

Selected Publication Trends in *JEAB*: Implications for the Vitality of the Experimental Analysis of Behavior

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To provide some insight into the current vitality of the experimental analysis of behavior, we updated and extended an analysis by R. A. Williams and Buskist (1983) of selected trends in the *Journal of the Experimental Analysis of Behavior*. Specifically, the number of articles published and the percentage of those articles that were empirical, the number of different affiliations of authors and number of articles per affiliation, the types of subjects used in empirical articles, and the topics investigated were analyzed for the years 1958 through 1999. Although several trends may point to a decline in the overall well-being of the experimental analysis of behavior, they may also be interpreted as signs of progress for the field.

Key words: publication trends, *JEAB*, vitality, experimental analysis of behavior

A report by R. A. Williams and Buskist (1983) painted a mixed picture of the overall well-being of the experimental analysis of behavior (EAB). This analysis, based on articles published in the *Journal of the Experimental Analysis of Behavior (JEAB)*, found that since 1958 there had been a general decline in the number of authors from different affiliations and fewer papers originating in independent research laboratories and medical schools. However, the number of publications authored by members of the editorial board was relatively low, and the number of publications authored by foreign researchers was increasing. Several reasons were given for these trends: the scarcity of employment opportunities for basic operant researchers, the increased specialization of those who work within EAB (e.g., more research in behavioral pharmacology), and an increased number of

EAB articles being published elsewhere.

An updated analysis of various publication trends in *JEAB*, the flagship journal for basic behavior-analytic research, seems appropriate for at least two reasons. First, it has been nearly 20 years since R. A. Williams and Buskist's (1983) analysis. A more recent analysis of *JEAB* publication trends, therefore, might reveal new trends that have appeared since that time. Such an analysis may lead to the identification of new conceptualizations of behavior, changes in experimental methodologies, and applications of laboratory findings that have emerged in EAB in the last two decades. Second, several published reports have discussed the purported decline of behavioral psychology in recent years (e.g., Robins, Gosling, & Craik, 1999; Sperry, 1988). Although the theoretical orientations and experimental practices of psychologists who conduct research in the EAB tradition have evolved and become considerably more varied since the days of early behaviorists such as Skinner and others, EAB is still typically relegated to a position under the broad heading of behavioral psychology. Thus, when statements are made regarding the decline of behavioral psychology, similar state-

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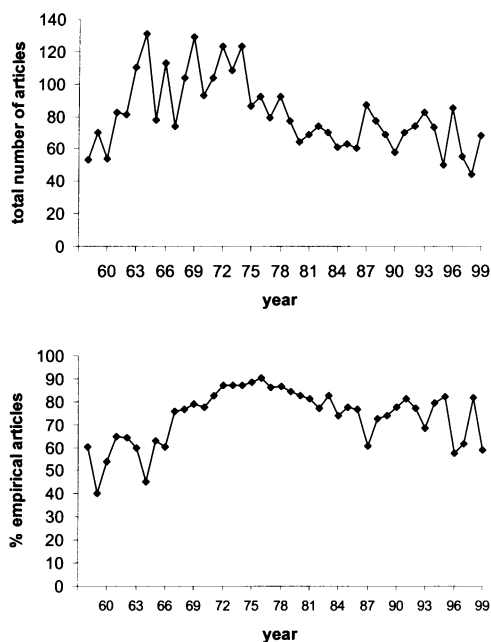


Figure 1. The top panel shows the total number of articles published per year in *JEAB* since 1958. The bottom panel shows the percentage of total articles that are empirically based.

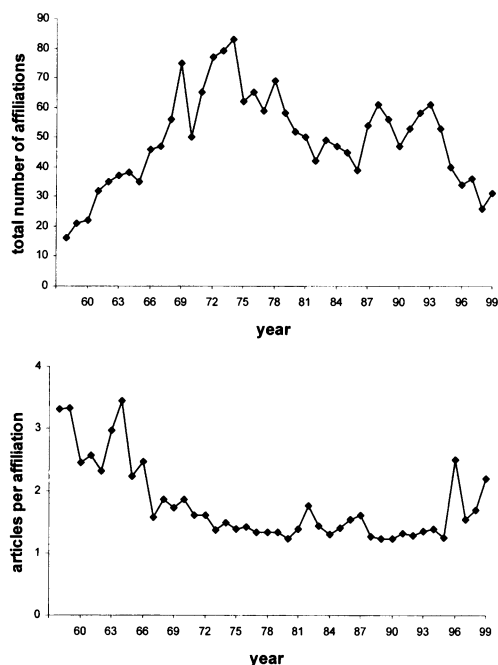


Figure 2. The top panel shows the total number of different affiliations of authors published in *JEAB*. The bottom panel shows the number of articles per affiliation.

ments about EAB are likely to emerge. In response to such statements, an analysis of *JEAB* publication trends might provide an important datum regarding the current health of EAB. Thus, the purpose of the present paper is to review and update various publication trends in *JEAB* to provide one important marker regarding the vitality of EAB.

The top panel in Figure 1 shows the total number of articles published per year in *JEAB* since 1958. Although considerable variability is present, the total number of articles increased during the late 1960s and early 1970s before beginning a gradual decline in the late 1970s. There was a slight increase in the number of articles published during the late 1980s and early 1990s, but the general trend suggests that the number of articles being published in *JEAB* is declining. However, the average number of pages per article has increased from approximately 8 pages in the 1960s to an average of 15 pages in the 1990s (not shown). In addition, the

total number of experiments per article has increased slightly from an average of 1.5 experiments in 1958 to an average of 1.7 experiments in 1999 (also not shown). These results are likely due to the increased sophistication in methods, technology, and conceptualizations that has emerged since the early writings of Skinner and others.

Although the total number of articles in *JEAB* has decreased, the percentage of those articles dedicated to empirical research (bottom panel, Figure 1) has remained relatively constant (70% to 80%) since the early 1970s. These data suggest that those who publish in *JEAB* have remained true to their empirical roots. Although theory has become increasingly important for many with behavior-analytic ties (e.g., Staddon, 2001), researchers in EAB continue to place primary emphasis on the collection of empirical data.

The upper panel of Figure 2 depicts the total number of different affiliations of authors published in *JEAB*

each year since 1958. When coauthors were from the same institution, the affiliation was counted only once. Also, if a single author had more than one affiliation, only one affiliation was counted. The latter rarely occurred and had no impact on the overall affiliation count. In general, the total number of affiliations increased throughout the 1960s, peaking at a high of 84 in 1974. Afterwards, a moderate decrease in the number of affiliations is evident, except for a period in the late 1980s and early 1990s when it rose briefly. Since this time, the number has steadily decreased, reaching a 38-year low of 27 affiliations in 1998.

Although the overall number of affiliations has decreased in recent years, this finding is potentially confounded by the decrease in the total number of articles published per year: If fewer articles are published in any given year, the number of affiliations will similarly decrease. Thus, a better indicator might be the number of articles per affiliation. If the number of articles per affiliation is high, then one might conclude that the majority of *JEAB* articles are being published by a small number of researchers from a handful of laboratories. Conversely, if the number of articles per affiliation is low, then it is more likely that *JEAB* articles represent a broader array of researchers from a larger number of affiliations.

The lower panel of Figure 2 shows the number of articles per affiliation per year since 1958. In general, the number of articles per affiliation decreased throughout the 1960s and 1970s, reaching its lowest total in 1980. That the number of articles per affiliation decreased throughout this time period is probably not surprising. During *JEAB*'s infancy, most of its articles were published by researchers from a small number of institutions with strong behavior-analytic orientations (e.g., Harvard and Columbia). As the popularity of *JEAB* grew and behavior analysts began to occupy more academic and research positions throughout the world, researchers from

a larger number of institutions continued to view *JEAB* as a viable outlet for their research. Starting in the late 1960s and continuing throughout most of the 1970s, 1980s, and 1990s, the number of articles per affiliation remained relatively low. This trend changed in 1996 when it climbed to its highest point since the mid-1960s. In recent years, the number has once again increased, suggesting that a smaller number of affiliations are responsible for many of *JEAB*'s articles.

Figure 3 shows the types of subjects used in empirical articles published in *JEAB* per year. For rats, nonhuman primates, and other nonhuman subjects (e.g., cats, cows, and chickens), the number of articles has decreased moderately or remained relatively stable, accounting for anywhere from 5% to 50% (rats), 0% to 21% (nonhuman primates), and 0% to 12% (other) of published empirical articles in *JEAB*. In contrast, the percentage of published empirical articles using pigeons and humans has been much more variable, ranging between 20% and 74% for pigeons and 3% and 42% for humans. Note that increases in the percentage of studies using pigeons are associated with decreases in the percentage of studies involving humans, and vice versa. For example, an increase in publications with pigeons as subjects in the 1960s and 1970s was mirrored by a general decrease in publications involving human subjects during the same period. In the early 1980s, the number of publications with human subjects increased, but recently has declined again.

These data seem to be at odds with previous reports that predicted that the number of human operant studies in *JEAB* would soon outnumber those using nonhuman subjects (Dougherty, Nedelmann, & Alfred, 1993; Hyten & Reilly, 1992). This state of affairs is disconcerting considering that several authors have commented on the importance of studying basic principles of behavior with human subjects (e.g., Hake, 1982; Nevin, 1982; Skinner,

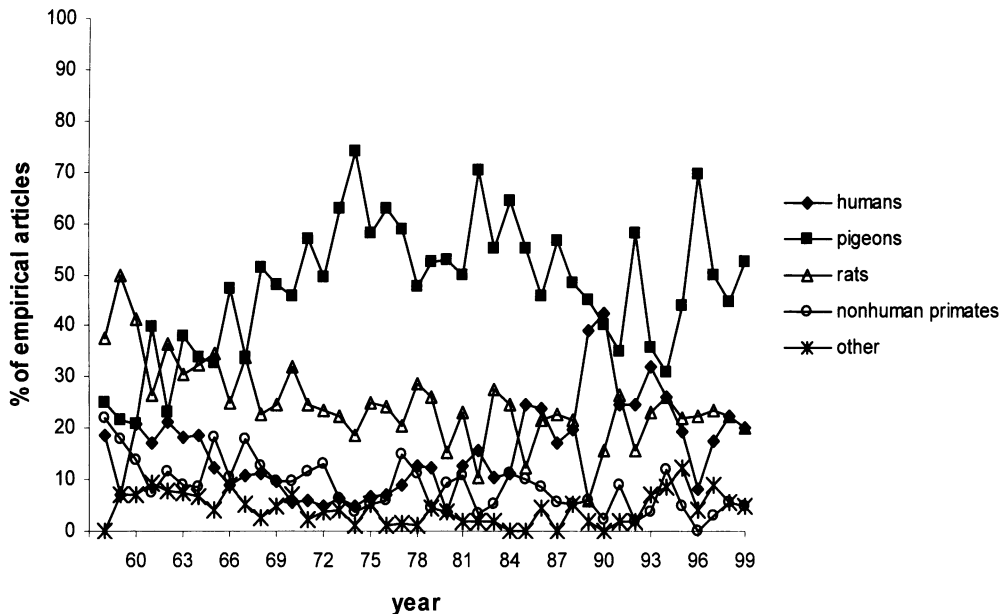


Figure 3. The types of subjects used in empirical articles published in *JEAB*.

1953). Fortunately, other outlets have been available for those who wish to publish human operant research. For example, *The Psychological Record*, which publishes a wide range of experimental and theoretical articles, has become an important forum for human operant researchers (Buskist, Sherburne, & Critchfield, 1996).

Figure 4 shows the topics investigated in empirical articles. For purposes of analysis, articles were placed into one of the following categories: (a) Reinforcement and Punishment, (b) Choice, (c) Stimulus Control, (d) Social and Verbal Behavior, (e) Behavioral Pharmacology and Toxicology, and (f) Response Properties. In addition, we identified a small number of articles ($n = 33$) examining topics that did not fit easily into any of the other categories (e.g., Conrad, Sidman, & Herrnstein, 1958). However, studies of this nature have not been a focus of operant research and, thus, are not included in Figure 4.

To determine which category was most appropriate, we examined the experimental questions posed by the researchers as well as the key words that

were listed for each article. If an article examined more than one topic and potentially could be placed in more than one category, we further examined the experimental questions and key words, and came to agreement regarding the more appropriate category. For example, Galizio (1979) examined both instructional control and avoidance responding. Because the primary focus of his studies was to examine instructional control, the article was included in the Social and Verbal Behavior category. The top panel shows the cumulative number of articles for the three most frequently studied topics (400 or more publications each): Reinforcement and Punishment, Choice, and Stimulus Control.

Topics falling under the broad rubric of Reinforcement and Punishment generally have received the most attention in EAB. Included in this category are topics such as schedules of reinforcement, aversive control, conditioned reinforcement, and temporal control. Much of the work done in this area was carried out in the 1960s and early 1970s. This probably is not surprising considering that some of the early

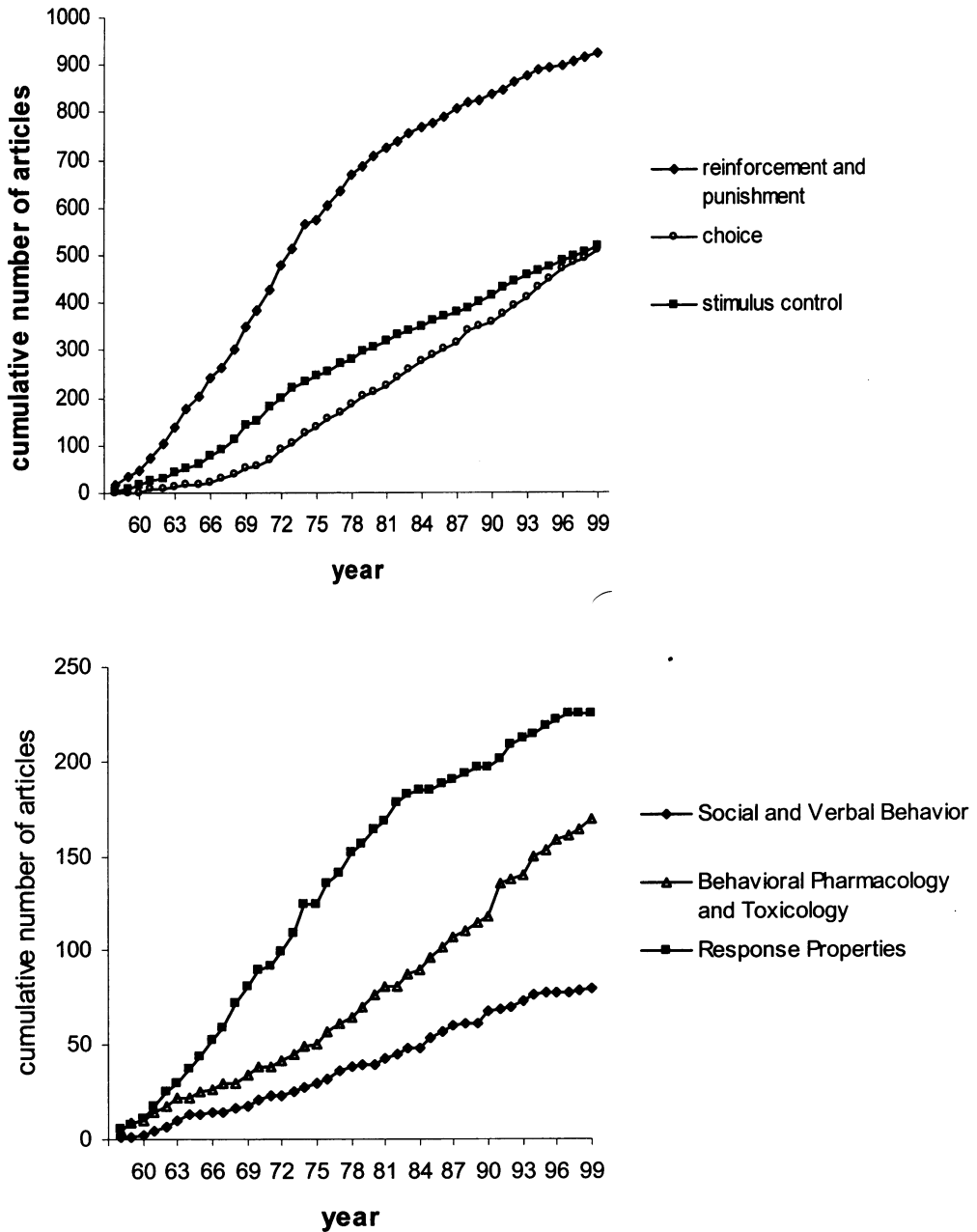


Figure 4. The top panel shows the cumulative records for the three topics that have been investigated the most in *JEAB*: Choice, Stimulus Control, and Reinforcement and Punishment. The bottom panel shows the topics that have been investigated less often in *JEAB*: Social and Verbal Behavior, Behavioral Pharmacology and Toxicology, and Response Properties.

work on punishment (see Azrin & Holz, 1966) and schedules of reinforcement (Ferster & Skinner, 1957) occurred early in this period. Reaching its zenith in 1974, publications in the

area of Reinforcement and Punishment declined to a point at which fewer than five studies per year were published between 1995 and 1999. Although several researchers, including Zeiler

(1984), have suggested that much more needs to be done on topics in this area, little additional research has been conducted.

Included in the category of Choice are articles on matching, behavioral economics, foraging, and so on. As with Reinforcement and Punishment, much of the work conducted in this area was carried out in the late 1960s and 1970s soon after publications by Herrnstein (1961, 1970). Although work in the area of Choice has been relatively stable since the 1970s, research topics such as foraging (Baum, 1982) and behavioral economics (Hursh, 1984) have emerged, suggesting that EAB researchers are identifying other subjects that can be explained nicely using models of choice.

In the category of Stimulus Control, topics such as stimulus equivalence, stimulus generalization and discrimination, and studies using matching-to-sample methodology are included. Many articles on stimulus control appeared in early issues of *JEAB* before decreasing during the 1970s and early 1980s. Although the total number of articles on stimulus control did not change dramatically throughout the 1980s and 1990s, the focus of research within the area of stimulus control did. Beginning with an influential paper by Sidman and Tailby (1982), research in the area of stimulus equivalence began to account for a large percentage of articles in the area of stimulus control. Whereas equivalence studies were nearly nonexistent throughout most of the 1970s, equivalence accounted for between 10% and 50% of the stimulus control articles published between 1982 and 1999 (see top panel, Figure 5). Similarly, an analysis of the total number of equivalence articles appearing in *JEAB* started to increase in the early 1980s and has continued to be a topic of considerable interest throughout most of the 1990s (see bottom panel, Figure 5).

The bottom panel of Figure 4 shows the cumulative number of articles for those topics that have received rela-

tively less attention in *JEAB* (less than 250 publications each): Social and Verbal Behavior, Behavioral Pharmacology and Toxicology, and Response Properties. Included in the category of Social and Verbal Behavior are articles on cooperation, competition, instructional control, and so on. In general, the study of social and verbal behavior has received little attention in *JEAB*, although a few years (e.g., 1985 and 1990) revealed a conspicuous increase in the number of published articles.

Similarly, studies of Behavioral Pharmacology and Toxicology have accounted for a relatively small percentage of *JEAB* articles. Except for a special issue in 1991 that contained 17 articles, studies of behavioral pharmacology and toxicology (e.g., Dews, 1958; Newland & Marr, 1985; Schaal, Miller, & Odum, 1995) have averaged less than five articles per year. Although the trend in publications in the area has remained fairly consistent, the overall number of publications has remained small.

Response Properties includes articles that focus on autoshaping, response acquisition, response topography, and so on. These topics were an area of considerable interest in the 1960s and 1970s before decreasing in number in the early 1980s. Again, much of the initial interest in these topics might be attributed to studies that were published during 1960s (e.g., Brown & Jenkins, 1968; D. R. Williams & Williams, 1969). Since 1980, however, there have been only 2 years, 1982 and 1992, in which more than four articles on this topic have appeared in *JEAB*.

In accordance with the conclusions of R. A. Williams and Buskist (1983), these data paint a mixed picture of the well-being of EAB. Depending on how one interprets these results, disparate conclusions regarding several of our findings might be reached.

First, our analysis shows that in recent years the number of different affiliations has decreased and the number of articles per affiliation has increased

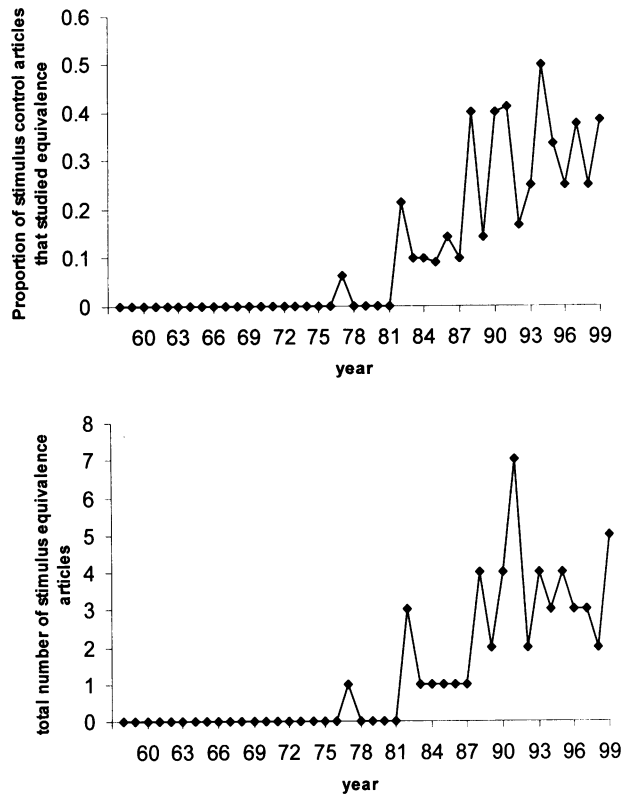


Figure 5. The top panel shows the proportion of stimulus control publications that have investigated stimulus equivalence. The bottom panel shows the total number of articles that have investigated stimulus equivalence.

slightly. This may reflect a decline in the number of researchers who conduct basic behavior-analytic research. Not only would this affect the number of empirical studies being conducted, but it may also have an adverse effect on the variety of topics and issues that are the focus of empirical research. Conversely, such findings do not necessarily point to a decline in the number of researchers who conduct basic behavior-analytic research. One possibility is that, more recently, a smaller number of researchers may be responsible for many of the manuscripts that are reviewed and subsequently published in *JEAB*. For example, researchers at two or three affiliations may be conducting a substantial amount of research in a given area and, consequently, submitting an inordinately large number of manuscripts for review. If this work

meets the rigorous requirements necessary for publication in *JEAB* but submitted manuscripts that examine other topics do not, then the end result may be a diminished number of affiliations represented. However, this does not mean that fewer experimental psychologists are conducting basic behavior-analytic research.

Second, the total number of articles published per year in *JEAB* has decreased. Two variables that might provide insight into this issue are submission and acceptance rates for *JEAB*. Analysis of submission rates for the years 1990 through 1999 shows that the number of manuscripts submitted to *JEAB* has decreased significantly. In the first 4 years of the decade, the overall submission rate varied between 137 and 156 manuscripts. The number of submissions to *JEAB* in the latter half

of the decade varied from 113 in 1996 to a decade-low total of 91 in 1999. During this same period, acceptance rates for *JEAB* remained stable at approximately 50%.

Once again, these data may signal one of two possibilities. First, the number of researchers who conduct basic behavior-analytic research may be decreasing. If so, then a potential outcome would be a decrease in the number of submissions. Conversely, a decrease in the number of submissions to *JEAB* may be an indicator of the expanding breadth of research being conducted by basic operant researchers. As the range of research interests and topics in EAB increases, basic researchers may be inclined to submit their manuscripts to journals that publish articles representing a marriage between basic operant research and topics that, heretofore, had been outside the realm of EAB. For example, it is not uncommon for EAB researchers who examine the effects of drugs or toxicants on behavior to publish their work in pharmacological journals such as *Behavioural Pharmacology* or toxicological journals such as *Neurotoxicology & Teratology*. Similarly, journals such as *Behavioural Processes*, *Behavioral and Brain Sciences*, *Animal Learning & Behavior*, and *Journal of Behavioral Decision Making*, as well as numerous others, have remained viable outlets for basic operant researchers. Thus, a decline in the number of submissions to *JEAB* may feasibly represent a positive trend in EAB. Although we did not gather submission or acceptance rates for other journals, our conclusions may be strengthened or weakened by examining similar data from other basic experimental journals. With the recent escalation of applied psychology, it seems possible that other basic experimental journals, especially those that focus on animal research, may be experiencing similar declines in the number of submissions. Conversely, if the submission and acceptance rates of other basic experimental journals have remained stable or increased in recent

years, this may be a negative sign for EAB. In the absence of these data, however, our conclusions should be viewed with caution.

Third, the number of human operant articles in *JEAB* has declined in recent years. This finding might lead some to conclude that those in EAB have abandoned the study of complex human behaviors such as social and verbal behavior. Unfortunately, this appears to be true for the study of human social behavior (Saville, 2001). In contrast, several areas of human operant research have continued to appear regularly in other journals. Buskist et al. (1996) found that the overall number of human operant articles in *The Psychological Record* has increased in recent years. A cursory glance at recent issues of this journal reveals numerous articles on stimulus equivalence. Similarly, *The Analysis of Verbal Behavior* and the *Experimental Analysis of Human Behavior Bulletin* have continued to be important outlets for operant researchers who study verbal behavior. Thus, although human operant research has declined in *JEAB* in recent years, it may be premature to conclude that the study of human operant behavior has slowed significantly.

Fourth, the amount of research being conducted in many of the primary areas of study has either leveled off or declined in recent years. For the most part, there has not been an increase in the number of studies conducted in any of the major areas we defined. In addition, several topics that were the focus of numerous studies during the early years of *JEAB* are no longer studied. For example, throughout the 1970s, numerous studies on behavioral contrast were published. In addition, several theories were proposed that attempted to explain why behavioral contrast occurs (e.g., Gamzu & Schwartz, 1973; Herrnstein, 1970; Reynolds, 1961; Terrace, 1966). Since 1993, however, articles examining behavioral contrast have appeared in *JEAB* at a rate of less than one per year.

At a superficial level, this finding may seem to cast the well-being of EAB in a negative light. However, it seems just as likely that other nonnegative factors may have contributed to the change in research focus that has occurred in the pages of *JEAB*. The emergence of new content areas will often cause shifts in research focus. Consequently, EAB researchers with limited resources and time are often confronted with the choice of attempting to answer familiar research questions that have yet to be resolved or rearranging their research agendas in an effort to examine new topics. Thus, although topics such as behavioral contrast and schedules of reinforcement, for example, currently command little direct attention by EAB researchers, new topics such as foraging, behavioral economics, and stimulus equivalence have emerged in the past 20 years. Moreover, many of these older topics have provided the experimental base on which newer topics are being examined. For example, simple schedules of reinforcement have been used extensively to examine the pharmacological effects of morphine (Odum & Schaal, 2000), to study disparate response patterns under open and closed economies (Zeiler, 1999), and to analyze competitive behavior (Buskist & Morgan, 1987). Consequently, these older topics are still being examined indirectly and have not been abandoned completely.

A caveat regarding our categorization methods is in order, as well. Any method of categorization is arbitrary in nature and, consequently, may create dichotomies that may or may not truly exist. For example, studies of choice inevitably involve the study of concurrent schedules of reinforcement (e.g., Herrnstein, 1961). As such, the placement of an article into one category or another may be a function of our current conceptualization of a given research topic. From this standpoint, it seems evident that certain EAB topics have not necessarily been abandoned in favor of others. Rather, these topics may simply be the basis for slightly al-

tered research agendas. Although the continued study of topics that were once the focus of behavior-analytic research is important for understanding both human and nonhuman behavior, it is highly unlikely, however, that expanding the range of topics examined by experimental behavior analysts will ultimately hurt EAB.

What if our findings do, in fact, point to a decline in the health of EAB? What might those engaged in EAB do to remedy the current situation? One solution may lie in our teaching. Over the years, EAB has been under attack from those who view its general assumptions as incorrect (e.g., Chomsky, 1959). More often than not, these attacks have been based on misconceptions and unfounded conjecture (Todd & Morris, 1983). If we are to secure a bright future for EAB, then we must focus on our teaching so that the misconceptions that often lead students to renounce behaviorism and behavior analysis are remedied from the start (see Branch & Malagodi, 1980; Michael, 1980).

Second, it is essential that those engaged in EAB do not insulate themselves from other areas of psychology. A report published 20 years ago showed that, for the most part, those who publish in *JEAB* cited other *JEAB* papers more than any other source (Poling, Picker, Grossett, Hall-Johnson, & Holbrook, 1981). A recent citation analysis of human operant publications suggests that this convention has not changed (Critchfield et al., 2000). In reality, this practice may not differ significantly from practices found in other highly specialized journals. However, if EAB is to have an influence on other areas of psychology, it is imperative that we continue to find ways in which we might integrate our concepts, theories, and methods with other areas of psychology. Likewise, it is important that we do not continue talking only to one another (e.g., Buskist, 1987; Harzem, 2000; Todd & Morris, 1992).

Finally, it is essential to study those topics that have not been the focus of

EAB and, possibly, those that were once important but since have fallen out of favor. Whereas a topic such as social behavior has been the main focus in other areas of psychology, it rarely has been the focus of operant research. This is unfortunate, considering that it is one of the most common types of behavior (Hake, 1982) and that some of the founding fathers of EAB alluded to its importance 50 years ago (Keller & Schoenfeld, 1950; Skinner, 1953). As such, a complete understanding of human behavior may necessarily entail further analysis of the variables that are responsible for generating and maintaining social behavior.

Conversely, what if our findings do, in fact, signal increased health for EAB? The simplest piece of advice that can be given is to continue engaging in the behaviors that have led to the publication trends examined herein. In the face of protracted attack and misunderstanding from other areas of psychology, it is crucial that experimental behavior analysts continue to produce solid data, which has been the hallmark of EAB. Such progression, along with continued conceptual improvement, will lead to a more complete science of behavior.

Clearly, an analysis of *JEAB* publication trends is not the only means for assessing the well-being of EAB. Those areas of psychology that continue to implement behavioral principles successfully in an attempt to solve socially significant problems (e.g., applied behavior analysis, organizational behavior management, and behavior therapy) should also be analyzed. In addition, the continued use of EAB-based methods in several areas of psychology (e.g., the study of animal cognition), as well as other disciplines (e.g., neurotoxicology), suggests that EAB has continued to exert its influence in other ways. Regardless of the current state of EAB, however, additional work remains if we are to increase the impact that our science could have on both the advancement of

scientific knowledge and the betterment of society.

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