THE IMPACT OF APPLIED BEHAVIOR ANALYSIS ON DIVERSE AREAS OF RESEARCH¹

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The impact of applied behavior analysis on various disciplines and areas of research was assessed through two major analyses. First, the relationship of applied behavior analysis to the general area of "behavior modification" was evaluated by examining the citation characteristics of journal articles in JABA and three other behavior-modification journals. Second, the penetration of applied behavior analysis into diverse areas and disciplines, including behavior modification, psychiatry, clinical psychology, education, special education, retardation, speech and hearing, counselling, and law enforcement and correction was assessed. Twenty-five journals representing diverse research areas were evaluated from 1968 to 1974 to assess the extent to which operant techniques were applied for therapeutic, rehabilitative, and educative purposes and the degree to which methodological desiderata of applied behavior analysis were met. The analyses revealed diverse publication outlets for applied behavior analysis in various disciplines.

DESCRIPTORS: applied behavior analysis, applied research, behavior modification, clinical psychology, education, psychiatry, impact of applied behavior analysis

The application of operant techniques has proliferated in recent years across diverse types of settings, populations, and target behaviors (*cf.* Kazdin, 1975*a, b*). Certainly, the appearance of the *Journal of Applied Behavior Analysis* (JABA) fostered this proliferation because it formalized the autonomy of a given area of research. Perhaps, because applied behavior analysis has been so diverse, it may seem difficult to define. It is part of the general domain of "behavior modification", which itself has evaded definition (*cf.* Agrad, 1973). Yet, applied behavior analysis has somewhat less of an identity problem than other areas of behavior-modification research because of its strong association with a particular methodological stance, *viz.*, the experimental analysis of behavior, which has thrived so well in laboratory work, as published in the *Journal of the Experimental Analysis of*

Behavior (JEAB). Applied behavior analysis embraces the intrasubject methodology that is a long-standing tradition in operant work (Sidman, 1960). To this tradition of experimentation is added the focus on behaviors of social significance usually in applied, rather than laboratory, settings (Risley, 1970). An additional feature that defines applied behavior analysis is the attempt to effect socially important changes in behavior so that an experimental intervention makes a difference to the individual's functioning in his or her environment (Baer, Wolf, and Risley, 1968; Risley, 1970).

Applied behavior analysis investigations published in JABA have encompassed an array of disciplines and research areas including psychiatry, clinical psychology, and education, among others. Despite the diversity of research in JABA, the thrust of applied behavior analysis on specific areas of research remains unclear. The present paper examined the impact of applied behavior analysis on various areas of research. Two types of analyses were completed. First, the relationship of applied behavior analysis to the general area of behavior modification

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was examined. Citation characteristics of JABA and three other behavior-modification journals were recorded to determine the degree to which applied behavior analysis is integrated in or isolated from related research. Second, the major portion of the paper evaluated the penetration of applied behavior analysis in diverse areas including behavior modification, psychiatry, clinical psychology, education, special education, retardation, speech and hearing, counselling, and law enforcement and correction. Twenty-five journals were sampled to assess the impact of applied behavior analysis across these areas of research from 1968 to 1974.²

ISOLATION OR INTEGRATION: RELATIONSHIP OF JABA TO OTHER BEHAVIOR-MODIFICATION JOURNALS

The initial analysis examined the degree of integration or isolation of applied behavior analysis and behavior modification in general. The data relied upon were citation characteristics of different journals in behavior modification. Citation characteristics (the references employed by articles in a given journal) have been used by several investigators to make conclusions about interrelationships between journals and also between areas of research (e.g., Krantz, 1971; Narin and Garside, 1972; Xhignesse and Osgood, 1967).

Xhignesse and Osgood (1967) employed a number of dimensions for analyzing citation characteristics of psychology journals. A few of these dimensions are particularly noteworthy. Their analysis focused upon the communication network among journals. In the communication network, a given journal can serve as a *receiver* of information and as a *source* of information. A journal is a receiver to the extent to which its authors cite other articles in related journals. A journal is a source of information to the extent that its articles are referred to in related journals. The extent to which a journal serves as either

a receiver or a source of information reveals the interaction between journals within specific areas of research.

The significance of determining the extent to which journals rely upon each other *vis a vis* citation characteristics was pointed out by Krantz (1971), who assessed the relationship between operant and nonoperant psychology by examining the citation characteristics of articles published in JEAB and related journals. The results revealed a substantial increase in the proportion of self-citations in JEAB over the period of 1958 (the journal's inception) through 1969. Krantz also noted that another journal that frequently cited JEAB articles showed a decelerating trend in citing JEAB over time, and concluded that there was a mutual isolation of operant research (by JEAB in its high self-citation rate) and other approaches (by their failure to cite operant findings).

In the present study, citation data of JABA and other behavior-modification journals were evaluated to examine the interrelationship between operant and nonoperant work in behavior modification. The citation characteristics of JABA and three other behavior-modification journals were examined, including *Behavior Therapy* (BT), *Behaviour Research and Therapy* (BRT), and the *Journal of Behavior Therapy and Experimental Psychiatry* (JBTEP).

Self-Citation

To evaluate the self-citation pattern of JABA, reference sections of each article across all journal issues were scored for the proportion of citations to JABA, *i.e.*, self-citation.³ The self-citation rates of the other behavior-modifi-

²For each journal examined in the present paper, the data for 1974 were incomplete.

³To assess reliability for the citation data, two raters independently scored articles for citation rates. Two randomly selected issues from each of the four behavior-modification journals (across all the years of publication from 1968 to 1974) were employed. Within each of the eight issues, one article was randomly selected for assessing agreement in the citation of JABA. Agreement between the two raters was assessed by comparing the proportion of JABA citations for each article. Agreement between raters was 100% across all articles.

cation journals also were examined. The percentage of self-citations for each journal was obtained by calculating the proportion of self-citations to the total number of citations to any other source for each article.

The mean percentages of self-citation across all years for each journal were 21.1% for JABA, 15.3% for BRT, 4.1% for BT, and 4.0% for JBTEP. The annual self-citation percentages for these journals appear in Figure 1. The data revealed an obvious acceleration in self-citation for JABA from 1968 to 1972, becoming relatively stable for the last 3 yr. The self-citation rate of any new journal might ac-

celerate in its early years because a body of seminal information is being formed to which subsequent studies can refer. Yet, the self-citation patterns of BT and JBTEP, also recent journals (beginning in 1970), are not at all similar to that of JABA. The rates are lower and the slopes do not appear as steep. The self-citation rate of BRT, a journal in existence for over a decade, is also notably below that of JABA.

The self-citation data of JABA are similar to those of JEAB in its first 7 yr of existence (Krantz, 1971). Yet, for JEAB the self-citation rate in a 7-yr period beginning with the incep-

Fig. 1. Self-citation for JABA, *Behavior Therapy* (BT), *Behaviour Research and Therapy* (BRT), and *Journal of Behavior Therapy and Experimental Psychiatry* (JBTEP).

tion of the journal was much greater than for JABA. Indeed, for the sixth and seventh years of JEAB's existence, the percentage of self-citations surpassed 40%, well above JABA's self-citation record.

Interestingly, in its first year, JABA's self-citation rate was higher than the first-year self-citation rates of the other behavior-modification journals (BT, JBTEP). JABA's self-citation rate was higher in its first year than the rates of BT and JBTEP after their first 4 yr of publication. The rate of self-citation of JABA in its first year (relative to the other journals) might indicate familiarity of JABA authors with the research of other individuals before its publication. The authors responsible for investigations in a specialized area may be in close communication with each other and make frequent reciprocal citations. Such a notion would be consistent with the interpretation of self-citation data as indicating a high degree of specialization.⁴

Reciprocal Citation

An accelerated rate of self-citation by itself does not indicate that an area is becoming isolated from related research. As Krantz (1971) noted, the isolation of an area of research is evident when self-citation is relatively high and when related journals do not cite that journal. Further evaluation of the possible isolation of applied behavior analysis can be obtained by examining reciprocal citation. In the present analysis, reciprocal citation referred to the extent to which a particular journal was cited by JABA and that same journal cited JABA. To obtain a clear pattern of isolation of applied behavior analysis from related research (*i.e.*, behavior modification), reciprocal citation would have to decelerate over time.

JABA's citation rate of other behavior-mod-

ification journals and the citation rates of JABA by these other journals appear in Figure 2. An obvious trend is the decelerating rate of citation of BRT by JABA (upper portion). The citation rates of BT and JBTEP by JABA have remained close to 1% with no clear trends. The lower portion indicates a relatively low rate of JABA citations in all three journals with no obvious pattern across journals.

Examining both portions of Figure 2, JABA has made more references to BRT than BRT has made to JABA. Interestingly, JABA has decreased its citation of BRT, while BRT has slightly increased its citation of JABA over the years. No clear trends of increasing or decreasing reciprocal citation can be readily inferred for BT and JBTEP. BT and JBTEP have tended to cite JABA more frequently than JABA has cited them. While this might be an artifact of JABA being an older journal (thereby providing a greater source of research to be cited), the pattern is consistent across all years since the inception of BT and JBTEP.

Taking the pattern of reciprocal citation as a whole, it is unclear that JABA is being cited less by other related journals or is citing other journals less frequently over time. An exception to this is the reduction in the citation of BRT by JABA. The trend is dramatic and might be attenuated by the appearance of two new journals (BT and JBTEP) in 1970. The newer behavior-modification journals have served as a citation source for JABA and may have accounted for some of the reduction in citing BRT.

Isolation and Integration: Summary

The citation data indicated that JABA has become increasingly more specialized than other behavior-modification journals as reflected in their self-citation rates. However, considering journals in other areas, JABA does not itself suffer an unusually high self-citation rate. As noted earlier, the self-citation rate of JEAB after 7 yr of existence was over 40% (Krantz, 1971). In the same amount of time, JABA's

⁴A strong case cannot be made from early self-citation in the inception of a journal. Publication lags differ across journals and may well account for self-citing articles that first appeared in the journal in the same year as the journal began.

Fig. 2. Reciprocal citation: behavior-modification journals cited by JABA (upper portion) and which cite JABA in their reference sections (lower portion).

self-citation rate was about 25%. One journal considered to have a relatively high self-citation rate is the *Journal of Experimental Psychology* (Xhignesse and Osgood, 1967), with a rate of about 35% (between 1950 and 1960). In the time span sampled by Xhignesse and Osgood, American Psychological Association journals self-cited on the average between 3% and 35% (median = 14%). The self-citation rate of JABA is relatively high given these norms but not particularly extreme.

The reciprocal citation data do not indicate that JABA is increasingly isolated from other behavior-modification journals. Although JABA has relied less upon one journal (BRT) as a source of information over time, other journals have not systematically relied upon JABA less as a source of information. Of course, to make statements about the isolation or integration of applied behavior analysis on the basis of citation data alone would be misleading. More direct evidence can be obtained by examining the extent to which other journals report applied behavior analysis investigations.

PENETRATION OF APPLIED BEHAVIOR ANALYSIS INTO SPECIFIC DISCIPLINES

The impact of applied behavior analysis can be assessed by examining journal articles across diverse disciplines and areas of research. Twenty-two journals were sampled from psychiatry, psychology, clinical psychology, education, special education, retardation, speech and hearing, counselling, and law enforcement and correction. In addition, the impact of applied behavior analysis on behavior modification in general was examined by including three behavior-modification journals (BT, BRT, JBTEP). For each journal, the annual percentage of articles in applied behavior analysis was scored from 1968 to 1974.⁵

⁵For the analyses in this section, technical notes and articles in JABA and their equivalent in other journals were omitted from consideration. In addition,

Two related analyses were completed. Initially, journals were searched for empirical articles in which operant techniques were applied for therapeutic, rehabilitative, or educative purposes. This analysis provided a general view of the pervasiveness of applied operant techniques. A second analysis critically examined applications of operant techniques to evaluate the extent to which they adhered to fundamental methodological desiderata that characterize applied behavior analysis (*i.e.*, intrasubject replication design and reliability of assessment).

Applications of Operant Techniques

There are no necessary content boundaries that define applied behavior analysis. Diverse interventions, if conducted within the methodological framework of operant investigations, can be included in the definition. The extent to which the research is *applied* is defined by its focus on clinically or socially significant behavior (Risley, 1970), rather than by the techniques employed to alter behavior. The extent to which the research is *behavior analysis* is determined by the methodological stance adhered to in implementing and evaluating experimental interventions (Skinner, 1966). These criteria for defining applied behavior analysis do not specify precise interventions that must be employed. Currently, the vast majority of applied behavior analysis investigations consists of the application of operant principles. To evaluate the impact of applied behavior analysis on diverse disciplines, the extent to which operant techniques have been applied was determined.

To be counted as applied operant work, the investigation or study had to: focus on overt

tion, across all journals, equipment notes, letters to the editor, book reviews, and special notes unique to specific journals were excluded in computing the proportion of articles. Sections referred to in some journals as case studies were included in the present analyses because in many instances single-case experiments were presented here. An attempt was made to focus on the major articles in a given journal (including discussion and empirical articles). (For JABA, the section entitled Brief Reports, a recent innovation, was excluded from the present analyses.)

behavior (of humans), employ some overt environmental manipulation (usually) involving an operant technique, and attempt to alter behavior of clinical or social (*e.g.*, therapeutic, rehabilitative, or educative) significance. Laboratory investigations to test some theoretical notion or aspects of contingency manipulation that excluded the goal of achieving a therapeutically relevant change in behavior were omitted.⁶ Usually, an operant technique was required for the article to be counted. However, if an investigation employed an intrasubject replication design and focused on behavior of applied import, the particular environmental intervention (*e.g.*, operant or nonoperant) was not important. For example, any overt psychological manipulation employed to alter behavior using an ABAB design would be included. (Physiological interventions such as drugs or diet were not included, even if the design requirements were met.)

In summary, an article was classified as applied operant work if it focused on behaviors of clinical or social significance and if it met either criterion pertaining to the behavior-change techniques (*e.g.*, operant techniques typically employed in JABA) or research methodology (*e.g.*, use of an intrasubject replication design).⁷

⁶The vast majority of articles in JEAB would not meet the criteria for the present classification system because of the focus of that journal on infrahuman subjects, or in the case of human experiments, on laboratory tasks.

⁷Reliability for this analysis was assessed by having two raters independently score journals in diverse areas and select those investigations that met the criteria outlined for the analysis. Thirteen journals across all areas (*e.g.*, psychiatry, clinical psychology) were scored by both raters. (For the majority of these journals, all issues for six of the 7 yr sampled in the present study were rated by both observers.) To compute reliability, agreements between raters were divided by agreements plus disagreements and multiplied by 100. An agreement was scored when both raters included the identical article as applied operant work in a given journal issue. A disagreement was scored when one observer scored an article as applied operant work, whereas the other observer failed to include the article. A large number of journal issues included no applied operant articles, agreed

The percentage of articles reporting investigations of operant techniques of all articles published in each journal surveyed are presented in Table 1. Before evaluating specific content areas, it is instructive to note the data for JABA (see Figure 3). As expected, JABA showed the greatest percentage of articles on applied operant work, relative to other journals sampled, with a mean of 91.4% across all years (see Table 1). This is no coincidence, because the procedures for classifying articles as applied operant investigations resembled the criteria employed for publication in JABA (*e.g.*, use of an intrasubject design). In any case, the data for JABA, as a preliminary source of information, suggest some "face validity" of the criteria used to classify articles as applied operant work.⁸

Behavior modification. Applications of operant procedures comprised a substantial percentage of articles in the behavior-modification journals (see Figure 3). Indeed, the mean rates of articles employing operant techniques across all years sampled were 36.6% for JBTEP, 29.1% for BT, and 26.9% for BRT. These journals showed a relatively stable rate over time.⁹ Operant techniques seem to be well established in behavior-modification journals, comprising between 20 and 50% of the articles.

Psychiatry. The psychiatry journals generally indicated a low percentage of applied operant articles (see Table 1). The mean rates for each journal across all years sampled were 7.8% for

to by both raters. However, concurrence between observers on nonoccurrences of operant articles was not counted as an agreement. Using the above reliability formula, agreement between observers across issues from the 13 journals was 93.3%.

⁸It should be noted that the reason JABA did not have a perfect (100%) record for applied operant studies is due primarily to the appearance of non-empirical articles and a few laboratory investigations that did not meet the criteria for this analysis.

⁹The reduced percentage for BRT in 1974 must be interpreted cautiously. (The first issues of this journal in 1974 were exceedingly small because of publication problems related to a printers' strike. Thus, the small total number of journal articles may not provide a stable estimate.)

Fig. 3. Articles in behavior modification employing operant techniques for applied purposes.

the *Journal of Child Psychology and Psychiatry*, 2.1% for the *Journal of Nervous and Mental Disease*, 1.5% for *Archives of General Psychiatry*, 1.4% for *American Journal of Orthopsychiatry*, and 0.7% for *American Journal of Psychiatry*. Systematic trends were not obvious from the data, although the *American Journal of Orthopsychiatry* has shown a slight increase in applied operant articles since 1968 and 1969.

Clinical psychology. Clinical psychology reflected a somewhat greater impact of applied operant techniques than did psychiatry (see Table 1). The mean rate of applied operant studies across all years sampled was 5.3% for the *Journal of Abnormal Psychology*, 3.1% for the *Journal of Consulting and Clinical Psychol-*

ogy, and 0.9% for the *Journal of Clinical Psychology*. The *Journal of Abnormal Psychology* had a higher level of applied operant studies than the other clinical psychology journals (perhaps because of the relatively frequent publication of "treatment" articles). Both the *Journal of Abnormal Psychology* and the *Journal of Consulting and Clinical Psychology* showed relatively stable rates over the years sampled.

Education, special education, and mental retardation. Journals in these areas showed the greatest impact of applied operant work of all areas sampled. This impact is reflected in the mean percentages of applied operant studies across all years sampled, which were: 10.3% for *Mental Retardation*, 7.6% for *Psychology*

Table 1
Percentage of Articles of Applied Operant Techniques

	1968	1969	1970	1971	1972	1973	1974
BEHAVIOR MODIFICATION							
JABA	90.9	93.3	94.3	90.6	89.8	92.3	88.9
Behavior Therapy			30.4	31.3	30.2	27.3	26.2
Behaviour Research & Therapy	33.3	27.4	26.9	26.7	25.9	29.3	18.8
J. Behavior Therapy & Exp. Psychiat.			27.9	39.1	33.9	47.4	34.6
PSYCHIATRY							
Am. J. Orthopsychiatry	0	0	3.2	1.6	1.3	1.5	2.0
Am. J. Psychiatry	0.5	0.9	0.5	0.4	0.4	0.4	1.6
Archives of General Psychiatry	0.6	0.6	2.8	2.4	1.9	1.5	1.0
J. Child Psychol. & Psychiatry	33.3	6.3	0	0	4.0	0	11.1
J. Nervous & Ment. Dis.	0.9	2.1	0	4.7	0	7.1	0
CLINICAL PSYCHOLOGY							
J. Abnormal Psychology	2.9	5.8	6.9	4.4	6.2	5.0	5.7
J. Clinical Psychology	0	0	1.2	1.2	2.7	0	1.5
J. Consult. & Clin. Psychol.	4.6	1.5	2.4	2.3	2.7	2.8	5.6
EDUCATION, SPECIAL EDUCATION, MENTAL RETARDATION							
Am. Educational Res. J.	10.0	2.8	2.6	10.0	2.1	6.3	14.3
Am. J. Mental Deficiency	3.6	6.4	0.9	11.3	5.2	1.8	5.9
Exceptional Children	3.2	7.5	10.7	7.1	8.8	0	9.8
J. Educational Psychol.	1.4	2.4	2.8	1.2	2.3	1.9	0
J. Learning Disabilities	1.7	0	4.2	4.5	1.4	8.6	7.3
J. Special Education	13.9	2.0	1.7	0	4.4	2.2	7.7
Mental Retardation	2.0	6.2	13.0	12.9	14.7	12.8	10.7
Psychology in the Schools	1.6	1.3	5.7	6.2	13.9	8.4	15.9
MISCELLANEOUS							
Corrective and Social Psychiatry	0	0	0	4.8	0	4.8	9.1
J. Counseling Psychol.	0.9	0	3.8	3.6	2.8	1.8	1.5
J. Research Crime & Delinquency	0	0	5.9	6.7	0	0	5.6
J. Speech & Hearing Dis.	3.1	5.1	21.1	8.9	7.6	6.9	13.6
Psychological Record	2.7	1.6	10.8	16.1	9.8	12.5	0
Psychological Reports	0.6	1.0	0.9	1.5	2.4	1.6	3.0

in the Schools, 6.9% for the *American Educational Research Journal*, 6.7% for *Exceptional Children*, 5.0% for the *American Journal of Mental Deficiency*, 4.6% for the *Journal of Special Education*, 4.0% for the *Journal of Learning Disabilities*, and 1.7% for the *Journal of Educational Psychology*. Increases in applied operant work over time appear evident for

Mental Retardation, *Journal of Learning Disabilities*, and *Psychology in the Schools* (see Table 1). The penetration of operant procedures in education, special education, and retardation has been relatively great.

Miscellaneous. The journals grouped under "miscellaneous" represent select areas where only one or two journals were sampled. "Gen-

eral psychology" was represented by *Psychological Record* and *Psychological Reports*, which include research in a wide range of areas. The *Psychological Record* has been considered an important outlet for laboratory and applied operant work (Krantz, 1971). Speech and hearing were represented by the *Journal of Speech and Hearing Disorders*; counselling was represented by the *Journal of Counselling Psychology*; correction and law enforcement was represented by *Corrective and Social Psychiatry* and the *Journal of Research in Crime and Delinquency*.

The means of applied operant investigations were: 9.5% for the *Journal of Speech and Hearing Disorders*, 7.6% for *Psychological Record*, 2.7% for *Corrective and Social Psychiatry*, 2.6% for the *Journal of Research in Crime and Delinquency*, 2.1% for the *Journal of Counseling Psychology*, and 1.6% for *Psychological Reports*. The *Journal of Speech and Hearing Disorders* and *Psychological Record* showed some years with relatively high rates of applied operant studies.

Summary

Overall, the above data indicated that applied operant work has increased in a few journals such as the *Journal of Behavior Therapy and Experimental Psychiatry*, *Journal of Learning Disabilities*, *Mental Retardation*, and *Psychology in the Schools*. No clear data suggest that journals are systematically decreasing their publication of applied operant work over time. The above analysis suggests that operant techniques have been applied across diverse disciplines as reflected in several major journals. While no area appears free of applications of operant techniques, certainly education, special education, and mental retardation have been penetrated to a greater extent than other areas by these techniques.

Applied Behavior Analysis

The definition of applied operant work in the above analysis did not include a qualitative eval-

uation of the methodology evinced by the studies. In making this classification originally, it was difficult to ignore the tremendous variability of articles in terms of experimental rigor. Thus, a finer evaluation was made to provide information about the methodological standards met by applied operant studies in various journals. The present analysis was based upon all of those articles in the previous analysis that were classified as examples of applied operant work.

On methodological grounds, it may be important to distinguish between the (mere) use of operant techniques to change behavior and applied behavior analysis. Applied behavior analysis has been characterized by specific requirements of design, evaluation, and assessment. In a clinical "case", one might apply "reinforcement" to change a particular behavior. However, this should be distinguished from the application of techniques that include experimental design and careful evaluation.

The present analysis examined whether investigations included in the previous analysis met basic methodological standards typically employed in applied behavior analysis research. The criteria employed for this analysis were based upon the widely practised research methodology employed (*cf.* Sidman, 1960) and discussed in JABA (*e.g.*, Baer *et al.*, 1968; Bijou, Peterson, and Ault, 1968; Kazdin, 1973), as well as specific guidelines recommended to JABA authors with regard to response assessment (*cf.* JABA, 1969, page 1). Specifically, applied operant studies were classified as to whether they met minimal standards usually met by applied behavior analysis investigations.

To be counted as "meeting the standards", an investigation had to employ an *intrasubject replication design* (*e.g.*, reversal, multiple baseline, multiple schedule) to evaluate the experimental intervention. Investigations employing between-group designs were counted as meeting the standard only if an intrasubject replication design was provided at some point (*e.g.*, ABAB design for one of the groups). For example, in a study with two or more groups, at least one

group had to be exposed to the conditions so that a functional relation could be determined (*cf.* Bolstad and Johnson, 1972; Kaufman and O'Leary, 1972 for examples in JABA). Thus, the initial criterion for this analysis pertained to the experimental design. By invoking a design criterion, single-case experiments (where causal knowledge about treatment interventions could be obtained) were distinguished from mere applications of operant procedures for clinical purposes (which might be seen in an unevaluated "case study").

A second criterion for classifying studies as meeting standards of applied behavior analysis was the assessment of *reliability* of the behavior observed. The study had to assess quantitatively reliability somewhere in the design for at least one of the dependent measures employed (if several measures were used). The reliability criterion was obviated when a dependent measure (at least one) in the study was automatically recorded with equipment (*e.g.*, EEG, plethysmography) or was a response-duration measure or weight (when these were assessed by an experimenter).

The present analysis included articles classified as applied operant work in the previous analysis. The percentage of articles of those that were applications of applied operant work meeting the design and assessment standards was examined.¹⁰ Thus, if a journal had five of

its total articles of applied operant work for a given year, but four of these met the design and reliability requirements outlined above, the data for that year would be 80% (by the formula, total articles meeting standards over total articles of applied operant work, multiplied by 100).

The data for this analysis are presented in Table 2. The data for JABA provide a preliminary check on the criteria employed. As is obvious from Figure 4, JABA showed a high proportion of articles that met design and assessment standards. The mean percentage of investigations across all years was 78.9%. The high proportion comes as no surprise and is mentioned in passing in part to support the discriminability of the classification system for this analysis.

Behavior modification. Other behavior-modification journals revealed interesting data. The mean percentages of applied operant investigations meeting design and assessment criteria were 40.3% for BT, 27.5% for JBTEP, and 16.7% for BRT. Some trends can be detected by the annual percentages (see Figure 4). Since the inception of BT, the percentage of investigations that met design and reliability criteria has increased. Indeed, each year showed an improvement over the previous year. Similarly, for BRT, there has been an increase in the studies meeting the criteria. Finally, JBTEP showed no change over the last few years and a slight drop since the first 2 yr of the journal's inception in the articles meeting the criteria.

The data for the percentage of studies meeting the criteria of design and assessment for the three non-JABA behavior-modification journals must be viewed in conjunction with earlier data on the percentage of applied operant studies (Figure 3). Those data indicated that only JBTEP showed a slight increase in the number of applied operant articles. Yet, the percentage of these articles meeting rigorous design and assessment criteria has decreased slightly. It should be noted that JBTEP publishes a large number of "case reports" where

¹⁰Reliability for this analysis was assessed by having two raters independently classify applied operant articles employed in the previous analysis as meeting or not meeting the standards for assessment and design. Reliability was computed by dividing agreements by the total number of agreements and disagreements and multiplying by 100. For this analysis, an agreement was scored when both raters considered a given applied operant study as "meeting the standards". A disagreement was scored when one rater considered the article as "meeting the standards" and the other did not. Both raters frequently agreed that a given article did not meet the standards. However, these instances were not included as agreements in the computation of reliability because the high rate of these "nonoccurrences" of the target class could inflate reliability. Using the above reliability formula, agreement between two raters across 13 different journals was 94.0%.

Table 2
Percentage of Applied Operant Articles Meeting Design and Assessment Criteria

	1968	1969	1970	1971	1972	1973	1974
BEHAVIOR MODIFICATION							
JABA	86.7	82.1	72.7	72.4	70.5	86.7	81.3
Behavior Therapy			28.6	33.3	42.1	42.9	54.5
Behaviour Research & Therapy	13.0	11.8	0	16.7	21.4	20.8	33.3
J. Behavior Therapy & Exp. Psychiat.			33.3	38.9	21.1	22.2	22.2
PSYCHIATRY							
Am. J. Orthopsychiatry	—	—	0	100.0	0	0	0
Am. J. Psychiatry	0	0	0	0	0	0	0
Archives of General Psychiatry	100.0	0	50.0	0	0	66.7	100.0
J. Child Psychol. & Psychiatry	0	0	—	—	0	—	0
J. Nervous & Ment. Dis.	0	0	—	25.0	—	33.3	—
CLINICAL PSYCHOLOGY							
J. Abnormal Psychology	0	14.3	0	0	20.0	16.7	0
J. Clinical Psychology	—	—	0	0	25.0	—	0
J. Consult. & Clin. Psychol.	0	0	25.0	0	60.0	40.0	40.0
EDUCATION, SPECIAL EDUCATION, MENTAL RETARDATION							
Am. Educational Res. J.	0	0	0	0	0	0	0
Am. J. Mental Deficiency	0	0	0	38.5	40.0	100.0	100.0
Exceptional Children	33.3	16.7	44.4	0	0	—	50.0
J. Educational Psychol.	0	0	0	0	0	50.0	—
J. Learning Disabilities	0	—	0	0	0	50.0	0
J. Special Education	40.0	0	0	—	0	0	0
Mental Retardation	0	0	14.3	12.5	27.3	10.0	0
Psychology in the Schools	0	0	0	0	11.1	28.6	28.6
MISCELLANEOUS							
Corrective and Social Psychiatry	—	—	—	0	—	0	100.0
J. Counseling Psychol.	0	—	0	0	0	0	0
J. Research Crime & Delinquency	—	—	0	0	—	—	0
J. Speech & Hearing Dis.	0	0	12.5	20.0	50.0	0	0
Psychological Record	0	0	42.9	30.0	33.3	25.0	—
Psychological Reports	0	0	25.0	0	30.0	37.5	25.0

— Open spaces indicate that data could not be completed because no applied operant investigations were reported for that year.

operant procedures are employed but in many cases apparently not systematically evaluated. In any case, the data in Figure 4 show that the methodological requirements for applied operant work employed by JABA are increasingly

met in investigations in other behavior-modification journals, with JBTEP as an exception.

Psychiatry. Psychiatry journals revealed a low percentage of studies meeting the design and assessment criteria (see Table 2). Indeed, the

Fig. 4. Applied operant articles in behavior-modification journals meeting assessment and design criteria.

modal annual percentage across all journals was zero. The means were 45.2% for *Archives of General Psychiatry*, 20% for the *American Journal of Orthopsychiatry*, 14.6% for the *Journal of Nervous and Mental Disease*, and 0% for both the *American Journal of Psychiatry* and the *Journal of Child Psychology and Psychiatry*.¹¹ Of the few investigations of ap-

plied operant techniques, only a small percentage across all psychiatry journals met the criteria of applied behavior analysis.

study for that year. Second, because there were many years for the psychiatry journals in which the journals had no applied operant investigations, the present analysis was not applicable. That is, it was not possible to compute the percentage of investigations applying operant techniques that met design and assessment criteria because there were no operant investigations. The net effect of these two considerations was that the psychiatry data did not provide stable estimates (*e.g.*, means). On the other hand, these limitations reflect the paucity of applied operant work.

¹¹Nonzero means of the psychiatry journals were spuriously variable for two reasons. First, in some instances, a journal was scored as having 100% of its applied operant articles as meeting the design and assessment criteria in a given year. Yet, this percentage may have been achieved as a function of only one

Clinical psychology. The mean percentages of investigations in clinical psychology journals meeting the design and assessment criteria were 23.6% for the *Journal of Consulting and Clinical Psychology*, 7.3% for the *Journal of Abnormal Psychology*, and 6.3% for the *Journal of Clinical Psychology*. Interestingly, the *Journal of Consulting and Clinical Psychology* showed an increase in studies meeting design and reliability criteria over the last few years.

Education, special education, and mental retardation. The mean percentages of investigations meeting the criteria differed dramatically across journals. The mean percentages were 39.8% for the *American Journal of Mental Deficiency*, 24.1% for *Exceptional Children*, 9.8% for *Psychology in the Schools*, 9.2% for *Mental Retardation*, 8.3% for both the *Journal of Educational Psychology* and the *Journal of Learning Disabilities*, 6.7% for the *Journal of Special Education*, and 0% for the *American Educational Research Journal*.

Over the years sampled (see Table 2), the *American Journal of Mental Deficiency* and *Psychology in the Schools* showed distinct increases in the percentage of applied operant investigations that met design and assessment criteria. A trend in the opposite direction appears evident for *Exceptional Children* which, save for 1974, showed a zero percentage after relatively high percentages from 1968 through 1970.

Miscellaneous. With the journals in this group, diverse data patterns were evident. The mean percentages of applied operant investigations meeting design and assessment criteria were 21.9% for the *Psychological Record*, 16.8% for *Psychological Reports*, 11.8% for the *Journal of Speech and Hearing Disorders*, 0% for both the *Journal of Counseling Psychology* and the *Journal of Research in Crime and Delinquency*. The high mean percentage for *Corrective and Social Psychiatry* (33.3%) resulted from only one article meeting the standard across 7 yr. For the *Psychological Record*, there was an apparent increase over the last few

years in the studies meeting the criteria, relative to the first few years sampled (see Table 2). An exception to this was 1974 for *Psychological Record*, which provided no data (i.e., studies investigating applied operant procedures) for the present analysis.

Summary: Penetration of Applied Behavior Analysis

The above analyses provided data across disciplines and journals within a given discipline. Some journals have increased both in the application of operant techniques and in the adherence to methodological criteria employed by JABA. However, journals could be distinguished by the extent to which minimal design and assessment criteria of applied behavior analysis were invoked for acceptance for publication.

The data patterns for the behavior-modification journals were quite encouraging. In general, applied operant investigations increasingly met the minimal design and assessment standards of applied behavior analysis. Considering the data from both analyses, *Behavior Therapy* showed no change in the percentage of investigations that were applications of operant procedures but an increase in the percentage of these studies that met minimal design and assessment criteria of JABA. Similarly, *Behaviour Research and Therapy*, showed little change in the percentage of applied operant investigations, but an increase in the percentage of the studies that met design and assessment criteria. Finally, the most interesting pattern, noted for the *Journal of Behavior Therapy and Experimental Psychiatry*, revealed a slight increase in the percentage of applied operant studies and a slight decrease in the percentage of articles that met minimal design and assessment criteria since the inception of the journal.

There is a great deal of variability across the journals sampled, even within a given area of research and within a particular journal over time. The tremendously wide variability in the percentage of articles meeting minimal design

and assessment criteria for a given journal across years (e.g., *Journal of Speech and Hearing Disorders*, *Journal of Abnormal Psychology*) suggests that these criteria are not consistently applied in the journal review process for publication.

Various journals have published applied operant articles but have never met minimal design and assessment criteria of applied behavior analysis (e.g., *American Journal of Psychiatry*, *Journal of Child Psychology and Psychiatry*, *American Educational Research Journal*, and the *Journal of Counseling Psychology*). If the more important characteristic of applied behavior analysis is its methodological stance, rather than its adherence to a set of techniques and principles derived from a particular "theory", this is not reflected in much of the applied literature. Operant techniques have made markedly greater penetration than the methodology, at least in some journals.

LIMITATIONS OF THE DATA ANALYSES

The present analyses were limited by a number of factors, some of which were due to archival data in general and others to possible errors of choice (e.g., sampling of disciplines and journals). Possible limitations include the period of time sampled, the journals selected, and the conclusions made from classifying operant investigations alone.

Period of time sampled. The data relied upon were limited to the period 1968 through 1974. The time span was selected because it corresponded to the period in which JABA has been published. Yet, almost all of the journals sampled have been in existence long before 1968. In making claims about "trends" in these journals, the relatively short period sampled may partially distort the conclusions. However, extending the time span earlier than 1968 for most journals probably would not have led to markedly different conclusions about trends. Indeed, the conclusions reached about changes

over time may have been more obvious because of a protracted history of zero or relatively few instances of applied operant work.

Journal selection. The number of journals and the particular ones selected are an obvious source of potential bias. Journals important to a given discipline sampled may have been omitted. However, some journals that were examined in different areas were excluded from the final report because of having virtually no applied operant studies. Many of the journals examined in the present study had a similar low rate but were included because they were considered to be major journals in established areas (e.g., *Archives of General Psychiatry*). Despite the intent to cover diverse areas, no doubt journals were excluded through an oversight. A broader criticism can be made of the journal selection. With few exceptions, selection was restricted to journals published in the United States. Certainly, it would be of great interest to evaluate the international impact of applied behavior analysis by systematically examining foreign publications.

Classification of research. The major portion of the paper examined whether applied operant investigations met design and evaluation standards set by JABA. A number of journals showed an increasingly greater proportion of the applied operant studies meeting these standards. In general, it is likely that the number of articles submitted to virtually all journals is increasing. The increased submission rates no doubt are associated with increased rejection rates, because many journals are not free to increase the number of articles accepted (due to journal space limitations). The greater the rejection rate, the less likely that methodologically "weak" studies are accepted for publication. Thus, there may be a "natural selection" of superior studies across diverse areas of research and not only in applied operant work. The conclusions made earlier about the percentage of studies meeting design and assessment standards (within the limitations of the definitions) remain accurate. However, improvements in

method may characterize all articles across diverse areas of research and not just applied operant investigations. The quality of investigations published in general with respect to methodology and assessment may be improving.

CONCLUSION

The citation characteristics of JABA and other behavior-modification journals indicated that JABA relies relatively heavily upon its own research. Although JABA does not appear to be increasingly isolated from research in other behavior-modification journals, there is little question that the journal has achieved a high degree of specialization. The penetration data indicated that a number of journals have published few or no articles employing operant techniques or methodology. Simply stated, JABA has not penetrated various sources for which its content and methodology are relevant. On the other hand, in the last few years, select journals have increased in the proportion of investigations applying operant techniques and/or meeting minimal standards of assessment and design that characterize JABA investigations. Thus, a corpus of non-JABA research that might be of interest to JABA audiences is developing.

The penetration of operant techniques and methods into diverse areas of research may make it difficult for most investigators to keep informed of research outside of JABA and perhaps one or a few other journals. Of course, it is virtually always difficult to keep fully informed of a given research literature. Yet, this may be especially problematic for research in applied behavior analysis. Applied behavior analysis itself is not a discipline but reflects a methodological approach to the evaluation of data and focus of intervention. The research crosses several disciplines. It is likely that any individual who conducts applied behavior analysis is trained in one discipline (*e.g.*, psychology) and is relatively well informed of applied behavior analysis research published in the jour-

nals of that discipline (*e.g.*, *Psychological Record*). Individuals trained in a given discipline are not likely to subscribe widely to journals outside of their area, even though they might be vastly interested in keeping informed of innovative applied investigations not in JABA. Because these investigations have spread across diverse sources, it is difficult to be aware of them. Thus, potentially relevant research is not brought to the attention of JABA authors, thereby possibly sustaining the specialized and insular nature of JABA articles. Moreover, the specialization and relative lack of penetration may be exacerbated by JABA authors not realizing that publication outlets other than JABA exist for their work.

It might be useful to devise procedures whereby applied behavior analysis investigations not published in JABA are centralized in some fashion. Centralization of applied behavior analysis investigations might bring to the awareness of JABA authors and readers the methodologically sound research available in other sources.¹² Bringing other sources and specific investigations in the area to the attention of JABA authors and readers might increase the diversity of sources upon which JABA authors draw than currently is the case. (It also might encourage JABA authors to submit their investigations to other journals which are possible outlets for their research.) If JABA authors drew upon a greater diversity of sources in their own research reports, these reports might interest a wider range of colleagues (*i.e.*, non-JABA readers) and be interpreted as having wider relevance. Perhaps the impact of applied behavior

¹²It is beyond the scope of the present paper to detail specific suggestions for remedying or ameliorating the relative isolation and inconsistent penetration of applied behavior analysis. Several procedures that might be useful include abstracting or simply listing in JABA high caliber applied behavior analysis investigations published in other sources, reprinting particularly innovative articles, encouraging authors to review research from diverse sources in the introduction of their articles, to mention only a few alternatives that might be used.

analysis upon specific disciplines can be augmented by first allowing work from diverse disciplines and publication sources to have greater impact upon applied behavior analysis investigations published in JABA.

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