

How to write a scientific paper

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Overview

- The task of writing a research paper can be daunting.
- You may have completed ground breaking research, but unless the paper is correctly written, at best publication will be delayed, at worse never published.
- The purpose of this presentation is to try and provide an overview of how to write a well-structured research paper for publication.

Do I need to write a research paper?

- Editors and reviewers are looking for original and innovative research that will add to the field of study.
- Ensure that you have enough numbers to justify sound statistical conclusions.
- If the research you are going to report upon relates to a larger study, perhaps it is better to produce one important research paper, rather than a number of average incremental papers.

Style and language

- It is important to refer to the journal's author guide for notes on style.
 - Some authors write their paper with a specific journal in mind, while others write the paper and then adapt it to fit the style of a journal they subsequently choose.
- The objective is to report your findings and conclusions clearly, and concisely as possible.
- If English is not your first language it is recommended that a native English speaker review the paper before you submit it for publication.



"I don't care what you think", Tim said, "my paper is dynamic and stimulating"

The structure of a paper

- Scientific writing follows a rigid structure; a format developed over hundreds of years
- It has the advantage that it allows the paper to be read at several levels:
 - some people will refer to just the title,
 - others may read only the title and abstract,
 - while those who want a deeper understanding will read the majority, if not all, of the paper.
- The average paper usually contains the following sections:

Section	Purpose
Title	Clearly describes contents
Authors	Ensures recognition for the writer/s
Abstract	Describes what was done
Key Words (some journals)	Ensures the article is correctly identified in abstracting and indexing services
Introduction	Explains the problem
Methods	Explains how the data were collected
Results	Describes what was discovered
Discussion	Discusses the implications of the findings
Acknowledgements	Ensures those who helped in the research are recognised
References	Ensures previously published work is recognised
Appendices (some journals)	Provides supplemental data for the expert reader

Authors

- Only include those who have made an intellectual contribution to the research
- OR those who will publicly defend the data and conclusions, and who have approved the final version.
- The **order** in which the names of the authors appear can vary from discipline to discipline, in some fields the corresponding author's name appears first.

Title

- Describe the paper's content clearly and precisely
 - allows the reader to decide whether it would be appropriate to consult the paper further or not.
- **The title is the advertisement for the article**
- Do not use abbreviations and jargon.
- A&I (digital library) services depend on the accuracy of the title, extracting keywords from it that are used in searching.

Abstract

- **Briefly** summarise, the problem, the method, the results, and the conclusions.
- Should give sufficient detail so that the reader can decide whether or not to read the whole article.
- Together, the title and the abstract should stand on their own.
- Many authors write the abstract last so that it accurately reflects the content of the paper.

Introduction

- Clearly state:
 - the problem being investigated,
 - the background that explains the problem, and
 - the reasons for conducting the research.
- Summarize relevant research to provide context and state how your work differs from published work.
- Identify the questions you are answering.
- Explain what findings of others, if any, you are challenging or extending.
- Briefly describe your experiment, hypothesis(es), research question(s); general experimental design or method.

Methods

- Provide the reader enough details so they can replicate your research.
- Explain how you studied the problem, identify the procedures you followed, and order these chronologically where possible.
- Explain new methodology in detail, otherwise name the method and cite the previously published work.
- Include the frequency of observations, what type of data were recorded
- Be precise in describing measurements and include errors of measurement.



Gerald had begun to think that his methodology was too detailed

Results

- Objectively present your findings, and explain what was found.
- Show that your new results are contributing to the body of scientific knowledge.
- Follow a logical sequence based on the Tables and Figures presenting the findings to answer the question or hypothesis being investigated.
- Figures should have a brief description (a legend), providing the reader sufficient information to know how the data were produced.

Discussion

- Describe what your results mean, specifically in context of what was already known about the subject.
- Indicate how the results relate to expectations and to the literature previously cited
- Explain how the research has moved the body of scientific knowledge forward.
- Do not to extend your conclusions beyond what is directly supported by your results - avoid undue speculation.
- Outline what would be the next steps in your study.

References

- Whenever you draw upon previously published work, you must acknowledge the source.
- Any information not from your experiment and not "common knowledge" should be recognised by a citation.
- How references are presented varies considerably - refer to notes for authors for the specific journal.
- Avoid references that are difficult to find.



Jane suddenly realised that her reference list had too many self citations...

Article Submission

- Select your journal carefully
- Read the aims and scope
- Think about your target audience and the level of your work – do you have a realistic chance of being accepted?
- Follow the guidelines in the notes for authors and include everything they ask – it makes the editor's job easier...

Online Submission

- Many publishers now offer a completely electronic submission process.
- The article is submitted online and all of the review procedure also happens online.
- Speeds up the editorial process
- Elsevier have a system known as EES and also allow reviewers access to a huge citation database called Scopus throughout the process.

Journal Selection

• Key (Determining) factors

- Impact Factor
- Reputation
- A&I Coverage
- Access to the target audience
- Overall editorial standard
- Publication speed
- International coverage

• Marginal (Qualifying) factors

- Experience as a referee
- Track record
- Quality and colour illustrations
- Service elements

Journal Selection

Key Factors

- Impact Factor
- Reputation
- Editorial Standard
- Publication speed
- Access to Audience
- International Coverage
- Self Evaluation
- A&I Coverage
- Society Link

Journal Hierarchy



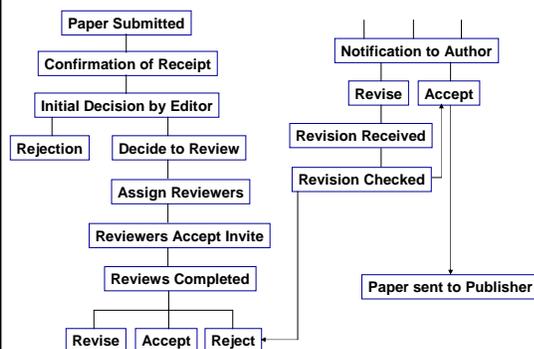
Marginal Factors

- Track Record
- Quality/Colour Illustrations
- Service Elements, e.g. author instructions, quality of proofs, reprints, etc
- Experience as Referee

After Submission

- Most journal editors will make an initial decision on a paper-deciding to send it out for review or to reject the paper.
- Most editors appoint two referees
- Refereeing speed varies tremendously between journals
- You should receive a decision of Accept, Accept with Revision (Minor or Major), or Reject.
- If your paper is rejected most editors will write to you explaining their decision

Overview of Peer Review Process



Further Reading

- Davis, Martha (2005) "Scientific Papers and Presentations", 2nd Edition. Academic Press (ISBN 0-12-088424-0)
- Grossman, Michael (2004) "Writing and Presenting Scientific Papers", 2nd edition, Nottingham University Press, (ISBN 1-897676-12-3).
- Clare, J & Hamilton, H (2003) "Writing research transforming Data into Text", Churchill Livingstone (ISBN 0443071829).

Questions...

Scientific paper writing – from a reviewer's (and researcher's) perspective. How do you get your papers published?

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Writing a scientific publication is basically the end of a scientific investigation!

Hence the work for a scientific publication starts much earlier, namely when you start your scientific research work

Therefore, first some guidelines are given how to do good research, Good Research Practices (GRP)

- Clearly define your research project
- Do a literature survey about the latest results published in this area in scientific journals and read these publications very carefully
- Note the author and the head of the department (which is in most cases the last name of the authors list)
- Store those publications in your computer or print them out
- Check which methods these authors have used and whether they are available for you as well
- Look about resources (technical equipment) available in your own department or in your university. If not available check within other universities (departments) about availability. Check also financial consequences to outsource your investigations to other laboratories

- If your research plan after your literature research study is still up to date, make a working plan (for about one year) how you think you will achieve your results

- If it is not up to date, revise your research plan. Do not duplicate already existing results (exception if you will work you in in special techniques in order to check whether you will get the same results!) or do not start with experiments which do not contribute any new insights to the scientific community.

- Do not start to do „me too“ research!

- **Do regularly a literature review of the most important journals of your field and store the important literature after reading in your computer**

Most important: Use from the very first day of your practical research onward a

LAB JOURNAL

in which all results of your practical research are carefully noted EVERY DAY!

-Do enough experiments to have significant results. To repeat them later is much more time consuming

- Test the validity of your experimental and analytical method

- If you are not familiar with a special experimental technique consult people who are specialists not only for performing the experiments but also for their interpretation

- Note all results in your lab journal and work them out in more detail if necessary

- Never think I will remember these results! In a few weeks you will have forgotten the details

- Do at appropriate intervals a literature review in order to know what the competitors are doing

- If you think you have sufficient new results enough for a publication, ask your supervisor for his/her opinion to publish them

- Do not wait too long to write the manuscript because your competitors do not sleep!

- Look for an appropriate journal with a suitable scope which may be interested to publish your results

Selection of the right journal

There are many scientific journal in the pharmaceutical sciences with high, medium or low impact. The scope of the journals is quite different. Read it carefully whether your paper fits within the scope of the selected journal

Criterion for the impact is the **impact factor**

which is the quotient of the number of citations of publications in the journal

divided by the number of publications

within one year in all journals in this area

The impact factor of a journal can be found at the website of the publisher (e.g. Elsevier) which are published annually

Pharmaceutical journals have in general a relatively low impact factor of 0,2 – 4,3. This in comparison to medical journals or Nature which are much higher

If you are convinced that you have very good results then choose a journal with a high impact factor. Never sell you under value!

If it is rejected in this journal you always can then submit your manuscript to a journal with lower impact factor

If you feel, your results are not strong or the work has a little bit the character of a “me too” paper, choose a journal with a lower impact factor

Never submit your manuscript to various journals at the same time. They may notice it (by perhaps choosing the same referees) and most probably they will put you on a black list

Most scientific pharmaceutical journals publish

- short communications

- full scientific papers

- review articles (in most cases on invitation)

- articles on invitation

Short communications have a maximum length (e.g. 2000 - 4000 words) and can be published relatively shortly. Do have the same scientific impact as a full scientific paper

Also full scientific papers have a maximum length which should not be exceeded

If you have selected a journal in which you would like to submit your scientific results, download the

Instructions for authors

and read them carefully

They give informations how

- to cite literature,

- which abbreviations you have to use

- quality of the figures and tables

- maximum numbers of words

- and the style of the journal in general

Submission of a scientific paper to a journal

Basically all journal ask for electronic submission

Follow the instruction very carefully

Most journals request

-A letter to the Editor

in which you should explain the novelty of your reserach, why it will be interesting for the readership of this journal,

that you fullfil the rules (e.g. of three) regarding the quality of the paper.

You may propose 3-4 referees

The corresponding author should preferentially submit the paper electronically because he has to declare that he/she is in agreement with the content of the manuscript

Content of a scientific article

-Title of the article

- Affiliation of the authors

- Keywords

- Abstract

- Introduction

- Materials and Methods

- Results

- Discussion

- References

- (evt) Acknowledgements

Title of the paper

- should be as informative and clear as possible, but also as short as possible

- the title should be attractive to attract the attention of the scientific community

- avoid to use abbreviations in your title

Affiliation should be precise

- including the affiliation of every author

- corresponding author mit postal address and email address

- follow order of the authors may be a problem: normally the one who has done (most) of the experimental work and has written the article is the first author. The last author is in most cases head of the department if he was involved in the research project or the direct supervisor

Abstract

- should be as informative as possible because the selection to read an article is made on the information od th abstract

▪ Hence the Abstract should contain the

- Aim of the study

- (Materials and Methods)

- **Results and Discussion**

- Conclusions

On the other hand the abstract should be as short as possible, otherwise it will not be read

Take a lot of care when writing the abstract!

Introduction

- should be not too long

- give a short introduction into the state of the art of the research area, was has been done so-far and where are the shortcomings of our knowledge

- explain shortly what is the aim of your research work, what will be really new and what will be your contributions to the scientific community

Materials and Methods

This section is meant that other researcher can reproduce your results. Hence give

- details about the correct name of the chemical substances, the name and affiliation of the manufacturer or supplier, evt purity grade

- details about the apparatuses used as name and type, manufacturer with country

Results

- Try to write your results in a clear and logical way, use short sentences!
- Use always the correct words (e.g. DSC scans and not thermograms. Do not mix them up).
- Use figures and/or tables for presentation of the results but avoid to repeat figures with similar results. Try to describe the results verbally
- Describe only the results you have got. Do not discuss them in this section

Discussion of the results

- Describe again shortly your results and judge whether they are reasonable.
- Give literature references from articles which support your results
- If your results are different from literature results find arguments why your results are correct (evt by using a new hypothesis) but do not criticize too strongly the results from other authors
- Try to make logical conclusions about your results.
- Nothing is more annoying for a referee than inconclusive results or poorly formulated facts.

References

- cite the most relevant literature related to your research work (supportive and/or controversial)
- citations of your own research work should not exceed 30% of all literature citations
- dependent on the length of your article 30 – 40 literature citations should suffice (exception review article!)
- try to cite the original literature and do not use secondary literature citations (go back to Einstein's first publication of his relativity theory!)
- read carefully the authors instruction how to correctly cite the literature

Look at the website of the journal how to submit your article electronically

Submit it and note the reply of the editor (the number of your publication)

Within about 4 -6 weeks you should receive the report of the editor-in-chief of the journal together with the referee's reports

The editor-in-chief may make the following decisions:

Acceptance without any change

Acceptance with minor changes

Major revision of the paper

Rejection of the paper

If your paper is accepted without any change or only with minor changes **be happy!!!!**

If your paper is returned with major revisions **read carefully the arguments** and the reasons why the referees feel the paper needs major revision.

In most cases the arguments of the referees are of great value and mostly improve the manuscript. **However if you are not in agreement with all the statements of the reviewers, write this in your rebuttal letter to the editor**

Before submitting your article again you have to mark the changes in your revised manuscript and you have to write in any case a rebuttal letter

Your supervisor certainly will be prepared to help you to write such a rebuttal letter!!!

If your paper has been rejected, read carefully the arguments of the editor and the referees. In most cases the referees have good arguments to reject a paper. Don't be desperate!!

Use the arguments and revise your paper accordingly. Such an improved version can be sent to another journal where it now can be accepted!

If you are **not in agreement** with the arguments of the referees which result in the rejection of your manuscript go to your supervisor and check with him/her what can be done.

If you are really badly treated your supervisor will help you to write the rebuttal letter or he/she will write one by him/herself and send it to the editor in chief.