Amsterdam UMC
University Medical Centers

VU VRIJE UNIVERSITEIT AMSTERDAM

Fostering Responsible Research Practices needs attention from all stakeholders

Lex Bouter

2021-05-21 – Fostering RRPs needs attention from all stakeholders – LM Bouter – 60 minutes incl. Q&A

Content

- What do we mean by research integrity?
- What are the challenges for researchers?
- What can research institutes do?
- What can journals do?

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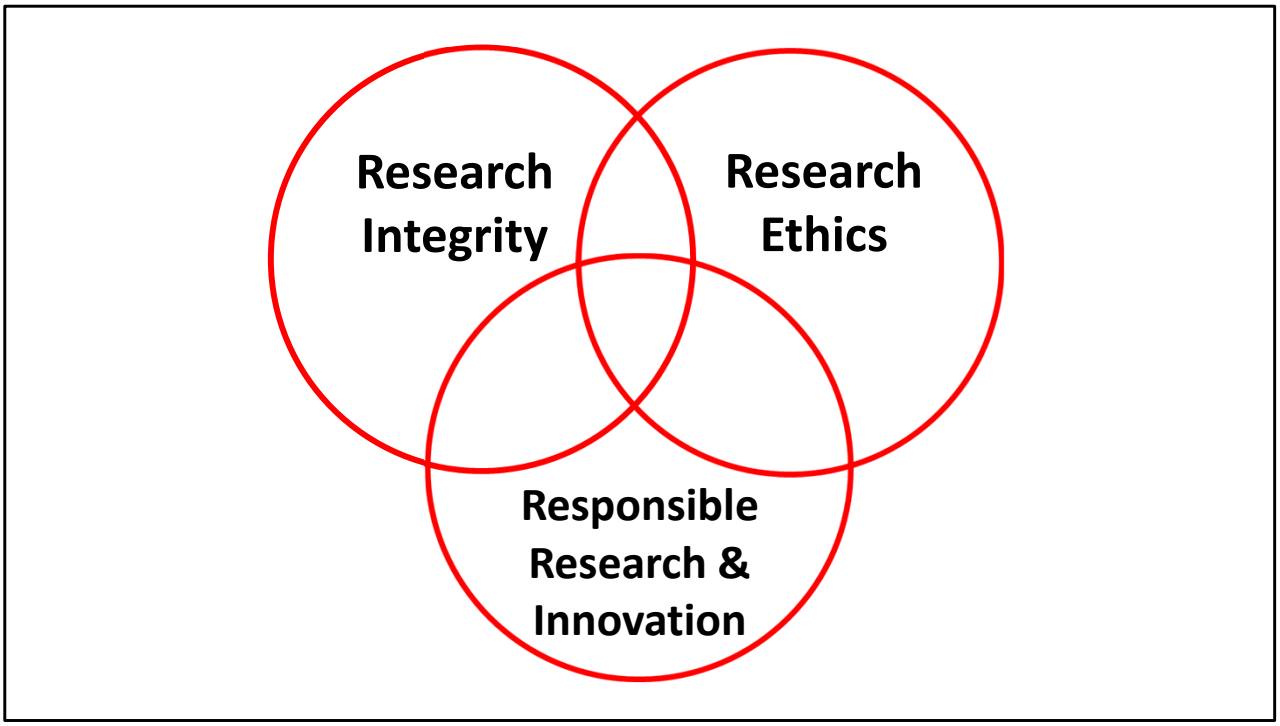
Research Integrity
Research Ethics
Responsible Research & Innovation

Research Integrity (RI) concerns behaviors of researchers that hamper validity (**truth**) of research or **trust** in science and between scientists.

Research Ethics (RE) concerns the ethical considerations of research with **humans** and **animals**.

Responsible Research & Innovation (RRI) concerns the benefits and harms of research for **society** and the **environment**.

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RI and RE standards can be ethical, methodological or both.

Singapore Statement on Research Integrity

Preamble. The value and benefits of research are vitally dependent on the integrity of research. While there can be and are national and disciplinary differences in the way research is organized and conducted, there are also principles and professional responsibilities that are fundamental to the integrity of research wherever it is undertaken.

PRINCIPLES

Honesty in all aspects of research

Accountability in the conduct of research

Professional courtesy and fairness in working with others

Good stewardship of research on behalf of others

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Adopted at the 2nd World Conference on Research Integrity in 2010 in Singapore. It is very much aspirational, became the informal global code of conduct, and is refereed to in almost all regional, national and institutional codes of conduct for research integrity.

https://www.wcrif.org/documents/327-singapore-statement-a4size/file

ALLEA
ALL European Academies

The European Code of Conduct for Research Integrity

REVISED EDITION

http://www.allea.org/wp-content/uploads/2017/03/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf

Published in 2017 and made mandatory for research sponsored by the EU (Horizon 2020 and Horizon Europe). Page 6 of Horizon Europe Programme Standard Application Form (https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/af/af_he-ria-ia_en.pdf) states:

We declare that the proposal complies with ethical principles (including the highest standards of research integrity as set out in the ALLEA European Code of Conduct for Research Integrity, as well as applicable international and national law, including the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols. Appropriate procedures, policies and structures are in place to foster responsible research practices, to prevent questionable research practices and research misconduct, and to handle allegations of breaches of the principles and standards in the Code of Conduct.

The hyperlink of Appropriate procedures, policies and structures opens the Guideline

for Promoting Research Integrity in Research Performing Organisations (https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/guideline-for-promoting-research-integrity-in-research-performing-organisations_horizon_en.pdf) by the SOPs4RI (https://sops4ri.eu/) consortium that is described in:

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

http://www.vsnu.nl/files/documents/Netherlands%20Code%20of%20Conduct%20for%20Research%20Integrity%202018.pdf

http://www.vsnu.nl/files/documenten/Nederlandse%20gedragscode%20wetenschappelijke%20integriteit%202018.pdf

https://doi.org/10.17026/dans-2cj-nvwu

There seems to be no South African Code of Conduct for Research Integrity.

These two documents come the nearest I was told, but they concern mainly research ethics and publication ethics.

https://www.nrf.ac.za/sites/default/files/documents/STATEMENT%20ON%20ETHICAL.pdf

https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/coc_research-resource-poor-settings_en.pdf

National Survey on **Research Integrity**

www.nsri2020.nl

@SurveyIntegrity

Research integrity covers a whole range of researcher behaviors: research misconduct, questionable research practices, responsible research practices.

In this survey among all academic researchers in the Netherlands we study the prevalence of fabrication, falsification, 11 questionable research practices and 11 responsible research practices, and explore their relation with 11 explanatory variables.

Research Misconduct

- ***Fabrication***: making up data or results
- ***Falsification***: manipulating research materials, equipment, or processes, or changing or omitting data or results
- ***Plagiarism***: not citing source when using ideas, procedures, results and text

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Research Misconduct included in the National Survey on Research Integrity
www.nsri2020.nl

RR1: In the last three years, I fabricated data in my research.
Clarification: Fabrication is making up data or results and recording or reporting them as real.

RR2: In the last three years, I falsified data in my research.
Clarification: Falsification refers to manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.

Netherlands Code of Conduct for Research Integrity
https://www.vsnu.nl/files/documents/Netherlands%20Code%20of%20Conduct%20for%20Research%20Integrity%202018.pdf

40. When making use of other people's ideas, procedures, results and text, do

justice to the research involved and cite the source accurately.

41. Avoid unnecessary reuse of previously published texts of which you were the author or co-author.

a. Be transparent about reuse by citing the original publication.

b. Such self-citation is not necessary for reuse on a small scale or of introductory passages and descriptions of the method applied.

Questionable Research Practices

- Not submitting a valid negative study for publication
- Poor mentoring and supervision of junior co-workers
- Insufficiently mentioning of study flaws and limitations
- Unfair reviewing of manuscript or grant application

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Questionable Research Practices included in the National Survey on Research Integrity www.nsri2020.nl

RP3: In the last three years, I gave insufficient attention to the equipment, skills or expertise essential to perform my studies.

RP5: In the last three years, I insufficiently supervised or mentored junior co-workers.

RP7: In the last three years, I chose inadequate research designs or used evidently unsuitable measurement instruments for my studies.
Clarification: An "inadequate research design" or "measurement instrument" may also refer to knowingly choosing a research approach or theory that is clearly inadequate to answer the overall study question.

RP8: In the last three years, I unfairly reviewed manuscripts, grant applications or colleagues applying for promotion.

RP10: In the last three years, I drew conclusions that were not sufficiently substantiated by my studies.
Clarification: This refers to instances when you let your own convictions guide the conclusions of your study more than is warranted by the data.

RP11: In the last three years, I used published or unpublished ideas or phrases from others without properly referencing its source.

RP13: In the last three years, I kept inadequate notes of my research process in a project.

RP14: In the last three years, I did not mention clearly important details of my study method in my publications.

RP18: In the last three years, I chose not to submit or resubmit valid negative studies for publication.
Clarification: A valid negative study may be defined as one that did not support your original study hypothesis.

RP20: In the last three years, I insufficiently mentioned study flaws and limitations in my publications.

RP22: In the last three years, I selectively cited references to enhance my own findings or convictions.
Clarification: This also refers to intentionally excluding references that might undermine your theory or the argument you want to make.

Responsible Research Practices

- Pre-registration and FAIR data handling
- Being transparent about competing interests
- Avoiding gift and ghost authorships
- Correction or retraction when error is detected

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Responsible Research Practices included in the National Survey on Research Integrity (www.nsri2020.nl)

RP1: In the last three years, I disclosed who funded my studies and all my relevant financial and non-financial interests in my publications.

RP2: In the last three years, I took steps to correct errors in my published work whenever I and/or peers provided valid reasons for such a correction.

RP4: In the last three years, the allocation and ordering of authorships in my publications, were fair and in line with the standards of my discipline. Clarification: Fair allocation refers to inclusion of all authors who made a genuine intellectual contribution to at least one of the following elements: the design of the research, the acquisition of data, its analysis or the interpretation of findings.

RP6: In the last three years, I contributed, where appropriate, to making my

research data findable, accessible, interoperable and reusable in accordance with the FAIR principles.
Clarification: For some types of research this means providing detailed descriptions of where source material can be found (complete with relevant file numbers, page numbers, etc.)

RP9: In the last three years, I kept a comprehensive record of my research decisions throughout my studies.

RP12: In the last three years, I pre-registered my study protocols in line with open science practices.

RP15: In the last three years, I managed my research data carefully by storing both the raw and processed versions for a period appropriate to my discipline and methodology used.

RP16: In the last three years, my research was published under open access conditions.
Clarification: 'Open access' publication refers to publication where there are no financial, legal or technical barriers to accessing it.

RP17: In the last three years, when making use of other people's ideas, procedures, results and text in my publications, I cited the source accurately in accordance with the standards of my discipline.

RP19: In the last three years, I fully disclosed and made accessible on open science platforms my underlying data, computer codes, or syntaxes used in my research.

RP21: In the last three years, before releasing results of my research, I meticulously checked my work to avoid errors and biases.

Spectrum of research practices

How it should be done:

Relevant, Valid, Reproducible, Efficient

Sloppy science: **34%**

Ignorance, honest error or dubious integrity

Scientific fraud:

2%

Fabrication, Falsification, Plagiarism

Responsible Research Practices

Questionable Research Practices

Research Misconduct

3

The figures concern the question 'did you at least once in the last 3 years engage in FF / QRP ?' and come from the frequently cited meta-analysis:

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

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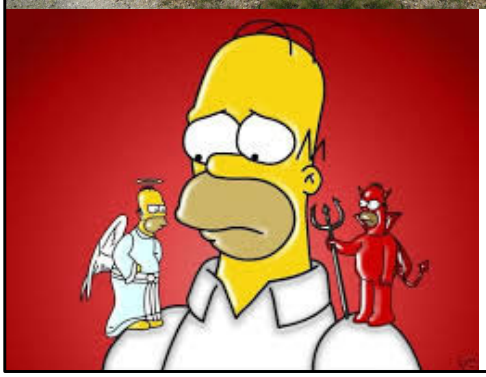

What is good for the ***truth*** of and the ***trust*** in research is not always good for your academic career

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Many rewards in academia are linked to having positive and spectacular results as these are published more easily in high impact journals and will be cited more often.

The various Questionable Research Practices (QRPs) have in common that they can effectively help to get these positive and spectacular results.

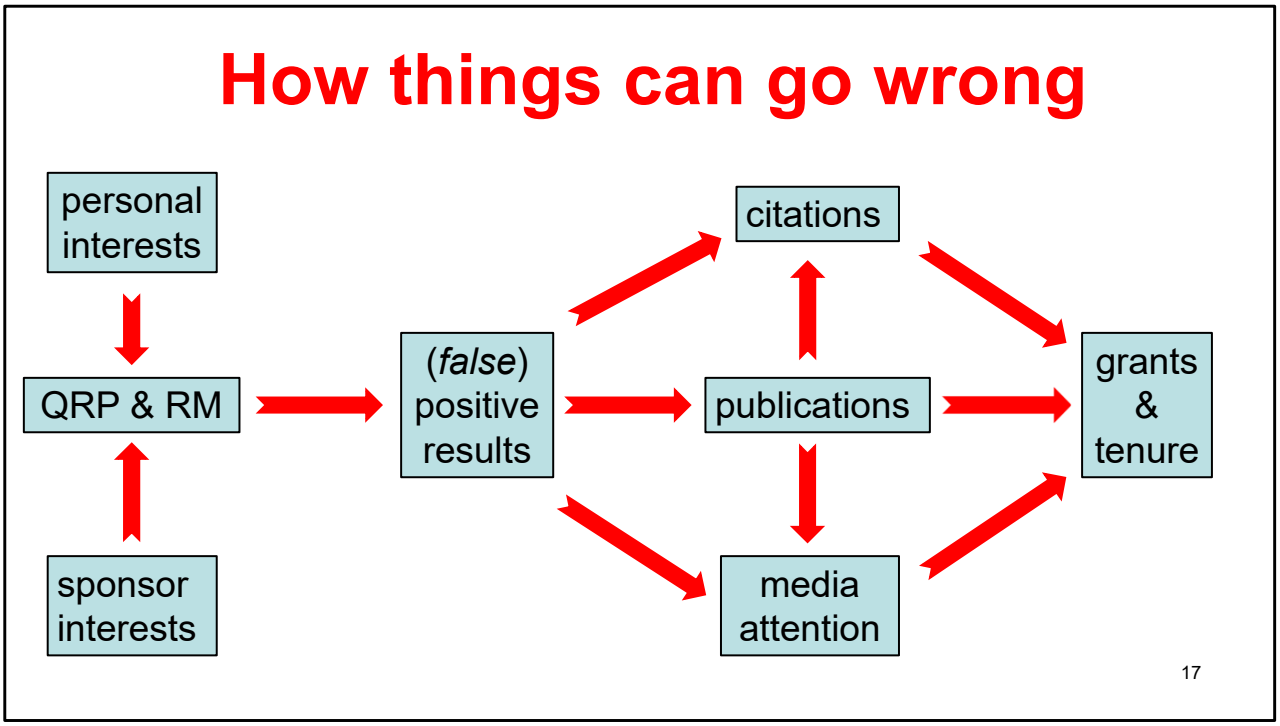
Functioning of moral compass depends on:

- Virtuousness of the individual
- Research climate in the lab
- Adequate incentives

Researchers navigate the dilemmas in their work with their moral compass. The quality of this compass depends on how virtuous the researcher at issue is.

But there are also strong other drivers of their behaviour in the direct professional environment and the system of science at large.

That doesn't deminish the personal responsibility to behave well in research. In fact it makes personal responsilility larger: individual researchers also have to help to improve the research climate and to remove perverse incentives.

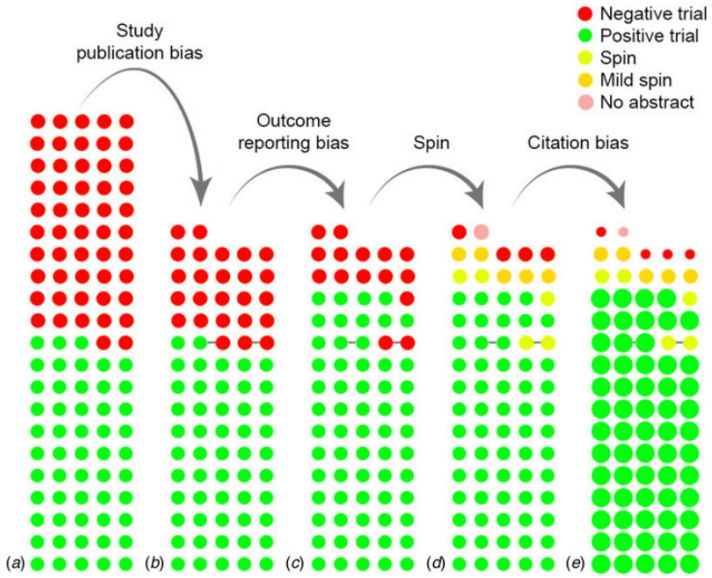


This slide shows – in a simplified way – how things can go wrong.

In most disciplines the proportion of papers reporting positive results increased over time. Positive results are published and cited more often, and also get more media attention. This will probably increase the likelihood of getting grants and tenure. QRP and RM can effectively help to get (false) positive results. We have also some evidence that conflicts of interest and sponsor interests may lead to sloppy science (QRPs) or worse (research misconduct - RM).

Negative findings are so unpopular that often these are not reported at all. Especially small studies with positive outcomes will predominantly be chance findings. These phenomena will distort the published record and can explain the large replication difficulties some disciplinary fields.

How negative results become invisible the published literature



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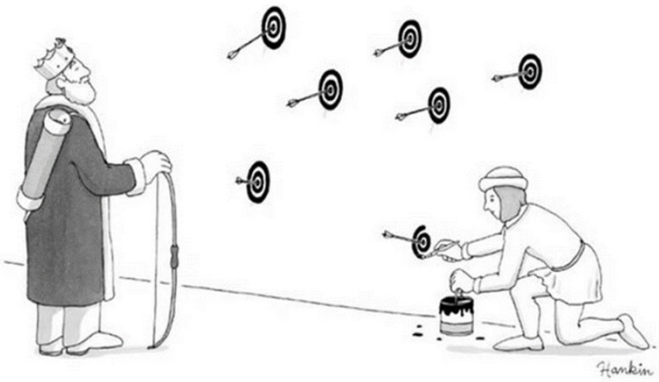
de Vries YA, Roest AM, de Jonge P, Cuijpers P, Munafò MR, Bastiaansen JA (2018). The cumulative effect of reporting and citation biases on the apparent efficacy of treatments: the case of depression. Psychological Medicine 1–3. https://doi.org/10.1017/S0033291718001873

This example concerns the fate of an inception cohort of 105 RCTs of the efficacy of anti-depression drugs from the FDA database. The cohort is complete in the sense that pharmaceutical companies must register all trials they intend to use to obtain FDA approval before embarking on data collection. The FDA considered 50% of the trials to be positive after carefully looking at the results.

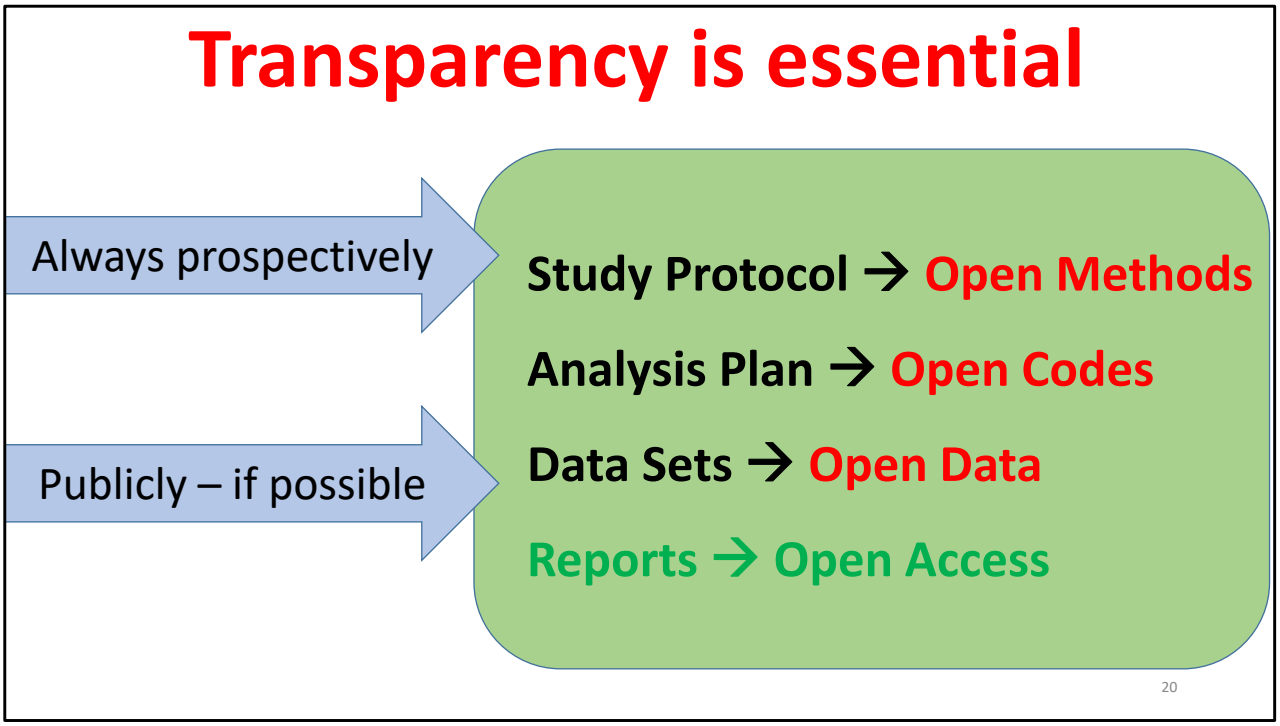
QRPs are important drivers of 'replicability crisis'

- Selective reporting
- Low power
- Low rate of true effects
- P-hacking
- HARKing

Hypothesizing After Results are Known



Wicherts et al - Degrees of freedom - checklist to avoid p-hacking - Front Psych 2016; 7: 1832. https://www.frontiersin.org/articles/10.3389/fpsyg.2016.01832/full



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

Bouter LM, ter Riet G. Empirical research must be replicated before its findings can be trusted. Journal of Clinical Epidemiology 2021; 129: 188-190. https://www.jclinepi.com/article/S0895-4356(20)31118-5/fulltext

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- What do we mean by research integrity?
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- What can journals do?

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Open Access

Research integrity: nine ways to move from talk to walk

Nature 2020; 586: 358-60

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Researchers need help from their institutions in avoiding questionable research practices.

In 2020 we published in Nature what these institutions should do specifically, based on research from a large EU consortium: https://sops4ri.eu/

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, Rea 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

The European Code of Conduct for Research Integrity (http://www.allea.org/wp-content/uploads/2017/03/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf) was
published in 2017 and made mandatory for research sponsored by the EU (Horizon 2020 and Horizon Europe). See page 6 of Horizon Europe Programme Standard Application Form (https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/af/af_he-ria-ia_en.pdf)

states:

We declare that the proposal complies with ethical principles (including the highest standards of research integrity as set out in the ALLEA European Code of Conduct for Research Integrity, as well as applicable international and national law, including the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols. Appropriate procedures, policies and structures are in place to foster responsible research practices, to prevent questionable research practices and research misconduct, and to handle allegations of breaches of the principles and standards in the Code of Conduct.

The hyperlink of Appropriate procedures, policies and structures opens the Guideline for Promoting Research Integrity in Research Performing Organisations (https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/guideline-for-promoting-research-integrity-in-research-performing-organisations_horizon_en.pdf) by the SOPs4RI (https://sops4ri.eu/).

Horizon Europe consortium Standard Operating Procedures for Research Integrity (SOPs4RI)

https://sops4ri.eu/

Area	Topic	Action*
Support	Research environment	Ensure fair assessment procedures and prevent hypercompetition and excessive publication pressure.
	Supervision and mentoring	Create clear guidelines for PhD supervision (such as on meeting frequency); set up skills training and mentoring.
	Integrity training	Establish training and confidential counselling for all researchers.
Organization	Ethics structures	Establish review procedures that accommodate different types of research and disciplines.
	Integrity breaches	Formalize procedures that protect both whistle-blowers and those accused of misconduct.
	Data practices and management	Provide training, incentives and infrastructure to curate and share data according to FAIR principles.
Communication	Research collaboration	Establish sound rules for transparent working with industry and international partners.
	Declaration of interests	State conflicts (financial and personal) in research, review and other professional activities.
	Publication and communication	Respect guidelines for authorship and ensure openness and clarity in public engagement.

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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, Rea 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

Open Access

PLOS ONE

RESEARCH ARTICLE

Perceptions of research integrity climate differ between academic ranks and disciplinary fields: Results from a survey among academic researchers in Amsterdam

Tamarinde L. Haven[1]*, Joeri K. Tijdink[1,2], Brian C. Martinson[3], Lex M. Bouter[1,2]

RESEARCH ARTICLE

Perceived publication pressure in Amsterdam: Survey of all disciplinary fields and academic ranks

Tamarinde L. Haven[1]*, Lex M. Bouter[1,2], Yvo M. Smulders[3], Joeri K. Tijdink[1,4]

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The Wellcome Trust published in 2020 a very informative survey results on how researchers perceive their culture: https://wellcome.ac.uk/sites/default/files/what-researchers-think-about-the-culture-they-work-in.pdf.

Website: www.amsterdamresearchclimate.nl

Preregistration of study protocol and data analysis plan: https://osf.io/x6t2q/

Publications:

- Haven TL, Tijdink JK, Martinson BC, Bouter LM. Perceptions of research integrity climate differ between academic ranks and disciplinary fields: results from a survey among academic researchers in Amsterdam. PLoS ONE 2019; 14: e0210599 (https://doi.org/10.1371/journal.pone.0210599).
- Haven TL, de Goede MEE, Oort FJ. Personally perceived publication pressure: revising the Publication Pressure Questionnaire (PPQ) by using work stress models. Research Integrity and Peer Review (2019) 4:7 (https://doi.org/10.1186/s41073-019-0066-6)

- Haven TL, Bouter LM, Smulders YM, Tijdink JK. Perceived publication pressure in Amsterdam: survey of all disciplinary fields and academic ranks. PLoS ONE 2019; 14: e0217931. (https://doi.org/10.1371/journal.pone.0217931)
- Haven T, Tijdink J, Pasman HJ, Widdershoven G, ter Riet G, Bouter L. Do research misbehaviours differ between disciplinary fields? A mixed methods study among academic researchers in Amsterdam. Research Integrity and Peer Review 2019; 4:25. (https://doi.org/10.1186/s41073-019-0081-7)
- Haven T, Tijdink T, Martinson B, Bouter L, Oort F. Explaining variance in perceived research misbehavior: results from a survey among academic researchers in Amsterdam. Research Integrity and Peer Review 2021; 6:7. https://rdcu.be/cjUlq

https://russellgroup.ac.uk/media/5925/realising-our-potential-report_4-compressed.pdf?=section2

https://russellgroup.ac.uk/media/5924/rce-toolkit-final-compressed.pdf?=section2

https://russellgroup.ac.uk/media/5923/realising-our-potential-case-studies_3-compressed.pdf?=dl1

PLOS BIOLOGY

ESSAY

The Hong Kong Principles for assessing researchers: Fostering research integrity

Open Access

PLoS Biology 2020; 18: e3000737

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How to realize fair assessment procedures of researchers is outlined in the Hong Kong Principles.

The name Hong Kong refers to the city where the 6th WCRI was held in 2019. Before and during the conference we discussed the HKPs and after the conference they were endorsed by its participants.

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

Please endorse the HKPs at www.wcrif.org/guidance/hong-kong-principles
On this webpage you can also find best practices, PP slides and a video on the HKPs.

- Grant applications
- Vacancies
- Promotion
- Tenure
- Awards

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Hong Kong Principles

1. Assess responsible research practices
2. Value complete reporting
3. Reward the practice of Open Science
4. Acknowledge a broad range of research activities
5. Recognize essential other tasks like peer review and mentoring

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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

Please endorse the HKPs at www.wcrif.org/guidance/hong-kong-principles
On this webpage you can also find best practices, PP slides and a video on the HKPs.

WORLD VIEW *A personal take on events*

Payouts push professors towards predatory journals

If South Africa truly wants to encourage good research, it must stop paying academics by the paper, says **David William Hedding**.

Open Access

Nature 2019; 565: 267

- Research Outputs Policy (2015): # publications is a main driver of university budget for research
- Percentage of pay-per-publication that is forwarded to department, research group and personal bank accounts varies
- This likely is a strong behavioural incentive

The Research Output Policy (2015) of the SA Department of Higher Education and Training (DHET):
http://www.sun.ac.za/english/research-innovation/Research-Development/Documents/Research%20Outputs/Research%20Output%20Policy/ENGLISH/Research%20Outputs%20policy%20gazette.pdf

The DHET subsidizes research outputs in the following categories:

Journal articles (research articles) in accredited journals
Peer-reviewed books/chapters in books
Peer-reviewed published conference proceedings

Internal distribution rules of University of Johannesburg:
https://www.uj.ac.za/research/Pages/DHET-Publication-Subsidy.aspx

Incentives works well

- For ***intended*** effects:
  - More publications
- 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
  - Stronger 'Matthew effect', less equity
  - Less time-consuming responsible research practices
- All incentives can and will be gamed if stakes are high

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Tomaselli KG. Perverse incentives and the political economy of South African academic journal publishing. S Afr J Sci. 2018;114(11/12), Art. #4341, 6 pages. https://doi.org/10.17159/sajs.2018/4341

Mathama E, McKenna S. The Unintended Consequences of Using Direct Incentives to Drive the Complex Task of Research Dissemination. Education as Change 2020; 24: 6688. https://upjournals.co.za/index.php/EAC/article/view/6688

Thomas A, De Bruin GP. Plagiarism in South African management journals. S Afr J Sci 2015;111: 2014-0017. http://dx.doi.org/10.17159/sajs.2015/20140017

https://en.wikipedia.org/wiki/Goodhart%27s_law

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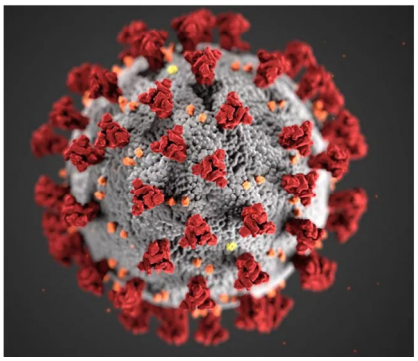
Hydroxychloroquine-COVID-19 study did not meet publishing society's "expected standard"

Lancet, NEJM retract controversial COVID-19 studies based on Surgisphere data



Didier Raoult

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Not all went well during the pandemic but probably less than 1 promille of the Covid-19 papers was retracted: to date about 120 in total.
There is little evidence that preprints fared worse than regular publications. In fact there is some research that suggests that manuscript change very little when promoted from preprint to accepted peer reviewd publication.

Some cases were very prominent in the media, the most wellknown example being that of the antimalarial drug hydroxychloroquine as a "miracle cure" in the treatment of Covid 19.
It first appeared as a preprint then a journal publication as a result of a seriously flawed study by the infamous French scientist Didier Raoult, on the basis of clinical observations among 24 patients with multiple co-morbidities. Suffice to say the study, with multiple grave errors from methodological flaws to data mismatch, to patient safety concerns made headline news. Resulting in the former US president claiming it as a cure for Covid. Later publications denying that based on dubious data: Lancet and NEJM had to retract these flawed analyses, although that didn't stop later publications from citing them as genuine information.

https://retractionwatch.com/retracted-coronavirus-covid-19-papers/

https://retractionwatch.com/2020/04/06/hydroxychlorine-covid-19-study-did-not-meet-publishing-societys-expected-standard/

https://retractionwatch.com/2020/06/04/lancet-retracts-controversial-hydroxychloroquine-study/

https://www.nytimes.com/2020/06/14/health/virus-journals.html

https://www.the-scientist.com/features/the-surgisphere-scandal-what-went-wrong--67955?_ga=2.70401744.1931656756.1608568714-1790261732.1608568714

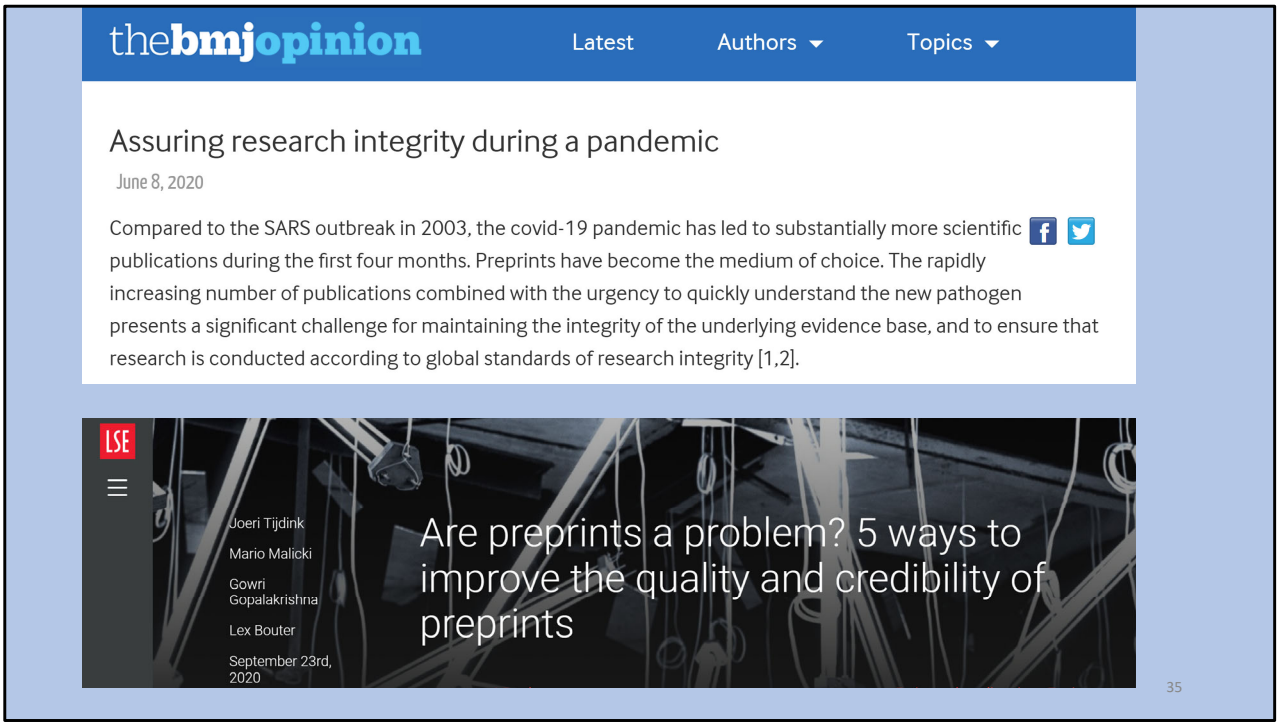
https://www.sciencemag.org/news/2021/01/many-scientists-citing-two-scandalous-covid-19-papers-ignore-their-retractions?utm_campaign=SciMag&utm_source=JHubbard&utm_medium=Facebook

Difficult issues with retraction

- Journals are (very) **slow** in responding
- Journals are **reluctant** to investigate
- Unclear if (all) **authors** need to **agree**
- Cleaning journals from **flawed** articles or **sanction** for RM
- Explanations are **vague** and aimed at avoidance of **lawsuits**
- Retracted articles are being **still cited**
- **Honorable self-retraction** is not clearly indicated

There seem to be a lot of room for improvement here. Recently some recommendations on the collaboration between research institutes and journals have been issued:

Wager E , Kleinert S and on behalf of the CLUE Working Group. Cooperation & Liaison between Universities & Editors (CLUE): recommendations on best practice. Research Integrity and Peer Review (2021) 6:. https://doi.org/10.1186/s41073-021-00109-3



We explored in these blogs how the pressure affects research integrity and how peprints can be improved.

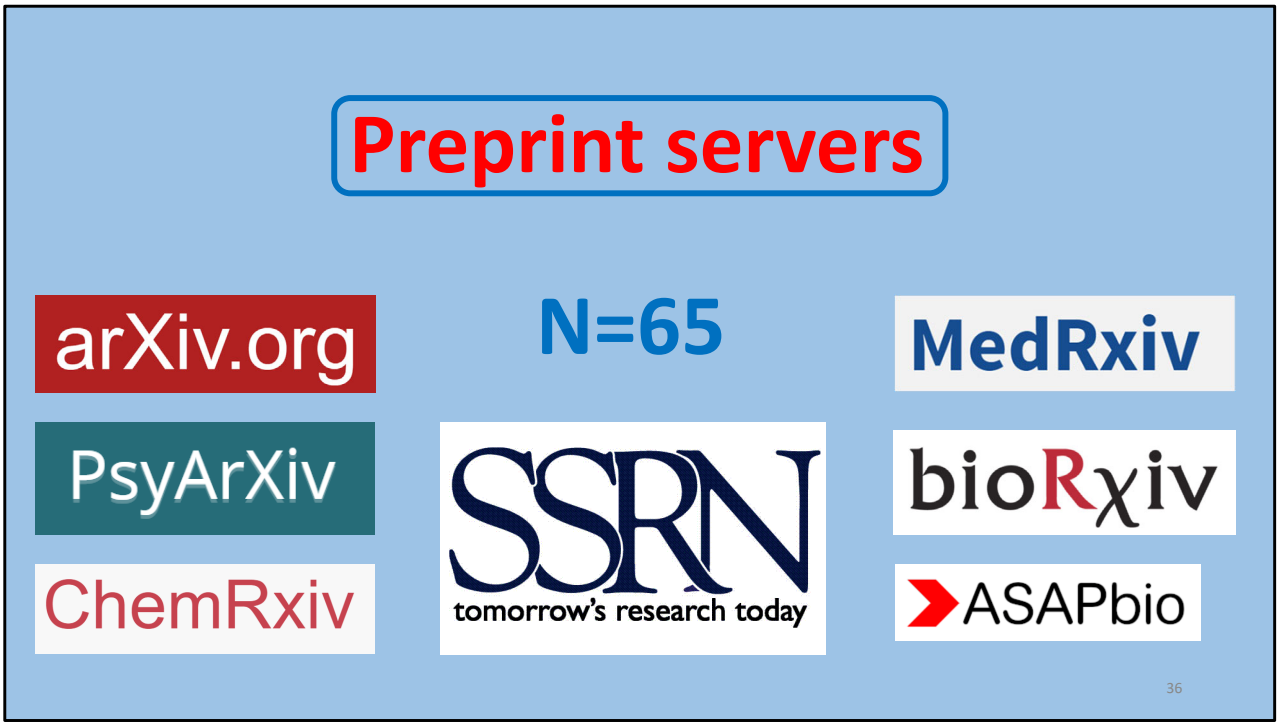
Gopalakrishna G, Bouter L, Mayer T, Steneck N. Assuring research integrity during a pandemic. BMJ Opinion. Published online: 8 June 2020. https://blogs.bmj.com/bmj/2020/06/08/assuring-research-integrity-during-a-pandemic/

Tijdink J, Malički M, Bouter L, Gopalakrishna G. Are preprints a problem? 5 ways to improve the quality and credibility of preprints. LSE Blogs, 23 September 2020. https://blogs.lse.ac.uk/impactofsocialsciences/2020/09/23/are-preprints-a-problem-5-ways-to-improve-the-quality-and-credibility-of-preprints/

Malički M, Jerončić A, ter Riet G, Bouter LM, Ioannidis JPA, Goodman S, Aalbersberg IJJ. Preprint servers' policies, submission requirements, and transparency in reporting and research integrity recommendations. JAMA 2020; 324: 16: 1901-3. https://research.vu.nl/ws/portalfiles/portal/118971203/2.511.pdf

Malicki M, Jerončić A, Bouter LB, ter Riet G, Ioannidis JPA, Goodman SM, Aalbersberg

IJ J. Preprint servers' policies, submission requirements, and transparency in reporting and research integrity recommendations. Research Square (25 January 2021) https://www.researchsquare.com/article/rs-153573/v1



The idea of preprints is immediate release of research reports to enable pre-submission peer review by colleagues in the field, flagging priority and quick dissemination (not always a good idea).
Preprint servers are digital platforms with typically no or minor upload criteria and weak monitoring functions.

https://arxiv.org/

https://chemrxiv.org/

https://www.biorxiv.org/

https://psyarxiv.com/

http://asapbio.org/

List of 65 preprint servers at
https://docs.google.com/spreadsheets/d/17RgfuQcGJHKSsSJwZZn0oiXAnimZu2sZsW

p8Z6ZaYYo/edit#gid=0

YouTube video 'What are preprints?'
https://www.youtube.com/watch?time_continue=9&v=2zMgY8Dx9co

Malički M, Jerončić A, ter Riet G, Bouter LM, Ioannidis JPA, Goodman S, Aalbersberg IJJ. Preprint servers' policies, submission requirements, and transparency in reporting and research integrity recommendations. JAMA 2020; 324: 16: 1901-3.
https://research.vu.nl/ws/portalfiles/portal/118971203/2.511.pdf

Malicki M, Jerončić A, Bouter B, ter Riet G, Ioannidis JPA, Goodman SM, Aalbersberg IJ J. Preprint servers' policies, submission requirements, and transparency in reporting and research integrity recommendations. Research Square (25 January 2021)
https://www.researchsquare.com/article/rs-153573/v1

Xie et al - Is preprint the future of science? A thirty year journey of online preprint services. https://arxiv.org/abs/2102.09066

Kirkham JJ, Penfold NC, Murphy F, et al. Systematic examination of preprint platforms for use in the medical and biomedical sciences setting. BMJ Open 2020; 10: e041849. https://bmjopen.bmj.com/content/10/12/e041849
Chalmers I, Glaziou P. Should there be greater use of preprint servers for publishing reports of biomedical science? F1000Research 2016; 5: 272.
https://f1000research.com/articles/5-272/v1

medRχiv

THE PREPRINT SERVER FOR HEALTH SCIENCES

Cold Spring Harbor Laboratory BMJ Yale

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Comments (584)

COVID-19 Antibody Seroprevalence in Santa Clara County, California

Eran Bendavid, Bianca Mulaney, Neeraj Sood, Soleil Shah, Emilia Ling, Rebecca Bromley-Dulfano, Cara Lai, Zoe Weissberg, Rodrigo Saavedra-Walker, Jim Tedrow, Dona Tversky, Andrew Bogan, Thomas Kupiec, Daniel Eichner, Ribhav Gupta, John P.A. Ioannidis, Jay Bhattacharya

doi: https://doi.org/10.1101/2020.04.14.20062463

9 comments on PubPeer (by: Chryseobacterium Taeanense, Inia Araguaiaensis, Scaphiodontophis Annulatus, Leptasterias Ochotensis, Gonia Chinensis, Tinodes Consuetus, Henosepilachna Cinerascens, Trichopsis Pumila, Coquillettidia Aurites)

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should *not* be used to guide clinical practice.

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This preprint led to a lot of heated discussions and detailed peer reviews on Twitter and lenghty articles in both scholarly and lay media.
The paper suggested that the case fatality rate would be in the range of that of influenza and not as high as many thought.
There turned out to be some methodological flaws and a number of unsubstantiated policy recommendations.
Many MedRxiv comments, Tweets, PubPeer comments and magazine articles put fair and unfair criticisms on the table.
Within a two weeks an improved preprint was uploaded although the debate on the interpretation was not settled.
The debate was complicated by the fact that right wing activists and some politicians used this study to emphasize their point that draconic measures where not justified.
While this was a good example of the self-corrective resilience of the research system it was a bad example of interaction between scientists and policy makers plus the general public – a media storm with one famous scientist at its core.

The preprint appeared on 17 April 2020 and the revised version was posted on 30 April 2020: https://www.medrxiv.org/content/10.1101/2020.04.14.20062463v2

The peer reviewed publication of the final version appeared on 22 February 2021: International Journal of Epidemiology, 2021, 1–10.
https://doi.org/10.1093/ije/dyab010

https://undark.org/2020/06/11/john-ioannidis-politicization/

https://www.buzzfeednews.com/article/stephaniemlee/stanford-coronavirus-neeleman-ioannidis-whistleblower

https://www.washingtonpost.com/dc-md-va/2020/12/16/john-ioannidis-coronavirus-lockdowns-fox-news/

https://www.youtube.com/watch?v=cwPqmLoZA4s&list=PLQtY8p5blBAjsMEGBe7aafyM9EoQ9lYnQ&ab_channel=JourneymanPictures

TOP guidelines and TOP Factor

8 MODULAR STANDARDS

Citation Standards Describes citation of data	**Data Transparency** Describes availability and sharing of data
Analytical Methods Transparency Describes analytical code accessibility	**Research Materials Transparency** Describes research materials accessibility
Design and Analysis Transparency Sets standards for research design disclosures	**Preregistration of Studies** Specification of study details before data collection
Preregistration of Analysis Plans Specification of analytical details before data collection	**Replication** Encourages publication of replication studies

Adopted by > 5000 journals !

	0	1	2	3
Data transparency	Data sharing is encouraged, or not mentioned	Articles must state whether or not data are available. Requiring a data availability statement satisfies this level	Articles must have publicly available data, or an explanation why ethical or legal constraints prevent it.	Articles must have publicly available data and must be used to computationally reproduce or confirm results prior to publication

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https://www.cos.io/initiatives/top-guidelines

Preregistration and Registered reports

Future-proof your research.
Preregister your next study.

CENTER FOR OPEN SCIENCE

PREREGISTERED

Registered Reports: Peer review before results are known to align scientific values and practices.

39

https://cos.io/rr/

https://www.cos.io/initiatives/registered-reports

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

Chambers C. What's next for registered reports. Nature 2019; 573 187-189. https://www.nature.com/articles/d41586-019-02674-6

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

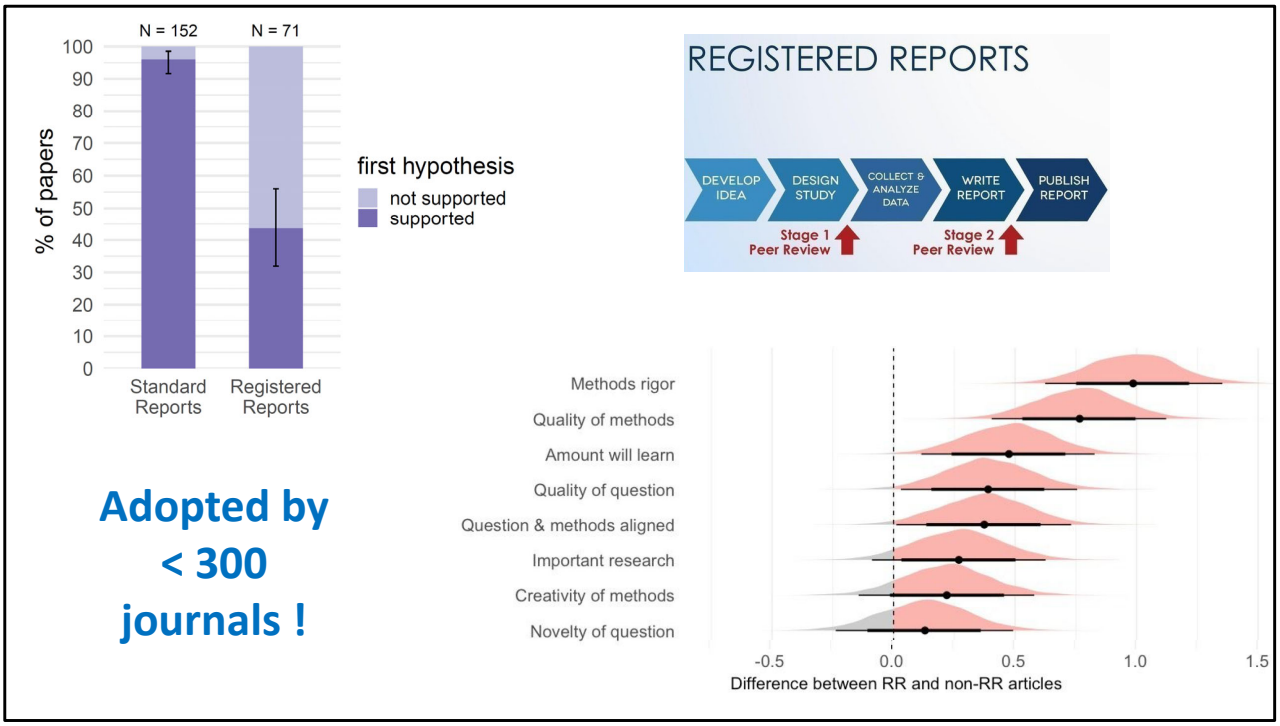
The preregistration revolution

Brian A. Nosek[a,b,1], Charles R. Ebersole[b], Alexander C. DeHaven[a], and David T. Mellor[a]

Progress in science relies in part on generating hypotheses with existing observations and testing hypotheses with new observations. This distinction between postdiction and prediction is appreciated conceptually but is not respected in practice. Mistaking generation of postdictions with testing of predictions reduces the credibility of research findings. However, ordinary biases in human reasoning, such as hindsight bias, make it hard to avoid this mistake. An effective solution is to define the research questions and analysis plan before observing the research outcomes—a process called preregistration. Preregistration distinguishes analyses and outcomes that result from predictions from those that result from postdictions.

2600–2606 | PNAS | March 13, 2018 | vol. 115 | no. 11

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



Chambers C. What's next for registered reports. Nature 2019; 573 187-189. https://www.nature.com/articles/d41586-019-02674-6

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

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. Research Quality of Registered Reports Compared to the Standard Publishing Model. OSF preprint. https://osf.io/preprints/metaarxiv/7x9vy/

https://cos.io/rr/

Interesting new initiative: https://rr.peercommunityin.org/

FAIR data reposition

Box 2 | The FAIR Guiding Principles

To be Findable:
F1. (meta)data are assigned a globally unique and persistent identifier
F2. data are described with rich metadata (defined by R1 below)
F3. metadata clearly and explicitly include the identifier of the data it describes
F4. (meta)data are registered or indexed in a searchable resource

To be Accessible:
A1. (meta)data are retrievable by their identifier using a standardized communications protocol
A1.1 the protocol is open, free, and universally implementable
A1.2 the protocol allows for an authentication and authorization procedure, where necessary
A2. metadata are accessible, even when the data are no longer available

To be Interoperable:
I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
I2. (meta)data use vocabularies that follow FAIR principles
I3. (meta)data include qualified references to other (meta)data

To be Reusable:
R1. meta(data) are richly described with a plurality of accurate and relevant attributes
R1.1. (meta)data are released with a clear and accessible data usage license
R1.2. (meta)data are associated with detailed provenance
R1.3. (meta)data meet domain-relevant community standards

42

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

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

> 2000 Data Repositories

https://osf.io/

https://dataverse.org/

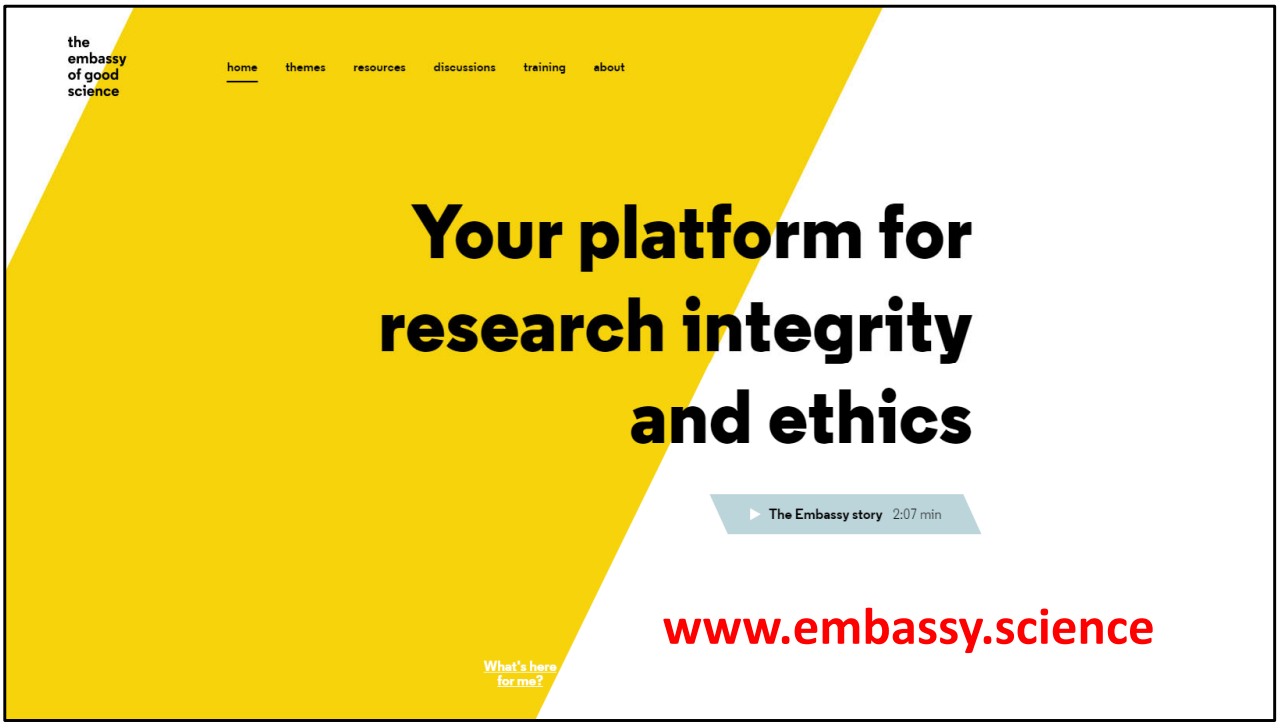
https://www.mendeley.com/

https://datadryad.org/

www.re3data.org

https://zenodo.org/

https://figshare.com/



https://www.embassy.science/

www.wcri2022.org