

Finally Finished: Part 7: The Writing Sequence

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INTRODUCTION

Having taken the plunge, conducted the research, and analysed the results, the only step remaining is to write up the report and submit it for publication. As they say “There is no science without writing”. The purpose of a scientific article is to construct a clearly written manuscript that describes a question and then logically presents answers, based upon theoretical or experimental results. It generally consists of three main components: the overall idea, a detailed description of the execution and analysis of the work, and a discussion of the findings. The guidelines below deal mainly with how to go about writing and presenting the work for publication.¹

A recap of the major steps involved in conducting research are:

- Identification of a research problem
- Literature Review
- Specifying the purpose of research, the Aim
- Determining specific research questions, the Objectives
- Specification of a conceptual framework, the Hypothesis²
- Explanation and Description of Materials and Methodology for data collection
- Data collection
- Verification and documentation of data, the Results
- Analyzing and interpreting the data
- Evaluating the results and debating the findings with reference to current literature, the Discussion
- Communicating the research findings, Publication submission³

These steps represent an outline of the overall process. However, they should not be seen as a fixed structure, but rather an interactive set of activities.⁴ Most research

begins with the problem statement, i.e. the purpose for conducting the study.⁵ The Literature Review acknowledges previous research in the field and helps to identify gaps in knowledge. It is often conducted before the research question is drafted as the identified deficiencies lead onto the research question, and provide justification for the study. The research question or Aim is synonymous with the hypothesis, and is the supposition to be tested. The Materials and Method then explains how the researcher will collect data to test the hypothesis. Results are then analyzed and interpreted via a variety of statistical methods. Discussion of the findings with reference to other literature help confirm or reject the Null hypothesis, and may lead to recommendations and suggestions for future research. Finally the paper is written up and submitted for publication.

When writing up the research, there is no strict sequence to follow, with different investigators all having personal preferences for tackling this task. Gauch suggested a “flip approach”, starting with the findings and discussion and then moving up to identification of the research problem that emerged from the findings, and finally conducting a literature review to introduce the findings. He argues that “the flip approach is justified by the transactional nature of the research endeavour where research inquiry, research questions, research method, relevant research literature, and so on are not fully known until the findings have fully emerged and have been interpreted”.⁴

This paper presents an alternative writing sequence that may help guide novice researchers in their initial publications.

WRITING SEQUENCE

1. Begin with the Aim, and write it out as a concise problem statement. It should clearly state what is being investigated and why.

2. Next document the Materials and Method used.

This is relatively easy as you will have just completed the study and should therefore know the exact details of the procedure. State: What was done; To whom; How it was done; and What materials were used to do it. It must be written with enough detail and clarity to allow others to duplicate the study. At this stage do NOT state what was found.

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NB: Keep **back-up copies** of your work at regular intervals, and date them each time new information is added. At this early stage it is also advisable to select one referencing system and format, and keep to that throughout the paper. If possible make use of one of the referencing software programmes available (End Note; Refworks). Try to use the style recommended by the journal to which you wish to submit the final paper, as this will save a lot of time at the end. Many journals reject a paper before it is even sent for review, based on minor technical errors such as incorrect referencing, labels, figures, author titles and affiliations, and accompanying documentation. When doing this electronically it can take hours of valuable time to re-upload the entire paper. Look at the Instructions to Authors section of the journal to find the exact requirements and adhere strictly to them.

3. The Results are then documented giving full details of what was found, but not actually showing all of the raw data unless it is specifically required in that situation.

For each variable investigated there should be a corresponding point of finding. Results may be presented as written statements, in tables or as figures. However, don't be tempted to exhibit the same results in all three forms. Choose the method which best suits that type of results or which highlights the information that you would like the reader to focus on. When deciding on which to use, consider that a figure may illustrate striking results better, however, figures are less exact than tables with numbers. Again, do not at this stage try to speculate as to why these results were seen or how the variables may have interacted with each other. There is no discussion or explanations in the Results section, but mention must be made of any outliers, fallout, or findings that were excluded, as well as the reasons for their omission. When using figures and tables, they are introduced as follows:

Table 1 represents the number of left-handed students in the final year dental class. Then insert a brief version of this statement as the table title, and place it above the table. (**Note:** Table numbers are written numerically as 1,2,3 etc. and not as Roman numerals, and 'Table' is capitalised).

Table 1: Number of left-handed students in final year dental class

Category	Series 1	Series 2	Series 3
Category 1	4	2	2
Category 2	2	4	2
Category 3	3	1	3
Category 4	4	3	5

If necessary take a few important points from the Table to mention in the results but do not repeat in words what is clearly evident from the charts. Similarly for Figures. Introduce the Figure with a brief statement, noting that the heading comes below the Figure. Be consistent with styles, fonts and colours for ease of reference when reading.

Don't be tempted to elaborate with descriptive words or value judgements e.g., amazingly, we found that there were more left-handed girls than boys, which was very interesting. State only the facts. Mark Twain had some (very damn) wise words for authors when he said "Substitute 'damn' every time you're inclined to write 'very'; your editor will delete it and the writing will be just as it should be".

4. The Discussion should be the main focus of the paper. As a guide, write one paragraph for each finding in the results, explaining what the findings mean. Now compare your findings with the literature that you have already reviewed during the planning stages. Structure and flow are important, thus each paragraph should end with a linking statement that leads into the next discussion point. Depending on the study type the structure can follow a geographical sequence where results are first compared to the local situation, then to the broader South African conditions, and then with global trends. It may be necessary to conduct another literature review to check for new developments, especially if a few months have elapsed since the research was initiated. It can be embarrassing to publish a "new" discovery and then find that others have already reported on the same findings. At least if you are aware of this, you can link the new literature into your own paper showing how it substantiates your work or discuss the differences. Throughout the discussion, try to link points to those mentioned in the Introduction. This ensures that the paper stays focused. NB: Do not suddenly introduce any new findings if they were not mentioned in the Results.

5. The Literature Review is best left until the end to write. By this stage you may be tiring, so it is an easier task to handle as you will have most of the information from your preliminary searches during your planning stages. It is also wise to leave it until the end in case any new research findings have emerged (see discussion above). Cite all relevant literature as you proceed, making sure to also include these in a comprehensive reference list. Choose and use only one reference style throughout (this should be that recommended by the particular journal to which you plan to submit your work). There are many software packages available that make citing literature easy e.g. End Note; Ref Works. It saves a lot of time and confusion later if they are used from the outset, especially when revisions are needed or new references added. Don't be tempted to add references for the sake of embellishing the review. Use only those that are appropriate, current and relevant. The review should have three sections, an introduction, the main body and concluding remarks. In the introduction the basic ideas are presented, and placed into focused categories. Thereafter try to identify themes and dedicate a section to each, using a funneling process. E.g. caries; caries in children; caries in children on medication. Other ways of ordering may be to follow a chronological progression, geographically (from local

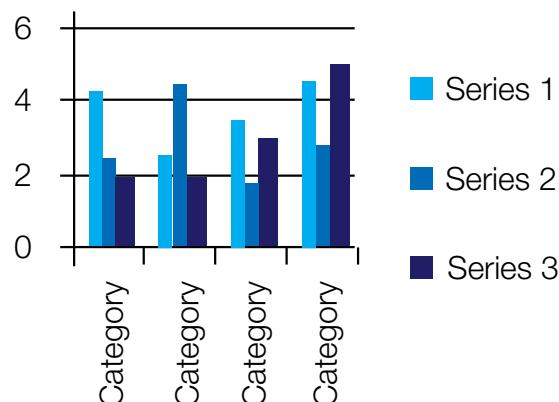


Figure 1: Number of left-handed students per year of study

to global) or developmentally. The concluding section of the review should tie up with the aim and objectives, and attempt to refine the research question, offering also possible recommendations or areas where future research is needed. It may also state the relevance of the study and possible clinical implications.

NB: Keep **back-up copies** at regular intervals, and date them each time you add new information.

6. The Conclusions should be a brief summary of the findings and should include a “take-home” message or recommendation based on the results. It should not be a repeat of the Discussion, and should not include further literature references. It should be concise and stated in the researchers own words. The conclusion to this paper is a good example. (It's also a deliberate bad example in that it contains a **reference**, and the opening line **repeats** the same word three times. Try to avoid verbosity as well as repeated use of the same word. A thesaurus is a great friend).

7. Proof read the paper in its entirety to ensure it is coherent, and that ideas flow logically. Edit spelling and typing carefully and if necessary ask a second person to cross check this.

8. Finally insert the Abstract. An easy way to do this is to read through the complete paper and highlight one to two sentences from each of the sections above. Then, simply cut and paste each highlighted section in the correct sequence, and structure them into a comprehensive overview of the research in its entirety. The abstract should be a single continuous paragraph, which can almost be considered an independent document. It does not rely on any material in the body of the report and vice versa. It is a short, easy to read summary that clearly states the objective, the hypothesis and its evaluation, how the investigation was carried out, a precise summary of the results, and a final sentence describing the significance of the findings and the impact of this work or clinical applications!

9. Create a Covering page consisting of the research title which should be concise, descriptive and captivating. Include the names of the author(s), their qualifications and affiliations. Also provide approximately five key words. These words should correlate with words that a potential reviewer may type into their search engines when conducting a literature review. Obviously you would like them to match your paper so that it will be read and cited by others. In the covering letter many journals also require that you include **Acknowledgements**, such as efforts of participant or consultants who are not co-authors. A statement of where the **funding** for the project was obtained from, and any conflict of interest. The Committee on Publication Ethics (COPE) states in its Guidelines on Good Publication Practice (2003) that: “Conflicts of interest arise when authors, reviewers, or editors have interests that are not fully apparent and that may influence their judgments on what is published. They have been described as those which, when revealed later, would make a reasonable reader feel misled or deceived. Articles will be evaluated fairly and will not necessarily be rejected when any competing interests are declared”. Examples of conflicts of interest include: having received fees for consulting; having received research funding having been employed by a related company; holding

stocks or shares in a company which might be affected by the publication of your paper; having received funds for attending a related symposia, or a talk.

You may also have to declare an **Ethics** statement, especially when the study made use of participants or patients. It should briefly state that the study was conducted in accordance with the guidelines set out by the Declaration of Helsinki,⁶ that consent was obtained and that anonymity and confidentiality were ensured. It may also be required to mention how data is being stored.

10. Finally, Submit for Publication (to the SADJ!).

This is the most important step after completion and editing is to submit the findings for publication. After all, the main aim of research is dissemination of knowledge to the broader scientific community, plus there is no greater thrill than to see your own name in print (and it impresses colleagues, family and friends!).

CONCLUSIONS

The conclusion should not have any references, however this Internet conclusion was the best conclusion we could find and has to be cited to avoid plagiarism! **Close with logic.** If the research paper presented multiple sides of an issue, use the final paragraph to present a coherent, rational opinion based on the evidence. Include enough information to back up the statement but avoid excess detail. If the research did not provide any clear-cut answers to the problem statement, indicate this. Restate the initial hypothesis and specify whether it should still be believed or if the research has proved otherwise. Specify that an answer may still exist and propose further research that could shed more light on the topic at hand.⁷

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