The Analysis of Verbal Behavior: a Status Update

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Abstract We analyzed past volumes of *The Analysis of Verbal Behavior (TAVB)* to provide a comprehensive status update after 30 years of publication. Data on *TAVB*'s content, frequent contributors, and scholarly impact suggest a healthy state of the journal.

Keywords Authorship · Bibliometric analysis · Citations · Impact factor · Journals · Verbal behavior

The Analysis of Verbal Behavior (TAVB) occupies a unique and important role in behavior-analytic scholarship by providing a central location for the publication of conceptual and empirical developments in verbal behavior. This concentration enables efficient access to recent developments in verbal behavior and, in turn, likely facilitates further growth in the area. The journal, as of 2014, has served this vital role for 30 years.

At this point in the journal's history, it seems worthwhile to reflect on what has been published in *TAVB* and to evaluate the impact of this work. In behavior analysis, there is a precedent for reflecting on a journal's history. In 1993, *Journal of Applied Behavior Analysis (JABA)* published a special section to commemorate the journal's 25th anniversary (volume 26[4]). The special section included a range of historical articles on a variety of topics, including citations of the journal's articles (Laties & Mace 1993), publication trends (Northup et al. 1993), reminiscences of past editors (e.g., Wolf 1993), and histories of key training programs (e.g., Baer 1993). Taken together, these analyses provided a comprehensive description of *JABA*'s history, content, and impact during its first 25 years.

In *TAVB*, several prior articles have quantified aspects of the journal, including characteristics of published articles (e.g., populations, dependent variables, experimental design; Marcon-Dawson et al. 2009; Normand et al. 2000) and the journal's impact

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on other scholarship (Petersdottir & Peterson 2009). The purpose of the present article is to provide a more comprehensive status update on *TAVB* by highlighting various measures of *TAVB*'s content (i.e., number of articles, article type, topics of empirical articles), contributors (i.e., authors, institutions), and scholarly impact (i.e., journal citations, most cited articles, impact factor).

***TAVB* Content**

As mentioned earlier, two articles have previously conducted analyses of *TAVB* content (Marcon-Dawson et al. 2009; Normand et al. 2000). Normand et al. reviewed the journal's content (i.e., journal pages per year, experimental versus nonexperimental articles, experimental setting and design, dependent variables, participants) between 1982 and 1998. Marcon-Dawson et al. later published an extension that reviewed *TAVB*'s content from 1999 through 2008 using the same analyses. These types of journal content analyses can identify valuable trends in an area's productivity (e.g., Marcon-Dawson et al.; Normand et al.), categories of scholarly contribution (e.g., Marcon-Dawson et al.; Normand et al.), and topical emphases (e.g., Oah and Dickinson 1989; Sautter and LeBlanc 2006).

The present analysis of journal content began by counting the number of *TAVB* articles per year (excluding editorials) over the last decade (2005 to 2014). We selected the most recent decade to evaluate contemporary activity that might be predictive of productivity in the near future. Figure 1 depicts the count of *TAVB* articles per year. On average, 14.3 articles were published per year. Between 2007 and 2012, there were only 13 or fewer articles per year; however, there has been an increasing trend ever since, with the most articles (20) of the last decade appearing in 2014.

The subsequent analysis represents a historical comparison of *TAVB* content from the first¹ (1982 to 1987) and most recent (2010 to 2014) 5-year periods; these periods were selected to illustrate progress over the lifespan of the journal. The analysis began by classifying articles (excluding editorials) as either empirical or nonempirical in nature. An article was classified as *empirical* if it included any direct measure of behavior. All remaining articles were classified as *nonempirical*. The primary topic area (e.g., verbal operants, stimulus control processes) of each empirical article was then classified by the authors using a consensus approach. As shown in Figs. 2 and 3, there were several notable differences between the first and most recent 5-year periods of the journal. During the first 5 years, a minority (7 articles, 23 %) of the 31 articles were empirical (see Fig. 2). Across the seven empirical articles, six different primary topics were investigated (see Fig. 3). By contrast, a majority (54 articles, 75 %) of the 72 articles in the most recent 5 years were empirical. Across the 54 empirical articles, 19 different primary topics were investigated (see Fig. 3). Among these, recent primary topics were mands (9), tacts (6), intraverbals (6), and multiple verbal operants (5).

¹ The first 5 years of journal content actually spanned six calendar years because no content was published in 1984.

Fig. 1 Number of *TAVB* articles per year between 2005 and 2014

TAVB Contributors

A number of articles (e.g., Dixon et al. 2015; Shabani et al. 2004) have presented quantitative analyses of scholarly productivity in behavior analysis. For example, Shabani et al. identified the most prolific authors and institutions in 10 behavior-analytic journals and Dixon et al. identified the most prolific graduate-program faculty and institutions in six behavior-analytic journals. Such analyses of scholarly contributions can be useful because they highlight the achievements of prolific authors and institutions that, in turn, could offer a useful guide for those interested in selecting training and research sites.

The current analysis of *TAVB* contributors began by identifying *TAVB*'s most frequent authors and publishing institutions within the last decade (2005 to 2014). This period was selected because it provides a large enough time span to reflect frequent as well as recent contributions. We recorded the authors and affiliations of each article. If two or more authors were from the same institution, that institution would only be credited once for that article. In the case of an author with more than one affiliation, only the first affiliation was counted. Authors and

Fig. 2 Percentage of *TAVB* articles categorized as empirical and nonempirical during the first and most recent 5-year periods. The numbers embedded in the bars reflect the number of empirical and nonempirical articles in each category

Fig. 3 Topic areas of *TAVB*'s empirical articles during the first (*top panel*) and most recent (*bottom panel*) 5-year periods. The numbers in parentheses next to each topic reflect the number of empirical articles focused on the topic

institutions with five or more articles (excluding editorials) were then ranked. As shown in Tables 1 and 2, there were seven authors and institutions with five or more *TAVB* articles in the last decade. Western Michigan University was the most frequent publishing institution with 18 articles (see Table 1), and Douglas R. Greer was the most prolific author with 11 articles (see Table 2).

Another useful analysis of scholarly contributions is to examine new contributors to an area (see, e.g., an analysis of *JABA* authorship by Dunlap et al. 1998). Analyses of new or emerging authors in a particular area can be useful as a metric of potential future growth. We calculated the percentage of *TAVB* articles (excluding editorials) in the last 5 years (2010 to 2014) authored by up-and-coming scholars in the area. An author was classified as *up-and-coming* if he or she (a) published two or more *TAVB* articles between 2010 and

Table 1 Most prolific publishing institutions in *TAVB* between 2005 and 2014

Rank	Institution	# of articles
1	Western Michigan University	18
2	Columbia University Teachers College	11
3*	California State University, Los Angeles	7
3*	Southern Illinois University	7
4*	Florida Institute of Technology	5
4*	The Chicago School of Professional Psychology	5
4 *	Esch Behavior Consultants, Inc.	5

*Tie within the rank

2014 and (b) had received a doctoral degree after 2000. Authors meeting these criteria were J. J. Carnero, T. M. Cihon, B. E. Esch, M. J. Fryling, A. M. Karsten, C. F. Miguel, A. I. Petursdottir, R. Rosales, M. A. Shillingsburg, D. W. Sidener, T. M. Sidener, R. H. Thompson, and A. L. Valentino. Of the 72 *TAVB* articles published in the last 5 years, 23 articles (32 %) included at least one of the up-and-coming authors.

TAVB Scholarly Impact

The scholarly impact of behavior-analytic journals has previously been reported in a variety of ways. One approach has been to quantify the citations to one journal by other journals (e.g., *JABA*, Laties & Mace 1993; *TAVB*, Petursdottir & Peterson 2009). Another approach has been to summarize the most-cited articles published in a particular journal (e.g., *JABA*, Laties & Mace). A third approach has been to use journal-impact statistics published by the Institute for Scientific Information (ISI) in the *Journal Citation Reports (JCR)*, such as impact factor (e.g., Carr & Stewart 2005), self-citation rate (e.g., Carr & Stewart; Laties & Mace; Poling et al. 1994), and cited half-life (e.g., Carr & Stewart). As of 2014, *TAVB* has not been included in previous bibliometric analyses because it has not been issued an ISI impact factor. However, Petursdottir and Peterson published estimations of *TAVB*'s

Table 2 Most prolific authors in *TAVB* between 2005 and 2014

Rank	Author	# of articles
1	Greer, R. Douglas	11
2*	Miguel, Caio F.	6
2*	Rehfeldt, Ruth Anne	6
2*	Schlinger, Jr., Henry D.	6
3*	Sidener, Tina M.	5
3*	Petursdottir, Anna Ingeborg	5
3*	Esch, Barbara E.	5

*Tie within the rank

impact factor for the 2003 through 2007 publication years based on data available in the PsycINFO® database. According to their calculations, *TAVB*'s estimated impact factor ranged from 0.267 (2004) to 0.600 (2005). Analyses of a journal's impact are valuable because they provide information about a journal's visibility and effect on other scholarship, thus providing guidance to authors when deciding where to publish (Garfield 1999). For these reasons, we conducted five analyses of *TAVB*'s impact.

We first reviewed *TAVB*'s citations over the last 30 years. On September 8, 2015, a query of citations to *TAVB* was executed using the Publish or Perish© software application (Harzing 2007), which is based on citation data retrieved from Google Scholar™. Note that the citation data in this analysis represent all citations included in Google Scholar (i.e., the results were not refined to only peer-reviewed journals). Our first analysis revealed that since *TAVB*'s inception in 1982, there have been 6061 citations to articles in the journal. Our second analysis yielded the 25 most-cited *TAVB* articles (see Table 3). Zettle and Hayes (1986), Hall and Sundberg (1987), and Michael (1988) are the three most-cited *TAVB* articles in the journal's history.

The third analysis was an estimated impact factor of *TAVB* for the 2013 publication year, which was chosen because it is the most recent year with journal volumes consistently archived in the PsycINFO and Google Scholar databases. To calculate the 2013 impact factor, the number of 2013 peer-reviewed articles in either PsycINFO or Google Scholar that cited *TAVB* articles from 2011 and 2012 was divided by the number of *TAVB* articles published in 2011 and 2012. Based upon these calculations, the estimated impact factors for *TAVB* in 2013 were 0.769 (PsycINFO) and 0.962 (Google Scholar), which considerably exceed the estimated impact factors from earlier years, as reported by Petursdottir and Peterson (2009).

To supplement the standard impact factor described above, we calculated the 5-year impact factor (Jacsó 2009) for 2013 as our fourth analysis. The 5-year impact factor was calculated to correct for lag times in citing-journal practices (Petursdottir & Peterson 2009). In other words, if journals that routinely publish articles that cite *TAVB* have excessive times between submission and publication, these citations would likely not be captured by the traditional 2-year impact factor. To calculate the 2013 5-year impact factor, the number of 2013 peer-reviewed articles in either PsycINFO or Google Scholar that cited *TAVB* articles between 2008 and 2012 was divided by the number of *TAVB* articles published in 2008 and 2012. The journal's 5-year impact factors for 2013 were slightly higher than the 2-year impact factor at 0.814 (PsycINFO) and 1.017 (Google Scholar).

The final analysis was a measure of *TAVB*'s cited half-life for the target year 2013. The cited half-life (Garfield 1999) is a measure of the temporal distribution of citations to a journal's articles in a particular year. Thus, the cited half-life of a journal can indicate whether, for example, only a journal's early work is being cited or whether articles from throughout the journal's history are being cited. The cited half-life for 2013 was calculated by taking the median publication year of all *TAVB* articles that were cited in peer-reviewed articles in 2013 as indicated in the PsycINFO and Google Scholar databases. The median publication year was then subtracted from the target year (2013), which resulted in a cited half-life of 9 (PsycINFO; i.e., the median cited year was 2004) and 10 (Google Scholar, i.e., the median cited year was 2003).

Table 3 Top 25 most cited *TAVB* articles

Rank	# of citations	Author(s)	Year	Title
1	278	Zettle, R.D., Hayes, S.C.	1986	Dysfunctional control by client verbal behavior: The context of reason-giving
2	189	Hall, G., Sundberg, M.L.	1987	Teaching mands by manipulating conditioned establishing operations
3	166	Michael, J.	1988	Establishing operations and the mand
4	116	Barnes, D., McCullagh, P.D., Keenan, M.	1990	Equivalence class formation in non-hearing impaired children and hearing impaired children
5	102	Barnes, D., Hegarty, N., Smeets, P.M.	1997	Relating equivalence relations to equivalence relations: A relational framing model of complex human functioning
6	100	Sundberg, M.L., Michael, J., Partington, J.W., Sundberg, C.A.	1996	The role of automatic reinforcement in early language acquisition
7	90	Nuzzolo-Gomez, R., Greer, R.D.	2004	Emergence of untaught mands or tacts of novel adjective-object pairs as a function of instructional history
8*	87	Michael, J.	1985	Two kinds of verbal behavior plus a possible third
8*	87	Greer, R.D., Stolfi, L., Chavez-Brown, M., Rivera-Valdes, C.	2005	The emergence of the listener to speaker component of naming in children as a function of multiple exemplar instruction
9	85	Sautter, R.A., LeBlanc, L.A.	2006	Empirical applications of Skinner's analysis of verbal behavior with humans
10	82	Twyman, J.S.	1996	The functional independence of impure mands and tacts of abstract stimulus properties
11	80	Alessi, G.	1987	Generative strategies and teaching for generalization
12	79	Catania, A.C., Home, P., Lowe, C.F.	1989	Transfer of function across members of an equivalence class
13*	74	Sundberg, C.T., Sundberg, M.L.	1990	Comparing topography-based verbal behavior with stimulus selection-based verbal behavior
13*	74	Sundberg, M.L., Loeb, M., Hale, L., Eigenheer, P.	2002	Contriving establishing operations to teach mands for information
14	69	Partington, J.W., Bailey, J.S.	1993	Teaching intraverbal behavior to preschool children
15*	68	Carroll, R.J., Hesse, B.E.	1987	The effects of alternating mand and tact training on the acquisition of tacts
15*	68	Greer, R.D., Yuan, L., Gautreaux, G.	2005	Novel dictation and intraverbal responses as a function of a multiple exemplar instructional history
16	64	Miguel, C.F., Petursdottir, A.I., Carr, J.E.	2005	The effects of multiple-tact and receptive-discrimination training on the acquisition of intraverbal behavior
17	63	Sundberg, M.L., San Juan, B., Dawdy, M., Arguelles, M.	1990	The acquisition of tacts, mands, and intraverbals by individuals with traumatic brain injury
18*	62	Catania, A.C., Lowe, C.F., Home, P.	1990	Nonverbal behavior correlated with the shaped verbal behavior of children

Table 3 (continued)

Rank	# of citations	Author(s)	Year	Title
18*	62	Fiorile, C.A., Greer, R.D.	2007	The induction of naming in children with no prior tact responses as a function of multiple exemplar histories of instruction
19	61	Drash, P.W., High, R.L., Tudor, R.M.	1999	Using mand training to establish an echoic repertoire in young children with autism
20*	59	Shafer, E.	1995	A review of interventions to teach a mand repertoire
20*	59	Yoon, S.F., Bennet, G.M.	2002	Effects of a stimulus—stimulus pairing procedure on conditioning vocal sounds as reinforcers

Note: Data retrieved from Publish or Perish© on September 8, 2015. *Indicates a tie within the rank

Concluding Remarks

Collectively, the aforementioned analyses of *TAVB*'s content, contributors, and scholarly impact suggest a positive state of the journal. In terms of journal content, there has been an increasing trend in the number of published articles over the most recent four years. This trend coupled with the increased publication frequency of *TAVB* from one to two issues per year in 2014 suggests regularity in the supply of verbal behavior scholarship. In addition, there has been a substantial increase in the publication of empirical articles over the journal's history. This change is consistent with the increases in experimental articles published in *TAVB* over the years (Marcon-Dawson et al. 2009; Normand et al. 2000). Furthermore, we identified an increased diversity of topics addressed in the journal's recent empirical articles. Taken together, these developments are indicative of an increased capacity to ask and answer the many important empirical questions in the verbal behavior area.

Our data indicate that *TAVB* has had and is continuing to have a robust scholarly impact. Of the 6061 citations to *TAVB*'s articles, approximately two thirds (3739, 61.7 %) were to articles other than the 25 most-cited articles. This finding indicates that *TAVB*'s impact extends beyond its most well-known articles. In addition, 5 of the top 25 most-cited articles were published in the last decade. This is consistent with *TAVB*'s cited half-life metrics, which indicate that approximately half of all *TAVB* articles cited in 2013 were published within the most recent decade. Finally, although *TAVB* does not yet have an official ISI impact factor, its estimated 2013 impact factors increased substantially from earlier estimates (Petursdottir & Peterson 2009).

Perhaps the most positive of our findings is the degree to which recent *TAVB* articles have been authored by up-and-coming scholars in the verbal behavior area (32 % of recent articles), including 4 of the 7 prolific authors listed in Table 2. These data indicate an emerging generation who will likely continue to serve scholarly, and possibly training, functions in the verbal behavior area. This exciting personnel development, along with the aforementioned recognition of the journal's content, indicates a healthy state of the journal today and cause for optimism regarding the continued growth of *TAVB*.

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