SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY TRIVANDRUM - 695011

Research & Publication Cell

GUIDELINES FOR WRITING RESEARCH PAPERS

An objective of organizing a research paper is to allow people to read your work selectively. To this end, many journals require the following sections, submitted in the order listed. There are variations of course. Some journals call for a combined 'Results and Discussion,' for example, or include 'Materials and methods' after the body of the paper. The well-known journal *Science* does away with separate sections altogether, except for the 'Abstract.' The format for a specific journal will be available under "Instructions to Authors."

General structure of a manuscript:

- Title page
- Abstract
- Introduction
- Materials and Methods
- Results
- Discussion
- Acknowledgements
- Conflict of interest
- References
- Figures
- Tables

In all sections of your paper:

- Stay focused on the research topic of the paper
- Use paragraphs to separate each important point (except for the ‘Abstract’)
- Present your points in logical order
- Use present tense to report well-accepted facts; for example, 'the grass is green'
- Use past tense to describe specific results; for example, 'When weed killer was applied, the grass was brown'
- Avoid informal wording, addressing the reader directly, and jargon or slang terms
- Avoid use of superfluous pictures - include only those figures necessary to presenting results

Title Page:

Select an informative title. (Check if the Journal prescribes limit on the number of characters).

Include the name(s) and address(es) of all authors and other details as required by the Journal

Abstract

General intent-An Abstract is a summary of completed work. In a minute or less a reader can learn the rationale behind the study, general approach to the problem, pertinent results, and important conclusions or new questions.

Writing an Abstract- Write your summary after the rest of the paper is completed. Economy of words is important throughout any paper, but especially in an Abstract. However, use complete sentences and do not sacrifice readability for brevity. You can keep it concise by wording sentences so that they serve more than one purpose. Summarize the study, including the following elements in any Abstract. Try to keep the first two items to no more than one sentence each.

- Purpose of the study - hypothesis, overall question, objective
- Model organism or system and brief description of the experiment
- Results, including specific data - preferably quantitative if that is the form taken by the data; results of any statistical analysis should be reported
- Important conclusions or questions that follow from the experiment(s)

Style: -Single paragraph/structured:

- As a summary of work done, it is always written in past tense

- An Abstract should stand on its own, and not refer to any other part of the paper such as a figure or table
- Focus on summarizing results - limit background information to a sentence or two, if absolutely necessary
- What you report in an Abstract must be consistent with what you reported in the paper
- Correct spelling, clarity of sentences and phrases, and proper reporting of quantities (proper units, significant figures) are just as important in an abstract as they are anywhere else
- Avoid citations

Introduction

Your 'Introduction' should not generally exceed two typed pages.

General intent-The purpose of an Introduction is to acquaint the reader with the rationale behind the work, with the intention of defending it. It places your work in a theoretical context, and enables the reader to understand and appreciate your objectives**.**

Writing an Introduction-Here is the minimum information that should be included in a good Introduction.

- Describe the importance (significance) of the study - why was this worth doing in the first place? Provide a broad context.
- Defend the model - why use this particular organism or system? What are its advantages? You might comment on its suitability from a theoretical point of view as well as indicate practical reasons for using it.
- Provide a rationale- State your specific hypothesis(es) or objective(s), and describe the reasoning that led you to select them.
- Very briefly describe the experimental design and how it will accomplish the stated objectives.

Style:

- Use past tense except when referring to established facts. After all, the paper will be submitted after all of the work is completed.
- Organize your ideas, making one major point with each paragraph. If you make the four points listed above, you will need a minimum of four paragraphs.
- Present background information only as needed to support a position. The reader does not want to read everything you know about a subject.
- State the hypothesis/objective precisely - do not oversimplify.

- As always, pay attention to spelling, clarity and appropriateness of sentences and phrases.

Materials and methods

There is no specific page limit, but a key concept is to keep this section as concise as you possibly can. People will want to read this selectively. The reader may only be interested in one formula or part of a procedure. Materials and methods may be reported under separate sub-headings within this section or can be incorporated together.

General intent- The objective is to document all specialized materials and general procedures, so that another individual could use the information to plan his/her study, or determine whether or not your methods were appropriate.

Writing a Materials and methods section

Materials:

- Include specialized chemicals, biological materials, and any equipment or supplies that are not commonly found in laboratories.
- Do not include commonly found supplies such as test tubes, pipette tips, beakers, etc., or standard lab equipment such as centrifuges, spectrophotometers, pipette aids, etc.
- If use of a specific type of equipment, a specific enzyme, or a culture from a particular supplier is critical to the success of the experiment, then it and its source should be singled out, otherwise no.
- Materials may be reported in a separate paragraph or else they may be identified along with your procedures.
- In biosciences, we frequently work with solutions - refer to them by name and describe completely, including concentrations of all reagents, and pH of aqueous solutions, solvent if non-aqueous.

Methods:

- Describe the methodology completely, including such specifics as temperatures, incubation times, etc.
- To be concise, present methods under headings devoted to specific procedures or groups of procedures
- If well-documented procedures were used, report the procedure by name, perhaps with reference, and that's all.

Style:

It is awkward or impossible to use active voice when documenting methods without using first person, which would focus the reader's attention on the investigator rather than the work. Therefore when writing up the methods most authors use third person passive voice.

What to avoid

- Materials and methods are not a set of instructions.
- Omit all explanatory information and background - save it for the discussion.

Results

The page length of this section is set by the amount and types of data to be reported. Continue to be concise, using figures and tables, if appropriate, to present results most effectively.

General intent-The purpose of a Results section is to present and illustrate your findings. Make this section a completely objective report of the results, and save all interpretation for the discussion.

Writing a Results section- You must clearly distinguish material that would normally be included in a research article from any raw data or other appendix material that need not be published.

Content

- Summarize your findings in text and illustrate them, if appropriate, with figures and tables.
- In text, describe each of your results, pointing the reader to observations that are most relevant.
- Describe results of control experiments and include observations that are not presented in a formal figure or table, if appropriate.
- Analyze your data, then prepare the analyzed (converted) data in the form of a figure (graph), table, or in text form.

What to avoid

- Do not discuss or interpret your results, report background information, or attempt to explain anything.
- Never include raw data or intermediate calculations in a research paper.
- Do not present the same data more than once.

Style

- As always, use past tense when you refer to your results, and put everything in a logical order.
- In the text of the “Results” section, refer to each figure consecutively as ‘figure 1,’ ‘figure 2,’ etc. For eg. reference to ‘figure 3’ in the text should always be after ‘figure 2.” Number your tables also similarly.
- Place figures and tables, properly numbered, in order at the end of the report, after “References”

Figures and Tables:

- Each Figure must be numbered and complete with legend
- Each Table should be numbered and should have a heading
- Each figure and table must be sufficiently complete that it could stand on its own, separate from text
- In the manuscript, figures and tables are presented after “References”

Discussion

Journal guidelines vary. Space is so valuable that authors are asked to restrict discussions to four typed pages or less. That works out to one printed page. If you practice economy of words, that should be plenty of space within which to say all that you need to say.

General intent- The objective here is to provide an interpretation of your results and support for all of your conclusions, using evidence from your experiment and generally accepted knowledge, if appropriate.

Writing a Discussion-Interpret your data in the Discussion *in appropriate depth*. This means that when you explain a phenomenon you must explain mechanisms. If your results differ from your expectations, explain why that may have happened. If your results agree, then describe the theory that the evidence supported. It is never appropriate to simply state that the data agreed with expectations, and leave it at that.

- Decide if each hypothesis is supported, rejected, or if you cannot make a decision with confidence. Do not simply dismiss a study or part of a study as "inconclusive."
- Make what conclusions you can, then suggest how the experiment might be modified, if necessary, in order to properly test the hypothesis(es) or accomplish the objective(s).
- Explain all of your observations as much as possible, focusing on mechanisms.
- Decide if the experimental design adequately addressed the hypothesis, and whether or not it was properly controlled.

- Try to offer alternative explanations if reasonable alternatives exist.
- One experiment will not answer an overall question, so keeping the big picture in mind, where do you go next? The best studies open up new avenues of research. What questions remain?

Style:

- When you refer to information, distinguish data generated by your own studies from published information or from information obtained from other students (verb tense is an important tool for doing that).
- Refer to work done by specific individuals (including yourself) in past tense.
- Refer to generally accepted facts and principles in present tense. For example, "Doofus, in a 1989 survey, *found* that anemia in basset hounds *was correlated* with advanced age. Anemia *is* a condition in which there *is* insufficient hemoglobin in the blood."

The biggest mistake that authors make in discussions is to present a superficial interpretation that more or less re-states the results. It is necessary to suggest *why* results came out as they did, focusing on the mechanisms behind the observations.

Acknowledgements:

Financial support should be acknowledged. Any form of support received for conducting the study or the preparation of the manuscript also has to be acknowledged. Acknowledgement of an individual should be with his/her consent. Contributors who do not meet the criteria for authorship should be listed in the acknowledgment. Examples include: individuals who allowed their clinical experience to be included, a person who provided purely technical help, writing assistance, or a department chair who provided only general support. Groups of persons who have contributed materially to the paper, but whose contributions do not justify authorship may be acknowledged under a heading such as "clinical investigators" or "participating investigators," and their function or contribution should be described; for example, "served as scientific advisors," "critically reviewed the study proposal."

Conflict of Interest

All authors must make a formal statement indicating any potential conflict of interest. Such conflicts might include, but are not limited to, shareholding in or receipt of a grant or consultancy

References

List all literature cited in your report, in alphabetical order, by first author (Harvard Style) or in numerical order (Vancouver System). In a proper research paper, only primary literature is used (original research articles authored by the original investigators). Never include a web site as a reference - anyone can put just about anything on a web site, and you have no way of knowing if it is truth or fiction.

Harvard (Author / Date System):

The citation in the body of the text gives the author's surname(s) and the date of publication in brackets. This is the method preferred by many academic institutions. Please check with the relevant institution for exact requirements.

Examples of layout of references:

The list of references at the end of the article should then be in alphabetical order by first author's surname, with the date in brackets immediately afterwards, then the rest of the bibliographical details.

Journal Article

> Allen, A. (1993) Changing theory in nursing practice. *Senior Nurse*, 13(1), 43-5.
>
> i.e Surname, Initials. (Year) Article title. *Journal title*, Volume(Part), Pages.
> Note that the journal title should be italicised or underlined.

Book

> Burns, N. and Grove, S.K. (1997) The practice of nursing research: conduct, critique & utilization. 3rd edition. London, Saunders.
>
> i.e Surname, Initials, (Year) Book title. Edition. Place of publication, Publisher.
>
> Note that the book title should be italicised or underlined.

Book Chapter

Weir, P. (1995) Clinical practice development role: a personal reflection. *In*: Kendrick, K. (ed) *Innovations in nursing practice.* London, Edward Arnold. p. 5- 22.

i.e. Chapter author(s) (Year) Chapter title. *In:* Book author(s). *Book title.* Place of publication, Publisher. p. Pages.

Note that the book title should be italicised or underlined.

Vancouver (Numerical System):

The citation in the text is numbered consecutively. The reference list is then presented in numerical order.

Examples of layout of references:

Journal Article

> Vega KJ, Pina I, Krevsky B. Heart transplantation is associated with an increased risk for pancreatobiliary disease. Ann Intern Med 1996 Jun 1; 124 (11):980-3.
>
> i.e. Surname, Initials. Article title. Journal title. Year Month; Volume(Part): Pages.

Book

Ringsven MK, Bond D. Gerontology and leadership skills for nurses. 2nd ed. Albany (NY): Delmar Publishers; 1996.

i.e Surname, Initials. Book title. Edition. Place of publication: Publisher; Year.

Book Chapter

Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. p. 465-78.

i.e Chapter author(s). Chapter title. In: Book author(s). Book title. Edition. Place of publication: Publisher; Year. p. Pages.

Citing Electronic Sources

Full-Text Journal Article from Medline

Gopee, N. (1999). Referencing academic assignments. *Nursing Standard* 13(27), 37-40. Full-text [online]. Medline, Ovid Technologies Inc.[Accessed 9th February 2001].

i.e. Author surname, Initial. (Year) Title of article. *Journal title.* Volume (part), pages. Full-text [online]. Online database name on host [Accessed date].

Electronic Book on CD-ROM

Weatherall, D. Ledingham, J.G.G. et al (1996). Oxford textbook of medicine on compact disk. [CD-ROM] (3rd ed). Oxford, Oxford University Press. [Accessed 9th February 2001]

i.e. Author/editor. (Year). *Title* [type of medium CD-ROM]. (Edition). Place of publication, Publisher (if ascertainable). Available from: Supplier/Database identifier or number (optional) [Accessed Date] (optional).

Before citing electronic sources, check to see whether the journals 'Instructions to Authors' provides any guidance on requirements.

Each journal has a specific style in the presentation of references. The details will be provided under, “Instruction to Authors.” Attention should be paid to:

- Use of punctuation marks
- The number of names to be listed in case of multi authored papers
- Use of “and” before the last author
- The placement of authors’ initials

Authorship:

There are different ways of becoming an author on a scientific publication, and not all authors are viewed as equal contributors. All authors will benefit from a better and more quantitative understanding of how their contributions are likely to be perceived by their peers. Authorship credit should be based only on (1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; and (2) drafting the article or revising it critically for important intellectual content; and (3) final approval of the version to be published.

In multi-authored papers, the first author position should clearly be assigned to the individual making the greatest contribution. Authors often adopt different methods of crediting contributions for the following authors. In the “sequence-determines-credit” approach, the sequence of authors should reflect the declining importance of their contribution, as suggested by previous authors. Following informal practices, in biomedical sciences, the last author often gets as much credit as the first author, because he or she is assumed to be the driving force, both intellectually and financially, behind the research and is usually the corresponding author.

*Prepared by **Research and Publication cell**.*
Adapted from- David R. Capperrette- Experimental Biosciences, Bioc 211; Rice University, May 2005

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