

Writing a GOOD research paper

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Take home message

- writing takes much longer than expected
- ... so get started soon!
- writing is rewriting
- ... so get your first version quickly!

Outline

- What is a good paper?
- How to write a good paper
 - 1. Know your field
 - 2. Know what is expected from you
 - 3. start writing ASAP
 - 4. Take care of each section!
 - 5. Know some general principles
 - 6. Kill your first version

WHY a GOOD paper?

- 1.346 million articles were published in 23.750 journals within 2006
- Your great work does not get noticed if it is written poorly!

What is a GOOD paper?

- results
- well-written
- clear figures
- good story

DO SCIENCE

PACKAGE IT

SELL IT

Scientific paper still tells a STORY

- remember: your STORY helps others to understand your RESULTS.
- Story is not about YOU, it is about your RESULTS
- The same results can be framed within different stories
- Write your story in a few sentences!

How to write a good scientific story?

- 1. Know your field

READ papers

- Reading is DOING research
- „I don't read papers, I write them“
- To find relevant papers:
 - 1) search for reviews or papers (pubmed, google scholar)
 - 2) look at subsequent work citing them

How to write a good scientific story?

- 1. Know your field
- 2. Know what is expected from you (style)

Style of Science

- Specific language (terms, didn't, cool)
- Formal style (no way around it)
- (this does not mean COMPLICATED or DRY)
- Citations / References
- Specific structure

Structure of the paper

- Title
- Abstract
- Introduction
- Methods
- Results
- Discussion
- Conclusion
- References

Structure of the story

- Title
- Abstract = the teaser
- Introduction sets the stage
- Methods describe the characters
- Results is the main action
- Discussion: what happens now?
- Conclusion: the bottom line
- References

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- Writing is DOING research

How to WRITE?

- You would rather ...
- Write 1 hour every day
- Set regular writing time and keep it
- Know your distractions
- Plan each writing slot ahead: what part am I going to work on?
- Mornings in our lab ...

How to WRITE?

- For the organized mind:
- Use the OUTLINE
- Headings and subheadings
- What is the message of each paragraph?

Outline

3.1 Introduction to the experiment

3.1.1. Background of the experiment: Displaying 3D objects in a room instead of words on a screen

3.1.2. Three typical phenomena from laboratory experiments

3.1.2.1 Primacy

3.1.2.2 Recency

3.1.2.3 Isolation

3.1.3. Hypothesis: We can replicate these phenomena in our virtual reality setting

3.2 Methods

3.2.1 Subjects: 8 participants

3.2.2 Apparatus (Oculus)

3.2.3 Design: Description of the experiment

3.2.4 Data analysis

3.3 Results

3.3.1 What can we derive from the experiment

3.3.2 Comparison of change in memory performance

3.3.2 Conclusion of main results

How to WRITE?

- For the organized mind:
- Use the OUTLINE
- Headings and subheadings
- What is the message of each paragraph?
- For the rest of us:
- Just damn write!!

First draft

- These ideas have parallels on the neural level /.../ Decreased responsiveness to repeated stimuli is an ubiquitous property of biological systems (Sokolov ..., Ramaswami, 2014) as constant or repeating stimuli often carry no additional information beyond the initial processing. /... /repetition suppression (Grill-Spector), image stabilization (Martinez Conde), infant habituation ... even sleep ?????

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Title

- 20000 titles, 1000 abstracts, 200 papers
- Title has to be simple and clear
- „Personality cannot be predicted ...“
- (sexyness, accuracy, length)
- „Hold your horses: ...“
- „By a carrot or by a stick: ...“
- Talk to your friends: „Distilling the neural correlates of consciousness“

Abstract

- Think about the reader!
- Motivation + main result
- Abstract is read by many more people with the question „should I read the paper?“

Introduction

- WHAT? WHY? HOW?
- what is the general problem?
- context, prior work
- „In recent years...“; „It is known ...“; „One central controversy“;
- From more general to more specific (zoom in)
- References! (But NOT ALL related work)

Introduction

- WHAT? WHY? HOW?
- why should anyone care?
- the need, the open question
- Novelty
- Justification of the existence
- „However ...“; „It is unknown“; „A problem of the previous studies ...“

Introduction

- WHAT? WHY? HOW?
- how are YOU going to solve this open question?
- “to assess this problem ...”; „To directly test this conjecture ...“
- “we measured ...” / “we investigated”
- Hypothesis: „If ..., then ...“
- optional: a preview of results

Materials and methods

- The most complicated part
- use subheadings! structure structure structure!
- Subjects / apparatus / stimuli and task / statistical analysis
- the main point: a researcher has to be able to reproduce the results (deepmind, neural turing machines)

Materials and Methods

- the other main point: explain WHY
- „To limit the number of statistical tests ...“
- „To rule out the alternative explanation that ...“
- Don't reinvent: „Objects were randomized following a procedure similar to XXX et al. (2009).“
- emphasize the special parts, what is new
- „Usually ... , however we ...“
- Tables and figures

Results

- The most important part (the big war scene)
- Built around the FIGURES
- Lead the reader :-)
- „As our goal is ...“
- „Results of the first analysis showed ...
However ... To test for this possibility“
- Give a bit of discussion („... implying that ...“)

Discussion

- Repeat the main results ... briefly!
- „Our results demonstrate ...“
- NOW compare to related work thoroughly
- Avoid crazy speculations :-)
- Be critical of yourself (alternative explanations)
- Future directions?
- Open questions?

Conclusion

- Be short
- Give the main message and some outlook
- (Don't repeat, rephrase)

References

- Don't do it manually!
- You're not a hero if you do
- There is software!
- EndNote, Zotero, Mendeley

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General principles

- Put the READERS first, not yourself
- Be CLEAR, SIMPLE and BRIEF
- FIGURES - figures need to tell the story
- MAIN POINT several times!
- ONE idea = one sentence
- Use DOTS :-)

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Your first version

- ... will be CRAP!
- But it is a very important step :-)
- Don't be shy in SHARING
- Ask where readers got STUCK
- Be OPEN to suggestions! They will be tough
- Your version will NOT be the best version
- Rewriting is extremely good!

Rewriting

- M. Alley: „In my own writing, I average about 5 pages a day. Unfortunately, they are all the same page.“
- Take some distance from your paper!
- Do revisions in a completely different context

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- 7. Have some fun

For FUN

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For FUN

- Catch your supervisor :-)
- Leave something for the reviewer too :-)
- The reviews will be NASTY - take a few days off
- „The point is so elementary that it does not require a manuscript of this length to develop it“
- „I do not understand why the co-authors of this manuscript have allowed their names to be in the author list.“
- „The writing and data presentation are so bad that I had to leave work and go home early and then spend time to wonder what life is about“

Further reading

- "The craft of scientific writing" by Michael Alley
- Kallestinova, E. D. (2011). How to write your first research paper. *The Yale journal of biology and medicine*, 84(3), 181.
- Lots of materials in Google + YouTube