Applied Behavior Analysis*, *12*, 303–307.

Harris, F. R., Johnston, M. K., Kelley, C. S., & Wolf, M. M. (1964). Effects of positive reinforcement on regressed crawling of a nursery school child. *Journal of Educational Psychology*, *55*, 35–41.

Harris, F. R., Wolf, M. M., & Baer, D. M. (1964). Effects of adult social reinforcement on child behavior. *Young Children*, *20*, 8–17.

Harris, F. R., Wolf, M. M., & Baer, D. M. (1967). Effects of adult social reinforcement on child behavior. In S. W. Bijou & D. M. Baer (Eds.), *Child development: Readings in experimental analysis* (pp. 146–158). New York, NY: Appleton-Century-Crofts.

Hart, B. M., Allen, K. E., Buell, J. S., Harris, F. R., & Wolf, M. M. (1964). Effects of social reinforcement on operant crying. *Journal of Experimental Child Psychology*, *1*, 145–153.

Hart, C. (2001). *Doing a literature search: A comprehensive guide for the social sciences*. London, England: Sage.

Haughton, E., & Ayllon, T. (1965). Production and elimination of symptomatic behavior. In L. P. Ullmann & L. Krasner (Eds.), *Case studies in behavior modification* (pp. 94–98). New York, NY: Holt, Rinehart and Winston.

Hawkins, R. P., Peterson, R. F., Schweid, E., & Bijou, S. W. (1966). Behavior therapy in the home: Amelioration of problem parent-child relations with the parent in a therapeutic role. *Journal of Experimental Child Psychology*, *4*, 99–107.

Hearst, E., & Capshew, J. H. (Eds.). (1988). *Psychology at Indiana University: A centennial review and compendium*. Bloomington, IN: Indiana University Department of Psychology.

Heidbreder, E. (1933). *Seven psychologies*. New York, NY: Appleton-Century.

Hess, E. H. (1958). Imprinting in animals. *Scientific American*, *198*, 81–90.

Hewett, F. M. (1964). Teaching reading to an autistic boy through operant conditioning. *The Reading Teacher*, *17*, 613–618.

Hewett, F. M. (1965). Teaching speech to an autistic child through operant conditioning. *American Journal of Orthopsychiatry*, *35*, 927–936.

Higgins, J. P. T., & Green, D. (Eds.). (2008). *Cochrane handbook for systematic reviews of interventions*. Chichester, England: Wiley.

Hilts, P. J. (1974). *Behavior mod*. New York, NY: Harpers.

Hock, R. R. (2012). *Forty studies that changed psychology* (7th ed.). Upper Saddle River, NJ: Pearson.

Honig, W. K. (Ed.). (1966). *Operant behavior: Areas of research and application*. Englewood Cliffs, NJ: Prentice Hall.

Hughes, J. (2011). *On the origins of teepees*. New York, NY: Free Press.

Hull, C. L. (1943). *Principles of behavior*. New York, NY: Appleton-Century-Crofts.

Hull, D. L. (1988). *Science as a process: An evolutionary account of social and conceptual development in science*. Chicago, IL: University of Chicago Press.

Hull, D. L. (2001). *Science and selection: Essays on biological evolution and the philosophy of science*. New York, NY: Cambridge University Press.

Hull, D. L., Langeman, R. E., & Glenn, S. S. (2001). A general account of selection: Biology, immunology, and behavior. *Behavioral and Brain Sciences*, *24*, 511–573.

Isaacs, W., Thomas, J., & Goldiamond, I. (1960). Application of operant conditioning to reinstate verbal behavior in psychotics. *Journal of Speech and Hearing Disorders*, *25*, 8–12.

Iversen, I. H. (1992). Skinner's early research: From reflexology to operant conditioning. *American Psychologist*, *47*, 1318–1328.

Jensen, M. D., & Wosmack, M. G. (1967). Operant conditioning techniques applied in the treatment of an autistic child. *American Journal of Orthopsychiatry*, *37*, 30–34.

Johnston, J. M. (1996). Distinguishing between applied research and practice. *The Behavior Analyst*, *19*, 35–47.

Johnston, J. M., & Pennypacker, H. S. (2009). *Strategies and tactics of behavioral research* (3rd ed.). New York, NY: Routledge.

Johnston, J. M., & Shook, G. L. (1987). Developing behavior analysis as the state level. *The Behavior Analyst*, *10*, 199–233.

Johnston, M. K., Kelley, C. S., Harris, F. R., & Wolf, M. M. (1966). An application of reinforcement principles to the development of motor skills of a young child. *Child Development*, *37*, 379–387.

Jones, M. C. (1924). A laboratory study of fear: The case of Peter. *Pedagogical Seminary and Journal of Genetic Psychology*, *31*, 308–315.

Jones, M. C. (1974). Albert, Peter, and John B. Watson. *American Psychologist*, *29*, 581–584.

Kanfer, F. H., & Phillips, J. S. (1970). *Learning foundations of behavior therapy*. New York, NY: Wiley.

Kazdin, A. E. (1977). *The token economy: A review and evaluation*. New York, NY: Plenum.

Kazdin, A. E. (1978). *History of behavior modification: Experimental foundations of experimental research*. Baltimore, MD: University Park Press.

Kazdin, A. E. (1982). History of behavior modification. In A. S. Bellack, M. Hersen, & A. E. Kazdin (Eds.), *International handbook of behavior modification and therapy* (pp. 3–32). New York, NY: Plenum.

Kazdin, A. E. (2003). *Research design in clinical psychology* (4th ed.). Boston, MA: Allyn & Bacon.

Kazdin, A. E., & Pulaski, J. L. (1977). Joseph Lancaster and behavior modification in education. *Journal of the History of the Behavioral Sciences*, *13*, 261–266.

Kelleher, R. T. (1957a). A comparison of conditioned and food reinforcement on a fixed ratio schedule in chimpanzees. *Psychology Newsletter*, *8*, 88–93.

Kelleher, R. T. (1957b). Conditioned reinforcement in chimpanzees. *Journal of Comparative and Physiological Psychology*, *50*, 571–575.

Keller, F. S. (1963, August). *A personal course in psychology*. Paper presented at the meeting of the American Psychological Association, Philadelphia, PA.

Keller, F. S. (1966). A personal course in psychology. In R. Ulrich, T. Stacknik, & J. Mabry (Eds.), *Control of human behavior* (Vol. 1, pp. 91–93). Glenview, IL: Scott, Foresman.

Keller, F. S., & Schoenfeld, W. N. (1950). *Principles of psychology*. New York, NY: Appleton-Century-Crofts.

Kelley, M. L., Jarvie, G. J., Middlebrook, J. L., McNeer, M. F., & Drabman, R. S. (1984). Decreasing burned children's pain behavior: Impacting the trauma of hydrotherapy. *Journal of Applied Behavior Analysis*, *17*, 147–158.

Kennedy, C. H. (2005). *Single-case studies for educational research*. Boston, MA: Allyn & Bacon.

Konorski, J., & Miller, S. (1937). Two types of conditioned reflex. *Journal of General Psychology*, *16*, 264–272.

Krasner, L. (1977). An interview with Bijou. In B. C. Etzel, J. M. LeBlanc, & D. M. Baer (Eds.), *New developments in behavioral research: Theory, method, and application* (pp. 587–599). Hillsdale, NJ: Erlbaum.

Krasner, L. (1990). History of behavior modification. In A. S. Bellack, M. Hersen, & A. E. Kazdin (Eds.), *International handbook of behavior modification and therapy* (pp. 3–25). New York, NY: Plenum.

Krasner, L., & Ullmann, L. P. (Eds.). (1965). *Research in behavior modification*. New York, NY: Holt, Rinehart and Winston.

Kronick, D. A. (1976). *A history of scientific and technical periodicals: The origins and development of the scientific and technical press, 1665–1790* (2nd ed.). Metuchen, NJ: Scarecrow Press.

Kuhn, T. S. (1962). *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press.

Laties, V. G. (1987). Society for the Experimental Analysis of Behavior: The first thirty years (1957–1987). *Journal of the Experimental Analysis of Behavior*, *48*, 495–512.

Laties, V. G., & Mace, F. C. (1993). Taking stock: The first 25 years of the *Journal of Applied Behavior Analysis*. *Journal of Applied Behavior Analysis*, *26*, 513–525.

Lattal, K. A. (2008). *JEAB* at fifty: Coevolution of research and technology. *Journal of the Experimental Analysis of Behavior*, *89*, 129–135.

Laudan, L. (1977). *Progress and its problems: Toward a theory of scientific growth*. Berkeley, CA: University of California Press.

Leff, R. (1968). Behavior modification and the psychoses of childhood: A review. *Psychological Bulletin*, *69*, 396–409.

Leigland, S. (1996). The functional analysis of psychological terms: In defense of a research program. *The Analysis of Verbal Behavior*, *13*, 105–113.

Lent, J. R. (1968, June). Mimosa Cottage: Experiments in hope. *Psychology Today*, *2*, 51–58.

Lerman, D. C., Iwata, B. A., & Hanley, G. P. (2013). Applied behavior analysis. In G. J. Madden (Ed.), *APA handbook of behavior analysis* (pp. 81–104). Washington, DC: American Psychological Association.

Lindsley, O. R. (1956). Operant conditioning methods applied to research in chronic schizophrenia. *Psychiatric Research Reports*, *5*, 118–139.

Lindsley, O. R., Hobika, J. H., & Etsten, R. E. (1961). Operant behavior during anesthesia recovery: A continuous and objective measure. *Anesthesiology*, *22*, 937–946.

Loeb, J. (1912). *The mechanistic conception of life: Biological essays*. Chicago, IL: University of Chicago Press.

London, P. (1969). *Behavior control*. New York, NY: Harper & Row.

Lovaas, O. I., Beberich, J. P., Perloff, B. F., & Schaeffer, B. (1966). Acquisition of imitative speech by schizophrenic children. *Science*, *151*, 705–707.

Lovaas, O. I., Freitag, G., Gold, V. J., & Kassorla, I. C. (1965). Experimental studies in childhood schizophrenia: I. Analysis of self-destructive behavior. *Journal of Experimental Child Psychology*, *2*, 67–84.

Lutzker, J. R. (2008). Todd R. Risley (1937–2007). *American Psychologist*, *6*, 559.

Mace, F. C., & Critchfield, T. S. (2010). Translational research in behavior analysis: Historical traditions and imperatives for the future. *Journal of the Experimental Analysis of Behavior*, *93*, 293–312.

Mach, E. (1959). *The analysis of sensations and the relation of the physical to the psychical* (C. Williams, Trans.). New York, NY: Dover. (Original work published 1897)

Mach, E. (1960). *The science of mechanics: A critical and historical account of its development* (T. J. McCormack, Trans.). LaSalle, IL: Open Court. (Original work published 1883)

Malagodi, E. F. (1965). *Some effects of intermittently pairing a neutral stimulus with a primary reinforcing stimulus* (Unpublished master's thesis). University of Miami, Miami, FL.

Malagodi, E. F. (1967). *Second-order chained and tandem schedules of token reinforcement in the rat* (Unpublished doctoral dissertation). University of Miami, Miami, FL.

Malone, J. C. (2009). *Psychology: Pythagoras present*. Cambridge, MA: MIT Press.

Malott, R. W. (1975). Response. In W. S. Wood (Ed.), *Issues in evaluating behavior modification* (pp. 39–41). Champaign, IL: Research Press.

Malott, R. W., Whaley, D. L., & Ulrich, R. E. (Eds.). (1967). *Analysis of behavior principles and applications*. Dubuque, IA: William C. Brown.

Marr, M. J. (1985). 'Tis the gift to be simple: A retrospective appreciation of Mach's *The Science of Mechanics. Journal of the Experimental Analysis of Behavior*, *44*, 129–138.

Marr, M. J. (1991). The speciation of behavior analysis: The unnatural selection of foxes and hedgehogs. *The Behavior Analyst*, *14*, 183–186.

Marr, M. J. (2003). A still great voice: The golden sovereignty of *Science and Human Behavior*. *Journal of the Experimental Analysis of Behavior*, *80*, 311–312.

Martin, G., & Pear, J. (2002). *Behavior modification: What it I and how to do it* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Mayer, G. R., Sulzer-Azaroff, B., & Wallace, M. (2012). *Behavior analysis for lasting change* (2nd ed.). Cornwall-on-Hudson, NY: Sloan.

Meadows, A. J. (Ed.). (1979). *The scientific journal*. London, England: Aslib.

Mellon, M. W., & McGrath, M. L. (2000). Empirically supported treatments in pediatric psychology: Nocturnal enuresis. *Journal of Pediatric Psychology*, *25*, 193–214.

Merton, R. K. (1942). Resistance to the systematic study of multiple discoveries in science. *European Journal of Sociology*, *4*, 237–282.

Merton, R. K. (1957). Priorities in scientific discovery. *American Sociological Review*, *22*, 635–659.

Merton, R. K. (1961). Singletons and multiples in scientific discovery: A chapter in the sociology of science. *Proceedings of the American Philosophical Society*, *105*, 470–486.

Metz, J. R. (1965). Conditioning generalized imitation in autistic children. *Journal of Experimental Child Psychology*, *2*, 389–399.

Michael, J. (1980). Flight from behavior analysis. *The Behavior Analyst*, *3*, 1–24.

Michael, J. (2004, March). *Five early studies that shaped applied behavior analysis*. Paper presented at the meeting of the Behavior Analysis Association of Michigan, Ypsilanti, MI.

Miltenberger, R. (2008). *Behavior modification: Principles and procedures* (4th ed.). Pacific Grove, CA: Brooks/Cole.

Moore, J. (2008). *Conceptual foundations of radical behaviorism*. Cornwell-on-Hudson, NY: Sloan.

Morris, E. K. (2012). Sidney W. Bijou: Outstanding and out standing in his fields. In W. E. Pickren, D. A. Dewsbury, & M. C. Wertheimer (Eds.), *Portraits of pioneers in developmental psychology* (Vol. 7, pp. 205–227). New York, NY: Taylor & Francis.

Morris, E. K., Smith, N. G., & Altus, D. E. (2005). B. F. Skinner's contributions to applied behavior analysis. *The Behavior Analyst*, *28*, 99–131.

Mowrer, O. H. (1960). *Learning theory and behavior*. New York, NY: Wiley.

Mowrer, O. H., & Mowrer, W. M. (1938). Enuresis: A method for its study and treatment. *American Journal of Orthopsychiatry*, *8*, 436–459.

Moxley, R. A. (1992). From mechanistic to functional behaviorism. *American Psychologist*, *47*, 1300–1311.

Moxley, R. A. (1997). Skinner: From determinism to random variation. *Behavior and Philosophy*, *25*, 3–38.

Moxley, R. A. (2001). Sources of Skinner's pragmatic selectionism in 1945. *The Behavior Analyst*, *24*, 201–212.

Neale, D. H. (1963). Behaviour therapy and encopresis in children. *Behaviour Research and Therapy*, *1*, 139–149.

Neuringer, A., & Michael, J. L. (Eds.). (1970). *Behavior modification in clinical psychology*. New York, NY: Appleton-Century-Crofts.

Newton, I. (1803). *Principia mathematica* (A. Motte, Trans.). London, England: Symonds. (Original work published 1687)

O'Donnell, J. M. (1985). *The origins of behaviorism: American psychology, 1870–1920*. New York, NY: Columbia University Press.

O'Donohue, W. T., Henderson, D. A., Hayes, S. C., Fisher, J. E., & Hayes, L. J. (Eds.). (2001). *A history of the behavioral therapies: Founders' personal histories*. Oakland, CA: New Harbinger.

Ogburn, W. F., & Thomas, D. (1922). Are inventions inevitable? A note on social evolution. *Political Science Quarterly*, *37*, 83–93.

O'Leary, K. D., & Becker, W. C. (1967). Behavior modification on an adjustment class: A token reinforcement program. *Exceptional Children*, *33*, 637–642.

O'Leary, K. D., & O'Leary, S. G. (Eds.). (1972). *Classroom management: The successful use of behavior modification*. New York, NY: Pergamon.

Packard, V. (1977). *The people shapers*. Boston, MA: Little, Brown.

Patterson, G. R., Jones, R., Whittier, J., & Wright, M. A. (1965). A behaviour modification technique for the hyperactive child. *Behaviour Research and Therapy*, *2*, 217–236.

Pauly, P. J. (1987a). *Controlling life: Jacques Loeb and the engineering ideal in biology*. New York, NY: Oxford University Press.

Pauly, P. J. (1987b). General physiology and the discipline of physiology, 1890–1935. In G. L. Geison (Ed.), *Physiology in the American context* (pp. 195–207). Bethesda, MD: American Physiological Society.

Pavlov, I. P. (1927). *Conditioned reflexes: An investigation of the physiological activity of the cerebral cortex* (G. V. Anrep, Trans.). London, England: Oxford University Press.

Pear, J. J. (2007). *A historical and contemporary look at psychological systems*. Mahwah, NJ: Erlbaum.

Peterson, L., Homer, A. L., & Wonderlich, S. A. (1982). The integrity of independent variables in behavior analysis. *Journal of Applied Behavior Analysis*, *15*, 477–492.

Peterson, R. F. (1968). Some experiments on the organization of a class of imitative behaviors. *Journal of Applied Behavior Analysis*, *1*, 225–235.

Petroski, H. (1992). *The evolution of useful things*. New York, NY: Knopf.

Plaud, J. J. (1995). Analysis of complex human behavior: A reply to Staats. *The Behavior Analyst*, *18*, 167–169.

Popper, K. R. (1972). *Objective knowledge: An evolutionary approach*. Oxford, England: Oxford University Press.

Pressey, S. L. (1926). A simple apparatus which gives tests and scores—and teaches. *School and Society*, *23*, 373–376.

Ravitch, D. (1974). *The great school wars, New York City, 1805–1973: A history of the public schools as battlefield of social change*. New York, NY: Basic Books.

Rider, D. P. (1991). The speciation of behavior analysis. *The Behavior Analyst*, *14*, 171–181.

Risley, T. R. (1964). Generalization gradients following two-response discrimination training. *Journal of the Experimental Analysis of Behavior*, *7*, 199–204.

Risley, T. R. (1997). Montrose M. Wolf: The origin of the dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, *30*, 377–381.

Risley, T. R. (2001). Do good, take data. In W. T. O'Donohue, D. A. Henderson, S. C. Hayes, J. E. Fisher, & L. J. Hayes (Eds.), *A history of the behavior therapies: Founders' personal histories* (pp. 267–287). Reno, NV: Context Press.

Risley, T. R. (2005). Montrose M. Wolf (1935–2004). *Journal of Applied Behavior Analysis*, *38*, 279–287.

Risley, T. R. (2006). Montrose M. Wolf (1935–2004). *American Psychologist*, *61*, 73.

Risley, T. R., & Wolf, M. M. (1964, September). *Experimental manipulation of autistic behaviors and generalization into the home*. Paper presented at the meeting of the American Psychological Association, Los Angeles, CA.

Risley, T. R., & Wolf, M. M. (1966). Experimental manipulation of autistic behaviors and generalization into the home. In R. E. Ulrich, T. Stacknik, & J. Mabry (Eds.), *The control of human behavior* (Vol. 1, pp. 193–198). Glenview, IL: Scott, Foresman.

Risley, T. R., & Wolf, M. M. (1967a). Establishing functional speech in echolalic children. Behaviour Research and Therapy, *5*, 73–88.

Risley, T. R, & Wolf, M. M. (1967b). Experimental manipulation of autistic behaviors and generalization into the home. In S. W. Bijou & D. M. Baer (Eds.), *Child development: Readings in experimental analysis* (pp. 184–194). New York, NY: Appleton-Century-Crofts.

Risley, T. R., & Wolf, M. M. (1968). Establishing functional speech in echolalic children. In H. N. Sloane & B. D. MacAulay (Eds.), *Operant procedures in remedial speech and language training* (pp. 157–184). New York, NY: Houghton Mifflin.

Rosales-Ruiz, J., & Baer, D. M. (1997). Behavioral cusps: A developmental and pragmatic concept for behavior analysis. *Journal of Applied Behavior Analysis*, *30*, 533–544.

Routh, D. K. (2002). *Psychology at the University of Miami: 1927–2002*. Coral Gables, FL: Unpublished manuscript.

Rutherford, A. (2003). Skinner boxes for psychotics: Operant conditioning at Metropolitan State Hospital. *The Behavior Analyst*, *26*, 267–279.

Rutherford, A. (2009). *Beyond the box: B. F. Skinner's technology of behavior from laboratory to life, 1950s–1970s*. Toronto, Ontario: University of Toronto Press.

Ryback, D., & Staats, A. W. (1970). Parents as behavior therapy-technicians in treating reading deficits (dyslexia). *Journal of Behavior Therapy and Experimental Psychiatry*, *1*, 109–117.

Salter, A. (1961). *Conditioned reflex therapy: The direct approach to the reconstruction of* personality. New York, NY: Capricorn.

Saville, B. K., Beal, S. A., & Buskist, W. (2002). Essential reading for graduate students in behavior analysis: A survey of the *JEAB* and *JABA* boards of editors. *The Behavior Analyst*, *25*, 29–35.

Schneider, S. M., & Morris, E. K. (1987). A history of the term radical behaviorism: From Watson to Skinner. *The Behavior Analyst*, *10*, 23–39.

Schroeder, S. R., & Holland, J. G. (1968). Operant control of eye movements. *Journal of Applied Behavior Analysis*, *1*, 161–166.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Belmont, CA: Wadsworth.

Sherman, J. A. (1963). Reinstatement of verbal behavior in a psychotic by reinforcement methods. *Journal of Speech and Hearing Disorders*, *28*, 398–401.

Sherman, J. A. (1965). Use of reinforcement and imitation to reinstate verbal behavior in mute psychotics. *Journal of Abnormal Psychology*, *70*, 155–164.

Sidman, M. (1960). *Tactics of scientific research*. New York, NY: Basic Books.

Simonton, D. K. (1979). Multiple discovery and invention: Zeitgeist, genius or chance? *Journal of Personality and Social Psychology*, *37*, 1603–1616.

Skinner, B. F. (1930). On the conditions of elicitation of certain eating reflexes. *Proceedings of the National Academy of Sciences of the United States of America*, *16*, 433–438.

Skinner, B. F. (1935). Two types of conditioned reflex and a pseudo type. *Journal of General Psychology*, *12*, 66–77.

Skinner, B. F. (1937). Two types of conditioned reflex: A reply to Konorski and Miller. *Journal of General Psychology*, *16*, 272–279.

Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. New York, NY: Appleton-Century.

Skinner, B. F. (1945a). Baby in a box: Introducing the mechanical baby tender. *Ladies' Home Journal*, *62*(10), 30–31, 135–136, 138.

Skinner, B. F. (1945b). The operational analysis of psychological terms. *Psychological Review*, *52*, 270–277, 291–294.

Skinner, B. F. (1948). *Walden two*. New York, NY: Macmillan.

Skinner, B. F. (1953). *Science and human behavior*. New York, NY: Macmillan.

Skinner, B. F. (1956). A case history in scientific method. *American Psychologist*, *11*, 221–233.

Skinner, B. F. (1958, October 24). Teaching machines. *Science*, *128*, 969–977.

Skinner, B. F. (1960). Pigeons in a pelican. *American Psychologist*, *15*, 28–37.

Skinner, B. F. (1962). Two "synthetic social relations." *Journal of the Experimental Analysis of Behavior*, *5*, 531–533.

Skinner, B. F. (1966). The phylogeny and ontogeny of behavior. *Science*, *153*, 1205–1213.

Skinner, B. F. (1971). *Beyond freedom and dignity*. New York, NY: Knopf.

Skinner, B. F. (1976). *The particulars of my life*. New York, NY: Knopf.

Skinner, B. F. (1979). *The shaping of a behaviorist*. New York, NY: Knopf.

Skinner, B. F. (1981). Selection by consequences. *Science*, *213*, 501–504.

Skinner, B. F. (1988). The operant side of behavior therapy. *Journal of Behavior Therapy and Experimental Psychiatry*, *19*, 171–179.

Skinner, B. F. (1989a). The initiating self. In B. F. Skinner. *Recent issues in the analysis of behavior* (pp. 27–33). Columbus, OH: Merrill.

Skinner, B. F. (1989b). The origins of cognitive thought. *American Psychologist*, *44*, 13–18.

Sloane, H. N., & MacAulay, B. D. (Eds.). (1968). *Operant procedures in remedial speech and language training*. New York, NY: Houghton Mifflin.

Smith, L. D. (1992). On prediction and control: B. F. Skinner and the technological ideal of science. *American Psychologist*, *47*, 216–223.

Smith, L. D. (1996). Knowledge is power: The Baconian roots of Skinner's social meliorism. In L. D. Smith & W. R. Woodward (Eds.), *B. F. Skinner and behaviorism in American culture* (pp. 56–82). Bethlehem, PA: Lehigh University Press.

Staats, A. W. (1957). Learning theory and "opposite speech." *Journal of Abnormal and Social Psychology*, *55*, 268–269.

Staats, A. W. (1964a). A case in and a strategy for the extension of learning principles to problems of human behavior. In A. W. Staats (Ed.), *Human learning; Studies extending conditioning principles to complex behavior* (pp. 121–144). New York, NY: Holt, Rinehart and Winston.

Staats, A. W. (Ed.). (1964b). *Human learning: Studies extending conditioning principles to complex behavior*. New York, NY: Holt, Rinehart and Winston.

Staats, A. W. (1965). A case in and a strategy for the extension of learning principles to problems of human behavior. In L. Krasner & L. P. Ullmann (Eds.), *Research in*

behavior modification (pp. 27–55). New York, NY: Holt, Rinehart and Winston.
Staats, A. W. (1968a). A general apparatus for the investigation of complex learning in children. *Behaviour Research and Therapy*, *6*, 45–50.
Staats, A. W. (1968b). *Learning, language, and cognition*. New York, NY: Holt, Rinehart and Winston.
Staats, A. W. (1975). *Social behaviorism*. Homewood, IL: Dorsey.
Staats, A. W. (1981). Paradigmatic behaviorism, unified theory, unified theory construction methods, and the zeitgeist of separatism. *American Psychologist*, *26*, 239–256.
Staats, A. W. (1994). Psychological behaviorism and behavioralizing psychology. *The Behavior Analyst*, *17*, 93–114.
Staats, A. W. (1996). Aberrance in science: Should behavior analysts know about psychological behaviorism? *The Behavior Analyst*, *19*, 121–124.
Staats, A. W. (2012). *The marvelous learning animal: What makes human nature unique*. Amherst, NY: Prometheus.
Staats, A. W., & Butterfield, W. H. (1965). Treatment of nonreading in a culturally deprived juvenile delinquent: An application of reinforcement principles. *Child Development*, *36*, 925–942.
Staats, A. W., Finley, J. R., Minke, K. A., & Wolf, M. M. (1964). Reinforcement variables in the control of unit reading responses. *Journal of the Experimental Analysis of Behavior*, *7*, 139–149.
Staats, A. W., Minke, K. A., & Butts, P. (1970). A token-reinforcement remedial reading program administered by black therapy-technicians to problem black children. *Behavior Therapy*, *1*, 331–353.
Staats, A. W., Minke, K. A., Finley, J. R., Wolf, M. M., & Brooks, L. O. (1964). A reinforcer system and experimental procedure for the laboratory study of reading acquisition. *Child Development*, *35*, 209–231.
Staats, A. W., Minke, K. A., Goodwin, W., & Landeen, J. (1967). Cognitive behavior modification: "Motivated learning" reading treatment with subprofessional therapy technicians. *Behaviour Research and Therapy*, *5*, 283–299.
Staats, A. W., & Staats, C. K. (1963). *Complex human behavior*. New York, NY: Holt, Rinehart and Winston.
Staats, A. W., Staats, C. K., Schultz, R. E., & Wolf, M. (1962). The conditioning of textual responses using "extrinsic" reinforcers. *Journal of the Experimental Analysis of Behavior*, *5*, 33–40.
Straughan, J. H., Potter, W. K., & Hamilton, S. H. (1965). The behavioral treatment of elective mutism. *Journal of Child Psychol. Psychiatry*, *6*, 125–130.
Strauss, R. (2006, October). 20 people who changed childhood. *Child*, 107–114.
Sulzer-Azaroff, B., Thaw, J., & Thomas, C. (1975). Behavioral competencies for the evaluation of behavior modifiers. In W. S. Wood (Ed.), *Issues in evaluating behavior modification* (pp. 47–98). Champaign, IL: Research Press.
Sundberg, M. L., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification*, *25*, 698–724.
Thompson, R. H., & Borrero, J. C. (2011). Direct observation. In W. W. Fisher, C. C. Piazza, & H. S. Roane (Eds.), *Handbook of applied behavior analysis* (pp. 191–205). New York, NY: Guilford.
Thompson, T. (1984). The examining magistrate for nature: A retrospective review of Claude Bernard's *An Introduction to the Study of Experimental Medicine*. *Journal of the Experimental Analysis of Behavior*, *41*, 211–216.
Thompson, T. (1988). Benedictus behavior analysis: B. F. Skinner's magnum opus at 50. *Contemporary Psychology*, *33*, 397–402.
Thorndike, E. L. (1898). Animal intelligence: An experimental study of the associative processes in animals. *Psychological Review Monograph Supplements*, *2* (4, Whole No. 8).
Tolman, E. C. (1932). *Purposive behavior in animals and men*. New York, NY: Century.
Touchette, P. E. (1968). The effects of a graduated stimulus change on the acquisition of a simple discrimination in severely retarded boys. *Journal of the Experimental Analysis of Behavior*, *11*, 39–48.
Toulmin, S. (1972). *Human understanding: The collective use and evolution of concepts*. Princeton, NJ: Princeton University Press.
Ullmann, L. P., & Krasner, L. (Eds.). (1965). *Case studies in behavior modification*. New-York, NY: Holt, Rinehart and Winston.
Ulrich, R., Stacknik, T., & Mabry, J. (Eds.). (1966). *Control of human behavior* (Vol. 1). Glenview, IL: Scott, Foresman.
Verhave, T. (Ed.). (1966). *The experimental analysis of behavior: Selected readings*. New York, NY: Appleton-Century-Crofts.
Wahler, R. G., Winkel, G. H., Peterson, R. F., & Morrison, D. C. (1965). Mothers as behavior therapists for their own children. *Behaviour Research and Therapy*, *3*, 113–134.
Watson, J. B., & Rayner, R. (1920). Conditioned emotional responses. *Journal of Experimental Psychology*, *3*, 1–14.
Whitehead, W. E., Lurie, E., & Blackwell, B. (1976). Classical conditioning of decreases in human systolic blood pressure. *Journal of Applied Behavior Analysis*, *9*, 153–157.
Williams, C. D. (1959). The elimination of temper tantrums by extinction procedures. *Journal of Abnormal and Social Psychology*, *59*, 269.
Williams, C. D. (1962, September). Extinction and other principles of learning in the treatment and prevention of children's

disorders. In C. M. Franks (Chair). *The application of learning theory principles to the treatment and prevention of abnormal behavior*. Symposium presented at the meeting of the American Psychological Association, St. Louis, MO.

Williams, C. D., Tallarico, R. B., & Tedeschi, J. T. (1960). Manifest needs and manifest anxiety. *Journal of Consulting Psychology*, *24*, 371.

Willis, J. W., & Giles, D. (1976). *Great experiments in behavior modification*. Indianapolis, IN: Hackett.

Wolf, M. M. (1963). Some effects of combined S^D's. *Journal of the Experimental Analysis of Behavior*, *6*, 343–347.

Wolf, M. M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis*, *11*, 203–214.

Wolf, M. M. (1983). The week's citation classic. *Current Contents*, *39*, 18.

Wolf, M. M. (1993). Remembrances of issues past: Celebrating JABA's 25th anniversary. *Journal of Applied Behavior Analysis*, *26*, 543–544.

Wolf, M. M. (2001). Application of operant conditioning procedures to the behavior problems of an autistic child: A 25-year follow-up and the development of the teaching family model. In W. T. O'Donohue, D. A. Henderson, S. C. Hayes, J. E. Fisher, & L. J. Hayes (Eds.), *A history of the behavior therapies: Founders' personal histories* (pp. 289–294). Reno, NV: Context Press.

Wolf, M. M., Risley, T. R., Johnston, M. K., Harris, F. R., & Allen, K. E. (1967). Application of operant conditioning procedures to the behaviour problems of an autistic child: A follow up and extension. *Behaviour Research and Therapy*, *5*, 103–111.

Wolf, M., Risley, T., & Mess, H. (1964). Application of operant conditioning procedures to the behaviour problems of an autistic child. *Behaviour Research and Therapy*, *1*, 305–312.

Wolfe, J. B. (1936). Effectiveness of token-rewards for chimpanzees. *Comparative Psychology Monographs, 12*, No. 60.

Wolpe, J. (1961). The systematic desensitization of neuroses. *Journal of Nervous and Mental Diseases*, *132*, 180–203.

Wolpe, J., & Lazarus, A. A. (1966). *Behavior therapy techniques: A guide to the treatment of neuroses*. New York, NY: Pergamon.

Wood, W. S. (1975a). Acknowledgements. In W. S. Wood (Ed.), *Issues in evaluating behavior modification* (pp. xiii–xiv). Champaign, IL: Research Press.

Wood, W. S. (1975b). Introduction. In W. S. Wood (Ed.), *Issues in evaluating behavior modification* (pp. xv–xvii). Champaign, IL: Research Press.

Wood, W. S. (Ed.). (1975c). *Issues in evaluating behavior modification*. Champaign, IL: Research Press.

Woodward, W. R. (1996). Skinner and behaviorism as cultural icons: From local knowledge to reader reception. In L. D. Smith & W. R. Woodward (Eds.), *B. F. Skinner and behaviorism in American culture* (pp. 7–29). Bethlehem, PA: Lehigh University Press.

Zimmerman, E. H., & Zimmerman, J. (1962). The alternation of behavior in a special classroom situation. *Journal of the Experimental Analysis of Behavior*, *5*, 59–60.