Why can Open Science practices improve Research Integrity

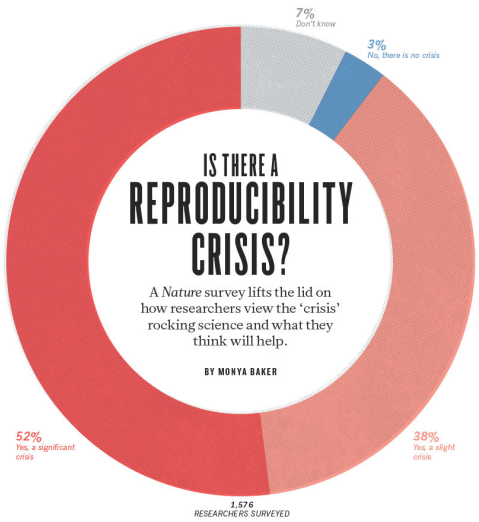
Lex Bouter

2021-05-08 – Why Open Science practices can improve Research Integrity – LM Bouter – 20 minuten + 10 minutes Q&A

Content

- Replication crisis
- Drivers of replicability
- Open Science practices
- Preprints

Replicability of studies is only 10-40 %



Sunday, November 29, 2020

Why I care about replication studies

About Me

Blog by Daniel Lakens,

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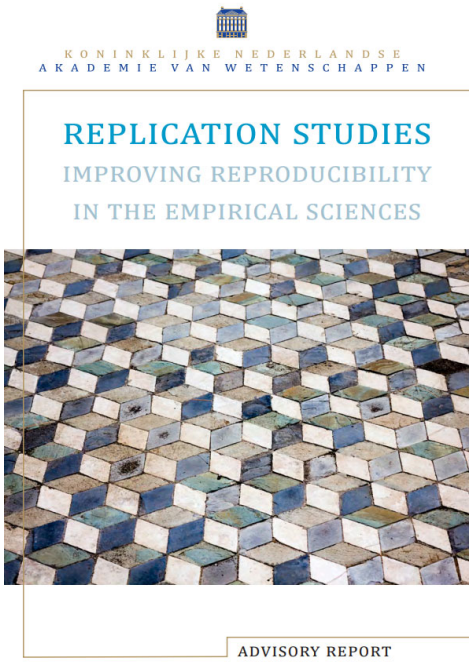
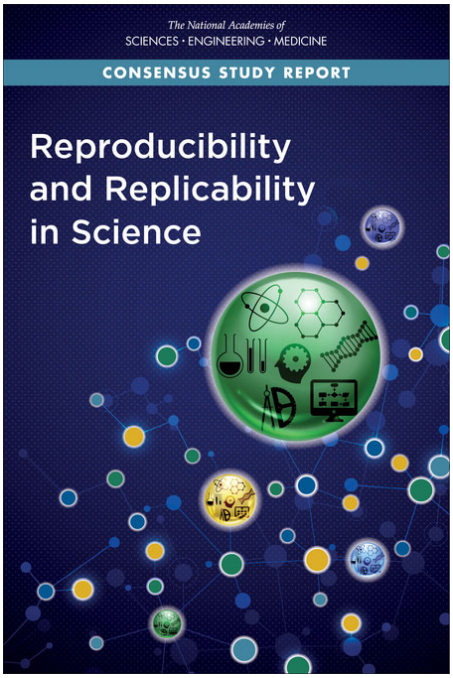
We talk about the replication crisis since 2014 and rightly so.

Baker - Is there a reprodubility crisis - Nature 2016; 533 452-4. https://www.nature.com/news/polopoly_fs/1.19970!/menu/main/topColumns/topLeftColumn/pdf/533452a.pdf

http://daniellakens.blogspot.com/2020/11/why-i-care-about-replication-studies.html





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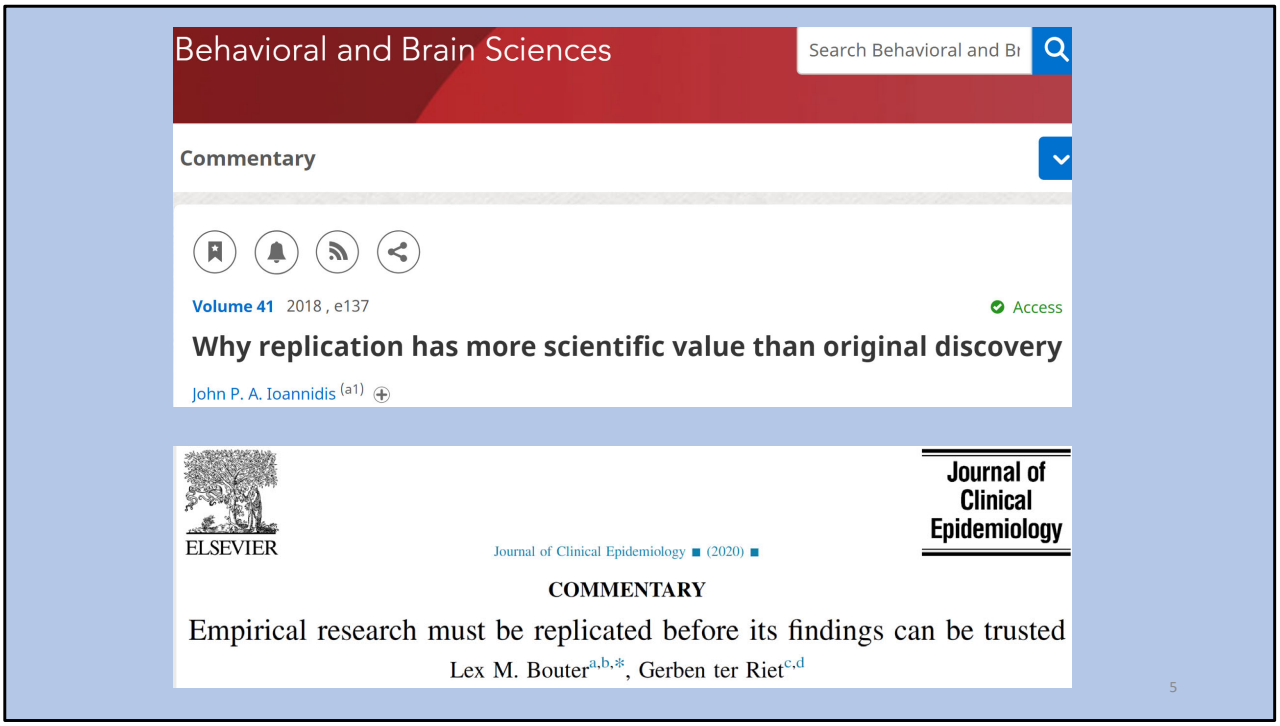
When you want to refresh details of the replication crisis and its drivers here are two excellent reports that can be downloaded for free.

The KNAW report appeared in January 2018
PDF available at: https://www.nrin.nl/wp-content/uploads/KNAW-Replication-Studies-15-01-2018.pdf

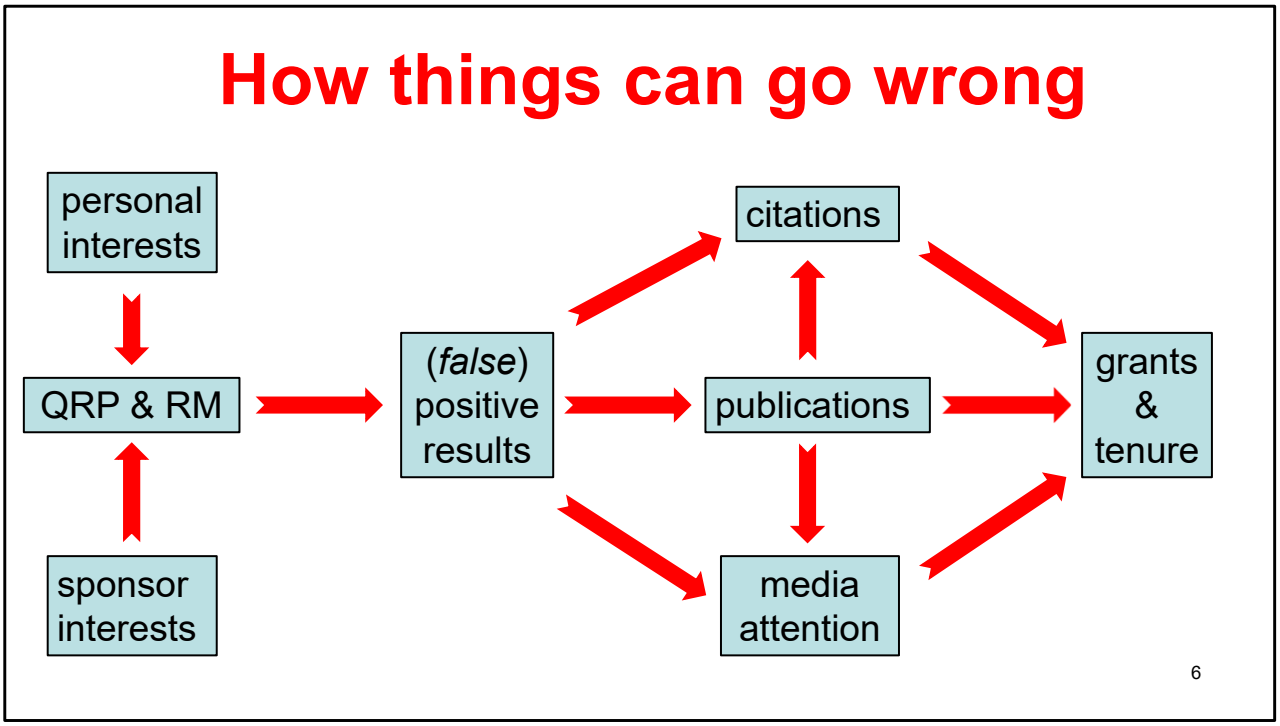
The NAS report appeared in June 2019
PDF available at: https://www.nap.edu/catalog/25303/reproducibility-and-replicability-in-science



These two articles explain why replication is important.

Ioannidis. 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

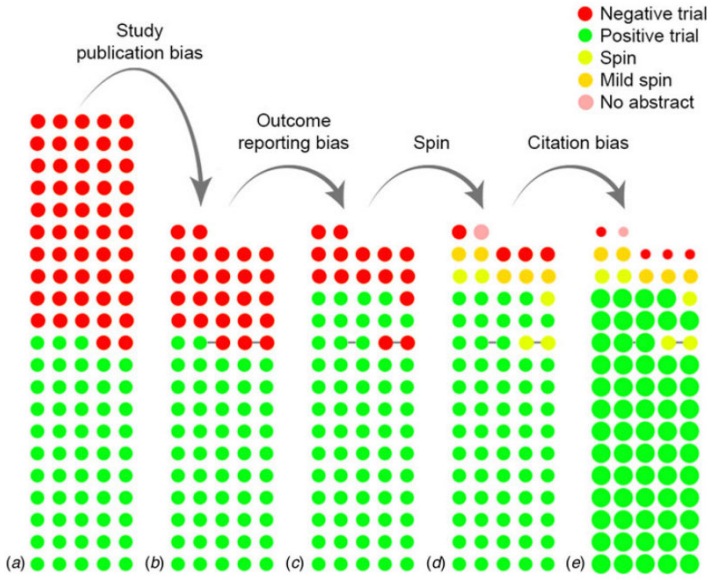


One of the most important causes of the replication crisis is selective reporting. This slide shows – in a simplified way – how things can go wrong.

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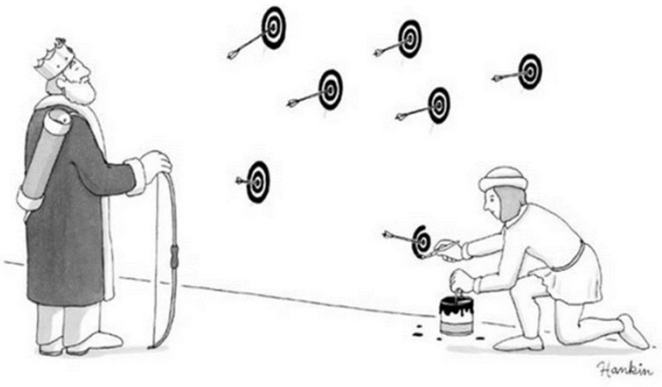
de Vries YA, Roest AM, de Jonge P, Cuijpers P, Munafò MR, Bastiaansen JA (2018). The cumulative effect of reporting and citation biases on the apparent efficacy of treatments: the case of depression. Psychological Medicine 1–3. https://doi.org/10.1017/S0033291718001873

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.

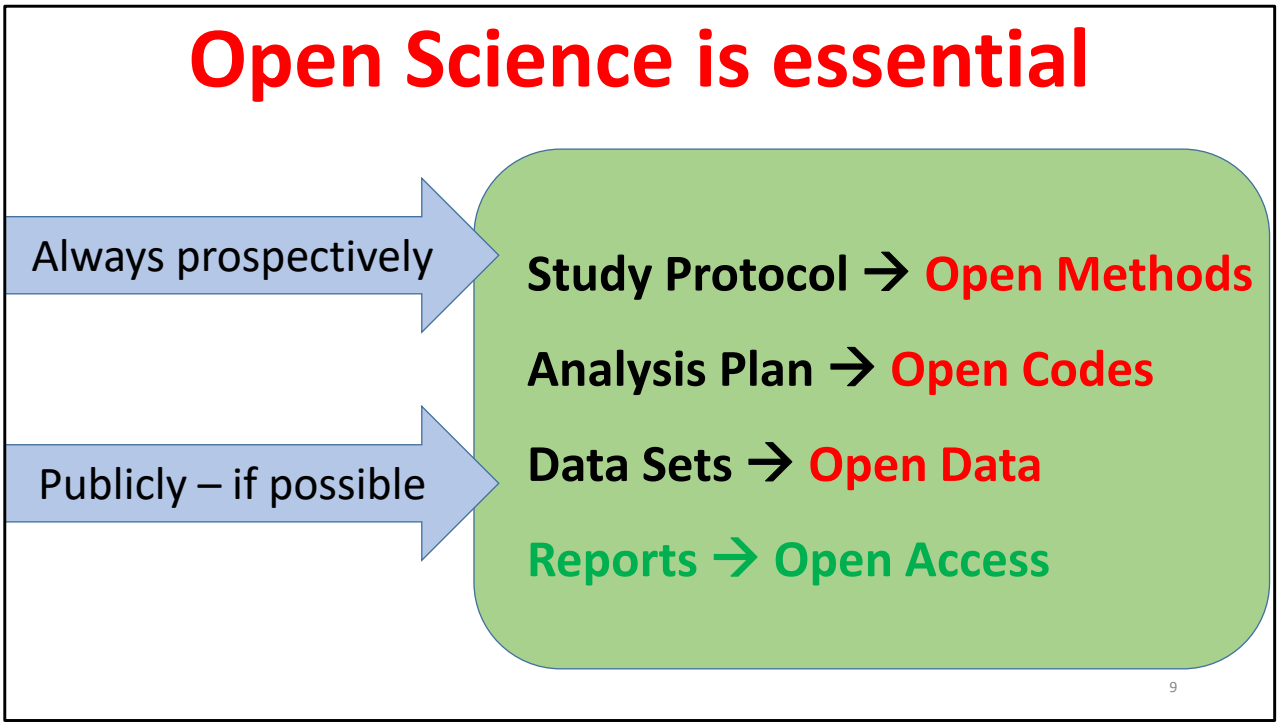
Drivers of the Replication Crisis'

- 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

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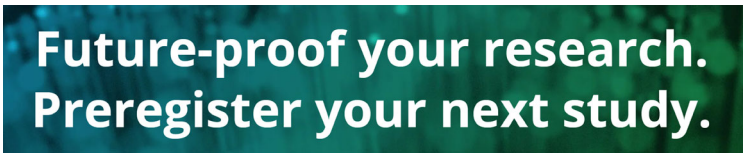
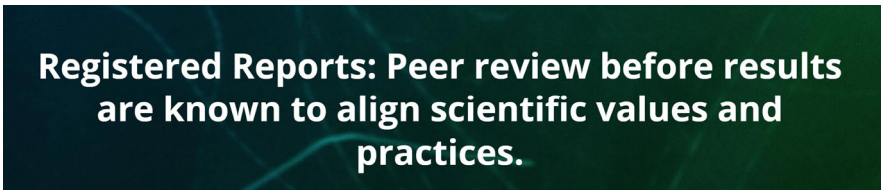
https://www.cos.io/initiatives/top-guidelines

Preregistration and Registered reports



CENTER FOR OPEN SCIENCE



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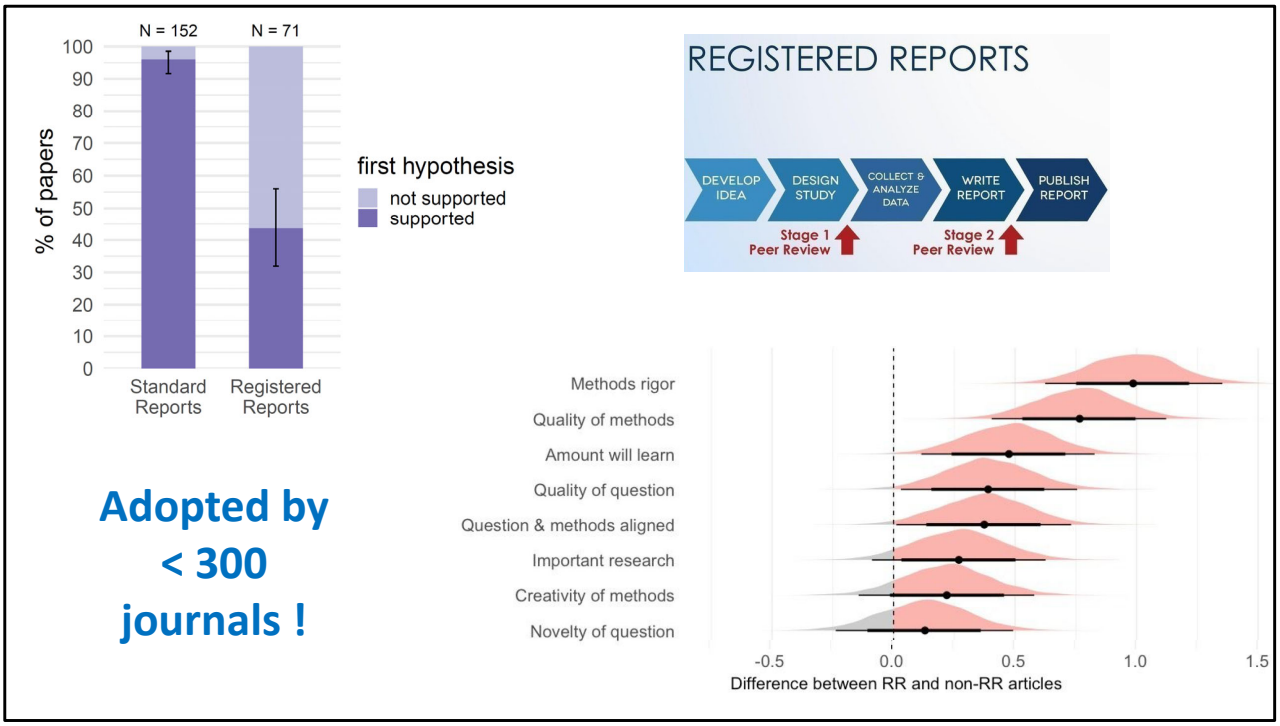
https://cos.io/rr/

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



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

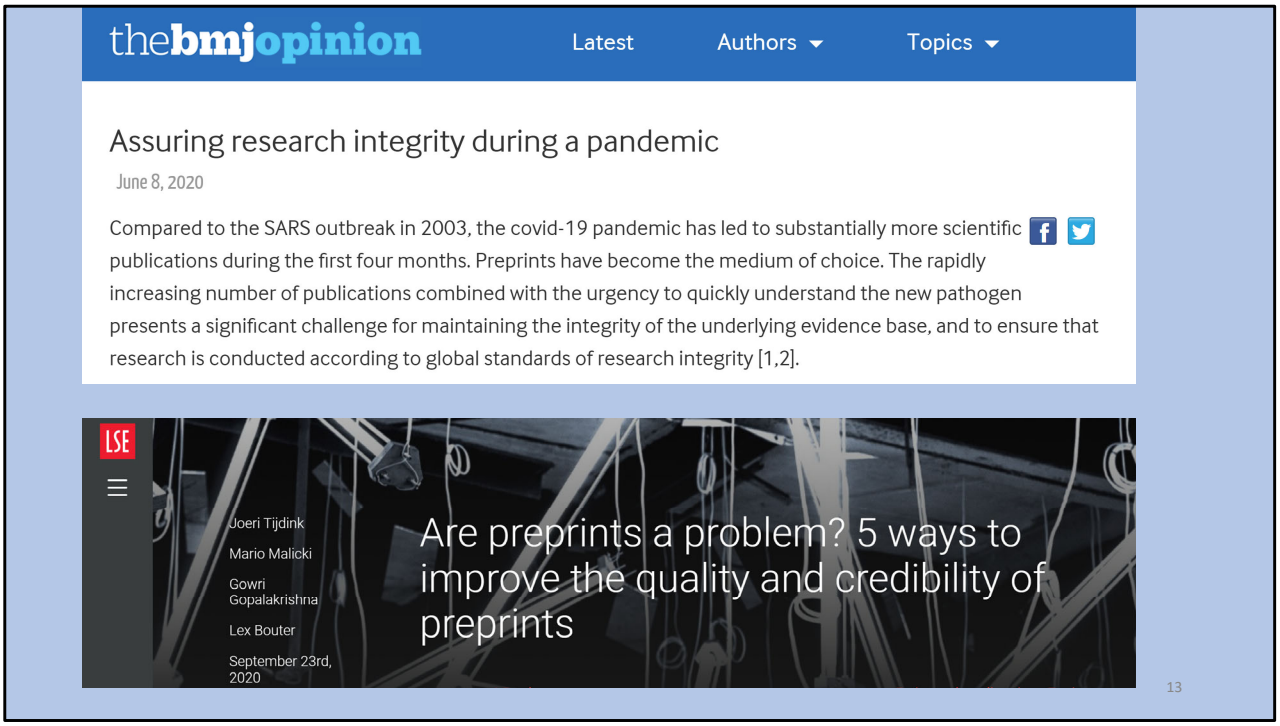
Allen C, Mehler DMA. Open science challenges, benefits and tips in early career and beyond. PLoS Biol 2019; 17(5): e3000246. https://doi.org/10.1371/journal.pbio.3000246

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/

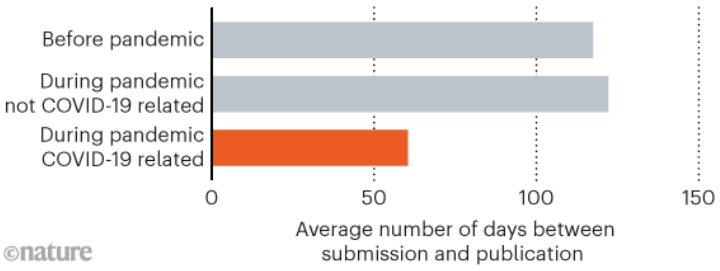


We explored in these blogs how the pressure affects research integrity and how preprints can be improved.

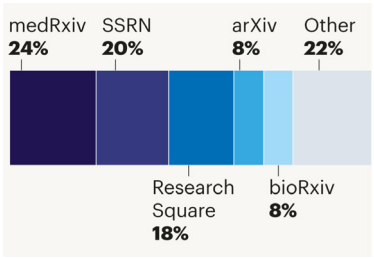
Gopalakrishna G, Bouter L, Mayer T, Steneck N. Assuring research integrity during a pandemic. BMJ Opinion. Published online: 8 June 2020. https://blogs.bmj.com/bmj/2020/06/08/assuring-research-integrity-during-a-pandemic/
https://blogs.bmj.com/bmj/2020/06/08/assuring-research-integrity-during-a-pandemic/#content

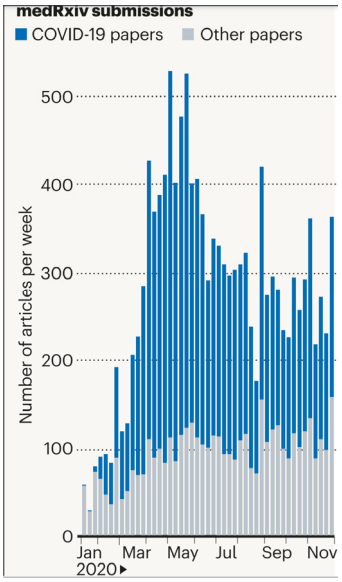
Tijdink J, Malički M, Bouter L, Gopalakrishna G. Are preprints a problem? 5 ways to improve the quality and credibility of preprints. LSE Blogs, 23 September 2020. https://blogs.lse.ac.uk/impactofsocialsciences/2020/09/23/are-preprints-a-problem-5-ways-to-improve-the-quality-and-credibility-of-preprints/

Rapid review



Rise of preprints





The COVID pandemic led to a surge of preprints and halved waiting time in regular journals.

Kwon D. How preprint servers are blocking coronavirus research. Nature 2020; 581: 130-1. https://www.nature.com/articles/d41586-020-01394-6

Else H. Covid papers: a torrent of science. Nature 2020; 588: 553. https://www.nature.com/articles/d41586-020-03564-y

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

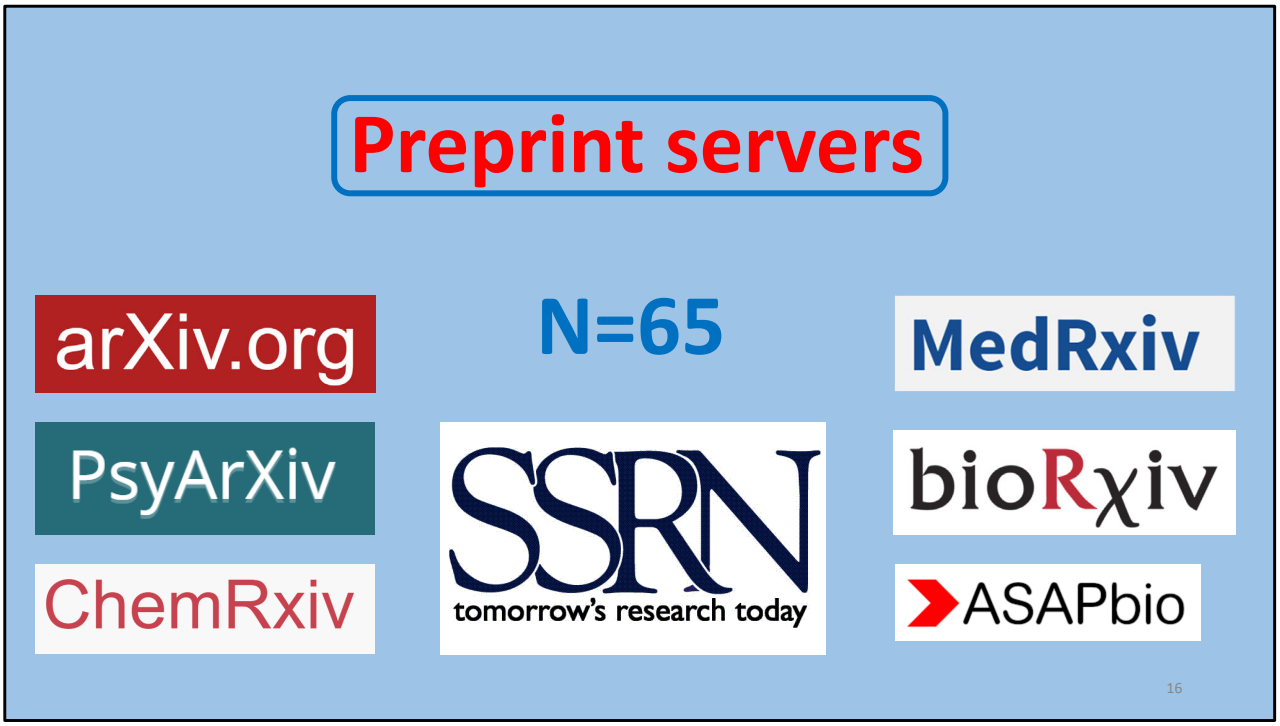
The peer reviewed publication of the final version appeared on 22 February 2021: International Journal of Epidemiology, 2021, 1–10.
https://doi.org/10.1093/ije/dyab010

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



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

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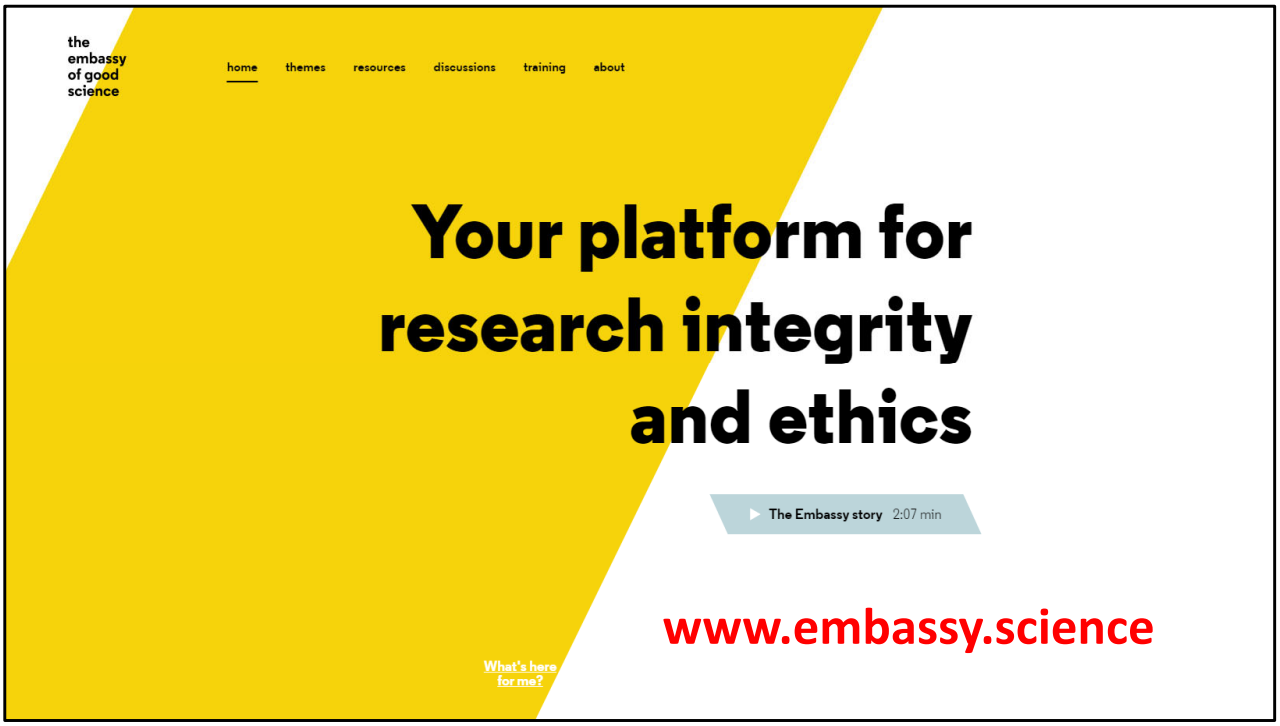

https://www.embassy.science/

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