



Why **Research Integrity** matters and how it can be improved

Lex Bouter



2023-07-07 Why Research Integrity matters and how it can be improved - LM
Bouter – LIBER 2023 – 35 minutes plus 10 minutes for introduction and Q&A

Content

- § Core concepts
- § Current problems
- § Open Methods and Open data
- § How to improve matters

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Bouter L. Why research integrity matters and how it can be improved. *Accountability in Research* 2023; 1-10.

Haven T, Gopalakrishna G, Tjink J, van der Schot D, Bouter L. Promoting trust in research and researchers: how open science and research integrity are intertwined. *BMC Research Notes* 2022; 15: 302. <https://doi.org/10.1186/s13104-022-06169-y>

Research Integrity concerns individual or collective behavior of researchers that promotes or hampers the validity (**truth**) of or the **trust** in research findings and in researchers

§ **Trust** needs to be deserved by being **trustworthy**

§ **Transparency** strengthens **trustworthiness**

§ **Open Science** practices enable **accountability**

Bouter L, Kleinert S, Horn L. Research integrity and societal trust in research. South African Heart Journal 2021; 18: 80-1.

<https://www.journals.ac.za/index.php/SAHJ/article/view/4879>

<https://www.wcrif.org/foundation/mission>

de Ridder J. How to trust a scientist. Studies in the History and Philosophy of Science 2022; 93: 11-20. <https://doi.org/10.1016/j.shpsa.2022.02.003>

Peels R, Bouter L. Replication and trustworthiness. Accountability in Research 2021. <https://doi.org/10.1080/08989621.2021.1963708>



National Survey on **Research Integrity**



Gowri Gopalakrishna

www.nsri.nl

@SurveyIntegrity

Gopalakrishna G, ter Riet G, Vink G, Stoop I, Wicherts J M, Bouter L. Prevalence of questionable research practices, research misconduct and their potential explanatory factors: a survey among academic researchers in The Netherlands. PLoS One 2022; 17: e0263023.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0263023>

Gopalakrishna G, Wicherts J M, Vink G, Stoop I, van den Akker O, ter Riet G, Bouter L. Prevalence of responsible research practices among academics in The Netherlands [version 2; peer review: 2 approved]. F1000Research 2022; 11: 471. (<https://f1000research.com/articles/11-471/v2>)

Bouter LM. Research misconduct and questionable research practices form a continuum. Accountability in Research 2023: 1-5. <https://bit.ly/3JOv95j>


Fanelli D. How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. PLoS ONE 2009; 4(5): e5738. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0005738>

Y. Xie, K. Wang, Y. Kong, Prevalence of research misconduct and questionable research practices: a systematic review and meta-analysis. Science and Engineering Ethics 2021; 27: 41.

<https://bit.ly/3ZdEeKQ>

Most prevalent (5/11) QRPs (score 5,6,7)	Prevalence (%)
Not submitting or resubmitting a valid negative publication	17.5
Insufficient mentioning of study flaws and limitations in publications	17.0
Insufficiently supervised or mentored junior co-workers	15.0
Insufficient attention to equipment, skills or expertise	14.7
Inadequate notes of research proces	14.5

Gopalakrishna G, ter Riet G, Vink G, Stoop I, Wicherts J M, Bouter L. Prevalence of questionable research practices, research misconduct and their potential explanatory factors: a survey among academic researchers in The Netherlands. PLoS One 2022; 17: e0263023.
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0263023>

QRP/FF	Prevalence (%)	 National Survey on Research Integrity
Any Frequent QRP (at least 1/11 QRPs with a score of 5,6,7)	51.3	
Fabrication (making up data or results)	4.3	
Falsification (manipulating research materials, data or results)	4.2	

Gopalakrishna G, ter Riet G, Vink G, Stoop I, Wicherts J M, Bouter L. Prevalence of questionable research practices, research misconduct and their potential explanatory factors: a survey among academic researchers in The Netherlands. PLoS One 2022; 17: e0263023. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0263023>

Fake publications

- Produced by individual researchers or **Paper Mills**:
 - **Fabrication** from scratch (*by humans or software*)
 - Fabrication by **plagiarism** (*by humans or software*)
 - Authorship brokering → **fake authors**
- **Fake reviewers**
- **Fake** guest **editors** (*of supplements on fake conferences*)
- Predatory open access journals (incl. **fake journals**)

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We have no solid data on the frequency of these phenomena, but they definitely seem to be on the rise.

COPE & STM report on paper mills:

<https://publicationethics.org/sites/default/files/paper-mills-cope-stm-research-report.pdf>

Paper mill worries:

<https://www.nature.com/articles/d41586-021-00733-5>

<https://www.nature.com/articles/d41586-022-02997-x>

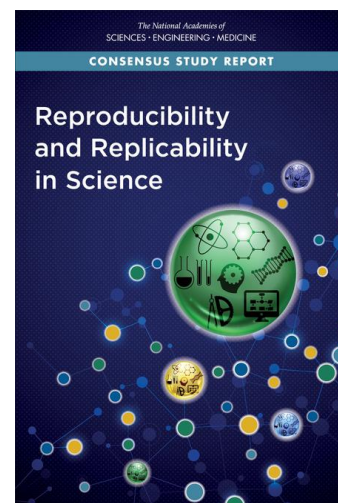
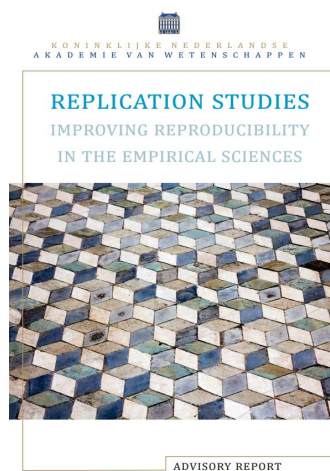
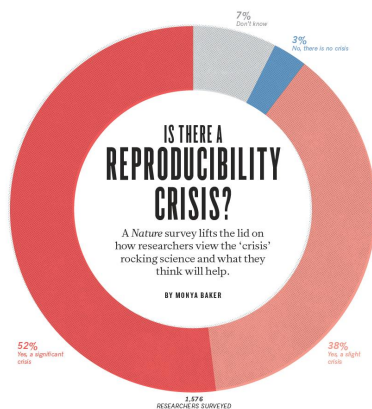
<https://www.nature.com/articles/d41586-020-02445-8>

<https://www.nature.com/articles/d41586-022-02100-4>

<https://www.enago.com/academy/paper-mills-a-rising-concern-in-the-academic-community/>

<https://www.nature.com/articles/d41586-022-01666-3>

<https://retractionwatch.com/2019/07/18/exclusive-russian-site-says-it-has-brokered-authorships-for-more-than-10000-researchers/>



Scoping review: 95 of 177 (**54 %**) studies were successfully replicated

8

Baker - Is there a replicability crisis - Nature 2016; 533 452-4

The KNAW report *Replication studies* appeared in January 2018

PDF available at: <https://www.nrin.nl/wp-content/uploads/KNAW-Replication-Studies-15-01-2018.pdf>

The NAS report *Reproducibility and replicability in Science* appeared in June 2019

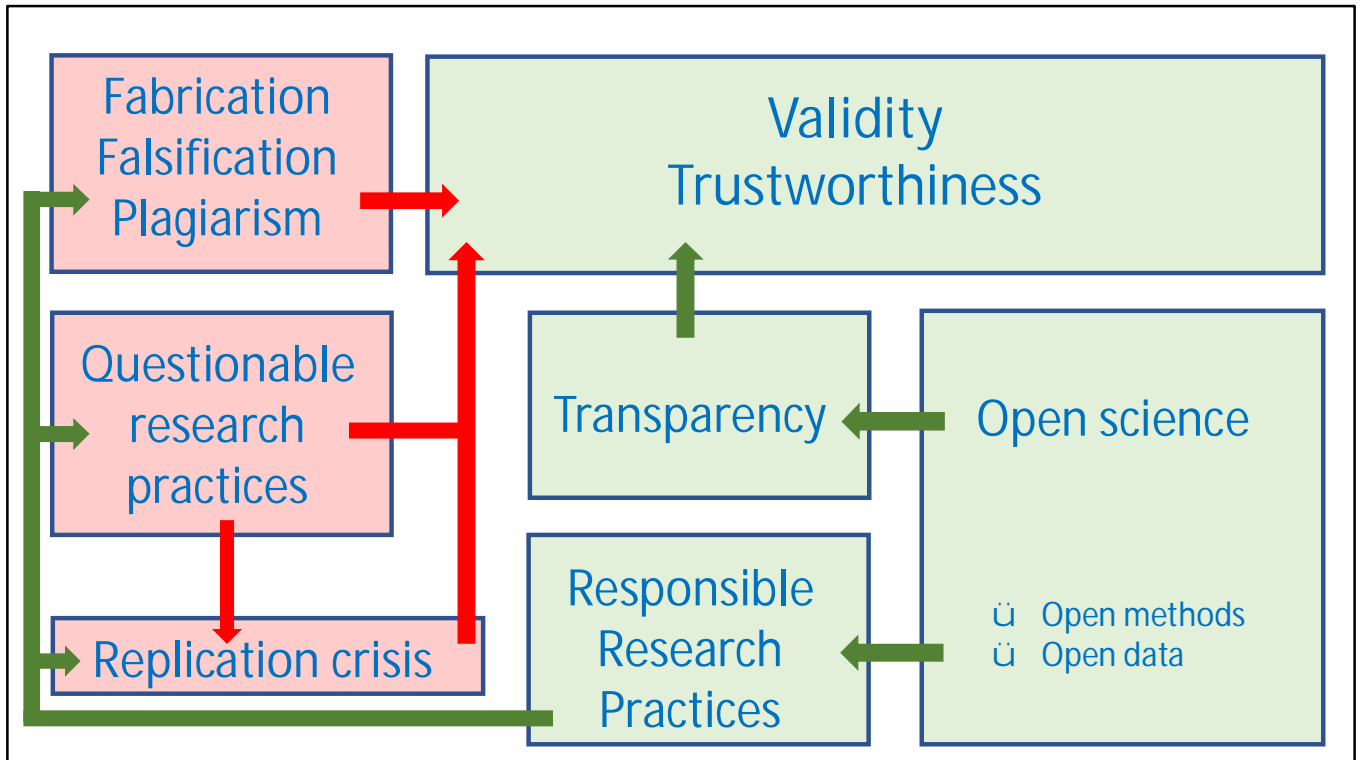
PDF available at: <https://www.nap.edu/catalog/25303/reproducibility-and-replicability-in-science>

Kelly D Cobey, Christophe A Fehlmann, Marina Christ Franco, Ana Patricia Ayala, Lindsey Sikora, Danielle B Rice, Chenchen Xu, John PA Ioannidis, Manoj M Lalu, Alixe Ménard, Andrew Neitzel, Bea Nguyen, Nino Tsertsvadze, David Moher. Epidemiological characteristics and prevalence rates of research reproducibility across disciplines: a scoping review of articles published in 2018-2019. *eLife* 2023; 12: e78518. <https://doi.org/10.7554/eLife.78518>

Ioannidis JPA. Why replication has more scientific value than original discovery. *Behavioral and Brain Sciences* 2018; 41: e137

Bouter LM, ter Riet G. Empirical research must be replicated before its findings can be

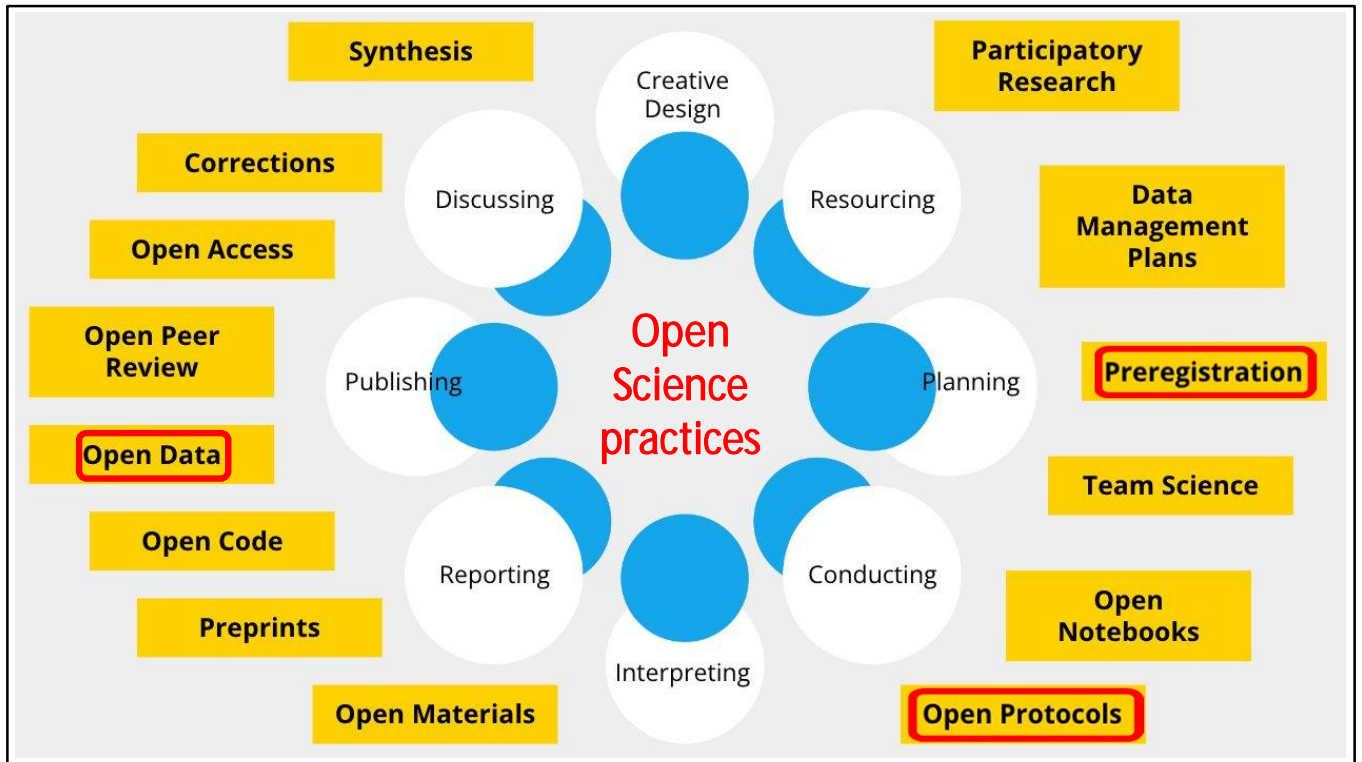
trusted. Journal of Clinical Epidemiology 2021; 129: 188-90.
[https://www.jclinepi.com/article/S0895-4356\(20\)31118-5/fulltext](https://www.jclinepi.com/article/S0895-4356(20)31118-5/fulltext)



Bouter L. Why research integrity matters and how it can be improved. *Accountability in Research* 2023; 1-10.

Haven T, Gopalakrishna G, Tjink J, van der Schot D, Bouter L. Promoting trust in research and researchers: how open science and research integrity are intertwined. *BMC Research Notes* 2022; 15: 302. <https://doi.org/10.1186/s13104-022-06169-y>

Bouter LM. Research misconduct and questionable research practices form a continuum. *Accountability in Research* 2023; 1-5.



Slide from Brian Nosek: *Welcome and prelude of the 10 Year Anniversary of the Center for Open Science*, Washington, DC, May 8, 2023
https://www.youtube.com/watch?v=Pn0lBuXgn5Q&ab_channel=CenterforOpenScience

Open Methods

- § (pre)registration of essential features of study design
- § publication or preprint of full study protocol (incl. data-analysis plans)
- § Registered Report

Essential traits of (pre)registration

- § prospective (before start of data collection)
- § public (embargo possible)
- § amendments with time stamp (data-driven?)

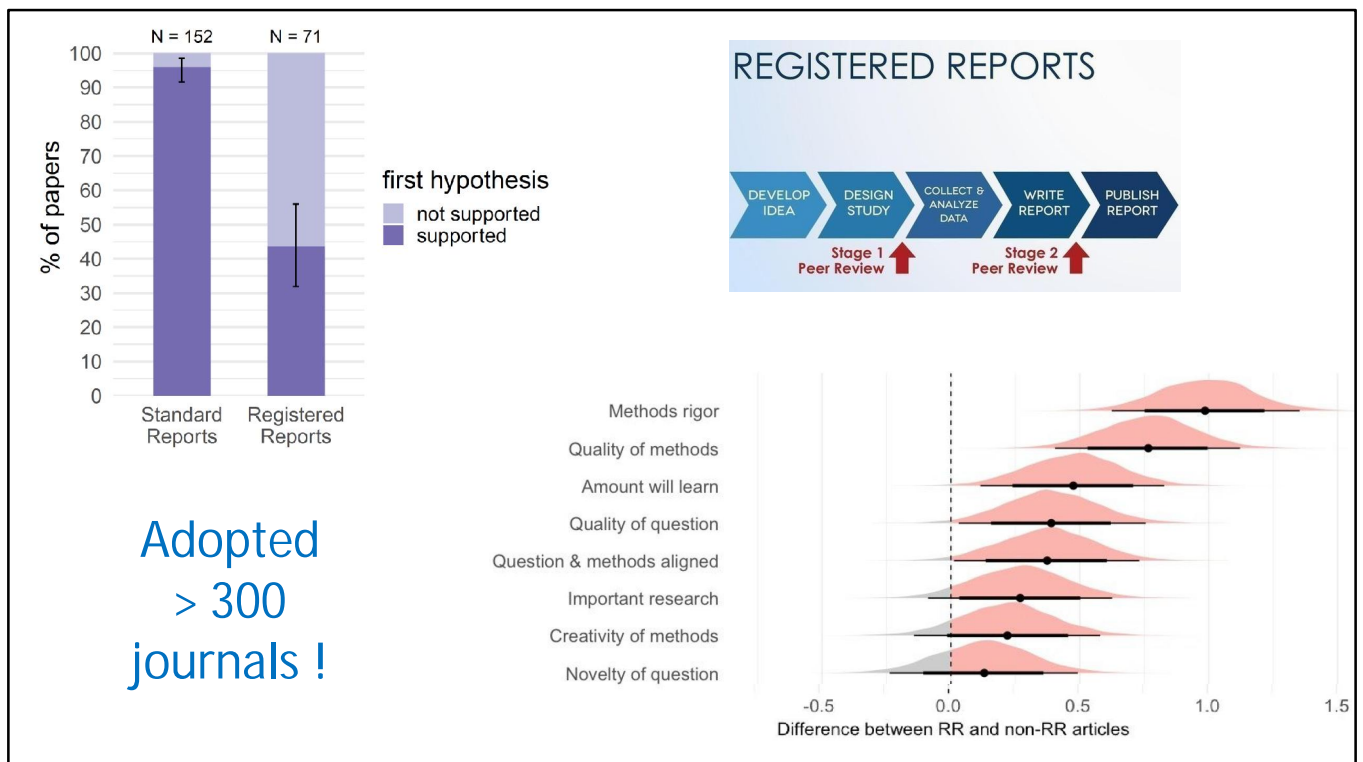


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Nosek BA, Ebersole CR, DeHaven AC, Mellor D. The preregistration revolution. PNAS 2018;115:2600-6. <http://www.pnas.org/content/115/11/2600>

Allen C, Mehler DMA. Open science challenges, benefits and tips in early career and beyond. PLoS Biol 2019; 17(5): e3000246. <https://doi.org/10.1371/journal.pbio.3000246>

<https://www.cos.io/initiatives/prereg>



Chambers C. What's next for registered reports. *Nature* 2019; 573 187-189.
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<https://www.nature.com/articles/d41586-023-00506-2>

Anne M. Scheel , Mitchell R. M. J. Schijen, and Daniël Lakens An excess of positive results: comparing the standard psychology literature with registered reports. *Advances in Methods and Practices in Psychological Science* April-June 2021, Vol. 4, No. 2, pp. 1–12. <https://journals.sagepub.com/doi/full/10.1177/25152459211007467>

Soderberg CK, Errington TE , Schiavone SR, Bottesini J, Thorn FS, Vazire S, Esterling KM, Nosek BA. Initial evidence of research quality of Registered Reports compared to the standard publishing model. *Nature Human Behaviour* 2021; 990–997

Henderson EL, Chambers CD (2022) Ten simple rules for writing a Registered Report. *PLoS Comput Biol* 18(10): e1010571. <https://doi.org/10.1371/journal.pcbi.1010571>

<https://cos.io/rr/>

Findable, Accessible, Interoperative, Reusable data reposition



Wilkinson MD, et al. The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data* 2016; 3: 160018.

<https://www.nature.com/articles/sdata201618%22>

Wagenmakers, E., Sarafoglou, A., & Aczel, B. (2022, August 15). Facing the Unknown Unknowns of Data Analysis. <https://doi.org/10.31234/osf.io/mjw2c>

<https://www.go-fair.org/fair-principles/>

Behaviour of researchers is driven by:

§ Individual factors:

virtuousness of the individual

§ Institutional factors:

research climate in the lab

§ Systemic factors:

adequate incentives



Kent BA, Holman C, Amoako E, Antonietti A, Azam JM, Ballhausen H, et al.
Recommendations for empowering early career researchers to improve research culture and practice. PLoS Biol 2022; 20: e3001680.
<https://doi.org/10.1371/journal.pbio.3001680>

Bouter LM. What research institutions can do to foster research integrity. *Journal of Science and Engineering Ethics* 2020; 26: 2363-69.
<https://link.springer.com/article/10.1007/s11948-020-00178-5>

Macleod M. Improving the reproducibility and integrity of research: what can different stakeholders contribute? *BMC Research Notes* 2022; 15: 146.
<https://doi.org/10.1186/s13104-022-06030-2>

Mejlgaard N, Bouter LM, Gaskell G, Kavouras P, Allum N, Bendtsen AK, Charitidis CA, Claesen N, Dierickx K, Domaradzka A, Reyes Elizondo A, Foeger N, Hiney M, Kaltenbrunner W, Labib K, Marušić A, Sørensen MP, Ravn T, Ščepanović R, Tijdink JK, Veltri GA. Research integrity: nine ways to move from talk to walk. *Nature* 2020; 586: 358-60. <https://www.nature.com/articles/d41586-020-02847-8>

www.sops4ri.eu

Explanatory Factors	ORP	FF	RRP
Likelihood of detection by reviewers		↓	
Support of research integrity norms	↓	↓	↑
Supervision for survival	↑		
Responsible supervision	↓		↑
Publication pressure	↑		↓



Gopalakrishna G, Wicherts J M, Vink G, Stoop I, van den Akker O, ter Riet G, Bouter L. Prevalence of responsible research practices among academics in The Netherlands [version 2; peer review: 2 approved with reservations]. F1000Research 2022; 11: 471. <https://f1000research.com/articles/11-471/v2>

Mertonian norms



Communism (scientific knowledge is not private property. Scientists must share it with the scientific community, otherwise knowledge cannot grow.)

Universalism (whether scientific knowledge is judged as true or false is judged by universal, objective criteria)

Disinterestedness (being committed to discovering knowledge for its own sake)

Organised scepticism (no knowledge claim is regarded as 'sacred'. Every idea open to questioning, criticism and objective investigation.)

https://en.wikipedia.org/wiki/Mertonian_norms

Originally published as: Merton RK. Science and technology in a democratic order. *Journal of Legal and Political Sociology*. 1942; 1: 115-26.

Reproduced as Chapter 13 (p. 267 – 78) of Merton RK. *The sociology of science: theoretical and empirical investigations*. Chicago, University of Chicago Press, 1973.

Hoekstra R, Vazire S. Aspiring to greater intellectual humility in science. *Nature Human Behavior* 2021; 5: 1602–1607. <https://doi.org/10.1038/s41562-021-01203-8>

Guidelines for research institutions on the **research integrity education of bachelor, master and PhD students**



Guidelines for research institutions on the **research integrity education of post-doctorate and senior researchers**

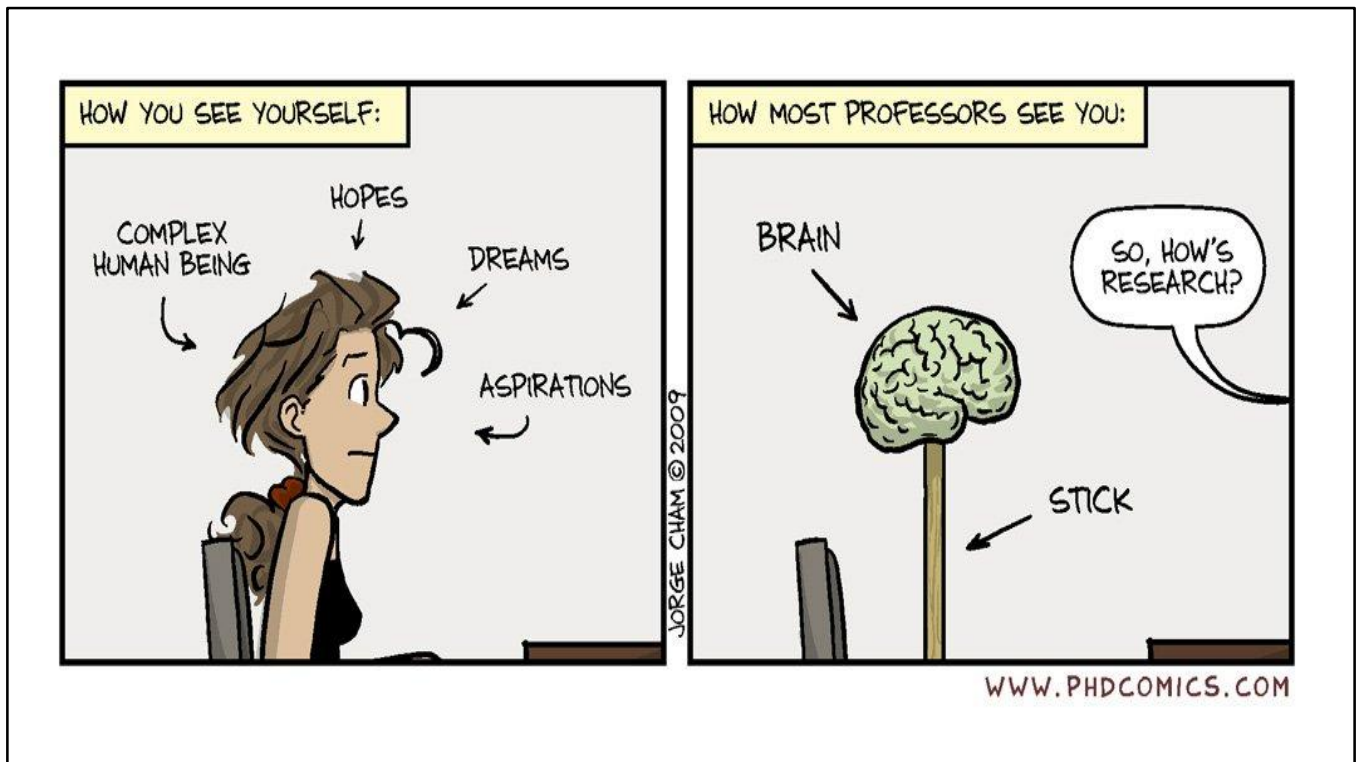
Guidelines for research institutions on the **research integrity education of institutional research integrity stakeholders**

Guidelines for research institutions on **continuous research integrity education**

www.sops4ri.eu – 131 SOPs and guidelines to foster research integrity

Labib K, Evans N, Pizzolato D, Aubert Bonn N, Widdershoven G, Bouter L, Konach T, Langendam M, Kris Dierickx K, Tijdink JK. Co-creating research integrity education guidelines for research institutions. MetaArXiv (3 March 2022).

<https://osf.io/preprints/metaarxiv/gh4cn/> - Journal of Science and Engineering Ethics (in press)



The most important elements of research climate may be the quality of mentoring and supervision. Early Career Researchers need also inspiring role models and opportunities to improve their skills and to develop their leadership style.

Pizzolato D, Reyes Elizondo A, Aubert Bonn N et al. Bridging the gap – how to walk the talk on supporting early career researchers [version 1; peer review: 1 approved]. Open Res Europe 2023, 3:75 <https://doi.org/10.12688/openreseurope.15872.1>



← Onze opleidingen



Superb supervision junior - mentoring your
PhD candidate towards responsible conduct
of research

Superb supervision: A pilot study on training supervisors to convey responsible research practices onto their PhD candidates

Tamarinde Haven, Lex Bouter, Louise Mennen & Joeri Tijdkink

Haven T, Bouter L, Mennen L, Tijdkink J. Superb Supervision: a pilot study on training supervisors to convey responsible research practices onto their PhD students. *Accountability in Research* 2022; 1-18.
<https://doi.org/10.1080/08989621.2022.2071153>



Assessment of researchers

- § Grant applications
- § Vacancies
- § Promotion
- § Tenure
- § Awards

Incentives works well

For *intended* effects:

- § More publications and citations

But also for *unintended* effects:

- § Focus on quantity, not quality
- § More plagiarism and duplicate publication
- § More 'salami slicing', gift authorship and use of predatory OA journals
- § Citation cartels and fake (Paper Mill) papers and fake peer reviewers
- § Less time-consuming responsible research practices

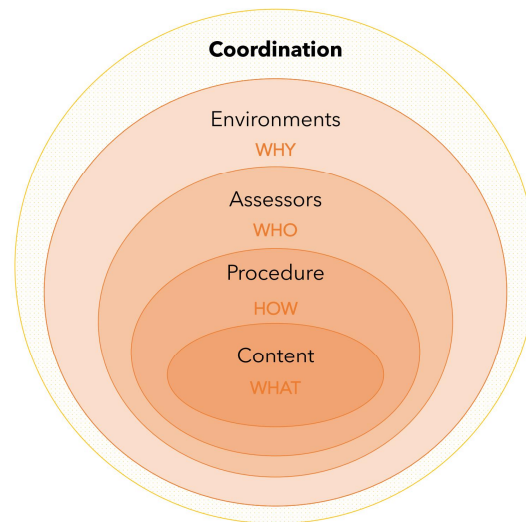
All incentives can and will be gamed if stakes are high

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Research assessments should recognize responsible research practices

Narrative review of a lively debate and promising developments

Noémie AUBERT BONN¹ and Lex BOUTER²



Aubert Bonn N, Bouter L. Research assessments should recognize responsible research practices: narrative review of a lively debate and promising developments. MetaArXiv (19 July 2021). <https://osf.io/preprints/metaarxiv/82rmj>

Raff JW. The San Francisco Declaration on Research Assessment. *Biology Open* 2013; 2: 533–534. <https://journals.biologists.com/bio/article/2/6/533/1056/The-San-Francisco-Declaration-on-Research>

Hicks D, Wouters P, Waltman L, de Rijcke S, Rafols I. The Leiden Manifesto for research metrics. *Nature* 2015; 520: 429–31. <https://www-nature-com.vu-nl.idm.oclc.org/articles/520429a.pdf>

Moher D, Bouter L, Kleinert S, Glasziou P, Sham MH, Barbour V, Coriat AM, Foeger N, Dirnagl U. The Hong Kong principles for assessing researchers: fostering research integrity. *PLoS Biology* 2020; 18: e3000737. <https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000737>

Editorial. Support Europe's bold vision for reforming research assessment. *Nature* 2022; 607: 636. <https://www.nature.com/articles/d41586-022-02037-8>

Neylon C. Stop misusing data when hiring academics. *Nature* 2022; 607: 637.

<https://www.nature.com/articles/d41586-022-02038-7>

<https://www.sfdora.org/>

Urgent need for evidence-based RI interventions

- § Document **effectiveness of interventions** before implementation
- § Outcomes to be measured:
 - § **Process** outcomes: participation, satisfaction, perception of usefulness
 - § **Intermediate** outcomes: attitude, knowledge, skills
 - § **Primary** outcomes: incidence of FFP, QRPs, RRP, research quality
- § Development and validation of **instruments** and **scales**
- § Agreement on **Core Outcome Set**

Surveys concern self-reported outcomes are subject to information bias (underreporting) and selection bias (low response rate)

We need more objective instruments, e.g. software to detect Risk of Bias, fake data, errors in data analysis, unreported discrepancies between protocol and publication, plagiarism, image manipulation etc. Publishers are developing the STM Integrity Hub to detect these errors (<https://www.stm-assoc.org/stm-integrity-hub/>).

Stages of implementation of EB RI policies



Brian Nosek: Strategy for cultural change. <https://www.cos.io/blog/strategy-for-culture-change>

Transparency can also improve validity and trustworthiness in other scholarly domains

Research funders should be more transparent: a plea for **open applications**

Serge P. J. M. Horbach¹, Joeri K. Tijdk^{2,4} and Lex Bouter^{3,4}

Opinion: A Call for **Open Funding Procedures**

How funders can improve transparency to foster efficiency and diversity in research

Serge P. J. M. Horbach, Lex M. Bouter, and Joeri K. Tijdk

****Open peer review** urgently requires evidence: A call to action**

Tony Ross-Hellauer, Lex M. Bouter, Serge P.J.M. Horbach

Horbach SPJM, Tijdk JK, Bouter LM. Research funders should be more transparent: a plea for open applications. Royal Society Open Science 2022; 9: 220750. (<https://doi.org/10.1098/rsos.220750>)

Horbach SPJM, Tijdk J, Bouter LM. The next frontier in open science: transparency in funding processes. Royal Society Blog 2023, January 9 (<https://royalsociety.org/blog/2022/12/transparency-in-funding-processes/>)

Horbach SPJM, Bouter LM, Tijdk JK. Opinion: a call for open funding procedures. The Scientist 2023, February 1 (<https://www.the-scientist.com/critic-at-large/opinion-a-call-for-open-funding-procedures-70903>)

Tony Ross-Hellauer T, Bouter LM, Serge P.J.M. Horbach SPJM. Open peer review urgently requires evidence: a call to action (submitted for publication)



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University of Athens



8th World Conference on Research Integrity

2-5 June 2024

Megaron Athens International
Conference Centre (MAICC)

www.wcri2024.org



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Vimeo: <https://bit.ly/3pvv0tZ>