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LITERATURE REVIEW

How to win (reviewer) friends and influence (editorial) people

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ABSTRACT

While collecting the right data and conducting the appropriate analyses are critical to scientific success, the process of writing your findings and steering them through submission, peer review, and into print is no less important. If you do not publish your work, your scientific career is likely to be brief and unrewarding. As a result, technical writing is a key skill for any researcher today. In this paper, the author goes through the difficult lessons learned from nearly three decades of experience as a scientist, reviewer, and (latterly) editor. The author covers topics such as precision in technical writing, common errors in presenting and describing data, writing a discussion section, and dealing with reviewers and editors.

Key words: scientific article, writing skills, academic writing, journal editors

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INTRODUCTION

As scientists, we are all professional writers.[1] Conference presentations and media interviews are important in disseminating our findings, but published peer-reviewed papers reach the widest audience and form a permanent record of our work and findings.[2] Therefore, crafting scientific papers is an essential skill for a scientist; after all, if we do not publish our findings, we will not be able to build the track record essential for attracting the funding that enables us to continue our research. Scientists are judged primarily on their published research output.

Commonly, the body of a typical research paper is organized according to the IMRaD structure[1]; that is, it comprises the Introduction, Methods, Results, and Discussion sections, each of which serves a distinct purpose. The introduction section tells the reader the reason behind conducting the study; it summarizes the context of the study and clearly states its aims. The methods section describes how the study was conducted and includes enough details to enable critical appraisal of the methods used and to allow someone else to replicate the study, should they wish to do so. The results section includes the findings of the study. The discussion section tells the reader what your findings mean, putting them into the context of the international literature, and accounting for any anomalies. Each section has its own rules. Most of us have had to learn those rules through trial and error, arriving eventually at an implicit understanding of what goes where and why. Even highly experienced scientists can get it wrong occasionally, but reviewers and editors are there to set them back on the right path. The IMRaD structure is rigid, but it has evolved that way because it is the most effective way to present a great deal of extremely complex scientific information in an efficient and relatively short paper.

In this paper, I will cover the three main areas of: (a) presenting and describing your data; (b) discussing your findings; and (c) navigating the publication process.

Presenting and describing your data

The presentation and description of your data should be detailed only in the results section. It may seem self-evident, but it is worth reiterating: the results section is where you present your data to the reader. Nothing else should be in this section. All subjective comments or references to the findings of others should be left to the discussion section. A good rule of thumb is that you should never, ever, see a citation used in a results section; if the author feels the need to use one, they are either giving further methods details, or putting the findings into the context of what has been done elsewhere (which is the job of the discussion section).

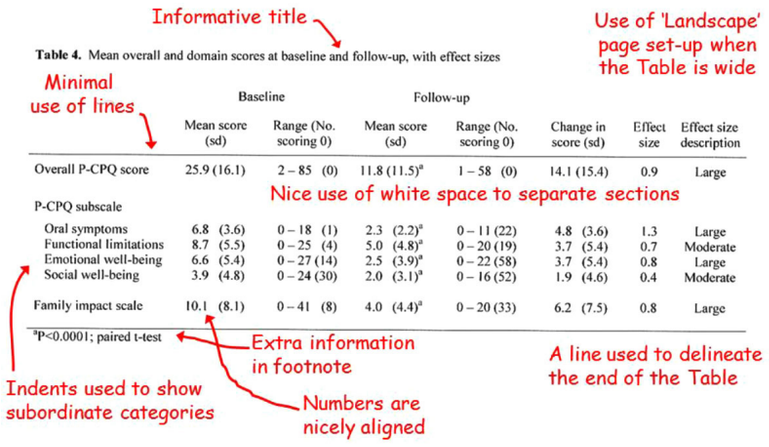

Table 4. Mean overall and domain scores at baseline and follow-up, with effect sizes

	Baseline		Follow-up				
	Mean score (sd)	Range (No. scoring 0)	Mean score (sd)	Range (No. scoring 0)	Change in score (sd)	Effect size	Effect size description
Overall P-CPQ score	25.9 (16.1)	2 – 85 (0)	11.8 (11.5)[a]	1 – 58 (0)	14.1 (15.4)	0.9	Large
P-CPQ subscale							
Oral symptoms	6.8 (3.6)	0 – 18 (1)	2.3 (2.2)[a]	0 – 11 (22)	4.8 (3.6)	1.3	Large
Functional limitations	8.7 (5.5)	0 – 25 (4)	5.0 (4.8)[a]	0 – 20 (19)	3.7 (5.4)	0.7	Moderate
Emotional well-being	6.6 (5.4)	0 – 27 (14)	2.5 (3.9)[a]	0 – 22 (58)	3.7 (5.4)	0.8	Large
Social well-being	3.9 (4.8)	0 – 24 (30)	2.0 (3.1)[a]	0 – 16 (52)	1.9 (4.6)	0.4	Moderate
Family impact scale	10.1 (8.1)	0 – 41 (8)	4.0 (4.4)[a]	0 – 20 (33)	6.2 (7.5)	0.8	Large

[a]P<0.0001; paired t-test

Figure 1. Features of a well-set-out Table

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Figure 2. The same Table with the gridlines visible

The British science writer and researcher Dr Ben Goldacre has superbly highlighted the need for a clear distinction between results and discussion: "Science isn't about authority, or white coats; it's about following a method. That method is built upon core principles: precision and transparency; being clear about your methods; being honest about your results; and drawing a clear line between the results… and your judgment calls about how those results support a hypothesis. Anyone blurring these lines is iffy."

There are excellent books available on presenting your results, such as that by Peat et al.[3] What I hope to offer here is a distillation of the principles and the lessons learned from publishing papers on the findings of epidemiological and health services research.

First, describe your participation rate and the characteristics of your sample. If you have data which enable you to compare the characteristics of those who took part and those who did not, then use them to form your first results table. If you have a representative sample and are able to demonstrate no systematic differences between those two groups, then your findings will have more impact because they are generalizable to the source population. Similarly, if your findings are from a follow-up study, your first results table should be a comparison of the key baseline characteristics of those who were followed up and those who were not. Again, being able to demonstrate the absence of systematic differences between the two groups makes your data even more compelling. Resist the urge to comment on these issues in the results section; that is for the discussion section to do.

You can now present your findings. Epidemiological papers usually feature a number of tables, each of which is introduced and then described in the results text. There are three key principles here. First, have one paragraph of results text per table; this makes it easier for the readers (and reviewers) to navigate through your findings. Second, do not repeat table data in the accompanying results text: the readers can see your data in the table; your task is to draw their attention to the important features of the data (and *only* the important features). Third, learn how to work with your tables using a word processor rather than a spreadsheet program (such as Microsoft Excel). You have more control over table formatting and layout in the former, and well-set-out tables are essential if you want to make the reviewers' task easier (and you do: a happy reviewer is a more benevolent one). The typical table structure features data in vertical columns and horizontal rows, and these should be labeled clearly

Table 1. Dental anxiety prevalence and the mean DMFS by sex and socio-economic status (SES)

	Number dentally anxious (%)	Mean DMFS (sd)
Sex	125 (9.6)[a]	9.9 (8.4)
Male	134 (17.8)	11.2 (7.3)
Female		
SES group		
High	94 (11.4)[a]	9.7 (7.6)
Medium	97 (13.8)	10.6 (8.4)
Low	68 (22.3)	12.4 (9.3)
All combined	259 (13.9)	10.6 (8.2)

[a]$P < 0.05$

and succinctly to identify their content. Usually, the first column (known as the table "stub") contains the independent variables through which you are seeking to present and describe the dependent variable(s). Other important features are the title, which should not be too long, but should be informative enough to give the reader an idea of the table's general content, and footnotes, which provide supplemental information (such as the meaning of abbreviations or the name and/or outcome of statistical tests). There should be minimal use of lines; these are used only to delineate different components of the table. Figure 1 presents an example of a well-set-out table (the data come from a paper which was published a few years ago.[4]

Note that even this particular table can be rendered very difficult to read just by showing all of the gridlines (Figure 2). You can see how hard it suddenly is to make out what the data are showing. To be fair, having the gridlines visible in Figure 2 does demonstrate a key principle of table compilation: each data item has its own cell in the table, which makes formatting the table and aligning text much easier, but the visible gridlines detract from the data.

A table should stand alone, with all of the required information in the title, the cells, and the footnotes. Place each table on a separate page at the end of the manuscript, after the references. Once you have introduced and described a table, only then can you move the reader on to the next one; never introduce more than one table at a time.

The main purpose of the results section is to present your data. However, a number of key principles can lessen your chance of alienating reviewers and readers. Be consistent and appropriate in the number of decimal places. The question might arise: what do I mean by appropriate? When reporting summary data such as means and standard deviations (or standard errors), it is customary to go no further than one more decimal place than was used in collecting the raw data. Thus, if your raw data were collected as integers (such as with age or DMF scores), your mean age (and SD) should be reported to no more than one decimal place; using additional decimal places implies a degree of precision that is not warranted by your data. It is also important to be consistent; some authors present standard deviations to one more decimal place than the mean, but there is no sound rationale behind doing so. In particular, for percentages, there is never a good reason to present them to any more than one decimal place. Ask for whether to report numbers less than 10 in word form, conform to the style of the particular journal for which you are writing. Use a space between a number and an associated bracket; for example, "34(56.4%)" should be written as "34 (56.4%)."

When describing their data, inexperienced (and sometimes experienced) researchers tend to fall in a number of common traps. The first is using "increased" where "greater" should be used. A good principle is that, if you did not observe "it" (whatever "it" refers to in your study) to increase during your study, you should not describe it as increased. Consider Table 1 as an example, which features bogus data from a fictional survey of dental anxiety and dental caries experience in a sample of adults.

Many would describe the table as showing an "increased prevalence of dental anxiety in females compared to males;" this, however, is wrong on two counts. First, the prevalence is *higher* in females *than in* males, and second, the "compared to" is not needed. The difference can be simply described as something along the lines of "Dental anxiety prevalence was higher among females than males." Moreover, the neophyte might be tempted to describe the gradient in data on mean DMFS across the SES categories as showing that "mean DMFS increased with decreasing SES." This, again, is highly inappropriate. The data are cross-sectional, not longitudinal, and so there is no observation of SES (or anything else) increasing or decreasing; those data would be more appropriately described along the lines of "There was a gradient in dental caries experience, whereby the mean DMFS was greatest among those of low SES and highest among those of high SES."

A number of "atrocities" associated with the presentation of data in tables deserve special mention. The first is presenting only the raw numbers and leaving the reader to calculate the percentages. Nothing irritates a reviewer more than having to get out a calculator unnecessarily! Another statistical *faux pas* is to present a highly significant difference as $P = 0.0000$. This is incorrect: the most commonly used statistical packages go to only four decimal places for the P value, so that particular value is more correctly presented as $P < 0.0001$. Another irritation is the misuse of "correlation,"

Table 2. A Discussion section template (gratefully adapted from Peat et al., 2002)

	Content	Comments
Paragraph 1	What did this study show? Briefly summarize the methods and findings in the context of the study aims.	This is important–it gives the reader a reminder of what the overall research question and study findings were, and it leads in well to the subsequent paragraphs.
Paragraph 2	The study's weaknesses and strengths (in that order).	Get these issues out of the way early on until you confront and deal with the study's weak points (anticipating any methodological criticisms), the reader will be unable to appreciate the brilliance of your work… Remind the reader of your study's strengths after that, so that they go into the next paragraphs thinking that perhaps your study was not so bad after all.
Paragraphs 3 to n-1	Discuss how the results support or refute current understanding.	This is the hardest part of the discussion section because it is where the main work is done–you are explaining your findings and putting them into context. Order the paragraphs from the most important to the least important discussion points. Your references to the literature should be focused and brief.
Paragraph n	Future directions. So what? Where next? Implications for current practice.	But the time you get to this part, the hard work is done. You will have been getting ideas for this paragraph while writing the earlier ones, and it is usually relatively easy. Resist the temptation to say that more research is needed.

which is often substituted for "association": unless you are presenting an actual correlation coefficient, do not use the term "correlation." Moreover, while presenting your correlation coefficient, please do not bother telling us about the associated P value, because even a weak correlation can be statistically significant. It is much more informative to describe the strength and polarity ("direction") of the correlation and ignore its statistical significance. One final error with table data is to present the column percentages instead of the row percentages.

Another common error is the misuse of the term "trend." This occurs primarily in two ways. First, it is used in a general manner to refer to patterns and differences in the data: neophytes will often refer to analyzing their survey data (cross-sectional, note) to identify the trends in those data. Second, some researchers will use the term "trend" to describe an apparent association, which is *almost* statistically significant. For example, if the P value for the apparent sex difference in the mean DMFS in Table 1 was, for instance, 0.08, they might describe the data as showing a trend for caries experience to be higher (or worse, "increased"!) in females than in males. This is incorrect; a trend is a unidirectional movement over time in the values of a variable [5], and the term should never be used in any other manner in scientific writing. Moreover, never present P values without the actual data from which they were calculated.

The next common error is conflating the terms "valid" and "reliable" regarding scientific measurement. Neophytes will write of their need for a "reliable" way of measuring a phenomenon, when it is clear from the context that they are really referring to a *valid* way of doing so. Essentially, reliability relates to the repeatability of the measurements, whereas validity relates to the extent to which they represent the entity or phenomenon, which the researcher is trying to capture.

Try to avoid referring to your participants as "subjects." They have been good enough to take part in your research as fully informed and willing participants; you have not "subjected" them to your research endeavors.

DISCUSSING YOUR FINDINGS

It should go without saying that this is done only in the discussion section, which is where you account for and discuss what you have found. I make a point never to use the term "results" in a discussion section, preferring to limit that to the results section itself. In all my years as a peer reviewer for scientific articles, the most consistent error I have observed is that authors tend to write an extensive and unorganized discussion section. It is worth considering the function of the discussion section. It is where the authors explain where and how the findings fit in with current knowledge and understanding, explain any inconsistencies, and write frankly and honestly about the study's limitations (after all, there is no perfect study). Writing a discussion section to deal with all this is not easy, and it is a good idea to use a template; this helps structure the discussion and reduces the chance of ending up with a long and meandering discussion which nobody wants to read. The template above (Table 2) has been borrowed and adapted from an excellent guide to scientific

writing[3], along with an editorial in the BMJ. [6] I have used it in many papers now, and it has been very useful.

The paragraph should be the unit of composition, with each paragraph serving a different purpose. When writing your discussion section, care to avoid over-interpreting your findings. Go only as far as your study design, sample, measurements, and analyses permit. This, of course, means that you must take care to match the appropriate study design and measurements to your research question, *before* you undertake the research. Moreover, if your sample is not representative, do not attempt to claim generalizability for your findings. Another good piece of advice is that less is better: there is no need to discuss every little association that you found stick to the research question. Some journals require a separate "Conclusions" section. It is important that this be a proper conclusion and not merely a restating of the findings.

Navigating the publication process

You have finished your paper. The first thing to do is to print out a hard copy, leave it for a while (preferably a day or two), and then take it somewhere quiet where you can read through it carefully with a red pen in your hand. Scrutinize every line and try to ensure that the writing is as tight and efficient as possible. Unnecessary words should be deleted. Every one of your co-authors should have read the final version of the paper, because all authors must take public responsibility for the content. Once the paper is ready for submission, do a final check to ensure that the formatting, layout, referencing, section headings and general style are consistent with the requirements of the journal to which you intend to submit the paper. Clearly, you need to have read (and followed) the "Instructions to authors" very carefully. Check your references closely to ensure that they follow the correct format and are consistent, and remember that referencing programs can often be more trouble than they are worth, especially if journal titles need to be abbreviated. Formatting and layout are important, too: a nicely organized paper makes a reviewer's job easier and more pleasant.

After submitting the paper, you must wait for the editor's response. This might take some weeks or even months, but you will eventually receive a decision, usually by e-mail. It takes time because the paper is sent out to independent scientific reviewers—who are usually busy and active researchers themselves—and have to fit their occasional reviewing work around everything else that they are doing. It should be noted here that the reviewers are not paid by the journal to review the paper; rather, they are doing it for the greater scientific good. Reviewers are asked to scrutinize the paper carefully and examine the following characteristics: the scientific rigor of the study; whether the study design was appropriate for the research question; the adequacy of the measures and the analyses; the importance and originality of the findings; the validity of the conclusions; the completeness of the literature cited; the adequacy and clarity of the writing; and whether the paper would be of interest to the journal's readership. They then supply a short (and usually pithy) report and recommendation to the editor, who then makes a decision based upon the reviewers' feedback and their evaluation of the paper.

If the final decision is to reject your paper, that is the end of your dealings with that particular journal, at least with respect to your current work (go and grieve for 10 to 15 minutes, and then move on). Alternatively, the editor may have decided to accept your paper unchanged; this is very much an exception rather than the rule! If it happens, go out immediately and celebrate your good luck and clearly exceptional scholarship. The more common scenario is that you are informed to revise and resubmit your paper so that it can be considered again; this is because the reviewers have found that your paper has some merits but contains sufficient deficiencies to require amendment. The reviewers' comments will be provided to you in the editor's decision e-mail. Read them carefully because, if you really want the editor to accept your revised paper, you will have to respond to each comment in a very considered and informative manner.

The first thing I do when revising a paper is copy the reviewers' comments from the decision e-mail and paste them into a new Word document. This becomes my "response to reviewers" document, in which I am able to show the reviewers exactly how I have dealt with or responded to each of the raised points. While I am working on that document, I also make the appropriate revisions in the manuscript (my personal preference is to use two computer screens simultaneously, which allows me to have both documents visible and lessens the chance of my neglecting to respond to a particular point). A key principle is to make your manuscript changes as obvious as possible for the editor and reviewers without making it too difficult for them to appreciate your revisions. It is a good idea to make any changes using a colored font (say, **red** or **blue**) so that, at a glance, they are able to see your revisions. Do not use the "track changes" facility; this tool can be useful for authors collaborating on a paper, but it is not a good idea to use it for responding to reviewers. When revising the manuscript, you *must* show that you have responded to every point raised by the reviewers. Their concerns are usually valid. Do not take issue with a reviewer's comment, unless you can completely justify yourself on scientific and methodological grounds (and there are no other grounds for doing so).

In closing, I hope that this short paper has been useful and informative. This paper was not intended to a be a set of instructions on how to write a paper, but rather a focused look at three key areas in scientific writing and publishing.

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