Disclosures

- The BMJ provides salary support for my services as an editor
- I contribute to the overall strategy and policies and practices on research articles in The BMJ
- I influence and make decisions on which research to publish in The BMJ
- Outreach activities such as this one might increase submissions to The BMJ
- I am co-editor of the Blogging Stroke, the blog of the Stroke Journal (AHA)
Innovations

• Peer Review
• Preprints
• Open access mandates

“Peer review is the critical assessment of manuscripts submitted to journals by experts who are usually not part of the editorial staff.

Because unbiased, independent, critical assessment is an intrinsic part of all scholarly work, including scientific research, peer review is an important extension of the scientific process.”

International Committee of Medical Journal Editors (ICMJE)
“We aim to report the ideas of others without guaranteeing them.”
Denis de Sallo

1665

“Memoirs sent by correspondence are distributed according to the subject matter to those members who are most versed in these matters. The report of their identity is not known to the author... The sanction which the Society gives to the work now published under its auspices, extends only to the novelty, ingenuity or importance of the several memoirs which it contains. Responsibility concerning the truth of facts, the soundness of reasoning, in the accuracy of calculations is wholly disclaimed: and must rest alone, on the knowledge, judgement or ability of the authors who have respectfully furnished such communications.”

1731
Royal Society Committee on Papers (1752)

“empowered to call on any other members of the Society who are knowing and well skilled in that particular branch of science that shall happen to be the subject matter...”

“It is a laborious and difficult method, involving heavy daily correspondence and constant vigilance to guard against personal eccentricity or prejudice or – the bugbear of journalism- unjustifiable censure. But that method may... be recommended as one that gives authoritative accuracy, reality and trustworthiness to journalism.”

Ernest Hart (Editor of The British Medical Journal) writing to US medical editors in 1893

Taken from Drummond Rennie, Editorial Peer review:its development and rationale, 2002
Technical review vs. editorial selection

**Technical review - by experts in the field**
- Is the work properly done?
- Are the claims statistically valid?
- Can the conclusions be drawn from the results shown?

**Editorial selection - by editors, with advice from experts in the field**
- Is the work interesting and important to the readers of this journal?
But...

- “Stand at the top of the stairs with a pile of papers and throw them down the stairs. Those that reach the bottom are published.”

- “Sort the papers into two piles: those to be published and those to be rejected. Then swap them over.”

- Slow
- Expensive
- Profligate of academic time
- Highly subjective
- Something of a lottery
- Prone to bias
- Easily abused
- Hopeless at spotting error and fraud

Impact of interventions to improve the quality of peer review of biomedical journals: a systematic review and meta-analysis

22 reports of RCTs (only 7 since 2004)
• Training (n=5): did not improve review report quality
• Addition of a statistical reviewer (n=2): improved the final manuscript
• Use of a checklist (n=2): did not improve the manuscript
• Open peer review ([open identities]; n=7):
  • improved quality of the review report;
  • did not affect the time reviewers spent on review;
  • decreased the rate of rejection
• Blinded peer review ([peer reviewers blinded to authors’ ID]; n=6): did not affect the quality of review or the rejection rate

Bruce R et al. BMC Medicine 2016;14:85
Unreliable and Inconsistent

- Weak level of agreement between reviewers
- Inconsistent decision making
- Failure to detect major methodological problems
- Does not filter best papers to best journals
Unreliable and Inconsistent

Table 1: Concurrency Within Pairs of Reviewers Who Rated (A, B, C, or D) 468 Consecutive Submitted Scientific Articles, Five or More Manuscript Pages in Length

<table>
<thead>
<tr>
<th>Data</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rejected papers (49)</td>
<td>39,7</td>
<td>31,1</td>
<td>17,5</td>
<td>11,7</td>
</tr>
<tr>
<td>Accepted papers (99)</td>
<td>90,5</td>
<td>33,7</td>
<td>10,9</td>
<td>5,3</td>
</tr>
<tr>
<td>All papers (496)</td>
<td>41,8</td>
<td>31,7</td>
<td>16,1</td>
<td>10,4</td>
</tr>
</tbody>
</table>

**NOTE:** (1) Both reviewers gave identical ratings, i.e., A-A, B-B, etc. (2) Reviewers differed by one step, i.e., A-B, B-C, or C-D. (3) Reviewers differed by two steps, i.e., A-C, B-D. (4) Reviewers disagreed totally, i.e., A-D. Dr. Ronald Goldberg collected and analyzed these data.


Kravitz RL et al. PLoS ONE 2010;5(4); e10072.

**Table 2:** Likelihood of Initial Decision to Reject in Relation to Reviewer Agreement

<table>
<thead>
<tr>
<th>Reviewer Recommendations</th>
<th>N (%)</th>
<th>Fraction Rejected by Editors (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreed overall to reject</td>
<td>967</td>
<td>10</td>
</tr>
<tr>
<td>Disagreed overall to reject</td>
<td>739</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>1706</td>
<td>10</td>
</tr>
</tbody>
</table>

**JGIM**

Kappa statistic for inter-reviewer agreement on reject vs. accept/revise was 0.11

**Peer-reviewed papers sometimes have to be retracted**
Unaccountability and risk of subversion

• Editors may choose reviewers with outcome in mind
• Reviewers shielded by anonymity may act unethically
• Authors may falsify reviews/stolen identities
Other issues...

Years of working and dozing in an editorial office persuaded me that the outside experts who advise editors are a saintly band who give unstinted help with no thought (and never a chance) of proper recognition. No general journal that publishes original work could function reasonably without being able to call on their aid. But how often should this help be invoked?

I am a convinced opponent of routine peer review of articles. The experts’ pronouncements tend toward cautious conservatism; they are not invariably beyond misplacing the big with the bogus; and they are apt to be swayed by the current vogue in their discipline. The expert is as likely as not a member of an in-group, recoiling from utterances that do not blend readily with the group’s current thinking. If he delivers an adverse opinion of an article, the editor may now it so

Current PR system is the best we can achieve

Readers can have confidence in rigour of publications

PR is holding back scientific communication

Scholarly communication is greatly helped by PR of journal papers

Without PR there is no control in scientific communication

Attitudes toward research and scholarly publishing

N=1907-1982

Did peer review at another journal help improve the article?

- Yes, helped me improve the article substantially: 25%
- Yes, led to some improvement: 22%
- No, led to no improvement: 45%
- Article was not previously peer reviewed: 8%

---

Does peer review...

- ...improve quality? Should be able: 93% Is able: 74%
- ...determine originality of the manuscript? Should be able: 88% Is able: 63%
- ...detect fraud? Should be able: 81% Is able: 41%
- ...help determine importance of the findings? Should be able: 81% Is able: 59%
- ...detect plagiarism? Should be able: 78% Is able: 44%
- ...ensure prior work is acknowledged? Should be able: 78% Is able: 44%
- ...select best manuscript for journal? Should be able: 76% Is able: 50%
“Peer review is like democracy, which is, to use Churchill's phrase, the worst form of government except for all those other forms that have been tried from time to time.”

Open Peer Review

- **Open identities:** Authors and reviewers are aware of each other’s identity
Open Peer Review

**Open reports**: Review reports are published alongside the relevant article.

*POTENTIAL BENEFITS OF PUBLISHED REVIEW*

**Encourages good-quality, constructive comments.** The expectation that reviews will be published will encourage editors and reviewers to hold them to a high standard.

**Preserves useful scholarship.** Peer reviews contain arguments and ideas that can reveal how thinking in a field evolves. This material should be preserved and made available to others.

**Builds trust.** Readers have a right to understand the level of scrutiny that a paper has undergone.

**Makes journal decisions more transparent.** Editors must integrate information from diverse sources, including reviewers, to make their decisions. Published peer review provides a window on the process.

**Creates a pathway for crediting reviewing.** Reviewers can point (even privately) to their work as evidence of scholarly activity for grants and promotions.

**Provides a resource for training.** Reports can show people how to (and how not to) assess a paper.

**Bolsters systemic study of peer review.** Published reports and rebuttals enable more research on best practices, leading to improvements in the system as a whole.

Polka JK et al. Nature 2018;560:545-7
Table. Results of Trials Comparing Signed and Unsigned Reviews

<table>
<thead>
<tr>
<th>Source, y</th>
<th>Design</th>
<th>No. of Reviewers/Manuscripts</th>
<th>Quality of Review</th>
<th>Advice on Publication</th>
<th>Time Taken to Review</th>
<th>No. of Reviewers Declining to Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morris et al., 1990</td>
<td>Nonrandomized comparison of unsigned vs voluntary signed review</td>
<td>139 reviewers (63% of reviewers in PCT who chose to sign their reviews)</td>
<td>No overall difference in quality (judged by editors)</td>
<td>More likely to recommend acceptance (P&lt;.001)</td>
<td>Not evaluated</td>
<td>Not evaluated</td>
</tr>
<tr>
<td>Godlee et al., 1998</td>
<td>PCT comparing signed and unsigned reviews</td>
<td>221 reviewers sent same article with 8 intentionally added errors</td>
<td>No significant difference in no. of errors detected</td>
<td>No significant difference</td>
<td>Not evaluated</td>
<td>No significant difference</td>
</tr>
<tr>
<td>van Rijmen et al., 1999</td>
<td>PCT comparing signed and unsigned reviews</td>
<td>250 blinded reviewers of 125 manuscripts</td>
<td>No significant difference (PQI scores from editors and authors)</td>
<td>No significant difference</td>
<td>No significant difference</td>
<td>Increased (55% vs 25%, 69% confidence interval, 0.24 to 1.48)</td>
</tr>
<tr>
<td>Walsh et al., 2000</td>
<td>PCT comparing signed and unsigned reviews</td>
<td>429 reviewers and manuscripts</td>
<td>Improved quality (PQI scores 3.35 vs 3.14; P=.03)</td>
<td>More likely to recommend acceptance (2% vs 18%; P=.01)</td>
<td>Increased (2.35 vs 1.65 hours; P=.001)</td>
<td>Not evaluated</td>
</tr>
<tr>
<td>van Rijmen et al., unpublished</td>
<td>PCT comparing signed reviews vs posting of signed reviews on the Internet</td>
<td>550 reviewers and manuscripts</td>
<td>No significant difference (PQI scores)</td>
<td>No significant difference</td>
<td>Increased (mean, 25 min longer)</td>
<td>Analysis of data not yet available</td>
</tr>
</tbody>
</table>

*PCT indicates randomized controlled trial; PQI, reviewer quality instrument. The PQI was calculated by van Rijmen et al.27

1Reviewers self-reported time.
2Of reviewers that took more than 4 hours to edit, 69% were signed vs 31% unsigned.

Godlee F. JAMA 2002;287:2762
The BMJ publishes all research with open access, identifies all reviewers to authors, and, since early 2015, publishes a detailed “prepublication history” that includes reviewers’ signed reports.

This open peer review policy draws on evidence from two randomised controlled trials of open peer review, and on 19 years experience of mandatory open peer review.

We also have very active commenting.
Open Peer Review

- **Open participation**: The wider community able to contribute to the review process
Open Peer Review

• **Open interaction**: Direct reciprocal discussion between authors and reviewers, or between reviewers, is encouraged

Open Peer Review

• **Open final version commenting**: Review of commenting on final “version of record” publication
Open Peer Review

- **Open platforms:** Review is do-coupled from publisher, facilitated by another entity that is independent from the publisher.

- **Open pre-review manuscripts:** Manuscripts are made immediately available in advance of the formal peer-review process.
Will X make peer review better, worse, or have no effect?

- Open identities
- Open reports
- Open participation
- Open interaction
- Open final version commenting
- Open platform
- Open pre-review manuscripts


N=3062

https://www.ibiology.org/biomedical-workforce/preprints/
Preprints

Faster dissemination

Pre-publication peer review

Freely available

Additional data

Authors' precedence

Premature harmful data
Why are preprints taking off now?

- Funders (NIH, Welcome) favour ‘interim research outputs’
- Funders accepting in grant applications
- NIH provide guidance on how to choose a repository
- Launching own open research platforms
- $$$ injection by CZI into bioRxiv
- Generational change?
What constitutes a preprint server? Does it matter?

1991
arXiv.org

1994
SSRN

2013
bioRxiv

Assign DOIs and take all types of data

Expose some or all of peer review

CellPress

F1000Research

Open for Science

BMJ 2019;365:i2301 doi: 10.1136/bmj.i2301 (Published 6 June 2019)

EDITORIALS

New preprint server for medical research
Announcing the launch of medRxiv for faster access to better evidence

Claire Rawlinson publisher, Theodora Bloom executive editor, The BMJ

*BMJ, London, UK
Automated and CSHL checks

Registration
Ethics (IRB, consent)
COI
Reporting checklists

Yale
BMJ
Harmful to health?

What do clusters of similar HIV genetic sequences tell us about HIV risks in Africa?

“...most sex partners are in or close to home, genetic diversity showed little or no geographic structure in the three studies that looked at the issue. Evidence from these studies does not support the common view that sex accounts for most HIV infections in Africa. Studies did not do what they...”
Harmful to health?

What do clusters of similar HIV genetic sequences tell us about HIV risks in Africa?

“...most sex partners are in or close to home, genetic diversity showed little or no geographic structure in the three studies that looked at the issue. Evidence from these studies does not support the common view that sex accounts for most HIV infections in Africa. Studies did not do what they...”
What happens once a preprint is live

- Prominent ‘not peer reviewed’ warnings, no press releases
- Moderated comments: peer-to-peer network for researchers
- Authors may submit a revised version
- Articles receive a DOI, and are citable with bidirectional linking between preprints and published versions
- Very rare take-downs
What is an unrefereed preprint?

Before formal publication in a scholarly journal, scientific and medical articles are traditionally “peer reviewed.” In this process, the journal’s editors take advice from various experts—called “referees”—who have assessed the paper and may identify weaknesses in its assumptions, methods, and conclusions. Typically a journal will only publish an article once the editors are satisfied that the authors have addressed referees’ concerns and that the data presented support the conclusions drawn in the paper.

Because this process can be lengthy, authors use the medRxiv service to make other scientists see, discuss, and comment on the findings immediately. Readers should therefore be aware that articles on medRxiv have not been finalized by authors, might contain errors, and report information that has not yet been accepted or endorsed in any way by the scientific or medical community.

We also urge journalists and other individuals who report on medical research to the general public to consider this when discussing work that appears on medRxiv preprints and emphasize it has yet to be evaluated by the medical community and the information presented may be erroneous.

Publishing work that has previously been a preprint
Duplicate publication is publication of a paper that overlaps substantially with one already published, without clear, visible reference to the previous publication. Prior publication may include release of information in the public domain.

This recommendation does not prevent a journal from considering a complete report that follows publication of a preliminary report, such as a letter to the editor, a preprint, or an abstract or poster displayed at a scientific meeting.

Authors who choose to post their work on a preprint server should choose one that clearly identifies preprints as not peer-reviewed work and includes statements of conflicts of interest.
Most major publishers ✔

Cell Press ✔

The Lancet ✔

JAMA ✘

NEJM ✘

BMJ Journals ✔

<table>
<thead>
<tr>
<th>Publisher</th>
<th>Policy type</th>
<th>Policy text</th>
</tr>
</thead>
<tbody>
<tr>
<td>The JAMA Network</td>
<td>Incompatible</td>
<td>“Public dissemination of manuscripts prior to, simultaneous with, or following submission to this journal, such as posting the manuscript on preprint servers or other repositories, is discouraged, and will be considered in the evaluation of manuscripts submitted for possible publication in this journal. The evaluation will involve making a determination of whether publication of the submitted manuscript will add meaningful new information to the medical literature or will be redundant with information already disseminated with the posting of the preprint.”</td>
</tr>
<tr>
<td>American Heart Association (AHA)</td>
<td>Compatible</td>
<td>All AHA journals share the same policy: “Posting of un-refereed manuscripts to a community pre-print server by the author will not be considered prior publication; provided that the following conditions are met: 1) During submission, authors must acknowledge pre-print server deposition and provide any associated accession numbers or DOIs; 2) Versions of a manuscript that have been altered as a result of the peer review process may not be deposited; 3) The pre-print version cannot itself have been indexed in MEDLINE or PubMed; 4) Upon publication, authors are responsible for updating the archived pre-print with a DOI and link to the published version of the article.”</td>
</tr>
<tr>
<td>BMJ (company)</td>
<td>Compatible</td>
<td></td>
</tr>
<tr>
<td>Nature Publishing Group</td>
<td>Compatible</td>
<td>The policy states &quot;Neither conference presentations nor posting on recognized preprint servers constitute prior publication.” and an editorial explains: “Nature never wishes to stand in the way of communication between researchers […] Communication between researchers includes not only conferences but also preprint servers. The ArXiv preprint server is the medium of choice for (mainly) physicists and astronomers who wish to share drafts of their papers with their colleagues, and with anyone else with sufficient time and knowledge to navigate it. […] If scientists wish to display drafts of their research papers on an established preprint server before or during submission to Nature or any Nature Elsevier is generally permissive with respect to authors and electronic preprints.” (iii) Authors can share their preprint anywhere at any time. (iv) (They) encourage authors to link from the preprint to their formal publication via its Digital Object Identifier (DOI). (iii) Authors can update their preprints on arXiv or RePEc with their accepted manuscript.” (However, please note that Cell Press, The Lancet and some society-owned journals have their own preprint policies available in the Information to Authors.) Wiley believes that in communities where non-commercial preprint servers exist, journals should allow for the submission of manuscripts which have already been made available on such a server. Allowing submission does not, of course, guarantee that an article will be sent out for review; it simply reflects a belief that availability on a preprint server should not be a disqualifier for submission. Wiley also believes that PLoS Journals feature this language: PLOS allows and encourages researchers to share early versions of their original research manuscripts via preprint servers either before or after submission to a PLOS journal. Authors choosing bioRxiv may now concurrently submit directly to select PLOS journals through bioRxiv’s direct transfer to journal service. Posting a research article on a preprint server prior to or concurrently with submission to a PLOS journal will not preclude consideration of manuscripts for peer review in any PLOS journal.</td>
</tr>
<tr>
<td>Journal</td>
<td>Publisher</td>
<td>Status</td>
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<td>----------------------------------------------</td>
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<tr>
<td>The BMJ (formerly British Medical Journal)</td>
<td>BMJ</td>
<td>Compatible</td>
</tr>
<tr>
<td>New England Journal of Medicine</td>
<td>Incompatible</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>AAAS</td>
<td>Compatible</td>
</tr>
<tr>
<td>The Lancet</td>
<td>Elsevier</td>
<td>Compatible</td>
</tr>
</tbody>
</table>

Integrating preprints and peer review

- Preprint ("the pre-review manuscript that is submitted to a journal, or any earlier draft.") can be posted.
- NEJM expects that the articles it publishes will not have been published or released elsewhere before they are published in NEJM. The policy page does not explicitly mention preprints; however, the journal has come under public scrutiny.
- Science will not consider any original research paper or component of a research paper that has been published or is under consideration for publication elsewhere. Distribution on the Internet may be considered prior publication and may compromise the originality of the paper as a submission to Science, although we do allow posting of research papers on not-for-profit preprint servers such as arxiv.org and bioRxiv. Please contact the editors with questions regarding allowable postings to other servers.
- Presentation of data at a scientific meeting, as a poster, abstract, orally, on a CD, or as an abstract on the web or on a pre-print server does not conflict with submission to The Lancet.

This is an abstract of a preprint hosted on an independent third party site. It has not been peer reviewed but is currently under consideration at Nature Communications.
Integrating preprints and peer review

Integrating preprints and peer review
Preprint journal clubs

UIUC Plant Physiology Journal Club: 2018-08-13

H. P. Barbiro... Neuroscience
C. Maximo
Nov 81

Recommendation services

Peer Community In
Evolutionary Biology

Can Ebola Virus evolve to be less virulent in humans?

Evolutionary Biology: recommendation

The tragic 2014-2016 Ebola outbreak that resulted in more than 30,000
West Africans has been a source of scientific community. It has been
known to produce severe outbreaks in remote villages and Africa. However,
needing a few months with high mortality rates, for several months in large urban human populations, an

Acute starvation differentially affects aggressive display in
pheromone physiology

P. P. Barbiro... Neuroscience
C. Maximo
Nov 81

upload preprint peer review
Overlay journals

Research into preprints

- Citation
- Changes during peer review
- Speed of uptake of findings
- Proportion of papers preprinted, and of preprints published
- Mainstream media coverage
- ...?
Open Access

“Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions. What makes it possible is the internet and the consent of the author or copyright-holder.” Peter Suber.

Two conditions:
1. Free of all restrictions on access (Gratis)
2. Free of many restrictions on use (Libre if 1+2)

http://legacy.earlham.edu/~peters/fos/brief.htm
Open Access

Ways to provide:

**Green**: Publish and self-archive in repository where it may be accessed for free (PubMed Central, Institutional, non-OA journal). Publisher may impose delay

**Gold**: Publish to make it immediately available (OA and hybrid OA journal)
“Predatory open access publishing is an exploitative form of academic publishing, in which publication fees is charged to the authors but the publishing as well as editorial services related to the journals is not provided.”

**Predatory Journals**

https://predatoryjournalsblog.wordpress.com

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<table>
<thead>
<tr>
<th>Table 10: Salient characteristics of potential predatory journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The scope of interest includes non-biomedical subjects alongside biomedical topics</td>
</tr>
<tr>
<td>2. The website contains spelling and grammar errors</td>
</tr>
<tr>
<td>3. Images are distorted/fuzzy, intended to look like something they are not, or which are unauthorized</td>
</tr>
<tr>
<td>4. The homepage language targets authors</td>
</tr>
<tr>
<td>5. The Index Copernicus Value is promoted on the website</td>
</tr>
<tr>
<td>6. Description of the manuscript handling process is lacking</td>
</tr>
<tr>
<td>7. Manuscripts are requested to be submitted via email</td>
</tr>
<tr>
<td>8. Rapid publication is promised</td>
</tr>
<tr>
<td>9. There is no retraction policy</td>
</tr>
<tr>
<td>10. Information on whether and how journal content will be digitally preserved is absent</td>
</tr>
<tr>
<td>11. The Article processing/publication charge is very low (e.g., &lt; $150 USD)</td>
</tr>
<tr>
<td>12. Journals claiming to be open access either retain copyright of published research or fail to mention copyright</td>
</tr>
<tr>
<td>13. The contact email address is non-professional and non-journal affiliated (e.g., @gmail.com or @yahoo.com)</td>
</tr>
</tbody>
</table>


---

**Open Access at BMJ**

Solutions for Authors, Institutions and Societies.

Making research free at the point of use is critically important to advancing medical research and enabling healthcare professionals to make better decisions. We offer authors, institutions and funders the option to publish open access research across our journals, including our flagship journal, The BMJ.
cOAlition S
Accelerating the transition to full and immediate Open Access to scientific publications
TRADITIONAL WORKFLOW

Author’s manuscript
Submit to journal
Peer review in private
Publication in journal
Commentary, discussion, education

https://osc.universityofcalifornia.edu/open-access-at-uc/open-access-policy/
“...anyone who reads journals widely and critically is forced to realize that there are scarcely any bars to eventual publication. There seems to be no study too fragmented, no hypothesis too trivial, no literature citation too biased or too egotistical, no design too warped, no methodology too bungled, no presentation of results too inaccurate, too obscure, and too contradictory, no analysis too self-serving, no argument too circular, no conclusions too trifling or too unjustified, and no grammar and syntax too offensive for a paper to end up in print.”

Next Congress: 2021

---

**Open Peer Review DELETE?**

- **Open pre-review manuscripts**: Manuscripts are made immediately available in advance of the formal peer-review process

---

### Table 3. Pros and cons of different approaches to anonymity in peer review.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Description</th>
<th>Cons/Pro/Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-blinded peer review</td>
<td>Referees are revealed to the authors, but referees are not aware of author's identity</td>
<td>Pros/Protections, no fear of retaliation, reduce bias in decision</td>
</tr>
<tr>
<td>Double-blinded peer review</td>
<td>Authors and referees are randomly anonymized</td>
<td>Cons/Inefficiency, less transparency, increase bias in decision</td>
</tr>
<tr>
<td>Triple-blinded peer review</td>
<td>Authors and referees are randomly anonymized</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
<tr>
<td>Public, open peer review</td>
<td>Referees are revealed to the authors, but referees are not aware of author's identity</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
<tr>
<td>Unidentified peer review</td>
<td>Referees are revealed to the authors, but referees are not aware of author's identity</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
<tr>
<td>Optional open peer review</td>
<td>Referees are revealed to the authors, but referees are not aware of author's identity</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
<tr>
<td>Pre-publication open peer review</td>
<td>Referees are identified to authors, and the article is published, with full peer review happening after the article is published</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
<tr>
<td>Post-publication open peer review</td>
<td>Referees are identified to authors, and the article is published, with full peer review happening after the article is published</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
<tr>
<td>Poor review by environment (PRE)</td>
<td>Referees are identified to authors, and the article is published, with full peer review happening after the article is published</td>
<td>Cons/Can lead to increased bias, increase in costs</td>
</tr>
</tbody>
</table>