RESEARCH ARTICLE





Essential Readings for Undergraduate Students in Behavior Analysis: A Survey of Behavior Analytic Faculty and Practitioners

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Abstract

A growing need for individuals with behavior analytic training at the undergraduate level has led to an increase in baccalaureate programs with a strong behavior analytic focus. Although research has been conducted examining essential and assigned readings at the graduate level, no research to date has focused on identifying suggested readings that should be a focal point of undergraduate training programs. The purpose of the present study was to identify what individuals from across the behavior analytic field believe are essential readings for undergraduate students as they prepare for employment in the field or admission into graduate programs. Respondents were asked to provide answers to a variety of questions about essential readings in the field and whether these would be critical to undergraduate training. This paper presents those texts that were deemed essential, as well as areas where opinions varied.

Keywords Behavior analysis · Undergraduate students · Instruction · Higher education · Teaching · BACB® · BCaBA®

One of the hallmarks of any training program is the associated readings that are considered essential to learn about elements such as philosophical positions, defining characteristics, and evidence-based procedures. While behavior analysis is considered young in comparison to related disciplines in the fields of psychology and education, the literature is vast. However, knowing which of these resources is considered to be an essential element of training programs is critical not only for those who may be developing and maintaining training programs, but for those who interact and employ graduates of these programs.

Saville, Beal, and Buskist (2002) published a study that surveyed editorial board members from the two flagship journals in the field of behavior analysis (i.e., *Journal of Applied Behavior Analysis* and *Journal of Experimental Analysis of Behavior*) to determine essential behavior analytic journal articles, behavior analytic books, as well as

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nonbehavioral journal articles and books for graduate training programs. Results of the survey provided a compilation of these resources and serves as a guide for critical readings in the field. While comprehensive in nature, the survey was limited to only editorial board members from two journals in the field and only had about one third of a response rate.

Pastrana et al. (2016) conducted a survey to gain a broader perspective on readings in the field in which they analyzed syllabi of behavior analysis training programs to generate a list of frequently assigned readings. A total of 20 Behavior Analyst Certification Board_® (BACB®) approved course sequences¹ at the graduate level (i.e., Board Certified Behavior Analysis (BCBA®) pre-approved course sequences) and their respective syllabi were included for analysis based on a combination of total individuals who took the BCBA exam for the first time and a minimum pass rate (i.e., 80%) between 2013 and 2014. Results of their examination yielded eight different lists of frequently assigned readings in the field and respective content areas (e.g., concepts and principles of behavior analysis, singlesubject methodology).

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¹ BACB-approved course sequences are now referred to as verified course sequences. The use of the term "approved course sequence" is used in this paper when referencing data that predates the change to the new terminology.

While both the Saville et al. (2002) and Pastrana et al. (2016) articles are valuable resources for those involved with behavior analysis graduate training and the products of such programs, their findings may not be relevant to those involved with training individuals at the undergraduate level. As the field of behavior analysis continues to grow, the development of additional behavior analytic training programs at the undergraduate level has followed suit. In 2001, the first year that course sequences were approved by the BACB, there were no approved course sequences offered at the Board Certified Assistant Behavior Analyst (BCaBA®) level. Two years later, the first 12 BCaBA approved course sequences had received approval at the undergraduate level. As of May 2017, 120 institutions worldwide are now approved by the BACB at the BCaBA level. While this number is not indicative of all undergraduate programs in behavior analysis that exist, or that have a strong emphasis in behavior-analytic training at the undergraduate level, it is a quantifiable and published number that suggests the overall growth in training programs at the baccalaureate level over the past 16 years. With increasing demands in the field of behavior analysis (e.g., legislation changes, international program development, growing need for skilled practitioners), more individuals have been charged with the development and maintenance of undergraduate behavior-analytic training programs, or the hiring and supervision of graduates from these programs. Therefore, having a resource to guide what may be considered essential readings in the behavior-analytic field at the undergraduate level is warranted. Thus, the purpose of the present study was to identify readings that faculty, practitioners, and employers in behavior analysis consider to be essential for students during their undergraduate training.

Method

Participants and Procedure

An email request for participation was sent to the editors of the following journals: *Behavior Analysis in Practice, Behavior Analysis: Research and Practice, Behavior Analysis Today, Journal of Applied Behavior Analysis, Journal of Behavioral Education, Journal of the Experimental Analysis of Behavior, Journal of Organizational Behavior Management, The Analysis of Verbal Behavior,* and *The Behavior Analyst.* Requests were also sent to the board of directors at the Association for Behavior Analysis International (ABAI), Association for Professional Behavior Analysts (APBA), and the Behavior Analyst Certification Board (BACB). Additionally, emails were sent to the points of contact for all Approved Course Sequences (BCBA and BCaBA) approved by the BACB. A recruitment email was also sent to all BCBAs and Board Certified Behavior Analysts-Doctoral® (BCBA- Ds) who agreed to be contacted through the BACB registry. Lastly, an announcement was posted on the Teaching Behavior Analysis (TBA-L) listserv recruiting participants for the study.

Materials

After providing informed consent, participants were asked a series of demographic questions related to their professional experience (e.g., Do you teach behavior analytic courses, and if so at what level? Are you a practitioner delivering behavior analytic services? Are you involved in the recruiting/hiring of behavior analytic practitioners? What was your highest degree earned?). Participants were also asked to identify if they were a behavior analytic journal editor; a member of a board of directors for the BACB, APBA, or ABAI; and to select their primary area(s) of interest (e.g., Autism, Developmental Disabilities, Education, Experimental Analysis of Behavior, Verbal Behavior). Following the completion of the demographic questions, participants were asked to list up to 10 behavior analytic journal articles that they believed were "essential readings" for undergraduate students who were interested in pursuing graduate school or working in the discipline. Similarly, participants were also asked to list up to 10 behavior analytic books that they considered essential readings for undergraduates. No definition of "essential" was provided on the survey.

Results

Participant Demographics

Three hundred and fourteen participants were recruited to participate in this study. Because some individuals did not follow the instructions (e.g., listed journal titles and not article titles; did not list any article or book titles), we eliminated 87 participants, resulting in 227 useable surveys. Approximately 47% (n = 107) of participants obtained a doctoral degree, with 51.5% (n = 117) of the participants earning a master's degree, and 1.3% (*n* = 3) of respondents completing a bachelor's degree. Of those individuals (n = 180) who responded to the credentialing question, the majority of participants (63.3%; n = 114) were BCBAs. The remaining participants identified themselves as BCBA-Ds (n = 61), BCaBAs (n = 2), Registered Behavior Technicians[®] (RBTs; n = 1), or "other" (n = 2). The majority of participants (52.9%) work most frequently in early intervention or K-12 services for individuals with autism and other developmental disabilities.

One hundred five (46.2%) of the respondents indicated that they currently taught behavior analytic courses. Instructors' teaching responsibilities were relatively equal, with 35 (33.3%) individuals responsible solely for undergraduate courses, 37 (35.2%) teaching only graduate courses, and 33 (31.4%) serving as an instructor for both undergraduate and graduate courses. One hundred eighty-one (79.7%) participants identified themselves as current practitioners, with 69 of those individuals providing both behavior analytic services and course instruction. Lastly, 103 participants (45.4%) reported being responsible for hiring behavior analytic practitioners (e.g., BCBA-Ds, BCBAs, RBTs).

Behavior Analytic Journal Articles

When asked to identify up to 10 "essential" behavior analytic journal articles for undergraduate students, participants listed a total of 468 different articles. The top 10 articles listed by all respondents are presented in Table 1. A comparison of the top 10 articles listed by respondents across various demographic categories resulted in relatively few differences; areas in which there were statistically significant differences are described below.

Teacher-Practitioner A significant association was found between type of employment (i.e., teacher, practitioner, or teacher-practitioner) and the "essential" behavior analytic journal article by Stokes and Baer (1977), $\chi^2(3, n = 229) = 8.22, p =$ 0.04. In order to determine where the difference occurred between groups, post hoc analyses were conducted examining the adjusted residuals. An adjusted residual of 1.96 or more indicates that the number of cases in a cell is significantly larger than would be expected if the null hypothesis were true. An adjusted residual of -1.96 or more indicates that the number of cases in a cell is significantly smaller than would be expected if the null hypothesis were true. Post hoc comparisons of the adjusted residuals revealed that teacherpractitioners were significantly more likely to list the Stokes and Baer (1977) article (adjusted residual = 2.7) as an essential reading than teachers-only or practitioners-only.

Similarly, a significant association was found between type of employment and the "essential" behavior analytic journal article authored by Van Houten et al. (1988), $\chi^2(3, n = 229) = 9.55$, p = 0.02. Post hoc comparisons of the adjusted residuals revealed that teacher-practitioners were significantly more likely to list the Van Houten et al. (1988) article (adjusted residual = 2.7) as an "essential" reading than teachers-only or practitioners-only. See Table 2 for overall rankings of the top 10 articles based on the total number of citations across employment demographics.

Practitioners A significant association was found between practitioners and non-practitioners and the "essential" behavior analytic journal article by Carr and Durand (1985), $\chi^2(1, n = 229) = 5.49$, p = 0.02. Practitioners were significantly more likely to list the Carr and Durand article than non-practitioners.

A significant association was also found between practitioners and non-practitioners and the Van Houten et al. (1988) article, $\chi^2(1, n = 229) = 5.11$, p = 0.02. Practitioners were significantly more likely to list the article as an "essential" reading than non-practitioners.

Course Level Instruction With one exception, there was significant agreement overall in the top 10 essential behavior analytic articles based on teaching responsibilities. A significant association was found between teaching responsibilities (i.e., undergraduate, graduate, or undergraduate-graduate) and the "essential" behavior analytic journal article by Carr and Durand, $\chi^2(3, n = 229) = 11.52$, p = 0.003. Post hoc comparisons of the adjusted residuals revealed that undergraduategraduate teachers were significantly more likely to list the article (adjusted residual = 3.0) as an "essential" reading than undergraduate-only or graduate-only teachers; while graduate-only teachers were significantly less likely to list the Carr and Durand article (adjusted residual = -2.9) as an "essential" reading than undergraduate-graduate teachers or undergraduate-only teachers. Table 3 provides overall rankings of the top 10 articles based on the total number of citations by participants in this demographic.

Behavior Analytic Books

The top 10 behavior analytic books cited by all respondents are listed in Table 4. A total of 158 books were listed by participants. Similar to the top 10 articles cited by respondents, the majority of participants were largely in agreement with "essential" behavior analytic books that undergraduate students should read. Three areas of differentiation were noted based on demographic criteria and are described below.

Teacher-Practitioners A significant association was found between type of employment (i.e., teacher, practitioner, or teacher-practitioner) and the "essential" behavior analytic book by Cooper, Heron, and Heward (2007), $\chi^2(3, n = 229) = 8.04$, p = 0.04. Post hoc comparisons of the adjusted residuals revealed that practitioners-only were significantly more likely to list the Cooper book (adjusted residual = 2.5) as an essential reading than teachers-only or teacher-practitioners.

Practitioners Similarly, a significant association was found between practitioners and non-practitioners and the Cooper et al. (2007) text, $\chi^2(1, n = 227) = 5.82$, p = 0.02. While a number of non-practitioners cited the book as being "essential" for undergraduates, practitioners were significantly more likely to list the text than non-practitioners.

Hiring Responsibilities Differences based on whether the respondent's job required him/her to hire employees were minimal, with one exception. A significant association was found
 Table 1
 Rank of essential

 behavior-analytic journal articles
 suggested for undergraduate

 students
 students

Overall rank	Number of listings	%	Article title	
1	169	74.4	Baer, D. M., Wolf, M. M., & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. <i>Journal of Applied Behavior Analysis</i> , 1, 91–97.	
2	107	47.1	Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. <i>Journal of Applied Behavior Analysis</i> , 27, 197–209.	
3	48	21.1	Baer, D. M., Wolf, M. M., & Risley, T. R. (1987). Some still-current dimensions of applied behavior analysis. <i>Journal of Applied Behavior</i> <i>Analysis</i> , 20, 313–327.	
4	47	20.7	Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. <i>Journal of Applied Behavior Analysis</i> , 6, 1–27.	
5	46	20.3	Wolf, M. M. (1978). Social validity: the case for subjective measurement or how applied behavior analysis is finding its heart. <i>Journal of Applied</i> <i>Behavior Analysis</i> , <i>11</i> , 203–214.	
6	42	18.5	Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems throu functional communication training. <i>Journal of Applied Behavior</i> <i>Analysis</i> , 18, 327–383.	
7	34	15.0	Van Houten, R., Axelrod, S., Bailey, J. S., Favell, J. E., Foxx, R. M., Iwata, B. A., & Lovaas, O. I. (1988). The right to effective behavioral treatment. <i>Journal of Applied Behavior Analysis</i> , 21, 381–384.	
8	25	11.0	Bannerman, D. J., Sheldon, J. B., Sherman, J. A., & Harchik, A. E. (1990). Balancing the right to habilitation with the right to personal liberties: the rights of people with developmental disabilities to eat too many donuts and take a nap. <i>Journal of Applied Behavior Analysis, 23</i> , 79–89.	
9	18	7.9	Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. <i>Journal of Consulting and Clinical Psychology</i> , <i>55</i> , 3–9.	
10	17	7.5	Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. <i>Journal of the Experimental Analysis of Behavior</i> , <i>37</i> , 149–155.	
10	17	7.5	Hanley, G. P., Iwata, B. A., & McCord, B. E. (2003). Functional analysis of problem behavior: a review. <i>Journal of Applied Behavior Analysis</i> , 36, 147–185.	

between individuals with hiring responsibilities and those who do not hire behavior analytic personnel and the "essential" book by Malott (2008), $\chi^2(1, n = 229) = 4.06, p = 0.04$. Participants who are responsible for hiring practitioners were significantly more likely to list the Malott book as an "essential" reading than individuals without hiring responsibilities.

Discussion

The opinions of behavior analysts teaching coursework, working in the field, and/or hiring behavior analytic practitioners may be important to several audiences. Those seeking employment or looking to enter graduate training programs would most directly benefit from knowing what sources they may turn to in making themselves the most attractive candidates. Individuals teaching undergraduate coursework may also be interested in knowing what they should consider assigning to their students to prepare them for employment in the field or further education. Finally, professionals responsible for hiring and training behavior analysts may use this resource to guide their interview practices, initial trainings, and continuing education for their employees.

While the present study differs from Saville et al. (2002) in both purpose and participant population, the results map on to their findings in several ways. Perhaps unsurprisingly, both the participants in our study and the JABA board members regarded Baer, Wolf, and Risley's (1968) paper as the most important reading. Now nearly 50 years after its publication, the dimensions of applied behavior analysis remain current. Our participants also ranked *Science and Human Behavior* (Skinner, 1953) nearly as important to undergraduates as did JABA editors for graduate students; *Science and Human Behavior* was the highest ranked book in Saville et al. (2002), and our participants' third highest ranked book.

It may be noted that with the exception of Michael, 1982, all of the "essential" articles identified in the current study are

 Table 2
 Rank of essential

 behavior-analytic journal articles
 suggested for undergraduate

 students across job type
 students

Article	Teacher $(n = 36)$	Practitioner $(n = 112)$	Teacher- practitioner $(n = 69)$	Neither $(n = 10)$
Baer, Wolf, & Risley, 1968	1	1	1	1
Iwata, Dorsey, Slifer, Bauman, & Richman, 1994	2	2	2	1
Baer, Wolf, & Risley, 1987	3	3	7	3
Stokes & Baer, 1977	5	5	3	3
Wolf, 1978	3	6	4	3
Carr & Durand, 1985	8	4	6	6
Van Houten, Axelrod, Bailey, Favell, Foxx, Iwata, & Lovaas, 1988	8	8	5	NR
Bannerman, Sheldon, Sherman, & Harchik, 1990	7	7	10	NR
Lovaas, 1987	NR	10	8	3
Michael, 1982	5	NR	9	6
Hanley, Iwata, & McCord, 2003	8	9	NR	6

Articles not rated in the top 10 for a specific subgroup are listed as "NR"

strictly applied in focus, rather than conceptual or theoretical. *Science and Human Behavior*, along with other "essential" books (e.g. *About Behaviorism, Verbal Behavior*) may be how respondents addressed the philosophical context of behavior analysis, but this question was not specifically asked of participants. The apparent applied focus in "essential" readings could be argued to be a sampling bias due to the relative proportion of practitioners in our sample, or alternatively an accurate representation of the expectations of those entering the field or applying to graduate programs. When we evaluate applicants to master's programs or a new behavior technician, we might expect them to be familiar with various prompting strategies, and why FCT can be a treatment for SIB, but less-so

expect a rousing discussion of the pragmatic truth criterion of radical behaviorism.

There were, of course, differences in our results with Saville et al. (2002), even if we restrict the comparison just to their participants identified as JABA editors. Cooper et al.'s *Applied Behavior Analysis* (1st ed., 1987) textbook was ranked comparatively much lower by JABA editors for graduate students as it was for our participants ranking for undergraduates. It is not clear to what extent the introduction of the second edition between our publication and Saville et al. (2002) was a contributing factor, or if members of the field view the text as more important for undergraduates than those in a graduate program.

Table 3Rank of essentialbehavior-analytic journal articlessuggested for undergraduatestudents across teachingresponsibilities

Article	Undergraduate instructors $(n = 35)$	Graduate instructors (n = 37)	Undergraduate and graduate instructors $(n = 33)$
Baer, Wolf, & Risley, 1968	1	1	1
Iwata, Dorsey, Slifer, Bauman, & Richman, 1994	2	2	2
Baer, Wolf, & Risley, 1987	3	5	6
Stokes & Baer, 1977	3	6	3
Wolf, 1978	3	3	5
Carr & Durand, 1985	6	NR	3
Van Houten, Axelrod, Bailey, Favell, Foxx, Iwata, & Lovaas, 1988	7	4	7
Bannerman, Sheldon, Sherman, & Harchik, 1990	7	10	9
Lovaas, 1987	8	7	10
Michael, 1982	8	7	8
Hanley, Iwata, & McCord, 2003	8	9	NR

Articles not rated in the top 10 for a specific subgroup are listed as "NR"

Table 4Rank of essentialbehavior-analytic bookssuggested for undergraduatestudents

Overall rank	Number of listings	%	Book title
1	115	50.7	Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). <i>Applied behavior</i> analysis (2nd ed.). Upper Saddle River, NJ: Pearson
2	68	30.0	Bailey, J. S., & Burch, M. R. (2016). <i>Ethics for behavior analysts</i> (3rd ed.). New York: Routledge
3	56	24.7	Skinner, B. F. (1953). Science and human behavior. New York: Macmillan
4	40	17.6	Skinner, B. F. (1974). About behaviorism. New York: Knopf
5	32	14.1	Miltenberger, R. G. (2015). <i>Behavior modification: principles and procedures</i> (6th ed.). Florence, KY: Cengage
6	30	13.2	Skinner, B. F. (1957). Verbal behavior. New York: Appleton-Century-Crofts, Inc
7	23	10.1	Malott, R. W. (2008). <i>Principles of behavior</i> (6th ed.). Upper Saddle River, NJ: Pearson
8	21	9.3	Skinner, B. F. (1948). Walden two. New York: Hackett Publishing Company
9	18	7.9	Bailey, J. S., & Burch, M. R. (2010). 25 essential skills and strategies for the professional behavior analyst: expert tips for maximizing consulting effectiveness. New York: Routledge
9	18	7.9	Pryor, K. (1985). <i>Don't shoot the dog: the new art of teaching and training</i> . New York: Bantam

A recent article (Pastrana et al., 2016) examined assigned readings in graduate training programs. While the purpose and methods of that study and the present one differed, there were several instances of overlap. Faculty and professionals have expressed some readings are essential for undergraduates, while some of those same readings appear frequently in graduate courses in successful BCBA training programs. For example, Cooper et al.'s Applied Behavior Analysis (2nd ed., 2007) was assigned most often in category of readings in applied behavior analysis and was listed as the first ranked behavior-analytic book in the current study. The overlap between articles identified by Saville et al. (2002), Pastrana et al. (2016) and the current study suggest a core group of essential readings at both the undergraduate and graduate level. This finding is of interest and may warrant further investigation as training programs continue to grow concomitant with the field of behavior analysis. Several questions arise in particular with comparison of the current study's findings to those from Pastrana et al., especially with respect to the overlap in ranked essential and assigned readings for graduate and undergraduate students. A clear follow-up to the present study will be an analysis of syllabi for BCaBA Verified Course Sequences in much the same fashion as Pastrana et al.

Given that separate training programs are devoted to preparing students at the undergraduate and graduate levels, and the BACB respectively has two distinct levels of certification, it may seem plausible that a different set of readings or rankings amongst the readings might have surfaced. Why this is not the case is not entirely clear, but several contributing variables may be of intrigue. It is possible that this is just merely the result of the publications that are currently available in our field and the audience for which they have been written. Respondents in the current survey may also have not been aware, or did not have access or exposure to readings that may have diverged more from those outlined by Pastrana et al. (2016). Likewise, articles that may be directed to an undergraduate population may have been published more recently and were not a part of the respondents' own training history. The field as a whole may find the topics of these readings to be of significance for all levels of training but may vary considerably with respect to such aspects as the accompanying assignments, depth of coverage, and speed with which materials is covered amongst these two distinct populations. It may be the case that it is predictable and even beneficial that readings overlap in undergraduate and graduate curricula. Researchers in other related sciences have found benefits to using primary research articles with first-year undergraduates (Krontiris-Litowitz, 2013; Wenk & Tronsky, 2011). Early exposure to not only the content, but also the jargon, format, authors, journals, and tools for finding these "essential" articles may be valuable to the introductory behavior analysis student. The fact that they may be exposed to those same articles again as graduate students could be better viewed as a success rather than an oversight.

Although a number of individuals participated in the study, it is possible that these data do not represent the viewpoint of the larger behavior-analytic community and therefore should not be considered as a fully comprehensive list of essential readings. Additionally, the current study's findings are limited to an extent, as they do not categorize the articles based on specific course content or the BACB's Fourth Edition Task List, leaving the reader to decide what are "essential" articles and books that cover content areas that are not represented by the texts identified by participants. If we aim to train undergraduates to proficiency so they can successfully graduate from these programs, be hired by employers seeking skilled behavior analysts at the undergraduate level, or even recruited into behavior-analytic graduate training programs, then investigating these may be of critical importance.

Pastrana et al.'s (2016) results and the results of the present study set the stage for several further analyses in our field and how we educate members. What do the entrance requirements for graduate training programs look like; which readings are we expecting graduate students to have already read, and if those overlap with those included in graduate coursework, what activities are pushing their understanding further? Of texts and articles with similar focus, which are better suited for undergraduate coursework versus graduate training? These studies and any that follow are a step toward turning our science in on itself to maximize our effectiveness, and can only help us in meeting the needs of the next generation of behavior analysts.

Compliance with Ethical Standards

Ethical Approval Procedures performed in this study involved the use of human participants and all were in accordance with the ethical standards of the institutional research committees both at the University of North Alabama and Western Michigan University, as well as the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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