

tions. The one that applies most closely to medical literature is the third: “A set of assumptions, concepts, values, and practices that constitutes a way of viewing reality for the community that shares them, especially in an intellectual discipline.” In addition, the word paradigm was first used in English in the 15th century and meant “an example, or pattern.” The same dictionary gives seven definitions for “envelope.” The one most applicable to medical research is “The set of limitations within which a technological system ... can perform safely and effectively.” Obviously, “pushing the envelope” means expanding those boundaries and limitations—an exciting concept.

The phrase “paradigm shift” was popularised by Thomas Kuhn, professor of history and philosophy of

science, in his 1962 book *The Structure of Scientific Revolutions*¹ and has been used regularly since then. There seems to be a good few years to be had yet in using the phrase “pushing the envelope,” but its days will surely be numbered.

There needs to be a new, exciting form of words for the titles of papers for the future. We must not confine our meditations but should begin to think outside of the box.

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1 Kuhn TS. *The structure of scientific revolutions*. Chicago: University of Chicago Press, 1962.

Readability of British and American medical prose at the start of the 21st century

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Articles published in the *BMJ* and *JAMA* are available on the internet, albeit for a fee in the case of *JAMA*. We wanted to determine whether the materials published by these two pre-eminent journals, while physically accessible to a broad population, are likely to be comprehensible to them.

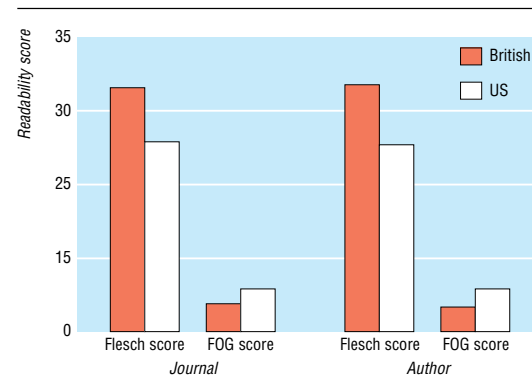
Methods and results

We obtained electronic versions of articles from the *BMJ* and *JAMA* published in the first six months of 2001. We limited our analysis to articles that were published as “Papers” in the *BMJ* or “Original Papers” in *JAMA*, had structured abstracts, and had first authors with either British or US institutional affiliations. The *BMJ* published 42 such articles and *JAMA* 68.

For each article, we noted the national affiliation of the first listed author. We used Readability Calculations software from Micro Power and Light (Dallas, TX) to calculate two validated readability scores—the Flesch ease of readability index¹ and the FOG index.² Flesch scores of <30 and FOG scores of >16 indicate extremely difficult reading, comparable to perusal of a legal contract.³

We performed independent *t* test analysis of these dependent variables, using both the journal (*BMJ* or *JAMA*) and the national affiliation of the first author (UK or US) as grouping variables. We performed a stepwise regression analysis to determine the independent contribution of journal, national affiliation of the first author, and the number of tables, figures, and references to the variation in ease of readability scores.

Articles published in the *BMJ* were easier to read than those published in *JAMA*, as indicated by higher mean Flesch scores (31.5 (SD 8.1) *v* 27.8 (6.4), *P*=0.009) and lower FOG scores (16.9 (1.6) *v* 17.8 (1.3), *P*=0.001). Similarly, articles written by British affiliates were easier to read than those written by US affiliates, as indicated by higher Flesch scores (31.9 (8.0) *v* 27.7 (6.5), *P*=0.003)



Mean ease of readability scores by journal and first author nationality. (For Flesch scores, higher values indicate easier readability; for FOG scores, lower values indicate easier readability)

and lower FOG scores (16.7 (1.5) *v* 17.9 (1.4), *P*<0.001) (figure).

In stepwise multivariate regression analyses, only first author’s nationality significantly contributed to the model, accounting for 7% of the variance in the model predicting Flesch scores (*F*=9.2, *P*=0.003) and 13% of the variance in the model predicting FOG scores (*F*=16.7, *P*<0.001).

Comment

Medical articles published by two major international journals are extremely difficult to read, according to two readability formulas that have been validated in many settings. Articles in the *BMJ* were easier to read than those in *JAMA*, and articles written by British authors were easier to read than those written by US authors. These differences persisted after correction for potential confounders.

The study has several limitations. Firstly, our outcome measures have been used in, but not validated

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for, the analysis of medical journal content.^{4, 5} However, the similarity of the scores we obtained to scores reported in other manuscripts suggests that readability scores are replicable for medical journals and have remained stable over time. Secondly, we examined only two journals for a brief period. To generalise findings will require broader studies. Finally, other factors are likely to contribute to variation in readability scores.

Despite these limitations, our findings have two implications. Firstly, researchers who use ease of readability measures in the analysis of medical articles should consider separating articles by journal and author's nationality. More importantly, virtually all of the medical manuscripts we evaluated were extremely difficult to read. Improving the readability of medical manuscripts may enhance their consumption—both by clinicians and the general public.

The views expressed in this article do not necessarily represent the views of the Department of Veterans Affairs or of the US government. (This article has a Flesch score of 34.6 and a FOG index score of 15.8.)

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A tale of two citations: counting on numeracy in the digital divide

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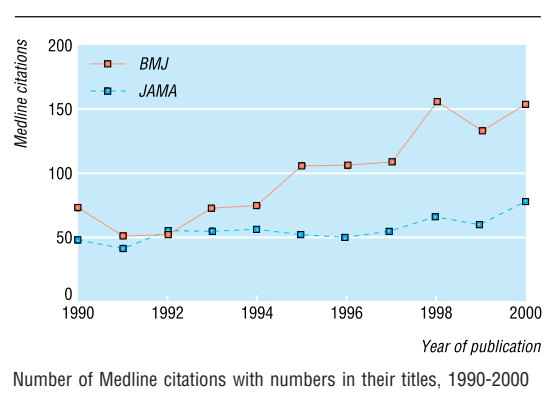
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The *BMJ* (*British Medical Journal*) and *JAMA* (the Journal of the American Medical Association) are vanguard clarions of their respective medical communities. In 1999 the *BMJ* published an analysis of *JAMA* cover art that was critical of the choices made.¹ This criticism inflamed many post-colonial physicians, who rose to defend their homeland. With pride, those west of the Atlantic pointed to the technological advances, the rise of Silicon Valley, and the importance of numbers in the daily lives of Americans.

To demonstrate this last item we evaluated whether numeracy in titles of articles in medical journals is more prevalent, and by inference more important to physicians, in the United States.



Methods and results

We reviewed issues of *JAMA* and *BMJ* for 2001. To maintain equivalence—that is, not comparing apples and oranges²—we examined only original contributions in *JAMA* and research papers in *BMJ*. A number in a title was identified as such if it was cardinal or ordinal, in digits or spelt out. Ethical discussions and case reports were not considered as numeric.

We carried out a Medline search for 1990-2000 using the same criteria, but this could not be restricted to original contributions or research papers.

Our null hypothesis was that the *BMJ* had equal numeric citations to *JAMA*. We computed relative risk ratios and used standard error for the log ratio with comparison of proportions to determine 95% confidence intervals. The Mann-Whitney U test was used for comparison of citation numbers over the years 1990-2000. Trends were examined with the Spearman rank correlation.³

We found that in 2001 *JAMA* had significantly fewer research titles with numbers (16% of 184 articles v 26%

of 234 for the *BMJ*; relative risk 0.63, 95% confidence interval 0.44 to 0.89). Additionally, Medline had fewer *JAMA* citations with numbers in the title for each year we searched except one (figure; $P=0.011$). Over the last 11 years of the millennium, the *BMJ* actually increased numeric citations ($P<0.001$ for trend). In 2001 not only were numbers less prevalent in titles in *JAMA* but research articles with numeric based conclusions were also less densely presented (0.13 conclusions per page for 1359 pages v 0.34 per page for 642 pages in the *BMJ*, relative risk 0.39, 0.32 to 0.46).

Comments

We found that the *BMJ* surpassed *JAMA* in its pursuit of numeracy and therefore claim that the much lamented decline of British medical numeracy¹ is inaccurate.

The upward trend over the past decade in the quantity of *BMJ* citations with numbers may reflect an increasing awareness of the importance and power of numeracy in medicine.⁵ Medical authors often feel the