Authorship Trends in *The Analysis of Verbal Behavior*: 1982–2016

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Published online: 31 March 2017

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Abstract *The Analysis of Verbal Behavior* (TAVB) is the only journal focused on theoretical and empirical research in verbal behavior. An assessment of authorship trends can provide a critical perspective on practices in verbal behavior analysis (e.g., participation by non-US institutions, contributions by female authors). The present study examines authorship trends in all articles published in TAVB since its inception (between 1982 and 2016). All authors and their affiliations were listed and the first authors denoted as such. Authors were characterized as follows: prolificacy, new vs. frequent contributor status, number of co-authors, editor status, fellow status in a professional organization, and gender. Institutional affiliations were characterized as follows: academic vs. nonacademic institutions, prolificacy, and location (country). The review included 383 articles by 487 authors from 200 institutions. Our findings revealed areas in which TAVB is reaching maturity (e.g., author gender) and areas in which further action by contributors and editors is needed (e.g., international participation).

Keywords Authorship trends · *The Analysis of Verbal Behavior* · Verbal behavior

Verbal Behavior News was created in 1982 by the Verbal Behavior Special Interest Group (VB SIG) of the Association for Behavior Analysis. This newsletter provided up-to-date information on developments in verbal behavior (VB) research and teaching. More substantive submissions led to the creation of a journal, *The Analysis of Verbal Behavior* (TAVB), in 1985 (Sundberg, 1997). From its inaugural issue, TAVB has primarily focused on publishing original papers pertaining to verbal behavior (Skinner, 1957).

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Several bibliometric analyses of *TAVB* articles have surveyed aspects of the journal, such as characteristics of published articles (Luke & Carr, 2015; Marcon-Dawson, Vicars, and Miguel, 2009; Normand, Fossa, and Poling, 2000), citation patterns (Critchfield, Buskist, and Saville, 2000; Luke & Carr), and *TAVB*'s impact on other journals (Luke & Carr, 2015). Results from prior reviews suggest that *TAVB* is maturing with respect to its content and scholarly impact. Publication analyses found an increasing number of empirical articles that adhered to the methodological standards of the experimental analysis of behavior and included a broad range of research in recent years, extending beyond basic verbal relations to address such topics as autoclitics (Luke & Carr, 2015; Marcon-Dawson et al., 2009; Normand et al., 2008). Citation analyses reveal that classical sources (e.g., Skinner, 1957) and recent empirical research are cited in *TAVB* empirical articles (Critchfield et al.).

In the most recent review of *TAVB*, Luke and Carr (2015) analyzed citation patterns of *TAVB* articles via PsycINFO and Google Scholar databases and found 6061 citations. Additionally, they selected articles published in 2013 that cited *TAVB* articles and calculated a citation half-life¹ of 9 and 10 years, respectively. They concluded that citation half-lives offer a favorable indication of the journal's influence. Moreover, Luke and Carr (2015) estimated the 2013 impact factor of *TAVB* as 0.769 based on PsycINFO and 0.962 based on Google Scholar; these values are more robust than the impact factor estimates (ranging from 0.267 to 0.600) found by analyzing *TAVB* citations in other behavior analysis journals (i.e., *Journal of Applied Behavior Analysis*—*JABA*, *Journal of the Experimental Analysis of Behavior*—*JEAB*) over a 2-year period (Petersdottir et al., 2009). Luke and Carr (2015) also analyzed selected authorship trends in articles published in *TAVB* from 2010 to 2014, including frequent contributors, prevalent institutions, and up-and-coming authors.² Luke and Carr (2015) identified seven prolific authors (e.g., D. R. Greer) and seven prevalent institutional affiliations (e.g., Western Michigan University). Results also suggested that up-and-coming authors wrote 32% of the articles published in the review period.

Taken together, data from prior reviews are valuable for the purposes of guiding readers, editors, and researchers in the evaluation of the *TAVB*'s evolution and in enhancing future contributions. Findings from prior reviews paint an encouraging picture of the status of *TAVB*; however, those reviews do not address factors such as co-authorship trends, participation of editors and professional association fellows as authors, author gender, contributions from international authors or institutions, or contributions by nonacademic institutions. The analysis of such factors can help to frame *TAVB*'s authorship trends and to inform priorities for the future of the journal.

The present study aimed to provide an assessment and critical interpretation of *TAVB*'s authorship trends from 1982 to 2016. Results may inform future actions by readers, editors, and researchers regarding factors in which *TAVB* is reaching maturity (e.g., author gender) and areas in which further action is needed (e.g., international participation).

¹ "A measure of the temporal distribution of citations to a journal's article in a particular year" (Luke & Carr, 2015, p. 158).

² "An author was classified as up-and-coming if he or she (a) published two or more *TAVB* articles between 2010 and 2014 and (b) had received a doctoral degree after 2000" (Luke & Carr, 2015, pp. 156–157).

Method

The current study included all articles, commentaries, brief reports, and book reviews published in *TAVB* and its predecessor, *Verbal Behavior News*, from 1982 to 2016 (hereafter, *TAVB* articles) while excluding editorials, calls for papers, errata, and announcements. All authors received credit for each publication, regardless of author order. All authors' institutional affiliations were listed and each institution received credit for each article, regardless of the number of affiliated authors.³ We coded the articles according to six features of authors, prolificacy, new vs. frequent contributor status, number of co-authors, editor status, fellow status in a professional organization, and gender, and three features of institutional affiliations, academic vs. nonacademic, prolificacy, and location (country).

Interobserver agreement

A second observer independently scored all author and institutional factors for half the articles published from 1982 to 2016. An agreement was defined as the primary and the secondary observer recording the same datum for each category for each article. The number of agreements (i.e., categories that were scored the same by two independent reviewers) was divided by the number of agreements plus disagreements and converted into a percentage, constituting mean agreement of 95% across categories (range, 91% to 100% within categories). When a disagreement occurred, it was registered and the first and second observers performed a collaborative review to reach a consensus.

Results and Discussion

TAVB Authors

Up to the year 2016, *TAVB* published 32 volumes including 383 articles by 487 authors. This section presents specific methodologies, results, and discussion of the six analyzed features of *TAVB* authors (i.e., author prolificacy, new vs. frequent author status, number co-authors, editor status, fellow status in a professional organization, gender).

Author Prolificacy

In the present research, a prolific author is one who had at least five articles published in *TAVB* during the analyzed period (Shabani, Carr, Petursdottir, Esch, and Gillett, 2004). To determine prolificacy, the number of published articles per author, regardless of author order, was counted and ranked. To illustrate the distribution of articles by prolific authors over the 35-year history of the journal, articles were ranked in two 12-year periods and one 11-year period.

³ This criterion was different from the one adopted by Luke and Carr (2015), who only credited the first affiliation if an author had more than one affiliation (p. 155).

Table 1 Prolific authors by rank

Rank	Authors	Articles	Mean
1	Michael, J.	20	0.57
1	Sundberg, M. L. ^a	20	0.57
3	Greer, R. D.	13	0.37
4	Rehfeldt, R. A.	11	0.31
5	Miguel, C. F. ^a	10	0.29
5	Palmer, D. C.	10	0.29
7	Carr, J. E.	9	0.26
8	Knapp, T. J.	8	0.23
8	Petursdottir, A. I. ^a	8	0.23
8	Schlenger, H. D. ^a	8	0.23
8	Schoneberger, T.	8	0.23
12	Catania, A. C.	7	0.20
12	Critchfield, T. S.	7	0.20
12	Leigland, S.	7	0.20
12	Lowenkron, B.	7	0.20
16	Esch, B. E. ^a	6	0.17
16	LeBlanc, L. A.	6	0.17
16	Mabry, J. H.	6	0.17
16	Malott, R.	6	0.17
16	Poling, A.	6	0.17
16	Shillingsburg, M. A.	6	0.17
22	Drash, P. W.	5	0.14
22	Esch, J. W. ^a	5	0.14
22	Eshleman, J. W.	5	0.14
22	Hall, G. A. ^a	5	0.14
22	Normand, M. P. ^a	5	0.14
22	Partington, J. W. ^a	5	0.14
22	Sidener, T. M.	5	0.14
22	Tudor, R. M.	5	0.14
22	Valentino, A. L.	5	0.14
22	Vargas, E. A.	5	0.14

^aIndicates authors who attended graduate school at Western Michigan University when J. Michael taught his course on verbal behavior

Thirty-one authors made prolific contributions to *TAVB* during the study period. Table 1 shows the rank, name, total number of articles, and mean number of publications per volume for each prolific author. The three most prolific authors were J. Michael (20), M. L. Sundberg (20), and R. D. Greer (13).

J. Michael is widely recognized for his exceptional contributions to behavior analysis. For example, the VB SIG established the Jack Michael Outstanding Contributions in Verbal Behavior Award in 2012. J. Michael's contributions to *TAVB* permeate its entire history, beginning with his first article in the inaugural volume in 1982. He served on the editorial board for 16 volumes (1986–2004) and as editor-in-chief for five volumes (2004–2008). Since 2015, he has served as the journal's only emeritus editorial board member. As Sundberg aptly observed, J. Michael had a "role as the

guiding force behind the journal” (1997, p. 3). His most significant influence, however, concerns the academic training of VB researchers. Nine prolific authors studied at Western Michigan University (WMU) during the time J. Michael taught his well-known VB course (see note, Table 1). As pointed out by one of J. Michael’s former students, “Jack was one of the main reasons that I went to Western Michigan and he remains one of the main sources of what I know about Skinner and behavior analysis. Taking his classes and talking with him outside of class over the years taught me much of what I know about behavior” (Normand, personal communication, January 26, 2016). The influence of J. Michael already goes beyond scholarly contributions of his graduate students. Five of the six former students of J. Michael who appear on the list of prolific authors in Table 1 directly or indirectly mentored their own students who collectively published 15 articles in *TAVB* from 2000 to 2016 (Clough, Meyer, and Miguel, 2016; DeGraaf & Schlinger, 2012; Gamba, Goyos, & Petursdottir, 2015; Heldt & Schlinger, 2012; LaFrance, Wilder, Normand, and Squires, 2009; Marcon-Dawson et al., 2009; Normand & Knoll, 2006; Normand et al., 2008; Petursdottir, Carp, Matthies, and Esch, 2011; Petursdottir et al., 2009; Ribeiro, Elias, Goyos, and Miguel, 2010; Santos, Ma, and Miguel, 2015; Sprinkle & Miguel, 2012; Sundberg, Endicott, and Eigenheer, 2000; Susa & Schlinger, 2012).

Tied in number of publications with J. Michael is M. L. Sundberg. He is well known for his pioneering role in founding and developing *TAVB*. From 1982 to 1997, he served as editor-in-chief during a period of low budget and low acceptance of verbal behavior research, even within the behavior-analytic community (Sundberg, 2014). Sundberg’s sustained contributions were recognized when he was accorded the Jack Michael Outstanding Contributions in Verbal Behavior Award in 2013.

Regarding the third most prolific author, R. D. Greer’s theoretical and empirical contributions on language development appear in *TAVB* beginning in 2004. Greer’s contributions to the journal gave way to an exceptional rate of 1.08 publications per year for the remainder of the study period.

To examine more recent trends, prolific contributors were assessed and ranked over three periods, from 1982 to 1993, from 1994 to 2005, and from 2006 to 2016. J. Michael and M. Sundberg appear in the first two of three periods. The number of prolific authors per period increased over time (3, 7, and 10, respectively). In the last period, four past students of J. Michael appear as prolific authors: B. E. Esch, J. W. Esch, C. F. Miguel, and A. I. Petursdottir. Miguel and Petursdottir served as *TAVB*’s editor-in-chief from 2009 to 2011 and 2012 to 2014, respectively.

The doubling of prolific authors from the first to the second period and the more than tripling from the first to the third period suggests an increasing number of productive scholars in the VB community. We detected one pattern among prolific authors that may raise concerns. Many scientific advancements occur by the clash of contrasting ideas and ways of thinking (Kuhn, 1970; Palmer, 2006). The fact that nearly half of the most recent prolific authors were students of J. Michael may indicate an endogenous dynamic within the journal. However, such dynamic might be related to the fact that *TAVB* is a small journal (throughout its entire run, *TAVB* has published less content than *JABA* does in 5 years) and is focused in a specific research area. Furthermore, we found some evidence of the influence of other schools of thought in *TAVB* (see fellows below).

Fig. 1 Cumulative number of articles by new first authors, new authors, and frequent authors who published at least three articles during the study period. Note: The number of articles displayed exceeds the number of articles published in *TAVB* as each article was scored for each category of authorship

New vs. Frequent Authors

Based on criteria proposed by Dunlap, Clarke, and Reyes (1998) all *TAVB* articles in the study period were classified according to authors' prior contributions. Three, non-mutually exclusive types of authors were identified: new, new first, and frequent. We defined a new author (regardless of his position as first, second, third, etc.) or a new first author as someone who did not publish in *TAVB* in the previous five volumes. We defined a frequent author (regardless of his position) as someone who published three or more articles in the previous five volumes. Readers should note that these classifications were applied beginning with volume 6 (1988) to accommodate the five-volume criterion.

Figure 1 depicts cumulative publications among new, new first, and frequent authors during the study period. New first authors published 252 articles (66% of total articles), with a mean of 8.69 articles per year (range, 1–18; $SD = 4.43$). During the same period, new authors co-authored 166 publications (43% of total articles) with a mean of 5.72 articles per year (range, 1–12; $SD = 2.95$). Such numbers indicate a sustained influx of new authors and new first authors in the journal, a highly desirable pattern that may anticipate a potential for future growth. Figure 1 also displays the cumulative number of articles published by frequent authors. Fifty-six articles (15%) had at least one author who published three or more articles in the previous five volumes. The figure depicts a steady rate of publications from 1999 through 2011, with a mean of 1.93 articles per year (ranging from 1 to 8; $SD = 1.87$). Publication rates increased to a mean of four articles per year from 2012 to 2016.

Only five articles (~1%) were authored by researchers who published six or more articles in the previous five volumes. From 1982 to 2006, J. Michael published one article after publishing five articles in the previous five volumes. On the other hand, from 2007 to 2013, D. Greer published four articles after publishing five articles in the previous five volumes. Increasing trends in contributions by frequent authors have also

been reported in studies of other behavior-analytic journals (Dunlap et al., 1998; Dymond, Clarke, Dunlap, & Steiner, 2000; Dymond & Critchfield, 2001).

Comparing author types can prove informative. For example, comparing the year in which frequent authors first appeared as new authors with the year in which they attained frequent author status reveals an average latency of 5.80 years (range, 1–15 years; SD = 4.02). A comparison of institutional affiliations of frequent authors when their first article was published in *TAVB* with their institutional affiliations at the time they achieved frequent author status reveals that 5 of the 17 frequent authors changed their institutional affiliations. Specifically, T. Schoneberger's affiliation changed from California State University, an academic institution, to the Stanislaus (CA) County Office of Education, a governmental one. A. L. Valentino's affiliation changed from Marcus Autism Center, an intervention and research organization, to Trumpet Behavioral Health, an intervention organization. The three remaining authors (M. P. Normand, C. F. Miguel, and A. I. Petursdottir) who were affiliated with WMU as students changed their affiliations when they assumed teaching and research positions after graduation.

Students who transition to academic positions are in a unique position to influence the journals in which they publish. A review of the past 8 years of the VB SIG Research Award indicates that it was granted to a student of M. P. Normand in 2008, students of C. F. Miguel in 2011 and 2014, and a student of A. I. Petursdottir in 2010. Additionally, since the VB SIG Grant Award was created in 2010, it has been granted to students of C. F. Miguel in each year except 2011 and to a student of A. I. Petursdottir in 2014. As noted earlier, five of six prolific authors who studied with J. Michael⁴ subsequently mentored students who published 15 articles in *TAVB* from 2000 to 2016.

The content of *TAVB* is enriched and the VB community is strengthened when a new generation of researchers moves forward on foundations established by previous researchers. However, endogenic practices are a concern. Future assessments of author characteristics such as academic background may indicate if diverse contributors should be sought out and supported by editors of the journal.

It is challenging to assess and interpret factors sustaining the influx of new authors, new first authors, and frequent authors in *TAVB*. Nevertheless, further research could assess two plausible factors. First, researchers could assess trends in VB research across all behavior-analytic outlets or changes in the number of graduate programs that offer a course on Skinner's analysis of VB over time (as was done in relation to graduate programs that had course sequences approved by the Behavior Analyst Certification Board or ABAI program accreditation by Dixon, Reed, Smith, Belisle, and Jackson, 2015). Second, further research could combine data from bibliometric analyses of *TAVB* (e.g., citation patterns, research nature, research topic, impact factor, authorship trends) to assess how the presence of different author types may influence the journal publication practices. For example, one might find that publication of a frequent author on a specific topic may increase the likelihood of publication of articles addressing the same topic by new authors, which could affect the journal's citation patterns and impact factor. Nevertheless, the diversity of topics addressed by recent empirical articles published in *TAVB* suggests that this may not be the case (Luke & Carr, 2015).

⁴ It is worth noting that J. E. Carr mentored A. I. Petursdottir and C. F. Miguel after J. Michael's retirement.

Fig. 2 Cumulative number of articles published by one to five authors per period

Another interesting question regards how authors interconnect as a social network and how such connections influence VB research. For example, researchers may find that specific people or groups exert considerable influence on their colleagues' topics of investigation, frequency of publication, and co-authorship practices. The journal's social network may affect the journal's citation patterns (especially cross-citation and self-citation) and impact factor, which can indicate the journals' endogenous practices compared to other journals within the field (e.g., *JABA*, Virués-Ortega, Pear, and Hurtado-Parrado, 2011). Such research may reveal how the social network contributes to perpetuating or changing the long-standing history of isolation of behavior analysis from other disciplines (Krantz, 1972), if only with regard to verbal behavior research.

Number of Co-authors

In order to determine the number of co-authors per article, the number of authors was tallied for each article and articles were ranked in two 12-year periods and one 11-year period. Figure 2 displays the cumulative number of articles published by one to five authors per period. Seven articles written by six or more authors did not follow any trend over the selected periods and were not included in this analysis.

While the number of articles written by a sole author was stable throughout the first and second periods (56, 64), that number declined by almost half in the third period (34). In other words, the number of co-authored articles increased substantially during the most recent period (126) compared to the first and second periods (45 and 52, respectively). For example, the mean number of articles by three co-authors increased by 3.4 times, the mean number of articles by four co-authors increased by 5.8 times, and the mean number of articles by five co-authors increased 11 times over previous periods.

Increased co-authorship is a phenomenon in many scientific fields. In social sciences, for example, the number of co-authored articles increased from 18% to 52% between 1955 and 2000. During the same period, the number of co-authors per article (team size) also increased, with the most substantial growth in psychology in which

team size increased 75% in comparison to previous periods (Wuchty, Jones, and Uzzi, 2007). Co-authorship yields several benefits. For instance, authors can combine their expertise, technological instruments, personnel, and financial support while dividing tasks associated with the process of conducting research and publishing. Such combined efforts probably increase the quality and quantity of papers, a notion supported by the finding that co-authored manuscripts are more likely to be accepted for publication and tend to have higher impact scores (Mckerchar, Morris, and Smith, 2011).

Further research is necessary to determine if benefits of co-authorship apply to articles in *TAVB*. While it is hard to measure the likelihood that co-authored manuscripts are accepted rather than single author articles, the impact of accepted articles could be assessed by re-analyzing data from Petursdottir, Peterson, and Peters, 2009 and Luke and Carr (2015) in search of co-authored articles among those most frequently cited papers. In addition, researchers could compare citation distributions over time between co-authored and single-authored papers.

Editor Status

We compared a list of *TAVB*'s editors, associate editors, assistant editors, and members of its advisory and editorial boards (hereafter, editorial board members) during the study period to a corresponding list of authors on an issue-by-issue basis. Authors were counted as editorial board members only if they were currently on the board for that particular issue, regardless of whether they have been part of the editorial board on previous issues. Each article authored by one or more editorial board members was credited once.

Almost one third of all articles (139) included editorial board members as authors. Participation of editorial board members as authors rose over the analyzed period. From 1982 to 2006, the mean percentage of articles by editorial board members was 44.4% (range, 28.5–85.7%; SD = 14.68%), with a peak in volumes 6 and 7 ($M = 85.7\%$ and 66.6% of articles, respectively). On the other hand, from 2007 to 2013, the percentage of articles authored by editorial board members dropped to 11.24% (range, 0–18.7%; SD = 7.58%). This decrease follows a general trend reported in reviews of other journals (e.g., *JEAB*; Williams & Buskist, 1983) and could be related to the fact that research on verbal behavior became more accepted in additional outlets (e.g., *JABA*, *JEAB*, *The Psychological Record*; Sundberg, 2014). In addition, the decrease could indicate the journal's maturity, as editorial board members, especially the editor-in-chief, may have submitted their work to other journals to avoid the perception of ethical conflicts (Petursdottir, personal communication, January, 20, 2016).

However, during the last three analyzed years (2014 to 2016), the mean percentage of articles by editorial board members increased to 53.61% (range, 43.48–64.71%; SD = 8.69%) which indicates a need for closer examination. From 1982 to 2006, the arguments that the VB research community was very small and had limited finances for promoting the journal were valid and could explain high editorial participation (Sundberg, 2014). However, data from the present review suggests the number of researchers interested in verbal behavior is constantly increasing and Springer-Verlag, a high visibility global publishing company, started publishing two issues of the journal per year in 2014.

Attempts to account for the recent increase in editorial board members contributions are beyond the scope of the present research. Future research could, for example, analyze data on dynamics between reviewers (Lange & Frensch, 1999; Mathews, 1997). It is nevertheless important for readers to note that *TAVB* relies on the voluntary contributions of members of the scientific community to submit, review, and edit manuscripts. Additional data regarding characteristics of editorial board members can be found in the later sections on “Gender” and “Institutional Location.”

Fellow Status in a Professional Association

A list was generated of authors who were appointed fellows by a professional association by reviewing authors who published at least three articles in *TAVB* in the study period against fellowship directories for the following behavioral associations: Association for Behavior Analysis International (ABAI), Association for Contextual Behavioral Science (ACBS), and Society for Quantitative Analysis of Behavior (SQAB).

A review of the fellows from previously mentioned behavioral associations indicated that 17 *TAVB* authors published while fellows of ABAI (J. E. Carr, A. C. Catania, T. S. Critchfield, S. Glenn, R. D. Greer, L. Hayes, T. J. Layng, L. LeBlanc, R. Malott, W. McIlvane, J. Michael, J. Moore, D. Palmer, K. Salzinger, K. Saunders, M. Sidman, and J. Spradlin) and two authors published while fellows of ACBS (D. Barnes-Holmes and S. Hayes). Fellowship is a recognition of outstanding and extensive scientific contributions (Association for Behavior Analysis International, 2015; Association for Contextual Behavioral Science, 2015). The presence of such number of fellows as authors indicates *TAVB*’s legitimacy as a forum for discussing VB research.

Fellow contributions can be found in several areas of VB research including the concept of motivating operations by J. Michael (see Petursdottir, 2013, for a special section devoted to the concept), the stimulus equivalence research program by M. Sidman (e.g., Sidman, 2009), and the development of relational frame theory by Barnes-Holmes and S. Hayes (Barnes, Hegarty, and Smeets, 1997; Hayes, Barnes-Holmes, and Roche, 2003). These contributions illustrate that, while *TAVB* was founded under and is influenced by Skinner (1957), its articles reflect the latest developments in the study of verbal behavior and language. We view such diversity of contributions by fellows as a positive indicator of the healthy status of the journal in that these contributions have the potential to refine the study of verbal behavior and to establish bridges with other psychological and linguistic theories. Such prospective benefits are especially valuable when considering our history of isolation (Krantz, 1972). Future research could encourage future participation by fellows using electronic tools (Harzing, 2007) to access citation rates and infer fellows’ impact within *TAVB* relative to their articles published in nonbehavioral outlets (e.g., Catania, 2013; De Houwer, Gawronski, and Barnes-Holmes, 2013).

Gender

The genders of authors and editorial board members were identified by reviewing their profiles (photos and descriptions) on institutional websites and professional social networks such as LinkedIn and Academia.edu. If no data were found, the author’s full name followed by “behavior analysis” was searched using the Google search engine.

Fig. 3 Percentage of male and female authors from 1982 to 2016

Search results (e.g., professional profile descriptions and photos) were crosschecked against other available sources (such as common male and female names in English-speaking countries and professional acquaintances of the second author). Gender ratios were assessed over the study period, as well as authors' respective participation as first authors.

Of the 487 authors who published in the study period, 243 (50%) were women and 222 (46%) were men. The genders of 19 authors (4%) were not identified due to insufficient data. Figure 3 depicts the percentage of articles published by male vs. female authors for the study period. From 1982 to 2001, most authors were male but gender parity approached from 2001 to 2016. It is interesting to note that female participation increased during the same period that co-authored papers also increased (see Fig. 2).

Comparison of the cumulative number of articles by the first author's gender indicates a constant rate of publications by male first authors and an increasing rate of publications by female first authors from 2005 (25 articles) to 2016 (110 articles). Progress toward gender equity is further highlighted by comparing the mean number of articles written by female first authors from 1982 to 2004 ($M = 1.09$ articles; $SD = 0.88$) with data from 2005 to 2016 ($M = 7.08$ articles; $SD = 2.63$). Growing female authorship was also reported in more dated studies that surveyed behavior-analytic journals other than *TAVB*. For instance, from 1978 to 1997, articles with female first authors were more common in *JABA* ($M = 30\%$ of articles) than *JEAB* ($M = 15\%$ of articles), and the overall percentage of female authors was also higher in *JABA* than *JEAB* (approximately 35% and 20%, respectively; McSweeney, Donahoe, and Swindell, 2000; McSweeney & Swindell, 1998). Data from *TAVB* beg the question of whether female participation continued to increase in *JABA* and *JEAB* during recent years (i.e., since 2000). Despite the lack of data for an updated comparison between journals, it appears safe to argue that female participation in several areas of behavior analysis is increasing and receiving acknowledgement (e.g., a special section on prominent women in behavior analysis; Nosik & Grow, 2015).

Fig. 4 Percentage of male and female editorial board members from 1982 to 2016

Gender distribution of *TAVB* editorial board members provides an indication of gender parity at the administrative level. Figure 4 displays the distribution of editorial board members by gender for the study period. From 1982 to 2008, most editorial board members were male (81.74%) but the journal approached gender parity over the last 8 years with 50% of editorial board members being female. It is interesting to note that this expanded female participation on the editorial board occurred 8 years following a corresponding increase in the number of female authors who published in the journal (i.e., 2001 and 2009) and 4 years following a 2005 increase in the number of female first authors. A similar percentage of male editorial board members from 1978 to 1997 was also recorded for *JABA* and *JEAB* (72% male editors and 85% male editors, respectively; McSweeney et al., 2000; McSweeney & Swindell, 1998). Again, an update of these statistics would permit a more informative comparison between *TAVB* and other behavior-analytic outlets.

Increasing female authorship is a global phenomenon in several areas of science, especially in the humanities, social sciences, and psychology (West, Jacquet, King, Correll, and Bergstrom, 2013). However, gender parity remains a distant reality for women in the sciences, overall. For example, Larivière, Ni, Gingras, Cronin, and Sugimoto (2013) found that female first authors published almost two times less frequently (1.93 times) than male first authors; women account for only 30% of authorships in co-authored articles; women are more frequently published in domestic journals; and articles with female sole authorship, first authorship, and last authorship receive fewer citations than articles in which male authors occupy these roles. Despite the general situation, the increasing participation of female authors and editorial board members in *TAVB* during recent years indicates that the journal is making significant progress toward gender parity.

Putting *TAVB* in perspective, future reviews could examine gender distribution within categories of author status (i.e., new and frequent), assess female participation in co-authored articles and their impact (citations), and examine patterns in the affiliation and national location of female authors. Such data could be compared to data from other sciences, placing *TAVB*'s record of female participation in a broader context.

Fig. 5 Cumulative number of articles with university and nonacademic affiliations from 1982 to 2016. Note. The number of articles displayed exceeds the number of articles published in *TAVB* as each author affiliation was coded separately

Finally, future research could assess correlations between female participation as editorial board members and subsequent increases in first author publication as one potential path to promote the long-term health of the journal as well as gender parity. For example, initiatives to recruit, mentor, and retain more early-career women as reviewers—particularly women from underrepresented ethnic and cultural backgrounds—may enhance their opportunities and skills germane to first authorship.

Institutional Affiliations

During the analyzed period, 487 authors were affiliated with 200 institutions. This section presents specific methodologies, results, and implications for the three analyzed features of institutional affiliations (i.e., academic vs. nonacademic institutions, prolificacy, and location).

Academic vs. Nonacademic Institutions

Types of publishing institutions were determined by visiting official websites or other online sources. We generated the following categories based on review of all institutions listed on at least two articles published during the study period: (1) university (e.g., Western Michigan University), (2) college (e.g., Wilmington College), (3) research and intervention organization (e.g., St. Amant Centre), (4) intervention organization (e.g., Carbone Clinic), (5) consulting service (e.g., APEX Consulting), (6) school (e.g., Garden Academy), (7) commercial organization (e.g., Headsprout), (8) government department [e.g., Stanislaus County (CA) Office of Education], (9) hospital (e.g., Oslo University Hospital), (10) professional association (e.g., American Psychological Association), and (11) other (e.g., B.F. Skinner Foundation).

Figure 5 depicts the cumulative number of articles published by institutions of each type. While a review of the authors' affiliations identified 11 institutional types, only two categories, university and other (which comprised all non-university institutions), are visually displayed given the predominance of university affiliations.

Articles by university-affiliated authors represent the most extensive journal contributions, accounting for 70.92% of the articles. University affiliations were stable throughout the review period with a mean of 11.62 articles per year (range, 3 to 26; SD = 5.99). Author affiliations for the remaining 29% of articles are as follows (from most frequent to least frequent types of institution): intervention organizations (8.08%), consulting services (5.75%), research and intervention organizations (4.67%), colleges (3.41%), schools (2.33%), commercial organization, government departments, hospitals, and professional associations (~1% each). Affiliations that were not cited in at least two articles (six institutions) were not classified nor were those affiliations with insufficient data (three institutions).

A predominance of university-affiliated authors is to be expected given the typical responsibilities of academic jobs. Articles from intervention organizations (45 total, 8.08% of articles) and consulting services (32 total, 5.75% of articles) constitute the majority of institutions in the other category. From 1982 to 2004, authors affiliated with intervention organizations contributed a mean of 0.95 articles per year (range, 0 to 4; SD = 1.15); however, from 2005 to 2016, contributions in this category almost doubled to two articles per year (range, 0 to 6; SD = 1.83). Over a similar period from 1982 to 2008, authors affiliated with consulting institutions contributed a mean of 0.69 articles per year (range, 0 to 3; SD = 0.95) but contributions doubled to a mean of 1.75 articles per year (range, 0 to 4; SD = 1.30) from 2009 to 2016.

Authors affiliated with Esch Behavior Consultants, Inc. contributed most of the consulting publications during the last analyzed decade (six articles). Most of these publications addressed behavioral interventions to develop verbal repertoires with people diagnosed with autism. The successful application of behavior analysis in the treatment of autism promotes a constant interchange between academic researchers and practitioners.

Relatively high participation by authors affiliated with intervention organizations and consulting services is especially encouraging given a continuing need for empirical validation of the broad applicability of VB interventions (Carr & Firth, 2005). Readers interested in promoting interaction between researchers in academia and practicing behavior analysts may benefit from discussions of the relations among research, innovation, and practice by Critchfield, Doepke, and Campbell (2015) from the hands-on recommendations for increasing applied research by Kelley et al. (2015) and from the integrative model for graduate applied training described by L. J. Hayes et al. (1995).

The diversity of institutional affiliations of the authors in a given journal may reflect the breadth of the research it publishes (Williams & Buskist, 1983). Given discussions of friction between researchers and practitioners (Critchfield, 2011; Marr, 1991; Schneider, 2012), it seems valuable that *TAVB* publishes articles addressing applied problems (Marcon-Dawson et al., 2009), thus contributing to a constructive dialogue between research and practice.

Institutional Prolificacy

We defined a prolific institution as one for which affiliated authors had at least five articles published, among them, during the study period. To determine prolificacy, the number of published articles per institution was counted and ranked. To identify recent trends, the number of published articles was ranked in two 12-year periods and one 11-year period. Furthermore, the average number of publications per institution was calculated by dividing the number of articles published by the number of volumes per period and overall.

Table 2 shows the rank, number of articles, and national location of 32 prolific institutions identified over the study period. Only eight institutions were not universities and only one institution is located outside of the USA (i.e., Universidade Federal de São Carlos). Western Michigan University was the most prolific institution; its 51 affiliated articles are 3.6 times greater than the second-ranked institution. This high productivity is partially due to the large number of articles published by Michael (20 articles) during his tenure at WMU. However, 31 additional WMU-affiliated articles remain (24 of these were published after J. Michael retired in 2003) constituting a publication rate still two times higher than the second-ranked institution. Western Michigan University was one of the first to organize a graduate program that conducted VB research, beginning in the 1970s (Sundberg, 2014). The WMU Department of Psychology may well have attracted a greater number of VB researchers and students based on this history, thus, producing a sustained research output.

Fourteen prolific institutions were represented during the first two analyzed periods (1982–1993, 1994–2005), seven per period. The number of prolific institutions increased to 12 during the third analyzed period (2006–2016). Only WMU was represented in each of the three review periods. California State University-Stanislaus was represented during the first two periods, and Teachers College of Columbia University was represented in the last two periods. Two prolific service delivery institutions (Sundberg & Associates; Regional Center of East Bay, Oakland, CA) were identified during the first review period, and three additional service delivery institutions were identified during the remaining two periods (Behavior Analysts Inc., Danville, CA; Esch Behavior Consultants, Inc., Marcus Autism Center). The spectrum of prolific institutions contributing to articles published in *TAVB* suggests the vitality of the journal, overall.

Institutional Location

An institution's location (i.e., country) was determined by searching its official name using the Google search engine. Editorial board members and authors affiliated with institutions from different nations were classified as multinational.

Figure 6 displays the cumulative number of articles published during the study period by authors whose affiliations are from countries other than USA and multinational affiliations, which reflects international collaboration; it also indicates the periods in which ABAI and, then, Springer-Verlag published *TAVB* (1998–2013 and 2014–2016, respectively). Of the 383 articles published during the study period, 328 (85.42%) were written by authors affiliated with US institutions. These contributions are stable with a mean of 9.56 articles per year (range, 3 to 21; SD = 4.79). The authors

Table 2 Prolific institutions

Rank	Institutions	Articles	Origin
1	Western Michigan University	51	USA
2	California State University, Stanislaus	14	USA
2	Teachers College, Columbia University	14	USA
4	California State University, Los Angeles	13	USA
4	Southern Illinois University	13	USA
4	West Virginia University	13	USA
7	Smith College	10	USA
8	Graduate School of Arts and Sciences, Columbia University	9	USA
8	Sundberg & Associates	9	USA
8	University of Maryland Baltimore County	9	USA
11	Behavior Analysts, Inc., Danville, CA	8	USA
11	Gonzaga University	8	USA
11	Marcus Autism Center	8	USA
11	University of Nevada, Las Vegas	8	USA
15	California State University, Sacramento	7	USA
15	The University of Kansas	7	USA
15	University of North Texas	7	USA
15	Texas Christian University	7	USA
15	University of Nevada, Reno	7	USA
20	Auburn University	6	USA
20	Emory University	6	USA
20	Esch Behavior Consultants, Inc.	6	USA
20	Eunice Kennedy Shriver Center	6	USA
20	Regional Center of the East Bay, Oakland, CA	6	USA
20	Universidade Federal de São Carlos	6	Brazil
20	University of Wisconsin-Milwaukee	6	USA
20	Western New England College	6	USA
28	Florida Institute of Technology	5	USA
28	Fred S. Keller School	5	USA
28	New England Center for Children	5	USA
28	The Chicago School of Professional Psychology	5	USA
28	University of North Carolina, Chapel Hill	5	USA

of 32 articles (8%) were affiliated with institutions from Canada and the UK (seven articles each); Norway (four articles); Australia and Brazil (three articles each); Israel, Mexico, and Spain (two articles each); and Ireland and Japan (one article each).

The remaining 23 articles were classified as multinational. From these, 21 papers represent collaborations between institutions in the USA and those of other countries: Brazil (seven articles); Ireland (three articles); Canada, Japan, and the UK (two articles each); and Germany, Iceland, Israel, Jordan, and Qatar (one article each). The remaining two articles reflect cooperation between institutions from the UK and Norway.

Fig. 6 Cumulative number of articles by location of the authors' institutional affiliations from 1982 to 2016. Multinational reflects articles with co-authors whose institutional affiliations include more than one nation. Non-USA indicates articles by authors whose institutional affiliations correspond to a single country outside the USA

From 2008 to 2016, multinational articles increased to a mean of 1.78 articles per year (range, 0 to 3; $SD = 1.03$) compared with a mean of 0.32 articles (range, 0 to 1; $SD = 0.47$) during the previous 25 years. It is worth noting that only four multinational articles were published in the 14 volumes of *TAVB* during its pre-ABAI period (0.28 per year), while 19 were published in the 19 volumes during ABAI and Springer-Verlag periods. Several factors may account for this more than threefold increase.

One explanation for increased multinational collaborations during the ABAI era of *TAVB* relates to international participation in the editorial board. Regarding the institutional location of *TAVB* editors, from 1982 to 1997 (pre-ABAI), all members of the editorial board were affiliated with US institutions. Editors affiliated to non-US institutions only appeared in 1998 when ABAI began publishing the journal. Nevertheless, participation by editors outside of the US never exceeded 17% (2016), with a mean of 8% of editors from 1998 through 2016.

When analyzing *JABA* publications from 1970 to 1999, Dymond, Clarke, Dunlap, and Steiner (2000) found low levels of international authorship, accounting for just over 5% of all articles; a rate that was confirmed in a recent update by Martin, Nosik, and Carr (2016). Dymond et al. suggested increasing international participation in the editorial board as a measure for promoting internationalization. Dymond (1997) made the same suggestion when a low international authorship was found in *JABA*, *JEAB*, and *The Behavior Analyst*. The importance of international cooperation in scientific activities is increasingly evident (Witze, 2016). “[Internationalization] can help the field of behavior analysis by providing opportunities to assess the generality of its scientific findings and technologies across a wide array of cultural diversity. It also can provide access to international resources as more countries are embraced” (Malott, 2004, p. 30). While participation by non-US authors and editors has increased since 1998, several steps may enhance the likelihood of further growth in this area.

Increasing international participation at all editorial levels is a fundamental step in expanding the diversity of a journal's research and readership (Dunlap et al., 1998; Dymond, 1997; Dymond et al., 2000; Dymond & Critchfield, 2001; Lattal, 1999). An increased internationalization of the editorial board based on "a system of equal representation from the international categories that publish in the journal, calculated annually, would be advantageous to the field" (Dymond, p. 118). A detailed inspection of the data suggested that *TAVB* editorial board has not reached such system. Editors of *TAVB* could create a mentor-based system to assist prospective authors from non-English language backgrounds (Dymond & Critchfield, 2001; Zsindely et al., 1982). Another editorial measure that could enhance international participation would be the publication of thematic issues addressing global topics relating to VB research (Lattal, 1999). Topics might include cross-cultural effects of information about the environmental impact of specific products on buying green (Layng, 2010) and effects of rules and deadlines on pro-environment behaviors (Malott, 2010).

Another possible explanation for the low international participation in *TAVB* may be related to a low number of research groups devoted to the study of verbal behavior outside the USA. In a related path, Martin et al. (2016) found low international participation in *JABA* despite the increase in the number of non-US behavior analysts certified by the BACB during recent years. The authors conclude that despite language and funding barriers, "behavior analysts must continue to build infrastructures (e.g., scholarships, grants, language translation efforts) to support behavior-analytic practice, training, and research activities around the world." (p. 420). In this regard, combined efforts from *TAVB* and VB SIG such as establishing international study groups, funding multinational research, and promoting language translations of verbal behavior textbooks and articles are promising strategies.

Marketing measures to increase the number of international authors and readers could involve promoting *TAVB* at international conferences and publishing its table of contents in international journals (Lattal, 1999). Such actions may increase awareness of behavior-analytic solutions among international scientists and practitioners as well as disseminate a science of behavior that is relevant to a wide array of problems (Critchfield et al., 2015).

Taken together, authorship and editorship analyses indicate that there is room to promote greater internationalization in *TAVB*. The feasibility and possible outcomes of the strategies suggested in this paper and elsewhere are subjects for future reviews.

Conclusions

The present review identified authorship trends over the past 34 years of *TAVB* activity. Results for the nine features of authors or institutions are best viewed as an initial step. Nonetheless, the study provides considerable information about current trends and fruitful directions for the future, especially when factor-specific data are cross-referenced. For instance, during the study period, there was an increased influx of articles written by frequent authors, co-authors, female authors, and articles originating from applied settings as well as non-US institutions. At the same time, the participation of editorial board members as authors has increased, thus, raising additional questions. Taken as a whole, such findings are further indicators of the present vitality of *TAVB*.

In hopes of continued development, we offered several recommendations for future action. Some recommendations involve assessing external variables that may influence authorship trends in the journal (e.g., increased number of graduate programs that teach verbal behavior, increased frequency of published volumes). Some recommendations involve assessing *TAVB* internal dynamics (e.g., studying how specific authors or networks of authors influence the journals' practices, the relative impact and possible benefits of co-authored papers, and correlations between gender and author type or number of co-authors). Finally, some recommendations involve non-research efforts to promote internationalization and cooperation between academic research and service delivery branches of the VB community.

As aptly noted by Petursdottir et al., “*TAVB* must compete with other behavior-analytic journals for submissions and influence” (2009, p. 118). We hope data provided by this study will inform prospective contributors and facilitate further discussion of *TAVB*'s extensive history and promising future in promoting the study of verbal behavior.

Acknowledgements This research was supported in part by a master scholarship (number 13/24761-0) from São Paulo Research Foundation (FAPESP) and a Senior Student Presenter Grant from the Society for Advancement of Behavior Analysis. We wish to express their appreciation to Mateus Nogueira for acting as the second observer. We thank Dr. Anna I. Petursdottir, editor of *TAVB* during the time the study was undertaken, for making available a list of editors for volumes 21 through 24 and Dr. Judah Axe, VBSIG chair, for providing names of the faculty advisors for winners of the VBSIG competitions from 2006 to 2014. Finally, we are grateful to the three reviewers who enriched the manuscript through their constructive recommendations.

Compliance with Ethical Standards

Conflict of Interest There is no potential conflicts of interests, financial or not, regarding the research: The authors declare that they have no conflict of interest.

Ethical Approval Concerning the manuscript “Authorship Trends in *The Analysis of Verbal Behavior*: 1982–2013”, the authors declare that:

1. All authors had made equal contributions to the research and are equally responsible for it.
2. The manuscript has not been submitted to any other journal.
3. The manuscript has not been published previously.
4. There were no procedures involving either humans or animals as participants.

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