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# Rigor and Reproducibility Review

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# Review!

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# Computational Reproducibility

# What do we mean by computational reproducibility?

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| --- | --- | --- |
| The ability to get similar findings when running an experiment again | The ability to get the same results when running analyses | The ability to detect variation in a sample set |

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# Which of the following is NOT an element of computational reproducibility

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# Using a tool like Excel can limit reproducibility because

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- The raw data file is changed by the analyses
- A person normally has to actively click, type and run the analyses
- The order operations is not stored and may not be obvious
- Because many computers have it, it can be easily shared

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# When conducting analyses, which of the following could be used to improve computational reproducibility

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Save the syntax/code for your commands

Comment the syntax/code so others know why you are doing things the way you are

Maintain a raw data file in the same file folder

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# How can setting up an R Project help computational reproducibility

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# R Projects

- Store your files together in one folder
- Maintain an R history file
- Maintain an optional git file

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# Reproducibility, Replicability, Repeatability

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# What are factors that limit replicability?

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# Limiting factors of Replication

- Complexity
- Variation
- Unknown information
- Limits to measurements
- Prior probablility
- Poor study design and execution
- Bad stats & bias

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# What are examples of ways one could one make their research reproducible?

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# How could one make their research reproducible

- → Use/Publish Protocols
- → Make Data Available
- → Make Analysis Code Available

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# Why might sex of subjects/specimens matter for rigor and reproducibility?

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# Sex as a biological variable may impact

- → Dosing levels
- → Adverse events
- → Response
- → Disease Presentation

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# What are problematic techniques that make research less repilcable? (e.g. p-hacking)

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# Problematic Techniques

- P-Hacking
- HARKing
- Cherry Picking/Publishing Only Positive Results

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# Which of the following is NOT true of underpowered studies?

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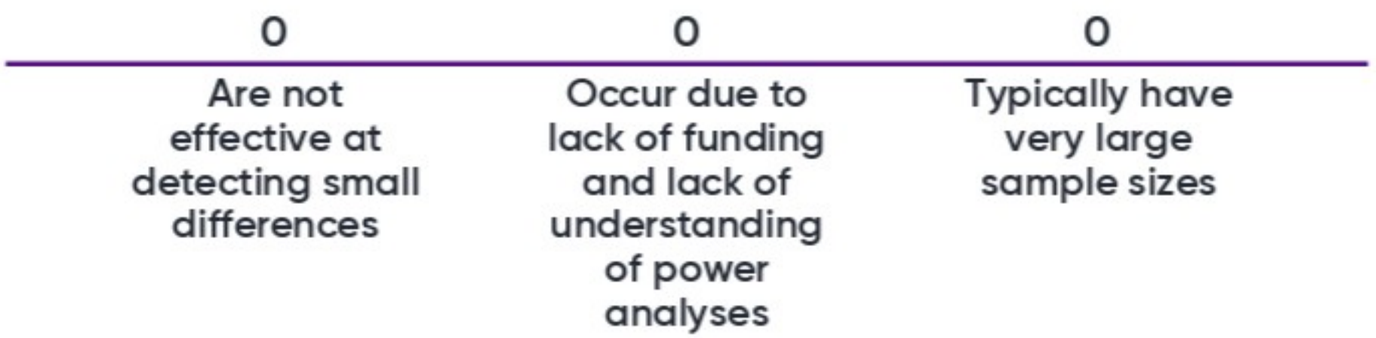


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# Low power increases the likelihood of

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| --- | --- |
| False Negatives - Findings that appear to show no difference between groups when a real difference exists | False Positives - Findings that appear to show a difference between groups when no actual difference exists |

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# Research Data Management

# What are elements of a good data management plan?

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# Elements of a Good Data Management Plan

- → Create a Data Inventory
- → Have a protocol for describing your data
- → Have a plan for preserving your data
- → Have a plan for accessing your data

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# Rigorous Research and Literature Review

# How does an effective literature search fit into the Rigor and Reproducibility Framework?

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# Adding terms with AND between them

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| --- | --- | --- |
| Is used between similar concepts to limit your search (e.g. Mouse AND Mice) | Is used between different concepts to limit your search (e.g. Mouse AND alcohol) | Is used between similar concepts to expand your search (e.g. Mouse AND Mice) |

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# Adding OR between terms

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| 0 | 0 | 0 |
| --- | --- | --- |
| Is used between similar concepts to expand your search (e.g. Mouse OR Mice) | Is used between similar concepts to limit your search (e.g. Mouse OR Mice) | Is used between different concepts to expand your search (e.g. Mouse OR alcohol) |

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# Appraising the Existing Literature

# How can researchers increase the rigor and reproducibility of their research when they publish?

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# How can researchers increase their rigor and reproducibility when publishing

- Report sex of sample
- Report blinding of sample
- Report how specimens were stored, if equal treatment (outside of treatment of interest) was given to control and experimental
- Report analysis techniques
- Try to clarify any areas of bias

# Publication bias is

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# Homework

Use an R Notebook (.rmd file) to write a short reflection on the elements of computational reproducibility, and if and why they could be relevant to your work. Demonstrate in your .rmd file how to read in a data file (i.e. read.csv) and perform a function like mean or median on a variable.