Representation of Behavioral Methodology in Experimental Psychology Textbooks

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Fourteen experimental psychology textbooks from eight publishers were reviewed to determine the coverage of behavioral research methods. The texts varied greatly in their presentation of behavioral research methods. All devoted a relatively small number of pages to behavioral methods, and only three texts presented examples of nonhuman animal research in addition to applied research.

Key words: textbooks, research, methods, representation, functional analysis

As will be familiar to most readers of this journal, *behavior analysis* may be defined, at least in part, by how it interprets behavioral phenomena and by its method of scientific investigation. Behavior analysts seek explanations “in the history of behavior–environment interactions, with the eventual goal being parsimonious, quantitative explanations based on a small number of principles. These principles are described in terms of factors that are subject (at least in principle) to direct experimental manipulation” (Branch, 1992, p. 1). Behavior is “dealt with . . . solely at the level of behavior . . . [with] no reference to intervening events” (Skinner, 1935, p. 60).

That is, the interpretation of behavior is a direct product of its scientific method. As stated on the inside front cover of every issue of the *Journal of the Experimental Analysis of Behavior (JEAB)*, the experimental analysis of behavior is concerned with “experiments relevant to the behavior of individual organisms.” Indeed, researchers in other areas of psychology (e.g., biofeedback) have argued that single-subject methodology may be the most appropriate research paradigm to answer the questions asked by their discipline (Bandeira, Bouchard, & Grang-

er, 1982).¹ Journals such as *Experimental and Clinical Psychopharmacology*, *Psychophysiology*, and *Biofeedback and Self-Regulation* are replete with experiments that use behavior-analytic methodology. Thus, it is not only reasonable but important to consider how this methodology is being presented to students in experimental methods textbooks.

METHOD

Sample

Review copies of the most recent edition of the available undergraduate experimental methods textbooks were requested from the major publishers of psychology textbooks. Sixteen experimental psychology textbooks were received. One book (Solso & Johnson, 1989) was eliminated because of its unconventional format. Two books were coauthored by the same authors in different order. The Kantowitz, Roediger, and Elmes (1994) version was eliminated because the majority of material was covered in chapters on spe-

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¹ This article is not meant to imply that anyone who uses a group design is not a behavior analyst, or that anyone who uses behavioral research methodology is necessarily a behavior analyst. Any researcher can conduct a group design experiment and give an environment-based behavior-analytic interpretation of the results. However, any honest reading of the history and current state of behavior analysis reveals clearly that behavior analysis rests on the functional analysis of the behavior of individual organisms as its scientific foundation.

cific topics, (e.g., psychophysics, social influence, etc.). The resulting sample consisted of 14 textbooks. (Elimination of a textbook was not meant to imply that the textbook was or was not a suitable textbook for any course, only that it was not possible to evaluate it by the same criteria as the other textbooks.)

Procedure

All texts were reviewed for coverage of behavioral research methods. For the purposes of the review, behavioral methods were defined according to two criteria: (a) There is systematic manipulation of independent variables under the control of the experimenter, and (b) the primary data are the behavior of individual organisms and are collected and preserved as such.

Here, the terms *quasi-experimental*, *experimental*, *quasi-behavioral*, and *behavioral* experimental designs need to be clarified. In what many psychologists consider to be the classic experimental methods textbook,² Campbell and Stanley (1963) differentiated between experimental and quasi-experimental designs. Experimental designs are "that portion of research in which variables are manipulated and the effects upon other variables observed" (p. 1). Quasi-experimental designs are those in which "full experimental control is lacking" (p. 34). Therefore, a true behavioral experiment meets the requirements of true experimental designs but has an additional requirement; the second criterion above. By the same token, a design may be a true experimental design but only a quasi-behavioral design if this criterion is not met. In other words, "behavior exists only between individual organisms and

their environments, and in order to be effective, experimental methods must respect this biological fact" (Johnston, 1988, p. 2). Likewise, a case study or life-history interview, although perhaps concerned with individual behavior, is not considered to be a behavioral research method because each violates the first criterion above (for further discussion, see Johnston & Pennypacker, 1993). All textbooks referred to behavioral research methods in sections or chapters on research with one or a small number of subjects.

The extent of coverage of behavioral methods in these textbooks was determined by the following: (a) the number of pages devoted to behavioral methods, (b) the percentage of pages of total text devoted to behavioral methods, (c) the number of pages devoted to experimental and quasi-experimental group-comparison designs, and (d) the percentage of pages of total text devoted to experimental and quasi-experimental group-comparison designs.

The breadth of coverage of behavioral research methods was evaluated according to (a) the number of specific behavioral designs covered (e.g., designs meeting the two criteria above). If a design was altered in any way, it was counted as a different design. For example, if a book described an ABA design and an ABAB design, it was counted as two designs. Likewise, if a text included multiple baseline designs across subjects, behaviors, and situations, it was counted as three designs. (b) The type of referenced research examples given. The classification of behavioral methods was evaluated according to the title of the chapter or section in which behavioral methods were covered. Quotes were recorded from the textbooks as examples of how behavioral methods were presented. The quotes are incorporated into the discussion below.

RESULTS AND DISCUSSION

Table 1 lists the textbooks reviewed and the chapter titles in which behav-

² Although Campbell and Stanley (1963) may be the classic textbook in experimental psychology, behavior analysis certainly has different works that are considered to be classic in the presentation of behavioral research methods, specifically Sidman's (1960) *Tactics of Scientific Research*. Johnston and Pennypacker's (1993) textbook holds a similar position. Perhaps Skinner (1956) provides the clearest presentation of how behavioral research is conducted.

TABLE 1

Textbooks and chapter title

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- Agnew, N. M., & Pike, S. W. (1994). *The science game*. Englewood Cliffs, NJ: Prentice Hall. "Statistical foundations II: Prediction."
- Bordens, K. S., & Abbott, B. B. (1991). *Research design and methods: A process approach* (2nd ed.). Mountain View, CA: Mayfield. "Using single-subject designs."
- Christensen, L. B. (1994). *Experimental methodology* (6th ed.). Needham Heights, MA: Allyn & Bacon. "Single-subject research designs."
- Cozby, P. C. (1993). *Methods in behavioral research* (5th ed.). Mountain View, CA: Mayfield. "Types of experimental designs."
- Elmes, D. G., Kantowitz, B. H., & Roediger H. L., III. (1992). *Research methods in psychology* (4th ed.). St. Paul, MN: West. "Small-N experimentation."
- Leary, M. R. (1995). *Introduction to behavioral research methods* (2nd ed.). Pacific Grove, CA: Brooks/Cole. "Single-case research."
- McBurney, D. H. (1994). *Research methods* (3rd ed.). Pacific Grove, CA: Brooks/Cole. "Single-subject experiments."
- McGuigan, F. J. (1993). *Experimental psychology* (6th ed.). Englewood Cliffs, NJ: Prentice Hall. "Experimental design: Single-subject research."
- Martin, D. W. (1991). *Doing psychology experiments* (3rd ed.). Pacific Grove, CA: Brooks/Cole. "How to plan a single-variable experiment."
- Ray, W. J. (1993). *Methods* (4th ed.). Pacific Grove, CA: Brooks/Cole. "Single-subject designs."
- Reaves, C. C. (1992). *Quantitative research for the behavioral sciences*. New York: John Wiley & Sons. "Quasi-experimental research."
- Rosnow, R. L., & Rosenthal, R. (1993). *Beginning behavioral research, a conceptual primer*. New York: Macmillan. "Quasi-experimental designs."
- Schweigert, W. A. (1994). *Research methods for psychology*. Pacific Grove, CA: Brooks/Cole. "Single-subject designs."
- Shaughnessy, J. J., & Zechmeister, E. B. (1994). *Research methods in psychology* (3rd ed.). New York: McGraw-Hill. "Single-case research designs."
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ioral research methods are discussed. Data on the extent and breadth of coverage are summarized in Tables 2 and 3, respectively. Comparatively few pages were devoted to the coverage of behavioral methodology in any experimental methods textbook, from a low of 0.05% and to a high of 6.8%. In contrast, coverage of experimental and quasi-experimental group methods ranged from a low of 7.0% to a high of 35.0% (Table 2).

There was high variability in terms of how much information was presented about behavioral methods (Table 3). The number of designs covered ranged from a high of six (Schweigert, 1994) to a low of one (Martin, 1991). The number of referenced research examples ranged from zero (Agnew & Pike, 1994; Martin, 1991) to nine (Christensen, 1994). All texts that provided research examples included research using human participants. Only three texts (Bordens & Abbott, 1991; Leary, 1995; McBurney, 1994) cited nonhu-

man animal research. Eleven texts included examples from special populations (e.g., blind, hyperactive, mentally retarded, or schizophrenic subjects).

Quotes revealed a range of presentations of behavioral research, from favorable to unfavorable. The most inaccurate presentations of behavioral research were in those texts that mistakenly identify behavioral research as nonexperimental. Rosnow and Rosenthal (1993) write that "these designs usually seem to belong more within the quasi-experimental (and sometimes pre-experimental) category" (p. 169). Reaves (1992) suggests that "it tends to be used more for illustration and demonstration than for proof" (p. 208). Conversely, Bordens and Abbott (1991) accurately state that "understanding a particular behavior means knowing what variables control the behavior and what functional relationships exist between these variables and the behavior. To be useful to psychologists, this understanding must be ap-

TABLE 2

Extent to which undergraduate experimental textbooks cover behavioral research methods

Text	Behavioral methods		Group designs	
	Number of pages	Percentage of text	Number of pages	Percentage of text
Agnew & Pike	4	1.1	47	13
Bordens & Abbott	36	5.6	78	14
Christensen	38	6.8	58	10
Cozby	4	1.3	22	7
Elmes et al.	26	6.4	53	13
Leary	15	3.6	113	27
McBurney	32	4.4	85	17
McGuigan	23	6.0	128	35
Martin	7	2.4	60	21
Ray	11	2.3	61	13
Reaves	7	1.9	61	16
Rosnow & Rosenthal	2	0.5	36	9
Schweigert	18	3.9	147	34
Shaughnessy & Zechmeister	14	2.8	130	26

TABLE 3

Referenced research examples and number of designs covered

Author(s)	Examples given	Designs covered
Agnew & Pike	None	2
Bordens & Abbott	Avoidance schedules, discrimination, desensitization, schedule effects, signal detection	5
Christensen	Classroom behavior, phobias, caffeine consumption, token economies, play behavior, industrial hazards, inattention, noncompliance, nursing home behavior	8
Cozby	Seatbelt wearing, bus riding	5
Elmes et al.	X-ray detection, hyperactivity, multiple personality, acupuncture, excessive crying, pain threshold	3
Leary	Disruptive behavior, cocaine and rat behavior, stuttering	4
McBurney	Scratching behavior, bed making, dark adaptation, hyperventilation, psychophysics	5
McGuigan	Excessive crying, hair twirling, exercise, talking out, independent play, periodontal disease	6
Martin	None	1
Ray	Baseball hitting, problem behavior, schizophrenia, memory	4
Reaves	Worker productivity, reading problems	5
Rosnow & Rosenthal	Disruptive behavior	3
Schweigert	None	5
Shaughnessy & Zechmeister	Facial screening, coaching, MR language, instruction compliance, shyness	5

plicable to individuals" (p. 281). Likewise, Cozby (1993) notes that "single-subject procedures are clearly experimental" (p. 97).

When compared with the coverage of group-comparison designs, the coverage of behavioral methods is meager. The comparisons in Table 2 are somewhat conservative. Much of the total content of experimental books centers on issues that are largely relevant to group designs, such as assignment procedures and inferential statistical analysis. In the texts we examined, the breadth of coverage was quite variable (Table 3). Conspicuously absent was any discussion of the vast range of topics (e.g., learning, behavioral economics, foraging, human and nonhuman choice behavior, human factors, language acquisition, stimulus equivalence, drug discrimination, psychopharmacology, stimulus control) for which behavioral designs are not only useful but often the most appropriate. Failure to include examples representative of this rich diversity may result in students being unaware of, or only vaguely familiar with, the range of behavioral research methods and applications available.

To their credit, some authors point out the wide applicability of behavioral methods. Bordens and Abbott (1991) state that "Today the approach is widely accepted, and experiments using it can be published in most reputable psychology journals" (p. 282). Elmes, Kantowitz, and Roediger (1992) conclude "you should not be misled into thinking that the use of small-*n* experiments is limited" (p. 164). McGuigan (1993) argues that "the problems of generalizing are essentially the same for both single-participant methodology and for group designs" (p. 234).

A crucial component in accurately presenting behavior analysis is to ensure the appropriate representation of the methodology used in behavioral research. The low percentage of pages on behavioral methods in textbooks may create "a negative view . . . that the study of an individual subject was

somehow 'unscientific' and that 'real science' was performed only with groups of individuals," based on the tradition of inferential statistics (Ray, 1993, pp. 298–299). This erroneous view is perpetuated by Christensen (1994), who suggests that "only multisubject designs are capable of establishing causal relationships" (p. 381). Likewise, Agnew and Pike (1994) suggest that one reason why single-case research is supposedly ill-respected is that "widely accepted statistical tests that would give us added confidence in whatever changes we see between baseline and treatment observations are lacking" (p. 264).

Some authors erroneously make direct statements about the limited utility of behavioral methods. For example, as Christensen (1994) quotes Cronbach (1975), "The results of the [small-*n*] study can be generalized only to another identical organism in the same controlled setting" (p. 384). He also concludes that "the single-subject experiment should serve only as a mapping device and not as a final indication of causality" (p. 384). Martin (1991) erroneously limits the use of behavioral methods based largely on limited applicability (pp. 99–100). Shaughnessy and Zechmeister (1994) claim that "The $N = 1$ experiment is usually not appropriate for examining the effect of interactions among variables" (p. 320).

A number of authors do accurately emphasize the advantages of behavioral methods. Bordens and Abbott (1991) point out the strength of behavioral methods, noting that "the single-subject approach strongly encourages you to identify these sources of behavioral control. The group approach does not, as the effects of the sources are hidden from view during the averaging process" (p. 289). Some authors also point out the appropriateness of behavioral designs for answering questions about individual behavior (and the inappropriateness of group-comparison designs). Martin (1991) suggests that "the major advantage of a baseline experiment is that it gives us a powerful

way of looking at the single subject's behavior" (p. 97). Similarly, McGuigan (1993) accurately concludes that, "conclusions gained from [group designs] rest on group means that may be misleading for individuals" (p. 235).

As Morris (1985) noted, "Behavior analysts have too often heard from supposedly knowledgeable peers that behavior analysis is a quaint anachronism of but minor historical importance" (p. 98). This is reflected in texts that imply that behavioral research methods were used for a brief period of time (from approximately 1938 with the publication of *The Behavior of Organisms* to the 1960s when Sidman's *Tactics of Scientific Research* was widely used). McBurney (1994), in a historical review, points out that statistically based "techniques dominated psychology research to such an extent that the single subject tradition almost disappeared for several decades" (p. 277), but accurately acknowledged the renewed popularity of behavioral methods.

The fact that research using a small number of subjects has a rich history is frequently overlooked by these textbook authors, and the point is lost that many of the most important findings in the history of psychology have resulted from the use of these designs (Johnston & Pennypacker, 1993, p. 322).

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