



EDITORIAL

The impact factor addiction: Facts and fiction

A dependência do fator de impacto: factos e ficção



The last decade was very favorable for the Portuguese Journal of Cardiology, with its inclusion in the Web of Science Core Collection and with the attribution of a journal impact factor (IF) by Journal Citation Reports (JCR). This has meant a marked rise in its prestige and its consolidation as a journal of high scientific quality. However, stabilizing and raising our IF will only be possible if we understand what an IF means and how it can be improved.

Journal metrics: the impact factor

The scientific performance of journals and authors is often assessed using bibliometric indices, of which the IF is the most popular. It is claimed to be an indicator of a journal's scientific quality and prestige, and is commonly used as a guide to what to read and where to publish.¹ Nowadays, choosing the journal in which to publish a manuscript is a question not only of what expert audience an author wants to reach, but also of professional promotion and prestige.

The journal metrics mania started over 50 years ago with the concept of the impact factor.² In 1955, Eugene Garfield, an American bibliometrician, suggested that the number of references could be used to measure a journal's impact. When Garfield first launched his idea of a citation index for scientific publications, he could hardly have imagined the immense impact this instrument would have. However, the expression 'impact factor' was only introduced in 1963³ and JCR was not published until 1975.

Since its introduction in 1975, the IF has gained increasing popularity as a measure of the quality of scientific journals. Every year JCR (currently owned by Clarivate Analytics) releases impact factor lists, grouped by scientific areas, that cover the world's most frequently cited peer-reviewed journals.³ The IF is an accepted measure of the quality of a journal all over the world and remains the most popular metric to judge its scientific performance.¹

The primary purpose of the IF was to improve the management and selection of library journal collections. In market research it provides quantitative evidence for

editors and publishers with which to compare their journals with others in the same subject category. Currently, it is used not only to evaluate and compare journals, but also to assess the scientific performance of authors, institutions, and countries. The IF is still used by funding agencies, universities and policymakers to select candidates for a particular position, to choose who will receive grants, to promote and reward, to establish scientific collaborations, to select editors for journals, and to determine the scientific output in a ranking, among many other functions.

The IF is not the perfect metric and has its limitations,³ about which much has been said and written, and there are ongoing efforts to develop other scores in order to find better ways to evaluate a journal's contribution to science. Several proposals for alternative bibliometric measures have appeared over the past 20 years,⁵ and a great number of metrics have been produced, varying from publication counts and citations to sophisticated impact indicators,⁴ including the 5-Year Impact Factor, the immediacy index, the cited half-life, the Eigenfactor score, the Article Influence score and the SCImago Journal Rank.^{2,3} The immediacy index reflects how often on average journal articles are cited in the same year of publication. The cited half-life reflects the period for which articles in a journal continue to attract citations. Open access journals and those covering rapidly growing fields will tend to have higher values on this metric.

In the end, all these metrics are based on citations, using them as indices of quality, and all have general and specific advantages and disadvantages.^{4,5} Other alternative metrics, such as the number of downloads or number of views, are also far from perfect and prone to manipulation.

It should be noted that, as pointed out by Garfield, the IF is not an absolute measure of the quality of a journal, but of its influence, and was never intended to serve as an indicator of the influence of individual papers.³ Despite these and other well-known concerns and criticisms, the IF remains a universally used instrument for the assessment of scientific output.¹

Recently, with the explosion of new journals of questionable scientific quality, including those that have been

Journal impact factor calculation

$$\text{2018 journal Impact factor} = \frac{153}{195} = 0.785$$

$$\text{JIF} = \frac{\text{Citations in 2018 to items published in 2016 (63) + 2017 (90)}{153}{\text{Number of citable items in 2016 (92) + 2017 (103)}{195}}$$

Figure 1 Calculation of an impact factor: the example of the Portuguese Journal of Cardiology, 2018.

termed ‘predatory journals’, the scientific publishing arena has become infected with questionable websites that claim to measure and index scientific journals and that provide fake and misleading IFs. Some examples are the Universal Impact Factor, Global Impact Factor and Citefactor.⁸ Authors must be able to recognize and avoid publishing in journals indexed in these bogus websites.

How the impact factor is calculated

The journal IF ranking system is based on the number of times an average article has been cited in the previous two years. It is calculated by the following formula:

IF=A/B, where

A=total number of citations of journal articles in the two years before the year considered;

B=total number of items published in the two years before the year considered (Figure 1).

Of note, the numerator of the IF is the number of citations of all types of items, whereas the denominator only includes citable items (Figure 2).

Clarivate Analytics divides source items into citable and non-citable items. Citable items only include original research articles (including case reports) and reviews. Editorials, letters to the Editor, news, corrections, book reviews, meeting abstracts, reprints, biographical items, images and so on, are all rated as non-citable. And here is the paradox: so-called non-citable items may be (and frequently are)

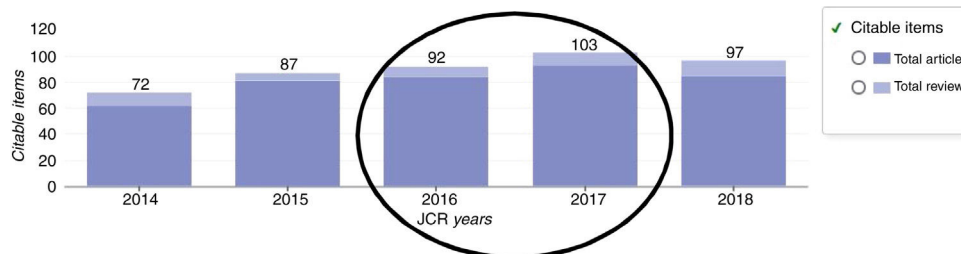


Figure 2 Items published in 2016 and 2017 (denominator of the impact factor formula) used for calculating the Portuguese Journal of Cardiology’s impact factor for 2018: original research articles (including case reports) and reviews.

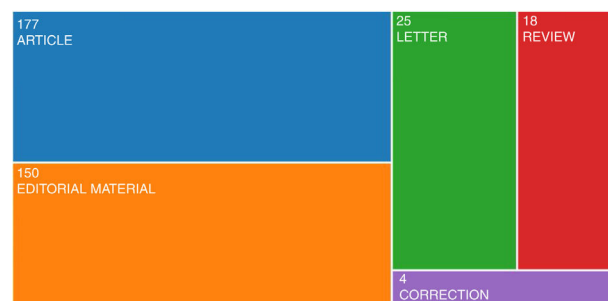


Figure 3 Types and numbers of published items in the Portuguese Journal of Cardiology in 2016 and 2017. All these items, when cited, are included in the numerator of the impact factor formula, while only published original articles and reviews are included in the denominator. Total items=374; denominator items=195 (177 articles [original articles and case reports]+18 reviews); numerator items=374.

cited. Their citations are included in the numerator of the IF formula, but are not included in the denominator.

In summary, all items eligible for the denominator are also eligible for the numerator, but the opposite is not true: the numerator can include material not included in the denominator (Figure 3).

Many authors not only submit their papers to journals with a higher IF, but also prefer to cite papers from journals with a higher IF even when these are not better or more suitable than similar papers published in journals with a lower IF. This is an example of the Matthew effect, by which ‘‘the rich get richer and the poor get poorer’’.

The misuse and proper use of impact factors

The proper use of the IF and related metrics has long been debated by the academic community, editors and funding agencies. Can the IF be ignored?

The Declaration on Research Assessment (DORA) is one attempt to do so.^{3,4} DORA recommends that the IF should not be used to evaluate an author because it is a bibliometric parameter designed to assess the influence of a journal. The basic message of DORA is that the scientific content of an article is much more important than the IF of the journal in which it appears, and the IF should be seen as only one among many metrics.^{3,4} A journal with a low IF can contain highly valuable content that even without being cited will affect its readers’ practice.²⁻⁶

The Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals, followed by hundreds of biomedical journals, including the Portuguese Journal of Cardiology, were recently updated by the International Committee of Medical Journal Editors. This document recommends that journals should reduce the emphasis on IF as a single measure of a journal's quality and is in agreement with DORA.⁷

How to improve a journal's impact factor

The secret of improving the IF is logical and simple, and consists of knowing the IF formula and related tips and tricks.

The aim is to increase the numerator (the number of citations), while controlling the denominator (number of published articles). When the numerator is higher than the denominator the IF is greater than one, when they are equal the IF is one, and when the numerator is lower than the denominator the IF is less than one.

It should not be forgotten that the IF for a particular year depends solely on citations in the previous two years. For instance, the IF for 2020 depends on citations and publications in 2019 and 2018. It should also be noted that the IF for 2019 will only be published in 2020, because it cannot be calculated until all the 2019 publications have been received. Similarly, the IF for 2020 will be published in 2021.

We are aware that IFs are often misused, manipulated and abused and that editors are often under pressure to increase their IF. In our opinion, wisdom and balance should rule: on one hand editors should not become slaves to the IF addiction, but on the other hand, they should not ignore its importance and simply behave as if it did not exist.

There are several logical and ethical editorial strategies to increase citations, which can help to increase the IF and other citation metrics.

Stimulate your team. All members of the Editorial Board should be instructed on the importance of the IF and how to improve it. They should be listed on the journal's website, along with a short biography and with their ORCID iD, enabling authors submitting their manuscripts to the journal to find information on the people who manage the journal, and their importance to the relevant scientific field.

Stimulate your readers and members. The journal's readers and supporters should be informed about the importance of the IF and how to improve it, when appropriate.

Publish more high-quality articles. Obviously, the most important and consistent (but also the most difficult) way to improve a journal's IF is for it to publish high-quality articles that are likely to be frequently cited. However, attracting high-quality manuscripts is not an easy task, particularly for journals whose IF is already low.⁵ It is worth noting that the overall level of quality of the different published articles also plays a role, since if all published manuscripts are of high quality this increases the chances of multiple citations. Another way to publish more high-quality articles⁹ is to improve the quality of the peer-review system. Journals should find good reviewers, national and international, prepare guidelines for them, find ways to ensure that these guidelines are applied, and motivate the reviewers. A rapid peer-review system, shortening publishing times from submission to production, can also play a role. A fast-track

publication system for very important papers should also be established and rapid online publication (online ahead of print or online first) should be a priority, as it increases the period during which the paper can be cited.

Select the types of manuscripts to publish. It is well known that whatever their quality, many case reports are seldom cited, and so publishing a large number of case reports is not an effective editorial strategy to increase the IF. On the other hand, original research and review or state-of-the-art articles, especially when systematic and well written, are more likely to be cited than others. It is also a useful editorial strategy to identify highly cited papers in the journal and in other journals (as these are indicative of hot, frequently cited topics), as well as to identify zero-cited papers (which are usually on topics that do not attract citations). The publication of good editorials and letters to the editor (which are not included in the denominator of the journal's IF formula) can also attract numerous citations.⁶

Publish more English language manuscripts. When the article's submission language is English, the entire editorial process becomes faster, enabling earlier online publication and longer citation time. Additionally, if articles are submitted in English the journal will be able to recruit international reviewers. Finally, articles submitted in English are more likely to be cited than those submitted in other languages and later translated into English.

Select (and instruct) authors. The journal can publish invited content from leading experts in the field, including editorials, reviews, guidelines, and special issues and debates on currently topical subjects. Authors should be encouraged to self-archive their articles in institutional or subject repositories. Freely available (open access) articles have greater visibility and are cited faster than subscription-access articles.^{10,11}

Increase the visibility of published manuscripts. One possible plan of action is to publish the most important articles in the first issues of the year, giving a longer window for citation. Another approach is to raise awareness of the journal and increase its visibility on the internet by promoting the best articles using social media such as Twitter, Facebook, LinkedIn, blogs, and academic network sites. Increasing the journal's visibility can also be achieved by ensuring that it is covered by as many indexing services as possible. Titles and abstracts of articles should be tailored to make them highly visible on search engines and bibliographic databases using search engine optimization.

Self-citations of a journal's own publications may occur for perfectly admissible reasons, but they should not be encouraged by the journal. Coercive citation, by which editors encourage the authors of work under review to cite the journal's own publications, is unethical and should be condemned. Since 2007, Clarivate Analytics has temporarily suspended some journals from JCR when excessive self-citation is detected and vigilance against high levels of self-citation is now part of JCR's routine practice. The majority of exclusions are due to excessive self-citation rates (>50%).¹² Within our area, cardiac and cardiovascular systems, most journals come under the usually acceptable 20% self-citation level.

In summary, although other tools for evaluating journals exist, the time-honored IF maintains its strong position and prestige. However imperfect, the IF continues to be

an important benchmark of a journal's success, though in our opinion, what really makes a high-quality journal are its readers, the expertise and dedication of its editors and reviewers, and the excellence of its editorial process.

Participating in social media networks also enables a journal to disseminate its articles quickly and effectively and to enhance its visibility. Sharing articles with a wider audience gives more visibility, which makes the article more likely to be cited.¹³

Thank you very much for your help and ongoing support for the Portuguese Journal of Cardiology. Stabilizing and raising our IF will only be possible if we understand what an IF means and how it can be improved.

Follow the *Revista Portuguesa de Cardiologia*/Portuguese Journal of Cardiology on Twitter @rpcardiologia, LinkedIn, and Facebook.

References

1. Smart P. Is the impact factor the only game in town? *Ann R Coll Surg Engl*. 2015;97:405–8.
2. Benedetti-Pinto B, Serra-Guimarães F, Roxo AC, et al. Does better editorial staff mean a better journal impact factor? *J Plast Reconstr Aesthet Surg*. 2016;69:1576–7.
3. Ioannidis JPA, Thombbs BD. A user's guide to inflated and manipulated impact factors. *Eur J Clin Invest*. 2019;49:e13151.
4. Donato H. Traditional and alternative metrics: the full story of impact. *Rev Port Pneumol*. 2014;20:1–2.
5. Roldan-Valadez E, Salazar-Ruiz SY, Ibarra-Contreras R, et al. Current concepts on bibliometrics: a brief review about impact factor, Eigenfactor score, CiteScore, SCImago Journal Rank, Source-Normalised Impact per Paper H-index, and alternative metrics. *Ir J Med Sci*. 2019;188:939–51.
6. Grzybowski A. The journal impact factor: how to interpret its true value and importance. *Med Sci Monit*. 2009;15:SR1–4.
7. International Committee of Medical Journal Editors. Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals. Available at: <http://www.icmje.org/recommendations/> [accessed March 2020].
8. Jalalian M. The story of fake impact factor companies and how we detected them. *Electron Phys*. 2015;7:72–1069.
9. Aydingöz U. Ways to improve a journal's impact factor in the online publication era. *Diagn Interv Radiol*. 2010;16:255–6.
10. Bornmann L, Marx W, Gasparyan AY, et al. Diversity, value and limitations of the journal impact factor and alternative metrics. *Rheumatol Int*. 2012;32:7–1861.
11. Eysenbach G. Citation advantage of open access articles. *PLoS Biol*. 2006;4:e157.
12. Miyamoto S. Self-citation rate and impact factor in the field of plastic and reconstructive surgery. *J Plast Surg Hand Surg*. 2018;52:40–6.
13. Ward A, Guest R. Making the most of social media. Available at: <http://www.elsevier.com/journal-authors/authors-update/issue-5/making-the-most-of-social-media> [accessed Jan 2020].

Helena Donato^{a,*}, Nuno Cardim^b

^a Documentation Service, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal

^b Cardiology Department, Hospital da Luz; Nova Medical School, Universidade Nova de Lisboa, Lisboa, Portugal

*Corresponding author.

E-mail address: helenadonato@chuc.min-saude.pt
(H. Donato).