Effective Dissemination Requires Effective Talk: a Comparison of Behavior-Analytic Journals

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Abstract We explored language used in three behavior-analytic journals (the *Journal of Applied Behavior Analysis* (JABA), the *Journal of the Experimental Analysis of Behavior* (JEAB), and *Behavior Analysis in Practice* (BAP)) to evaluate differences in factors related to the ease of comprehension. Using a linguistic analysis tool, we compared the first three paragraphs of the introductions of research articles in ten issues of each of the journals. JEAB was found to use language that was less concrete, meaningful, and imageable than the two applied journals. Implications for the field are discussed.

Keywords Dissemination · Language · Basic · Applied · Journals

Summary for clinicians:

- Being able to read broadly within behavior analysis and understand the language used is important for the application and dissemination of the discipline.
- Journals in our field vary in the language that they use, with some using more accessible language than others.
- The primary basic journal used language that was less concrete, imageable, and meaningful than the applied journals, which may make it more difficult to understand.
- The field should work to clearly communicate research findings and put them into practice.

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The sharing of results via publication is one of the ultimate outcomes of the scientific process. To be most effective, journals and other research outlets should be consumable by their intended audiences. That is, they should present papers which are easily understood by educated professionals within their respective disciplines. In behavior analysis, empirical research can be broadly divided into two ends of a continuum, basic and applied, with translational research between them. Basic research explores the fundamental principles of behavior. The *Journal of the Experimental Analysis of Behavior*, JEAB, is a primary outlet for basic behavior-analytic research. Applied research is designed to address problems found in the world outside of the lab. The *Journal of Applied Behavior Analysis*, JABA, is a primary applied research journal. This journal, *Behavior Analysis in Practice*, BAP, has a mission of broadly disseminating research to front-line practitioners of behavior analysis. To accomplish this goal, the science presented herein must be accessible to the intended audience.

The language that behavior analysts use is highly technical, with a large set of specialized jargon. Bailey (1991) argued that behavior analysis is good at being rigorous and precise, but not good at communicating outside of the discipline. Heline (1980) suggested that behavior-analytic language is “a distinct dialect of English” (p. 67). Training within the field creates a common verbal community (cf. Skinner 1957/1992) that can successfully use this language. Still, becoming well-versed in basic and applied literature is an arduous task, requiring a strong set of translational skills. In undergraduate and graduate training programs with an emphasis on behavior analysis (e.g., course sequences approved by the Behavior Analysis Certification Board), the set of objectives that can be met might be limited, given the need for training in both the understanding and the application of behavior-analytic techniques. With these limits, it is unsurprising that most behavior analysts are not equally fluent in both the basic literature and the applied literature.

The ease of understanding the research literature relates directly to practitioner's ability to apply the concepts presented. Skinner (1957/1992) described understanding as an appropriate reaction brought about by a piece of verbal behavior. For readers to demonstrate their understanding of a journal article, they have to be able to describe the article accurately, and, in the case of practitioners, to apply the information that is presented. As Jarmolowicz et al. (2008) found, more accessible language leads to better treatment implementation among individuals inexperienced with behavioral interventions.

Despite the importance of both basic and applied research, there may be structural barriers to being able to easily consume the research. We know that behavior declines as the effort required increases (e.g., Salamone et al. 2012). If professionals find it difficult to read articles in *JEAB*, they may be less likely to pick up a copy. Likewise, the linguistic barriers to understanding might make it difficult for people outside of the field (e.g., consumers of services) to accept behavior-analytic interventions.

The purpose of this study was to evaluate differences in the language used in the basic and applied behavior-analytic journals. We compared language used in *JEAB*, *JABA*, and *BAP* to evaluate stylistic differences between them. Specifically, we focused on three indices that relate to the ease of reading: concreteness, imageability, and meaningfulness. As defined by Graesser et al. (2004), concreteness is how non-abstract a word is (i.e., things you can hear, taste, or touch); imageability is a measure of how easy it is to construct a mental image of the words used; meaningfulness is a measure of relatedness to other words. Higher scores indicate that the words used can be easily associated with other words. These measures were selected because of their influence on how understandable a text is to readers, which has been demonstrated to impact the subsequent behavior of the reader. For example, Danks (1969) demonstrated that higher degrees of meaningfulness among words produced faster and more accurate sentence comprehension when compared to lower degrees of meaningfulness. Klee and Eyesenk (1973) found that sentences with concrete words were more easily understood than sentences with less concrete words, and that this effect was enhanced in people who had strong imagery ability.

We focused our analyses on the first three paragraphs of the introductions of selected journal articles; since introductions must engage the reader, readers might not continue with the article if the first couple articles are too dense, and the function of the journal (disseminating information) might be compromised. We hypothesized that, because of its aims to be a broadly readable journal, *BAP* would score higher on concreteness, imageability, and meaningfulness than both *JABA* and *JEAB*. We also hypothesized that *JABA* would score higher on these indices than *JEAB*.

We used a linguistic analysis tool (*Coh-Metrix*; McNamara et al. 2013) to analyze the first three paragraphs of introductions from ten issues of *JEAB*, *JABA*, and *BAP*. One issue was randomly selected from one volume per year for ten years of *JEAB* and *JABA* for analysis. We selected articles from the past ten years to ensure that we were including a broad range of contemporary papers; articles older than ten years may not reflect current writing practices or influence current clinical practice. Articles from *BAP* were selected from the ten issues available online in full text at the time of analysis. We focused our analyses on three factors that are related to how easy the text is to understand (imageability, concreteness, and meaningfulness), and we compared the indices that *Coh-Metrix* generated for these three factors.

Skewness and kurtosis of the three key variables were evaluated. None of the variables violated assumptions of normality, suggesting that the different number of articles per journal would not impact the statistical analyses. Visual analysis of the scores for each of the three measures failed to reveal any linear trends as a function of the journal volume or publication period.

Means and standard deviations of the key study variables are displayed in Table 1. Separate one-way ANOVAs were conducted to compare the mean text scores for the three outcome variables across the three journals (cf. Table 1). The analyses revealed significant differences between the three journals on concreteness, imageability, and meaningfulness. Effect size conventions for eta squared (η^2) indicate differences of small-to-medium effect for concreteness, medium effect for imageability, and large effect for meaningfulness.

To further explore the differences between the journals, independent *t* tests were conducted comparing the mean scores for each of the three outcome variables by journal. Language used in *JEAB* was significantly less concrete, imageable, and meaningful than both *JABA* ($t(201) > 2.2$, $ps < 0.04$, $ds > 0.31$) and *BAP* ($t(130) > 2.17$, $ps < 0.032$, $ds > 0.38$). Although analysis revealed a non-significant trend of small-to-medium effect for the difference between *JABA* and *BAP* on meaningfulness (with *BAP* demonstrating greater meaningfulness than *JABA* $t(159) = 1.81$, $p = 0.07$, $d = 0.29$), no differences emerged between *JABA* and *BAP* for concreteness ($t(159) = 0.13$, $p = 0.89$, $d = 0.02$) or imageability ($t(159) = 1.00$, $p = 0.32$, $d = 0.16$).

As hypothesized, there were differences in factors that could impact understanding between *JEAB*, *JABA*, and *BAP*, with *JEAB* scoring lower on all three primary variables than the other two journals. *BAP* used language that was more meaningful than *JABA*, but there was not a difference between these two journals with respect to their concreteness or imageability. Together, these findings suggest that the basic research may be more difficult to understand as a function of the language that is used to describe it.

Table 1 Means (M), standard deviations (SD), and one-way analyses of variance (ANOVA) of key study variables for full sample and by journal ($n=248$)

	Full sample ($n=248$)		<i>JEAB</i> ($n=87$)		<i>JABA</i> ($n=116$)		<i>BAP</i> ($n=45$)		ANOVA		
	M	SD	M	SD	M	SD	M	SD	$F(2, 245)$	p	η^2
Concreteness	364.00	26.91	358.30	23.63	366.89	30.08	367.55	22.57	3.07	0.048	0.02
Imageability	387.53	25.06	379.43	21.30	390.63	27.89	395.17	19.82	7.94	0.001	0.06
Meaningfulness	419.74	21.66	408.94	15.83	423.61	21.98	430.62	22.15	21.35	0.001	0.15

JEAB Journal of the Experimental Analysis of Behavior, *JABA* Journal of Applied Behavior Analysis, *BAP* Behavior Analysis in Practice

The differences in the language used may be a chicken-or-egg problem. It is possible that the language used makes the concepts more difficult. Likewise, the concepts presented in the basic research may make it more difficult to describe in concrete terms. If additional effort is required to understand the basic articles, it might lead to lowered levels of engagement with the text and a lowered likelihood that the reader will read the entire paper. However, it is likely that the habitual readers of the basic research know the jargon of the field well enough to find it perfectly understandable. That is, for the particular target audience of the journal, the language might be suitable. Future research could explicitly evaluate this question.

The findings of our study are directly related to the training of future generations of behavior analysts. Now that we have identified that there are differences between the basic and applied literatures, we can provide differential levels of support in the instruction provided. For example, when training with basic research articles, additional teaching aids that are not provided for applied studies (e.g., diagrams, discussion) could be provided.

Like all studies, our analysis has its limitations. While we did use linguistic analysis software to evaluate key metrics associated with reading comprehension, we did not directly assess behavior analysts' comprehension of articles. Future work could evaluate if the differences we found influence comprehension or the degree of preference for particular articles or writing styles. Additionally, future work could evaluate other components of manuscripts, such as the final paragraphs of the introduction or components of method sections, to see if they also systematically differ between these journals.

Our findings underscore the results presented by Dixon et al. (2013), who found, when surveying BCBAs about *BAP*, that more than 20 % of their respondents prioritized making the journal more practitioner-friendly. These participants also “expressed a preference for shorter, more colloquial articles” (p. 13), underscoring the value of understandable language. While this is important for the audience of *BAP*, it may also have some bearing on the readers of other journals.

The use of more understandable language might make it easier to apply behavior-analytic research findings and make these findings more accessible to the general public. Authors might consider using tools such as *Coh-Metrix* to assess the readability of their writing before submitting it for publication. On the other side of the publication process, perhaps editorial review processes could consider the linguistic characteristics of manuscripts as a criterion for evaluation, especially if the goal is broad dissemination. Making our language more understandable might benefit the field and allow for broader audiences to understand and accept behavior analysis.

Method

Sampling

Articles were included from one issue of ten randomly selected volumes of *JEAB* (from volumes 80 through 98) and *JABA* (from volumes 36 to 45), while articles from *BAP* were selected from the ten issues available online in full text at the time of analysis (volumes 1 to 5). For all of the journals, only research articles from each issue were selected for comparison. Eighty-seven articles were included from *JEAB*, 116 were included from *JABA*, and 45 were included from *BAP*.

Procedure

Copies of each article were found in online archives (e.g., the PubMed database). The first three paragraphs of each article were copied and pasted into a text file. Citations and equations were redacted before the text was submitted into *Coh-Metrix* (McNamara et al. 2013). The software provided an output with 106 indices, ranging from descriptive statistics to readability. For the current study, three of these indices (concreteness, imageability, meaningfulness) were compared. These indices were selected a priori to evaluate factors associated with reading comprehension.

Conflict of Interest The authors declare that they have no conflict of interest.

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