

Singapore Meeting on Research Integrity

Reproducibility: Research integrity but much, much more

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Matrix, Biopolis

“I want to do the right thing but...”

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SHAPES

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Clarifying concepts

- ▶ **Replicability** - “re-performing the experiment and collecting new data”
- ▶ **Reproducibility** - “re-performing the same analysis with the same code using a different analyst” (Patil, P., Peng, R. D., and Leek, J. 2016).

“...replicate a study or an effect (outcome of a study) but reproduce results (data analyses).” (Stevens, J.R. 2017)

Which behaviours undermine replicability/reproducibility?

1. Falsifying or 'cooking' research data
2. Ignoring major aspects of human-subject requirements
3. Not properly disclosing involvement in firms whose products are based on one's own research
4. Relationships with students, research subjects or clients that may be interpreted as questionable
5. Using another's ideas without obtaining permission or giving due credit
6. Unauthorized use of confidential information in connection with one's own research
7. Failing to present data that contradict one's own previous research
8. Circumventing certain minor aspects of human-subject requirements
9. Overlooking others' use of flawed data or questionable interpretation of data
10. Changing the design, methodology or results of a study in response to pressure from a funding source

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1. Publishing the same data or results in two or more publications
2. Inappropriately assigning authorship credit
3. Withholding details of methodology or results in papers or proposals
4. Using inadequate or inappropriate research designs
5. Dropping observations or data points from analyses based on a gut feeling that they were inaccurate
6. Inadequate record keeping related to research projects

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Table 1 | Percentage of scientists who say that they engaged in the behaviour listed within the previous three years (n = 3,247)

Top ten behaviours	All	Mid-career	Early-career
1. Falsifying or 'cooking' research data	0.3	0.2	0.5
2. Ignoring major aspects of human-subject requirements	0.3	0.3	0.4
3. Not properly disclosing involvement in firms whose products are based on one's own research	0.3	0.4	0.3
4. Relationships with students, research subjects or clients that may be interpreted as questionable	1.4	1.3	1.4
5. Using another's ideas without obtaining permission or giving due credit	1.4	1.7	1.0
6. Unauthorized use of confidential information in connection with one's own research	1.7	2.4	0.8 ***
7. Failing to present data that contradict one's own previous research	6.0	6.5	5.3
8. Circumventing certain minor aspects of human-subject requirements	7.6	9.0	6.0 **
9. Overlooking others' use of flawed data or questionable interpretation of data	12.5	12.2	12.8
10. Changing the design, methodology or results of a study in response to pressure from a funding source	15.5	20.6	9.5 ***
Other behaviours			
11. Publishing the same data or results in two or more publications	4.7	5.9	3.4 **
12. Inappropriately assigning authorship credit	10.0	12.3	7.4 ***
13. Withholding details of methodology or results in papers or proposals	10.8	12.4	8.9 **
14. Using inadequate or inappropriate research designs	13.5	14.6	12.2
15. Dropping observations or data points from analyses based on a gut feeling that they were inaccurate	15.3	14.3	16.5
16. Inadequate record keeping related to research projects	27.5	27.7	27.3

Note: significance of χ^2 tests of differences between mid- and early-career scientists are noted by ** ($P < 0.01$) and *** ($P < 0.001$).

Researchers Behaving Badly

Martinson, Anderson & de Vries
Nature 2005 435:737-738

Pressures impacting on replicability/ reproducibility

Professional & Personal

Professional advancement

Uneven playing field...When in Rome...

Adherence to questionable research methods

Institutional

Increased workloads
(more targets, fewer resources, less time)

Collaborative & cross-disciplinary research –fewer quality checks

Limited training

Funding & Journal

Limited funding to replicate research

Pressures to publish novel data

Publication bias – history of presenting largely only positive results



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Values in research	Obligations arising as standards of conduct
Honesty in the development, undertaking and reporting of research	<ul style="list-style-type: none"> • Present information truthfully and accurately in proposing, conducting and reporting research.
Rigour in the development, undertaking and reporting of research	<ul style="list-style-type: none"> • Underpin research by attention to detail and robust methodology, avoiding or acknowledging biases.
Transparency in declaring interests and reporting research methodology, data and findings	<ul style="list-style-type: none"> • Share and communicate research methodology, data and findings openly, responsibly and accurately. • Disclose and manage conflicts of interest.
Fairness in the treatment of others	<ul style="list-style-type: none"> • Treat fellow researchers and others involved in the research fairly and with respect. • Appropriately reference and cite the work of others. • Give credit, including authorship where appropriate, to those who have contributed to the research.
Respect for research participants, the wider community, animals and the environment	<ul style="list-style-type: none"> • Treat human participants and communities that are affected by the research with care and respect, giving appropriate consideration to the needs of minority groups or vulnerable people. • Ensure that respect underpins all decisions and actions related to the care and use of animals in research. • Minimise adverse effects of the research on the environment.

“For finite agents, life is full of conflicts among valuables, whether those valuables are goods all of which cannot be obtained or obligations all of which cannot be fully satisfied” Hoffmaster, B. and C. Hooker, 2017p. 66

One of our greatest developmental tasks as human beings and individuals is to improve moral knowledge and practices. The key way we achieve moral improvement is through resolving moral conflicts.

summarised from Hoffmaster, B. and C. Hooker, 2017p. 66

How to reach a compromise between values when values conflict

1. Identify the issue
 2. Identify the values at stake & in conflict
 3. Consider different courses of action and the values realised in each
 4. Engage in a balancing exercise and compromise
 5. Determine the most justifiable course of action
- 
- A series of white diagonal lines of varying lengths and thicknesses, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

References

- ▶ Patil, P., Peng, R. D., and Leek, J. (2016). A statistical definition for reproducibility and replicability. bioRxiv. doi: 10.1101/066803
- ▶ Stevens JR (2017) Replicability and Reproducibility in Comparative Psychology. Front. Psychol. 8:862. doi: 10.3389/fpsyg.2017.00862
- ▶ Martinson, B.C; Anderson, M. S; de Vries, Raymond, Scientists behaving badly. Nature. Jun 9, 2005; 435(7043):737-8
- ▶ NMRC, The Australian Code for the Responsible Conduct of Research, 2018, Reference number R39 ISBN 1864964383. Commonwealth of Australia, Canberra. Available at: <https://nhmrc.gov.au/about-us/publications/australian-code-responsible-conduct-research-2018>
- ▶ Hoffmaster, B. and C. Hooker, The Nature of Moral Compromise: Principles, Values, and Reason. Social Theory & Practice, 2017. 43(1): p. 55-78.

CASES

Credit: Mehau Kulyk/SPL/Getty Source:Jeffrey Perkel, A Toolkit for Data Transparency, Nature Vol 560 p513 (23 Aug 2018)

Case 1: Data Sharing

- A research team published a study on the cost-effectiveness of a clinical treatment in ABC Medical Journal.
- Several readers raise concerns about some of the analyses reported.
- They contact the study authors to request the data underlying the study, including sets of individual-level patient data (IPD) necessary to reproduce the cost-effectiveness analyses.
- The study authors offer to release aggregate data but do not want to release IPD because:
 1. their team obtained competitive grants to collect the data and then worked hard to collect it, so they should have the exclusive right to work and publish on it before others do;
 2. releasing IPD might compromise patient confidentiality.
- The concerned readers notify the editors of ABC about the authors' refusal to make the data available.

Case 1: Data Sharing

Questions for discussion:

- What values speak in favour of the authors' refusal to make IPD available? And what values speak against it?
- Is the study authors' refusal to make IPD available sufficiently justified?
- How should ABC Medical Journal respond?

Case 1 (cont'd)

- The study authors' refusal persists and the editors decide to issue an Expression of Concern in ABC Medical Journal.
- Moreover, the editorial board considers adopting a new data deposition requirement in order to avoid such a scenario in the future:

All data and related metadata underlying the findings reported in a manuscript must be deposited in an appropriate public repository at the time of manuscript submission, unless already provided as part of the submitted article. Repositories may be either subject-specific or generalist repositories. A Data Availability Statement must be submitted alongside the manuscript, stating that data are deposited publicly and list the name(s) of repositories along with DOIs of the relevant data sets.

Case 1 (cont'd)

Questions for discussion:

- Is this policy appropriate for ensuring that studies submitted to the journal will be replicable? Or do you think that the policy demands too much or too little?
- How should these data repositories regulate access to IPD? What values should play a role here?

Case 2: Analytical Errors

- Dr Tan, an epidemiologist specializing in the spread of infectious disease, reads a recently published paper of a senior internationally acclaimed colleague, Prof Ali, with great interest, but becomes concerned with two issues:
 - She believes that the statistical method used is inappropriate for the research questions being asked, and also that
 - Prof Ali's analysis was somewhat sloppy and contains errors.
- Dr Tan has access to the same government-provided database that underpinned Prof Ali's study and she decides to re-run the analysis using the same statistical method and dataset as Prof Ali.
- Her results do not fully support Prof Ali's conclusions in the paper and where there is support, there are noticeably smaller effect sizes.

Case 2: Analytical Errors

Questions for discussion:

- What are the values in conflict (if any)?
- What next steps should Dr Tan take and why?
- Would your answer to the above be any different if the revised analysis instead flatly contradicted Prof Ali's conclusions?
- Suppose that, in re-analysing Prof Ali's paper, Dr Tan finds it implausible that these are just innocent errors, and instead only make sense as a deliberate attempt to manipulate the data in order to more strongly support his conclusions. Would the next steps she takes be the same as before or not? Why?

Case 3: Institutional Factors

- The Provost of a local university wants to improve the local and international impact of the university's research, and is considering various proposals to further this goal:
 - Raising the research expectations for hiring and tenure of faculty even further
 - Carving out large bonuses for faculty who publish more in high-impact journals
 - Further differentiating research and teaching-track faculty staff, with higher research expectations for the former and lower research expectations for the latter
- The goal is to incentivize and promote greater, more impactful research output that will benefit society, as well as improve the university's reputation.

Case 3: Institutional Factors

Questions for discussion:

- Do any of the proposed plans strike an appropriate balance between: (1) scientific integrity, (2) societal benefit, and (3) the Provost's desire to improve the university's reputation?
- Would any of the plans create perverse incentives to engage in questionable research practices in order to secure high-impact publications – if not through outright fraud, then through selective presentation of data or manipulation of statistical methodology?
- What alternative proposals could mitigate these incentives, either at an institutional, departmental, or laboratory level?

*Thank you from the
SHAPES Team*