

Medical Communications

Editorial

Dear all,

In this first issue of 2018, I'm delighted to introduce an excellent article from one of EMWA's newest Workshop Leaders, John Dixon. Although John is new to teaching at EMWA, he's extremely experienced in his field – or, more correctly, fields! John qualified in medicine and initially trained as a surgeon before becoming a GP. Since 2003, John has completed an MBA and spent 5 years as Director of Medical Communications at InterComm International Ltd, becoming a healthcare communications consultant and trainer in scientific writing in 2013.

John shares all of our frustration at poorly

written and presented articles, and he brings his formidable knowledge and experience to bear on this topic in his article for *Medical Writing*. With characteristic humour and (as would be expected) great clarity, John explains that biomedical research writing is becoming increasingly difficult to read and understand, suggesting a review of the reasons for this as he does so. It is ironic that, with the Industry push towards open access and transparency, the information available is becoming increasingly difficult for readers to understand! However, John assures us that this is not a lost cause and suggests some tools that medical writers (and others) can use to help us all to think more about readability and how we write.

SECTION EDITOR



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This issue's article is a fascinating read and certainly reminded me of some of the reasons why readability is so crucial. I particularly liked John's cartoon, and I look forward to further thoughts and articles from him. Rest assured – I will make sure that I “shake off the ball and chain of traditional scientific writing”!

Bestest,

Lisa

Readability of biomedical research articles: Where are we now, and how can we move on?

Readable biomedical research articles – an oxymoron?

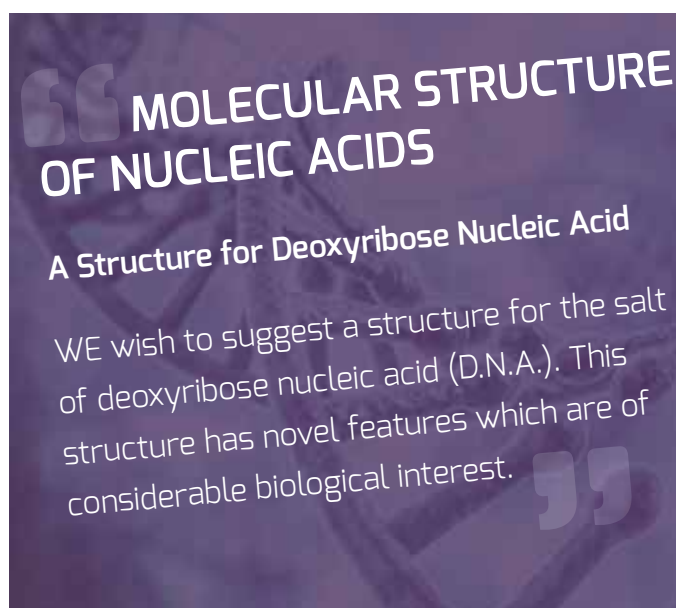
How often do we glide through a biomedical research article and think “this is well written”? Not often. Long gone is the time of highly readable articles such as Watson and Crick's classic 1953 paper on the structure of DNA.¹ I've spent years having to reread original articles because I'm struggling to understand what's going on. I used to think it was me. Perhaps this is partly true, and science is getting more complicated and sub-specialised. But authors of research articles do have something to answer for, even though it may not be their fault. We scientists have become writers without learning how to write readable prose. Instead, we copy what we read in original articles, thinking this is good style. We use intelligent-sounding text with long, complex sentences and scientific jargon. This style is deeply rooted – a ‘culture’ – and any challenge can meet with resistance. Indeed, after a recent workshop I delivered on effective scientific writing, a doctoral student came up to me. She said [*upset tone*]: “You mean to tell me that everything I've been taught about scientific writing is wrong! Well...”. Either through reader assessment or using readability formulas, the

conclusion is the same. Biomedical research articles are usually hard to read – as hard as legal contracts.

Growing inaccessibility of science despite open access

Worryingly, this situation is getting worse. Shown in a recent study of 700,000 abstracts in over 100 journals from the biomedical and life sciences from 1881 to 2015, articles have become progressively less readable.² True, science is getting more complex. But the authors associated this decline with an increase in the use of general scientific jargon (e.g. *mediated, paradigm, attenuated*) – and not, as one might expect, with discipline-specific words (e.g. *theophylline, post-synaptic, mutagenesis*).

Donald Hayes (sociologist) described this trend as a “growing inaccessibility” of science.³ So, articles are becoming even less readable! Yet we now live in the era of open access – improving access to research articles for everyone. Can anyone see a problem here?



Declining readability of our most trusted scientific resource, but who cares?

Here's another problem. Peer-reviewed articles are the most trusted source of scientific information for everyone from academic scientists to the general public – an important argument supporting the need for open access to *readable* manuscripts.⁴ Peter Suber (philosopher) reminded us of a “patronising” opinion held by some that “lay people don't care to read research literature and wouldn't understand it if they tried.”⁵ Countering this view, he advised us to read the moving account of a mother (without a scientific background) whose children had a rare and poorly documented genetic abnormality. She described her desperate attempts to *access* and *understand* any information to enable her to communicate with doctors and to help her children.⁶ Only peer-reviewed articles were of any help to her – and back then in 2005, most were protected by journal paywalls. Completing the picture, academic staff and postgraduates of science also benefit from articles being more readable.⁷ So, whether lay public or scientific specialists, we all care. We all need open access to *readable* manuscripts, the most trusted source of scientific information.

“– no more research on the topic is needed”: We need solutions!

Despite Hayes' advice back in 1994, yet another article (in the *BMJ*, 2002) illustrated how medical articles published in major journals such as the *BMJ* and *JAMA* were “extremely difficult to read”.⁸ Mark Hochhauser (a readability consultant) commented on this study in a subsequent letter to the *BMJ*. He advised that “no more research on the topic is needed”⁹ because researchers will continue to reach the same conclusion.⁹ He felt that readability studies have no influence on “physicians-researchers-writers”.

Research continues. However, having inevitably come to the same conclusion, some authors do suggest ways forward. In 2017, a study in *The Lancet* illustrated the plight of the modern e-patient. Assuming patients with chronic disease (e.g. diabetes) want to read online medical papers about their condition, many will be disappointed. Smith and colleagues found that abstracts about diabetes and sport were written at a readability level beyond such an audience.¹⁰ They recommended increased use of lay summaries,

and some journals already provide these (e.g. *BMJ*, *PLOS Medicine*, Nature Partner Journals).

A lay summary is just one of many avenues available to help non-scientists understand scientific research. Many non-scientists rely on science journalism, blogs, press releases and social media. Together, these pathways to help interpret and disseminate scientific knowledge represent a “science media ecosystem”.¹¹ Wikipedia increasingly acts as an “amplifier” for open access literature.¹² Perhaps patients with medical knowledge and Web 2.0 skills – patient rapporteurs – will become important intermediaries to help translate original research into understandable online material for e-patients.¹⁰

The science media ecosystem and intermediaries help people understand and interpret science. Arguably though, these are not good solutions. Indeed, in 2003, Jonathan Knight (physicist) quoted the editor-in-chief of *Science*, who called lay summaries and weblinks “Band-Aids” to solving the problem.¹³ Knight himself suggested these were only “bit-part solutions”. They don't get to the heart of the matter – the readability of the articles themselves. So, even though discipline-specific and technical words are mostly unavoidable, can we do anything to improve the readability of original articles? Or is it a lost cause?

The heart of the matter: Improving readability of original articles

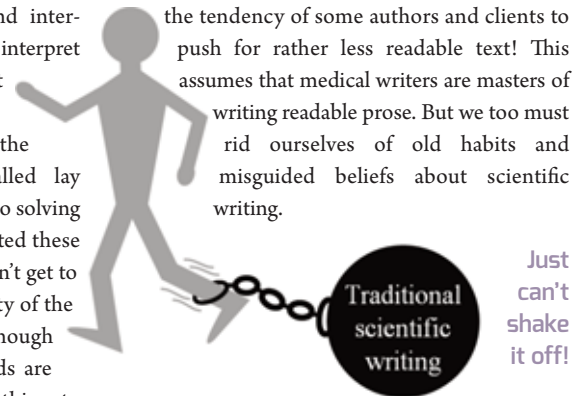
In 2007, John Ludbrook (medical researcher and surgeon) reviewed ways to improve the readability of biomedical journals.¹⁴ He advocated better teaching of writing skills at school and better supervision of postgraduate students. Is this possible? He recommended that postgraduates and their supervisors should read books on scientific writing. Good idea. So, let's not forget some great articles in *Medical Writing* – see for example the March 2017 edition on the topic of “writing better”.

Ludbrook encouraged university courses on writing skills, although he thought that students didn't make enough use of these. In my experience, postgraduate students are keen to attend such courses, but these courses are in short supply. Further, well-intentioned students may wish to attend a course, only to be asked at the eleventh hour to devote their time to something others consider more pressing. *Truly*

protected time would be nice.

Ludbrook suggested that editorial staff of biomedical journals could play a more active part in improving text before publication. Larger journals do make small improvements,¹⁵ but smaller journals are usually unable to handle technical editing. Perhaps journals should offer an award for the most readable paper of the year.¹³

Closer to home, Ludbrook and others have recommended that both authors and journals employ professional science editors¹³ – also known as medical writers. We medical writers have an important role in preparing manuscripts that are as readable as possible – that is, despite the tendency of some authors and clients to push for rather less readable text! This assumes that medical writers are masters of writing readable prose. But we too must rid ourselves of old habits and misguided beliefs about scientific writing.



Readability formulas and online tools

Ludbrook and others have suggested that authors could use readability formulas.^{2,16} Some actively recommend formulas, but Ludbrook thought that this was unlikely to help. I also think such tools are unlikely to help physicians-researchers-writers when they are in the midst of writing up new research. However, I think readability formulas and other tools can help – *when in the right hands and used as learning aids*. I suggest that the “right hands” are university graduates undertaking their first scientific research, and medical writers.

When running a spelling and grammar check on any document in Microsoft Word, anyone can apply two of these readability formulas: the Flesch Reading Ease and Flesch-Kincaid Grade Level formulas. They give a quantitative measure of readability. However, they were not designed to assess the readability of biomedical research articles, despite used widely for this purpose. Online readability tools include the Hemingway Editor and Readable.IO.^{17,18} These provide a visual analysis of text readability and make it easy to find problem sentences and words.

Medical writers should take time to experiment with these formulas and tools and use them to assess the readability of a piece of their own writing. This gives a practical feel for some of the important ways to improve readability. These include using shorter sentences; using shorter, non-technical words to replace longer words; removing unnecessary words such as adverbs; and balancing the use of the active and passive voice. Like golfers experimenting with their swing on the practice ground, playing around with readability formulas and tools can be more fun than reading books on the subject. Perhaps budding physicians-researchers-writers could benefit from exploring these tools at leisure, away from the immediate pressure of deadlines. Postgraduates and medical writers often love exploring these tools, enjoy the discussion they provoke, and indeed some tell me they continue to use them during the day job.

Conclusions: Hard truths but hopefully not a lost cause!

Many biomedical research articles are hard to read. There are bit-part solutions to help interpret research articles. But we need more-readable articles, not least because of open access and our overriding trust in original articles. Old writing habits die hard. Learning new writing skills is hard. However, I suggest there are some useful tools in the box to explore and enjoy using. Authors of articles like this sometimes end with a boast about the article's readability score. I'll deviate and let you look at a colourful analysis of some of this article using the Hemingway Editor (Figure 1). Satisfactory text is not highlighted!

Acknowledgements

The image of a person with a ball and chain was adapted from an original image at <https://www.dreamstime.com/stock-photography-man-dragging-chains-big-ball-debt-burden-concept-image34286972>.

References

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The screenshot shows the Hemingway Editor interface. The text being analyzed is: "How often do we glide through a biomedical research article and think 'this is well written?' Not often. Long gone is the time of highly readable articles such as Watson and Crick's classic 1953 paper on the structure of DNA. I've spent years having to reread original articles because I'm struggling to understand what's going on. I used to think it was me. Perhaps this is partly true, and science is getting more complicated and subspecialised. But authors of research articles do have something to answer for, even though it may not be their fault. We scientists have become writers without learning how to write readable prose. Instead, we copy what we read in original articles, thinking this is good style. We use intelligent-sounding text with long, complex sentences and scientific jargon. This style is deeply rooted – a 'culture' – and any challenge can meet with resistance. Indeed, after a recent workshop I delivered on effective scientific writing, a doctoral student came up to me. She said [upset tone]: "You mean to tell me that everything I've been taught about scientific writing is wrong! Well...". Either through reader assessment or using readability formulas, the conclusion is the same. Biomedical research articles are usually hard to read – as hard as legal contracts."

The readability score is Grade 8, Good, with 215 words. The analysis highlights several issues: 1 adverb (aim for 1 or fewer), 1 use of passive voice (meeting the goal of 3 or fewer), 1 phrase with a simpler alternative, 2 of 17 sentences are hard to read, and 0 of 17 sentences are very hard to read.

Figure 1. Analysis of the first paragraph of this article using Hemingway Editor

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