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The Peer-Review Process and Its Relationship With Environmental and Occupational Health

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Editorial

The Peer-Review Process and Its Relationship With Environmental and Occupational Health

Peer review of journal articles is now the norm in virtually all scientific disciplines.¹ The art of peer review has advanced over the years, and scientific publishing has embraced new thinking. In this editorial, we explore the basics of peer review and options for improving the process.

Winston Churchill once said democracy is the “worst form of government except all those other forms that have been tried.” Much the same could be said of peer review, in that it is the worst way to assess the value of work—except for all the alternatives. Authors worry about careless assignment of manuscripts, technical competence or bias among reviewers, and having their ideas stolen. Although all these horrors are possible, in a well-managed journal they seldom occur. Managing peer review effectively requires vigilance and close supervision, and this effort is usually rewarded by added value because papers are not only graded and sorted but are also better integrated into the scientific literature because of the input of thoughtful reviewers.

Cautious deliberation and evaluation is at the heart of the scientific process.² Peer review is the scientific community assessing the worth and meaning of a body of work before it is published. It is the first step in assimilating findings or insights into the worldview of scientific thought and integration into the broader scientific literature. Peer review is not only a quality-assurance mechanism, but also a means by which significant findings or insights are better integrated into the broader sphere of scientific knowledge. This occurs when reviewers identify hitherto unreported connections and, ideally, make constructive connections that link the current work more firmly to existing bodies of knowledge. Reviewers also assess the worth of a new submission in relation to existing knowledge in the field, all in the interest of enabling a more effective presentation to the scientific community at large. At the least, a conscientious reviewer (1) judges whether the presented findings accord with the predominant paradigm of scientific thinking at the

time and (2) draws the author’s attention to various anomalies that may need explaining.

In general, there are 3 main objectives of the peer-review process: (1) to prevent the publication of bad material, (2) to improve journal scholarship, and (3) to improve a manuscript’s language and data presentation.³ Any practicing editor is also aware however, that peer review is not and cannot be absolute. An excellent paper may be unsuitable for a particular journal. A paper that is acceptable but not monumental may still advance knowledge in a certain way or meet a particular need for data. There always will be bad reviewers of good papers, as well as split decisions to be managed. Groundbreaking work is seldom well-documented and irrefutable when it first appears, but neither is junk science. Editors are responsible for discerning the difference in such cases, albeit with guidance from reviewers. Regardless of any scientific article’s intrinsic quality, the publication process also involves a certain amount of politics.⁴ At the least, it requires a delicate web of interaction and sometimes negotiation among editors and reviewers on the basis of shared values, knowledge, and assumptions about the field.

Similarly, the decision process entails a series of complicated interactions between many participants. A previous editorial in the *New England Journal of Medicine*, for example,⁵ suggested that more than 20 physicians and scientists are involved in the decision-making process of each manuscript they receive. Although this is probably an extreme, most biomedical journals now follow a similar model when dealing with new submissions, whereby the first step involves an initial review by the editor in chief (or managing editor) to assess the suitability and appropriateness of its general content. Editors consider themes and features of a paper that are important to the mission of the journal and those which they believe will be important to readers.⁶ Sometimes the journal’s mission is also the editor’s personal mission, but this close identification can also lead to clouded judgment and bias. For such reasons, there should

always be some governance check on an editor's authority, an active editorial board, and (at least passive) oversight by the publisher. Governance itself is a topic for another editorial, but suffice it to say that it represents one of the less appreciated dimensions in the art of scientific publication management.

After passing a front-gate process, the editor usually assigns manuscripts to an executive or associate editor with experience in the particular field, who then organizes at least 2 peer reviewers to assess it.⁷ After receiving their appraisal of the manuscript, the associate editor reviews the manuscript again and makes an initial decision to accept, revise, or reject the article. Aside from manuscripts that are immediately rejected, most authors are required to revise their papers and relatively few are accepted outright.⁸ If the reviewers' opinions are discordant, the editor seeks a tiebreaking third and sometimes fourth reviewer, followed by an editorial meeting to decide the manuscript's ultimate fate. In the interest of time, the tie-breaking reviewer may be consulted informally or may be an in-house reader—such as another editor—but the tie-breaking reviewer should always have sufficient expertise in the field to be as qualified as their initial reviewing counterpart.

Although the decision to accept or reject is fairly clear, inviting authors to revise and resubmit their manuscripts conveys some ambiguity. It does not guarantee acceptance. Rather, it allows authors another opportunity to present their work more effectively for their scientific peers and in a format more consistent with the aims of the journal. A decision for major revision implies that an author's work does not fit content or meet standards within a particular field and thus needs to be reshaped to clarify the general message or to match the standards of a particular discipline. Minor revision implies that the work has a clear message but could be more effectively presented or should undergo correction of insubstantial errors. Despite this seemingly objective process, authors, scientists and scholars have often regarded the concept of peer review as a somewhat dubious and mysterious process. Regardless of the system used, authors are bound to fret about their submissions—Campion et al,⁷ for example, compared a manuscript out for peer review to a child away at camp.

In any case, there are 3 main types of peer review used for the assessment of scientific manuscripts: single blinded, double blinded, and fully open.

Single-Blinded Peer Review

A single-blinded peer-review system reveals authors' names to the reviewer, but reviewers themselves remain anonymous to the author. The majority of general medical journals used this method until recently, mainly because of custom.² The advantage of a single-blinded peer-review process is that it puts an author's submission in the context of their previous work and thereby gives a reviewer clues, by reputation and knowledge of the institution or group, to the

credibility of the current work.¹² However, the process is deeply flawed due to the competitive aspects of human nature. The same clues that lend credibility may also yield severe disadvantages for new investigators, maverick colleagues, and emerging institutions. Revealing the authors' names and institutions to reviewers also permits the Matthew Effect,⁹ whereby manuscripts submitted by well-known people tend to be accepted, regardless of quality. The primary criticism of single-blinded peer review is the perceived lack of transparency because important judgments made about others' work should not be done in secret.² Authors may feel defenseless against the arbitrary behavior of referees who cannot be held accountable.¹⁰ Transparency virtually demands accountability because reviewers will become known as biased or arbitrary if they do not behave.² When transparency is absent from the review process, authors may perceive it as secretive and suspicious.¹¹ Furthermore, a lack of transparency allows reviewers to hold up their competition, punish authors they do not like, or settle old scores.⁴ Even so, by the late 20th century, many well-known journals were still using such a system.¹²

Double-Blinded Peer Review

Because of substantial drawbacks in the single-blinded system, there are really only 2 acceptable versions of peer review: completely closed or completely open.¹³ A double-blinded peer-review process is completely closed, a system in which neither the author nor the reviewer knows the other's identity. Editors also may take steps to remove potential identifiers from the methods section and the reference list, to further ensure anonymity. A commonly cited disadvantage of the double-blinded system is that, ultimately, masking the identity of all authors—particularly high-profile scientists—is difficult.¹⁴ Some studies also indicate that the success of blinding does not differ much between journals that have such a policy and those that do not¹⁴ and that masking the author's identity may not necessarily improve the quality of reviews.¹⁵

Fully Open Peer Review

Fully open peer review has been gaining popularity in recent years, as shortcomings of the aforementioned methods have become more widely known and possibly also because editors in chief have increasingly sought the author's input on how best to manage the review process for their particular journal. A fully open system is cheap and easy to manage, and any journal can readily implement it.¹³ Nonetheless, it is not a panacea. A completely open peer-review system may suffer, for example, if junior reviewers are reluctant to criticize the work of senior researchers for fear of reprisals,² which may lead to a growing imbalance in political power.⁴ However, as in the single-blinded system, manuscripts submitted by famous people may be automatically accepted, regardless of quality, because of intimidation or awe.⁹ Whether practicable or not, this system is clearly

unpopular with reviewers: in a recent study, one-third of reviewers said they wished to remain anonymous.¹¹

Author-Nominated Reviewers

A counter to the potential for bias or lack of expertise in editor-assigned reviewers is a system that allows the author to nominate reviewers whom they believe have sufficient insight and expertise to judge their work fairly. Potential for bias in the other direction is, of course, obvious because these nominees may not be objective or may be colleagues of the author whose views are already known. Although author-suggested reviewers tend to make more favorable recommendations for acceptance of an article, the quality of their review is believed to be similar to reviewers who are editor-selected.¹⁶

Peer Review and Occupational Health Journals

Occupational and environmental health is a classic boundary discipline,¹⁷ or *Grenzgebiete*, as these fields were a century ago called in German. Many journals in this field evolved from the medical publication model. A recent investigation of the peer-review process used in dedicated occupational health periodicals found that although the vast majority of international publications now use a double-blinded peer-review system, some continued to use the single-blinded process.¹⁸ However, of those with a predominately single-blinded system, some articles or issues were also reviewed in a double-blinded manner.¹⁹ For this reason, some experts have recently proposed that manuscripts submitted to occupational health journals be subject to uniform requirements.¹⁸ Although such calls have lagged far behind the general medical community, which first suggested uniform requirements for biomedical journals in 1978,²⁰ the time is right for an increasing degree of standardization and accountability within the publication processes of our discipline.

General Criticisms and the Way Forward

A continuing and fundamental debate regarding peer review is whether it actually improves the quality of published research. Einstein's groundbreaking Annus Mirabilis Papers were not peer reviewed, nor was Watson and Crick's 1951 article on DNA structure.²¹ One reason is that most early medical journals, such as the *Lancet*, followed the model of journalism and frequently mixed opinion with data presentation. Other early journals began as the proceedings of a learned society, with articles intended to be comprehensive and accurate accounts of oral presentations or correspondence rather than archives of discrete written reports. Since the mid-17th century when they began to be published, scientific journal administrators often have received criticism regarding what they print.²² Structured peer reviewing did not become widespread until after the second world war.²³

By 1965, *Science*²⁴ had described peer reviewers' essential responsibilities, although it noted that the system would

work only if referees understood what they were supposed to do. An intrinsic criticism the entire peer-review process, then as now, regards the suitability of reviewers chosen by the editor and whether their expertise is valid.¹ The prestigious *Proceedings of the National Academy of Sciences* does not practice peer review, on the basis of the theory that members of the Academy already have demonstrated scientific excellence and are therefore capable of deciding the merits of their own work. Even so, scientists tend to write articles for different reasons than they read them,²⁵ and there is increasing pressure in biomedical science to have one's work published in the leading journals.⁴ Journal prestige is also a factor,²⁶ and editors may assign prestigious, although potentially inappropriate, reviewers.

Publication bias toward positive results—perceived or otherwise—has always troubled potential authors, but negative results do get published.²⁶ Manuscripts initially rejected by a top journal tend to be published in smaller periodicals,²⁷ and at least half all published occupational medicine articles will eventually be listed in Medline.²⁸ Even so, the decision to publish one's important findings in specialist occupational medicine journals rather than their more general medical counterparts creates a certain structural disadvantage for the author, not the least of which is being published in a journal with a relatively low impact factor.²⁹ Articles published in such journals also receive less coverage, given the fact that as journals specialize, they tend to become relevant to fewer people.³⁰

The time has come for environmental and occupational health journals to converge on standard procedures, formats, and benchmarks of quality. But environmental and occupational health is not biochemistry, nor is it a medical specialty. Its methods and approaches vary with the problem at hand, and the subject matter is heterogeneous. For this field, standardization should not lie in the uniformity in technique but, rather, in a more consistent level of quality across whatever discipline, method, or approach applies to the problem under study. Consistency in quality and a process that supports these standards, whatever the application, is much needed.

For all its faults, the peer-review process is still the best strategy for assessing manuscripts fairly and can result in the substantial improvement of papers prior to publication.¹¹ To facilitate this, occupational health journals must begin adopting standardized peer-review guidelines and editorial policies.¹⁸ Achieving editorial consistency and reviewer accountability is clearly a step in the right direction toward improving the quality of all manuscripts in the field.

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Double-Blinded Peer Review for Manuscripts Submitted to the *Archives of Environmental & Occupational Health*

Beginning January 2008, the *Archives of Environmental & Occupational Health* moved to a completely double-blinded peer-review process. This means that neither the author's nor the reviewer's identity will be disclosed to either party. As such, there are a few changes that authors must heed for the new system to be effective. Making these changes prior to submission will help authors reduce delays in manuscript review.

Each submission should now include at least 2 files: (1) a **cover page** containing the title of the article, what type of article it is (ie, full-length manuscript, brief communication, or case study), and the authors' names, affiliations, and address for correspondence; and (2) **the main document**, whose first page should contain only the title, abstract, and keywords. The text of the manuscript should begin on the second page of this file, and any accompanying tables or figures should be uploaded as separate files.

Page One

- Title of the article
- Type of article
- Author name(s) and affiliation(s)

Page Two

- Title of the article
- Structured abstract (maximum 135 words)
- Keywords

In the article text, authors should avoid referring to their institution by name, as well as any other statements that might make them potentially identifiable to reviewers. Authors should also avoid (where possible) citing their previously published articles by name in the text.

We trust that the adoption of a double-blinded system for the *Archives* will improve the quality of the review process, reduce bias, and signify a progressive move toward standardization among manuscripts submitted to journals of occupational and environmental health.