

# A Brief Guide to Best Practices in Writing Scientific Papers

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## Why publish in journals?

- Communicate your work
- Make an impact in your field of research
- Build track record for funding
- Get better known
- Advance your career
- Peer review gives your research authority

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## Outline

- **Best practices in writing a manuscript**
  - Is my work ready to publish?
  - Writing advice and common pitfalls
  - Selecting an appropriate journal
  - Open access and sponsor requirements
- **The review process**
- **Other important topics**
  - Bibliometrics (Impact factor, h-index etc...)
  - “Fair” uses of published work
- **Questions and Discussion**

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## Is my work ready to publish?

- Did you address an important problem?
- Has anyone else addressed this problem?
- Is your approach novel?
- Are your results valid?
- Are your results conclusive?
- Will your results have impact on the field?

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## Is my work ready to publish?

### Significance:

- Did you address an important problem?

### Novelty:

- Has anyone else addressed this problem?
- Is your approach novel?

### Validity:

- Are your results valid?
- Are your results conclusive?

### Impact:

- Will your results have impact on the field?

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## Writing the paper

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## Planning (before you start writing)

### Select the results to include in the paper

- Which are your most important results?
- How are they best presented - graph, table, images?

### Develop an outline

- A roadmap to help organise and develop the article
- Be clear about the aims and conclusions of the paper
- Try and tell a coherent story

### Think about which journal you will submit to

- Who is your intended audience?
- Are there specific journal instructions / requirements?
- Do you need to seek permissions for figures?

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## Where do I start?

Wherever you like... the results are a good place to start; they are the core of your article

- Title and Abstract
- Introduction
- Methods
- Results
- Discussion
- Conclusions
- Acknowledgments
- References/ bibliography

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## Introduction

- Define the problem (broadly) and provide context
- Describe previous work
  - What have others done to address the problem or establish the foundations for your study?
  - Confine to relevant research (it's not a literature review)
  - Cite primary sources where possible and recent reviews
  - Take care to accurately report key findings
- Identify the gap in knowledge, i.e. the specific problem your paper addresses
- State the hypothesis (where appropriate) and specific aims
- Be concise (it's not a novel)

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## Methods

- Should be concise but with sufficient detail for someone in your field to repeat the study
- Describe:
  - Instruments (model, key specifications)
  - Materials (key properties, dimensions)
  - Subjects (species/strain, gender, number, disease etc, as appropriate)
  - Methods
- Cite published methods as appropriate

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## Results

- Should be very concise; describe them in sufficient detail to be clearly understood
- Refer to every table and figure
- Describe key features/trends
- Keep figure captions brief, just enough detail to understand what is presented in the figure
- Represent data in an organised way and ensure that tables, figures and references are in order
  - e.g. table 5 should not be referenced before table 4

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## Discussion and Conclusions

- Highlight the significance of your results
- Show how your results and interpretations compare and/or contrast with previously published work
- Discuss the theoretical implications of your work as well as any practical applications
- Briefly discuss the limitations (not flaws) of your study and future avenues for research
- Summarise the main conclusions
  - These must be supported by your results
  - Link them to your stated aims

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## Title and Abstract

The title and abstract will be the **most visible** part of your article

### Title:

Should be short, accurate and give a good idea of the main result or conclusion of the article.

### Abstract:

- Summarises the paper in a single paragraph
- Should follow outline of the paper
  - aim(s), key methods, key results, main conclusion(s)
- Should be self contained

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## Authorship

- Only individuals that have contributed scientifically to the project should be listed as authors
  - Avoid gratuitous authorship
  - OK for technical staff to be listed as co-authors IF they contributed scientifically
- Many journals now require an explicit description of what each author's contribution to the manuscript was
- International Committee of Medical Journal Editors has a standard that has become quite well accepted
  - <http://www.icmje.org>

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## Order of Authors

- Typically, the first author is the person who did the majority of the work
  - Sometimes, there are 2 or 3 co-first authors
- The last author, often referred to as the senior author, is commonly the laboratory director who provided intellectual guidance and scientific oversight to the project.
- Middle authors may be listed by their contributions, alphabetically, or using some other process

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## References

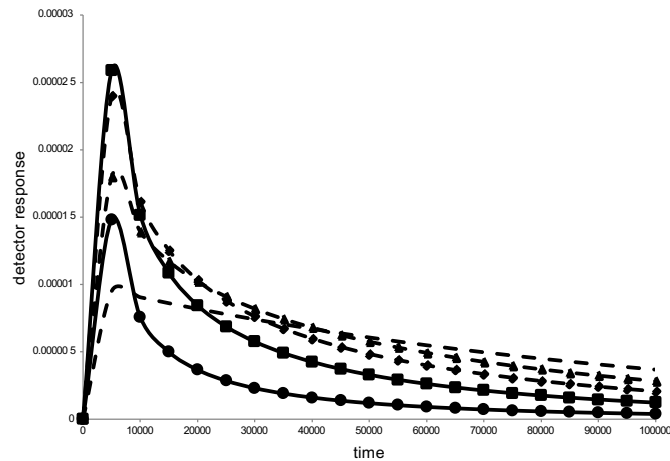
- Cite the **right** references
  - List only significant published references
  - Check all references for accuracy against original source
  - Follow reference style
    - Name and year
    - Order numerically as they are cited in the paper
- Ensure that all references in the list are used in the text and vice versa
- Acknowledgements
  - Make sure you acknowledge appropriate sources, e.g. funding, expertise, equipment

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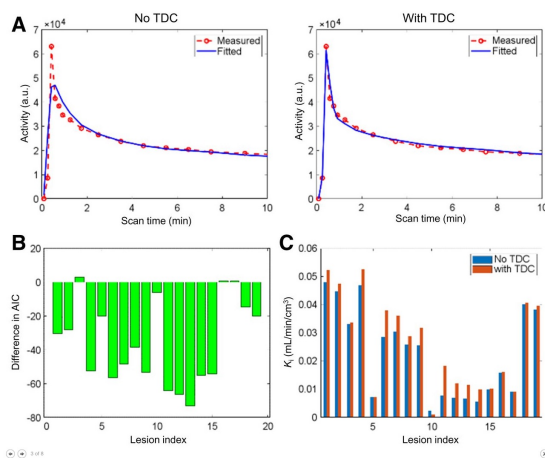
## A poorly presented figure



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## A better presented figure



- All axes labeled with quantity and units
- All curves use easily distinguished lines, symbols and colors that are defined
- Appropriate scaling used on axes
- All labels and numbers legible

Wang *et al* 2020 J Nucl Med 2022; 63: 1274-81.

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## Common pitfalls for young researchers

- Describing methodology in the Results section
  - The results section is for **results**
- Making the article too long
  - Introduction too long
  - Trying to include too many results
  - Writing style too verbose
- Not clearly defining the problem
- Not making the novel contribution(s) clear
- Conclusions too broad
  - Conclusions must be supported by results

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## Use of large language models (e.g. ChatGPT)

AI-based writing tools can help improve the readability of your article, and can be especially helpful if the article is not written in your native language.

- Many journals have specific guidelines about the use of these tools, for example:
  - Can only be used to polish, condense or lightly edit the manuscript
  - Use must be disclosed at time of submission
- Make sure to consult the journal
- The American Physical Society also has guidance:
  - <https://journals.aps.org/authors/ai-based-writing-tools>

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## Is my article ready for submission?

Your article is ready for submission when:

- It has no flaws or omissions
  - it is not the task of reviewers to find your flaws!
- All co-authors have read the manuscript and have no further suggestions for improvement
- All co-authors approve it for submission
  - Some journals and some institutions require a signed statement by all authors
- It has been proof read by at least one native english speaker
- It is in the required format for your chosen journal

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## IOP Publishing Author Guide



<https://publishingsupport.iopscience.iop.org/wp-content/uploads/2018/05/Author-Guide-V9.pdf>

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## Submitting the paper

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## Selecting the right journal

- **Journal audience and scope**
  - You can find it on the journal website
  - Contact the Publisher or Editor if in doubt
  - Browse the back issues to understand the journal's style and scope
- **Reputation (Impact Factor, discipline ranking)**
- **Visibility and relevance**
- **Speed of publication**
- **Open access, subscription or hybrid?**
- Select the journal that will provide the **most recognition** for your work

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## Open Access?

### Gold (open access)

- free to reader
- processing fee usually charged to author (\$2,000-5,000)

### Green

- free to author
- author/publisher places final manuscript in institutional or public repository, e.g. PubMed Central
- embargo period of 6-12 months often imposed by publisher (then free to reader)
- publication cost charged to reader or institution (subscription)

### Non Open Access

- free to author
- publication cost charged to reader or institution (subscription)

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## The review process – what to expect

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## Why do journals use a peer review process?

- As a **service to authors**—peer review should improve the paper!
  - Eliminate errors (ideally)
  - Ensure sufficient detail is provided
  - Improve clarity
- To ensure that the paper is suitable for the journal based on:
  - Scope
  - Quality
  - Originality
  - Importance

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## What happens after submission?

- Journal acknowledges your paper
- Preliminary decision to send to referees or not
  - In scope of the journal?
  - Is the manuscript complete?
  - Is the quality of writing acceptable?
- Editor, Associate Editor or journal staff select referees for the paper
  - Independent experts
  - Knowledge of the field
  - Previous record of fair and constructive refereeing
  - Are available and have the time

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## The review process

- Normally require **two referee reports** (can be one to three referees)
- Referees send their reports back to the Editor
- Typically '**single blind**' referee process is used:
  - Referee knows who the author is
  - Authors are not informed who the referee is
- Editor or Associate Editor makes decision based on referee reports
- Adjudicator or additional reviewers may be selected if the reports are conflicting
- A lot of variability in how long this takes
  - 3 weeks – 3 months is typical.

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## The initial editorial decision

- You will get an email from the editorial office:
  - Immediate accept – unusual but does happen
  - Modify / revise
    - Comments and suggestions from referees
    - Requested revisions may be classed as “minor” (may not go back to reviewers) or “major” (will go back to reviewers)
  - Reject
    - Not unusual! Many good journals have rejection rates of well over 50%

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## Responding to referees' comments

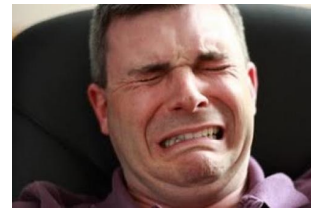


- Read referees' reports and put away for a day!
- Read comments again!
- Respond to each and every comment specifically
- Keep a list of your changes
- Where you disagree, explain why
- If a referee misses a point it is not necessarily his/her fault; you may not have explained it as clearly as you think
- Prepare a detailed covering letter with your response
- Be polite!

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## If your paper is rejected



- Do not despair: treat referees' comments as free expert advice
- You can re-write your article taking into account the suggestions of the referees and re-submit it (to another journal)
- If you think the review was unfair, appeal to the journal by sending a letter and explaining why you think your work did not receive a fair treatment

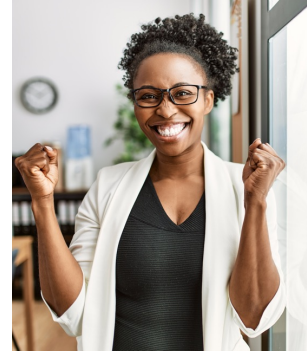
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## If your paper is accepted

- Great! Congratulations!
- The journal will expect you to check your proofs rapidly and carefully
  - Nominate another person if you are unavailable
  - Give one copy of proofs to somebody else to read
  - Reply to editor's queries



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## Other relevant topics

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## Journal impact factor

- In a given year, the impact factor of a journal is the average number of citations received per paper published in that journal during the two preceding years.
- For example, if a journal has an impact factor of 3 in 2023, then its papers published in 2021 and 2022 received 3 citations each on average in 2023.

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## Journal impact factor

<input type="checkbox"/> Nature Biomedical Engineering	2157-846X	2157-846X	ENGINEERING, BIOMEDICAL - SCIE	28.1
<input type="checkbox"/> Bioactive Materials	N/A	2452-199X	ENGINEERING, BIOMEDICAL - SCIE	18.9
<input type="checkbox"/> IEEE Reviews in Biomedical Engineering	1937-3333	1941-1189	ENGINEERING, BIOMEDICAL - SCIE	17.6
<input type="checkbox"/> BIOMATERIALS	0142-9612	1878-5905	ENGINEERING, BIOMEDICAL - SCIE	14.0
<input type="checkbox"/> Biomaterials Research	1226-4601	2055-7124	ENGINEERING, BIOMEDICAL - SCIE	11.3
<input type="checkbox"/> MEDICAL IMAGE ANALYSIS	1361-8415	1361-8423	ENGINEERING, BIOMEDICAL - SCIE	10.9
<input type="checkbox"/> IEEE TRANSACTIONS ON MEDICAL IMAGING	0278-0062	1558-254X	ENGINEERING, BIOMEDICAL - SCIE	10.6
<input type="checkbox"/> Advanced Healthcare Materials	2192-2640	2192-2659	ENGINEERING, BIOMEDICAL - SCIE	10.0
<input type="checkbox"/> Acta Biomaterialia	1742-7061	1878-7568	ENGINEERING, BIOMEDICAL - SCIE	9.7
<input type="checkbox"/> Annual Review of Biomedical Engineering	1523-9829	1545-4274	ENGINEERING, BIOMEDICAL - SCIE	9.7
<input type="checkbox"/> Biofabrication	1758-5082	1758-5090	ENGINEERING, BIOMEDICAL - SCIE	9.0
<input type="checkbox"/> International Journal of Bioprinting	2424-7723	2424-8002	ENGINEERING, BIOMEDICAL - SCIE	8.4
<input type="checkbox"/> Materials Today Bio	2590-0064	2590-0064	ENGINEERING, BIOMEDICAL - SCIE	8.2
<input type="checkbox"/> Photoacoustics	2213-5979	2213-5979	ENGINEERING, BIOMEDICAL - SCIE	7.9
<input type="checkbox"/> Bio-Design and Manufacturing	2096-5524	2522-8552	ENGINEERING, BIOMEDICAL - SCIE	7.9
<input type="checkbox"/> COMPUTERS IN BIOLOGY AND MEDICINE	0010-4825	1879-0534	ENGINEERING, BIOMEDICAL - SCIE	7.7

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## Interpreting Impact Factors

- **Strongly field dependent**
  - Broad journals tend to have higher IFs
  - Clinical journals tend to have higher IFs
- **Can be manipulated** (deliberately or accidentally)
  - Journals that publish only review articles or lots of review articles have higher IFs
  - Unscrupulous journals may ask reviewers to ensure manuscript cites papers from that journal
  - Various circumstances can lead to anomalous spikes in IF

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## h-index

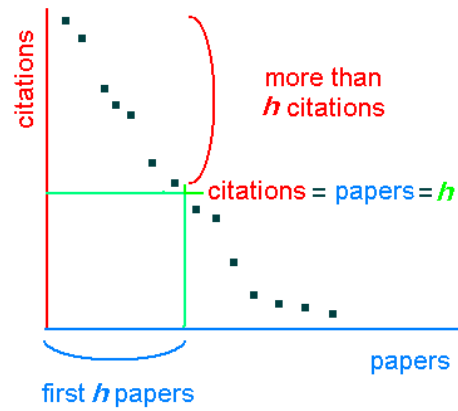
- An index that attempts to measure both the productivity and impact of the published work of a scientist.
- Based on the set of the scientist's most cited papers and the number of citations that they have received.
- Index can also be applied to the productivity and impact of a group of scientists, such as a department or university or country, as well as a scholarly journal.

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## h-index

- A scientist with an index of  $h$  has published  $h$  papers each of which has been cited in other papers at least  $h$  times.



<http://sci2s.ugr.es/hindex/>

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## Interpreting the h-index

- only for comparing scientists working in the same field
  - *different traditions for number of citations*
- does not account for the number of authors of a paper
  - *tends to favor fields with larger groups (e.g. experimental over theoretical)*
- discards information contained in author placement in the authors' list
- the h-index is bounded by the total number of publications.
  - *scientists with a short career are at an inherent disadvantage, regardless of importance of their discoveries*

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## Interpreting the h-index contd...

- does not consider context of citations
  - *negative citations, general citations in introduction*
- does not account for gratuitous authorship
- favorable bias for review articles
- can be manipulated by excessive self-citation
- different databases yield substantially different results
  - *E.g. Google scholar gives high numbers – broadest coverage of documents – but possibly less accurate*

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## Bibliometrics Summary

The **impact factor** and **h-index** can be useful metrics, but only when applied and interpreted appropriately!

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## Fair use of Published Material

- **Journal holds copyright on paper**
  - Unless you publish open access
- **Each journal has its own policies**
  - If in doubt about using material, contact the journal

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## Distribution - Examples

- **Personal Use**
  - ✗ Post final type-set journal PDF on your website, institutional repository or scientific social networks\*
  - ✓ Post your version of final manuscript after embargo
  - ✓ Reuse your own figures without permission – but still need to cite/link to source
- **Distribution to Colleagues**
  - ✓ Send journal PDF to a colleague who requests one
  - ✗ Mass email journal PDF to all your contacts\*

\*OK if paper published open access

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## Educational Use - Examples

- **Theses**
  - ✓ Use your own published text/figures in your thesis without permission
  - ✗ Use other copyrighted material in thesis without permission
- **Classroom Use**
  - ✓ Reproduce/distribute journal PDFs for classroom use

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Questions?

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