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ESSAY

Simple rules for concise scientific writing

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Scientific Significance Statement

One of the most common editorial refrains, regardless of discipline, is "this needs to be *tighter*." It typically means too many words and ideas are jumbled together and the underlying point is obscure. The writing is not *concise*. But, improving conciseness is difficult because the problem is caused by a host of factors that are easily overlooked, especially by early career researchers. Here, I describe what it means to write concisely and outline 10 rules, with examples, to help scientists tighten their prose.

"I am writing a longer letter than usual because there is not enough time to write a short one."

Blaise Pascal, *Lettres Provinciales* (ca. 1657)

For many scientists, writing clear and concise manuscripts is a major hurdle to professional success. This overarching challenge can be split into two issues: writing initial drafts and effective revision. Both require considerable investments of time and energy; yet, even with endless supplies of both, making it to the "end" can be difficult, because the "end" is undefined. it is a "you know it when you see it" point that requires considerable experience to identify. Getting to that endpoint—a clear and concise finished work—is often particularly difficult for early career researchers.

This essay's motivation stems from a common editorial refrain: "this needs to be *tighter*." I have given and received this advice dozens of times. I can also attest to how vague it can feel when received, and how desirable specific steps to remedy the issue would be. Ultimately, your reader is telling you to be more *concise*. They want you to give the same information in fewer words. By spending the necessary time to craft your manuscript with conciseness in mind, you will build goodwill with your audience. However, before getting to the rules below, a note of caution: it is important not to take your pursuit of conciseness too far. It is easy to condense into unclarity. By cutting too many words and losing key information, you will create one problem while fixing another. The key is to tighten your writing while keeping the core ideas intact.

Below, I provide a practical guide to writing more concise scientific manuscripts structured as 10 rules that range from big picture, philosophical ideas to specific, practical concepts. Like any good rule, most can be broken under the right circumstances, so I encourage the reader to treat them more as guidelines than laws. However, I have book-ended the essay with two rules that should not be broken. To succeed in writing concisely you must take writing seriously (Rule 1) and embrace feedback (Rule 10). Finally, I must acknowledge the inherent irony that the published version of this essay will represent. Like every bit of writing that has or ever will be drafted, this essay could be more concise. This is unavoidable. Writing concisely is not a binary of success or failure. Rather, it is a question of degree. You should strive to do it well while recognizing that you must eventually stop somewhere.

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Rules for concise scientific writing

Rule 1: Take writing seriously

Conciseness alone does not ensure good scientific writing. However, good science writing that is not concise is rare

(or non-existent), so pursuing conciseness as part of a larger strategy to write effectively is worthwhile. In his guide to scientific writing, Joshua Schimel makes a key point for scientists: "you are a professional writer" (Schimel 2012). Thus, you must take your writing seriously. For me, this means writing almost every day, learning as much as I can about the process by talking with and reading writers I admire, and actively seeking feedback on my work. While much has been written about increasing writing productivity and effectiveness (e.g., Filstrup 2019; Strunk 2007; Schimel 2012; Hotaling 2018), less attention has been devoted to advising writers on issues of clarity and conciseness (but see Gopen and Swan 1990, Williams and Bizup 2016). From emails to manuscripts, the ability to make points clearly and efficiently is perhaps the most important writing skill you can develop. However, if you think you will always nail it on the first attempt, you will be mistaken. Before you can write well, you must get comfortable receiving feedback and revising your work (see Rule 10). Great writing blooms from great revision, and great revision starts with listening to feedback. But it all begins and ends with putting time and effort into your writing.

Rule 2: Identify and stick to your message

As early in the writing process as possible, you should identify your message. What is your paper's goal? Can you summarize the key points in a few sentences? I often add summary sentences to the top of my working document so I see them often. Others like to write the Abstract before anything else. Regardless, once your guide is set, every paragraph and sentence should flow from that overarching roadmap. In other words, you must *stick* to your message. Many scientists find success laying out manuscripts with the ABT (And, But, Therefore) method where main points are linked with an "and", conflict or *why this matters* is introduced with a "but", and things are tied together with a "therefore" (Olson 2015). The ABT template is well-suited to drafting the summary sentence(s) described above.

For Introductions and Discussions, I take my approach a step further. I write each paragraph's focal point in a sentence or less above it and I draft the paragraph with this goal in mind. This process keeps my thoughts on track and limits the inevitable text expansion that comes with directionless writing. Later, when revising, I ask modified versions of my earlier question for each section, paragraph, sentence, and word: does it advance the story? Is it adding value? If the answer(s) are anything other than yes, I either edit to be clearer or remove the offending text altogether. As Kurt Vonnegut put it, I try to "have the guts to cut" (Vonnegut 1980).

It is also important that your manuscripts and even individual sentences not read like mysteries. Your reader is experiencing your thoughts for the first time. They cannot predict where you are going. And, even if they can, making them try distracts from their most important job: reading and

considering what you wrote. Give the reader an early roadmap so everything you lay out fits the picture they already have in mind. By connecting each part of your paper to a larger, overarching message, you will build one of the world's most powerful communication tools: *narrative*.

Rule 3: Get to the point

You and your audience have a mutual goal: transferring information as efficiently as possible. Long-winded setups, extra details, and irrelevant tangents undermine that goal. At best, they waste the reader's time. At worst, they confuse or cause them to stop reading. As you write, a little voice in your head should be reminding you to get to your point as efficiently as possible for everyone's sake.

Rule 4: Keep your Methods and Results contained

Text that should be in the Methods and Results has a way of creeping into other parts of a paper. At times, this is alright; you may want to contextualize what you are discussing. But, too often, early drafts (and often published papers!) will rehash these details where they do not belong. You should read and re-read your manuscripts with an eye towards moving anything better suited to the Methods or Results to those sections. If you find the information is already there, it is time to delete it. Similarly, there is also no need to rehash a study's broader goals in the Methods or Results; manuscript framing belongs elsewhere. One note of caution: this rule assumes a standard Introduction, Methods, Results, and Discussion structure. Some journals include the Results before the Methods. If this is the case, you will likely need to give some methodological context to each result as you go. That is okay.

Rule 5: Do not repeat yourself (too often)

Redundancy is the bane of conciseness and repetitive papers come across as lazy. Of course, there are places (e.g., Conclusions) where reiteration can guide the reader to a bigger message. But in general, once you state something, it only needs to be repeated to add key information (e.g., differentiating between two approaches when describing results). It is also unnecessary to repeat content in figures and tables elsewhere in the manuscript. For example, if you provided an overview of the study area in Figure 1, there is no need to spend precious text describing where your study sites are in relation to each other. The same is true for tables. Once information is in a table, you should only refer to specific details (e.g., a study group and statistical value) in the text before referencing your table.

Rule 6: Avoid unnecessary or inefficient "lead-ins"

When writing a scientific article, unnecessary "lead-ins" undermine brevity. If you are unclear what I mean by an unnecessary "lead-in," re-read the first sentence of this section. Do I need "when writing a scientific article" to set up the sentence? I do not. The sentence should begin with "unnecessary" and with that simple edit, its length drops from nine to four words. Similar pointless setups are pervasive

and over an entire manuscript—perhaps totaling 8,000 words—their net effect can be hundreds, even thousands, of extra words. By learning to recognize and avoid them, you will tighten your writing and make your readers happier (see examples in Box 1).

Rule 7: Use first-person, active voice

First-person, active voice is generally tighter and, in my view, more interesting as it allows the writer to describe the actions they performed from their perspective. *We collected the data this way. I argue this point. Our finding is interesting for this reason.* First-person, active voice puts key subjects and actions at the beginning of the sentence which helps you get to the point quickly and avoid inefficient sentences (see Box 1). It should be noted, however, that situations may arise that require passive voice. For instance, if the author(s) did not collect the data being referred to, then referencing its collection passively (i.e., "Samples were collected…") is appropriate.

Rule 8: Remove unnecessary words

"The road to hell is paved with adverbs."
        Stephen King, *On Writing*: *A Memoir of the Craft* (2000)

Two types of "filler" sneak into sentences: extra words or phrases that can be removed with no effect on the message and phrases that can be condensed from several words to one or two. Sentence filler generally consists of three features being overused: (1) qualifiers, (2) prepositional phrases, and (3) transitions. However, they are not mutually exclusive and often co-occur.

(1) Qualifiers are usually adverbs that modify or enhance other words in a sentence (e.g., quickly, extremely, frequently). They often add nothing and can be removed. (2) Extraneous prepositional phrases (e.g., in this case, among other writers, on the other hand, for the most part) or similar multi-word setups can make sentences feel jumbled and unclear. While it may be hard to cut a phrase entirely, look to replace multi-word phrases with single words. Switching from passive to active voice (see Rule 7) can also help reduce overuse of prepositional phrases. (3) Transitions—words that link one sentence to the next (e.g., however, meanwhile, thus)—can be important, but odds are you include more than you need. Work to remove extraneous transitions and, if possible, combine sentences. See Box 2 for examples of common filler.

Rule 9: Simplify your language

"Use the smallest word that does the job."
        E.B. White

You do not need complicated words and clever phrasing to write well. They take up space, waste time, and may cause your message to be misinterpreted. Stephen King cautions against being so taken with a certain word or phrase that you stick with it despite issues (King 2000). As you revise to reduce your word count, you should also try to reduce your manuscript's syllable count by using shorter words wherever

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Box 1. Avoid unnecessary or inefficient "lead-ins."
Extra words often find their way into the beginnings of sentences, sometimes more than doubling their length with no added value. Here are three common types to avoid:

1. Citation reference.
You rarely need to reference cited work at the beginning of a sentence and doing so requires more words than citing it at the end. In the example, the issue is compounded by including "In a recent study" before getting to the inefficient reference.

In a recent study, Smith *et al.* (2015) showed that giraffes are larger than squirrels.
        > Giraffes are larger than squirrels (Smith *et al.*, 2015). [6 words saved]

2. Display item reference.
The same premise applies to figures, tables, boxes, and other display items.

In Figure 1, we show that testosterone levels were higher in birds than fish.
        > Testosterone levels were higher in birds than fish (Figure 1). [4 words saved]

3. Inefficient lead-ins.
Often, an inefficient lead-in can be fixed by reorganization. Below, by bringing the previous conclusion (sharks) to the beginning, it's easier to get to the point and and tighten the sentence.

If you find yourself swimming in the ocean, be wary of sharks.
        > Be wary of sharks when swimming in the ocean. [3 words saved]

Box 1. Avoid unnecessary of inefficient "lead-ins."

Box 2. Remove unnecessary words.
Many sentences contain filler that can be removed or condensed. Often, sentence filler stems from overused qualifiers, prepositional or multi-word phrases, and transitions.

Overused qualifiers that can often be removed:
Actually, basically, extremely, fairly, kind of, quite, rather, really, sort of, very.

Multi-word phrases that can be condensed:
In order to **>** To
As well as **>** And
Both of them **>** Both
Was found to be **>** Was
Substantially more **>** Greater
In spite of the fact **>** Although
There is no doubt that **>** Clearly
Around the world **>** Worldwide **OR** global
A recent study has shown **>** A recent study showed
In the paper, the conclusion is that **>** We conclude that

Removing transitions and combining sentences where possible:
Moreover, we show that sharks are larger than otters. Thus, sharks should be considered in global management plans. Finally, sharks are also faster swimmers than otters.

Which can be tightened to...
We show that sharks are larger than otters and should be considered in global management plans. Sharks also swim faster than otters.

Box 2. Remove unnecessary words.

possible (e.g., replacing "utilize" with "use"; see Box 3 for common examples).

Rule 10: Seek and embrace feedback
"I believe more in the scissors than I do in the pencil."
    Truman Capote

Diagnosing editorial issues in your own writing is difficult. Thus, good feedback is as important as the writing itself. From the perspective of conciseness, for instance, it is hard to see alternative, tighter ways to phrase something, to notice when you are repeating yourself, or to identify places where your narrative has strayed from the overarching goal. While all editorial feedback will not be focused on conciseness, plenty will. You can also direct those giving you feedback to focus on certain components of your manuscript. If I am working under a word limit, I will remind readers that the paper needs to be a specific length and to please look for areas where it can be condensed, whether through rephrasing or removing entire portions.

Helpful editorial input will not happen magically, however, even with the right co-author, peer, or supervisor. It starts with you—the writer—and the feedback environment you construct. Are you overconfident and quick to ignore people's input? Do you take feedback seriously? Are you kind to those giving you feedback (especially those that are well-intentioned but critical)? While difficult to hear, having a friend or reviewer let you know when something is not ready for publication due to major flaws will save you considerable trouble in the long run.

Box 3. Simplify your language.
Using simpler language with fewer syllables and more straightforward phrasing will tighten your prose. Below are common multi-syllable words with shorter replacements.

Presents **>** is
Important **>** key
Supplement **>** add
Numerous **>** many
Utilize **OR** leverage **>** use
Frequently **OR** typically **>** often

Box 3. Simplify your language.

Box 4. Simple rules for concise scientific writing.
1. Take writing seriously.
2. Identify and stick to your message.
3. Get to the point.
4. Keep your Methods and Results contained.
5. Don't repeat yourself (too often).
6. Avoid unnecessary or inefficient "lead-ins."
7. Use first-person, active voice.
8. Remove unnecessary words.
9. Simplify your language.
10. Seek and embrace feedback.

Box 4. Simple rules for concise scientific writing.

To get the most out of the feedback process, I have three recommendations. First, take the plunge and send your work to people who you can trust to be critical when warranted. While a pat on the back or "Looks great!" message may feel good in the short-term, a lack of critical feedback before submission or publication is a recipe for disaster. Second, take feedback graciously. You are asking someone to do something difficult—to spend their time reading your work and telling you how they think it could be improved. This is no small feat. People are busy and do not want to hurt your feelings, especially when you are their peer or mentee. Third, take feedback seriously. Many writers, and particularly those early in their career, cannot properly assess their own writing and tend to be overconfident. Or, they are at least unaware of the effort required to produce high-quality work. So, it is important to be humble when taking criticism. Disagreements about wording or style are common. They are what make writing more art than science. But, to dismiss someone's feedback outright, or to assume you know best, undermines the process, weakens your writing, and wastes everyone's time.

For many, the idea of being *overconfident* in their writing ability is unimaginable. If you are in that group, you likely experience a lot of anxiety about writing, especially when it comes to receiving feedback. If that is true, remember that the feedback you receive only applies to your writing. It has nothing to do with you as a person. It may help you to remember the bigger message your critics are giving you when they provide feedback; they believe in you and your writing enough to spend their limited time helping you improve. If they thought you could not do it, they would not waste their time.

However, if you lack confidence, be careful not to blindly accept comments or edits as absolute truth. Consider each one carefully, ask for clarification when needed, and trust your own intuition when you are not sure about something. If a problem is noted, your critic is likely correct that something is amiss where they specified. However, they may not necessarily be right about how to fix it.

Conclusion

In this essay, I described 10 rules for concise scientific writing (summarized in Box 4). This list is neither exhaustive nor absolute. Rather, it stems from my own experiences in academia and the feedback I have given or received on everything from emails to manuscripts. No matter where your career takes you, being able to write clear, concise prose will serve you well.

Conflict of interest

The author has no conflicts of interest.

References

Filstrup, C. T. 2019. How to be a better scientist. Limnol. Oceanogr. Bull. **28**: 38–39. https://doi.org/10.1002/lob.10298

Gopen, G. D., and J. A. Swan. 1990. The science of scientific writing. Am. Sci. **78**: 550–558.

Hotaling, S. 2018. Publishing papers while keeping everything in balance: Practical advice for a productive graduate school experience. Ideas Ecol. Evol. **11**: 35–46. https://doi.org/10.4033/iee.2018.11.5.f

King, S. 2000, *On writing: A memoir of the craft*. Scribner.

Olson, R. 2015, *Houston, we have a narrative: Why science needs story*. Univ. of Chicago Press.

Schimel, J. 2012, *Writing science: How to write papers that get cited and proposals that get funded*. USA: OUP.

Strunk, W. 2007, *The elements of style*. Penguin.

Vonnegut, K. 1980, *How to write with style*. International Paper Company.

Williams, J., and J. Bizup. 2016, *Style: Lessons in clarity and grace*, 12th Edition. Upper Saddle River, NJ: Pearson.