

Journal impact factor: this editorial, academic and scientific influence

Fator de impacto: importância e influência no meio editorial, acadêmico e científico.

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Abstract

In this report the authors present information on the bibliometric tools and their importance in measuring the quality of scientific journals and researchers. They present in particular the history and deployment of the impact factor of the existing Institute for Scientific Information since 1955. It is presented and discussed the criticism regarding the inadequacy of the impact factor for evaluation of scientific production, misuse and strategies editorial handling of the bibliometric index. It is presented the new classification CAPES for the journals, based on various criteria and the impact factor and its influence on national scientific and academic area. Concludes that, despite all obstacles and discussions, the impact factor of the Institute for Scientific Information is still a useful tool and the only available one to assess the scientific and intellectual productivity.

Descriptors: Impact factor. Citation index. Bibliometrics indicators.

Resumo

Neste relato, os autores apresentam informações sobre os instrumentos bibliométricos e a sua importância na aferição da qualidade dos periódicos científicos, pesquisadores e docentes. Apresentam em particular a história e a implantação do fator de impacto do *Institute for Scientific Information* existente desde 1955. São apresentadas e discutidas as críticas referentes à inadequação do fator de impacto para avaliação da produção científica, uso indevido e estratégias editoriais de manipulação deste índice bibliométrico. É apresentada a nova classificação CAPES para os periódicos, baseada em vários critérios e no Fator de impacto, em especial, e a sua influência na vida acadêmica e científica nacional. Conclui que, apesar de todos os óbices e discussões, o Fator de Impacto do *Institute for Scientific Information* ainda é uma ferramenta útil e, isoladamente, a única existente para avaliar os periódicos científicos e a produtividade intelectual.

Descritores: Fator de Impacto. Índices de citação. Indicadores bibliométricos.

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INTRODUCTION

In the Editorial of February 2008 of CLINICS Journal, the scientific editor informed, referring to the citation on the cover, that the journal - in its fourth year of existence - was included and indexed in Journal Citation Reports (JCR) of the Institute for Scientific Information (ISI) [1]. The editor emphasized that the inclusion of the journal in the ISI database was the last indexation that remained to CLINICS, and so the Impact Factor (IF) of the journal would be measured from 2009. It was also announced that the unofficial IF of the journal was 0.8, emphasizing that such a result would place CLINICS in good positions compared to 23 Brazilian journals indexed to that database at the time. He also mentioned the fact that there is little national scientific journals with a value exceeding 1.0.

A recent note from 09/17/2009, published on the Internet by the editors of Nature to all publishers of journals and addresses from their mailing list, reports that the journal was considered the first of the ranking in the area of multidisciplinary science journals. They inform in the message that the new impact factor for the year 2008 is 31.434, following by Cell, with 31.253 and 28.103 with Science. From this information, the editors mentioned that in addition to IF there are other bibliometric data which also attest to the success of Nature and concluded their message by offering a 30% discount for new subscribers, as the reason for the celebration of confirmation of the journal to be the best ranked among all journals in the area.

Corroborating this information, scientific editors from Brazilian journals [2] have shown as the key objective the indexation of their journals in the database of ISI and Medline, which shows not only a trend of improvement, but an obvious internationalization of Brazilian scientific journals.

Corroborating this trend, since May 2009, Periódicos Capes provided free access to the JCR, whose signature is very expensive and difficult to achieve.

With this preamble, which can be measured by the information mentioned above, is that we justify the writing of this article to be educational, aiming to disseminate information on the most important bibliometric tool used, especially the IF, scoring its history, relevance and the restrictions that exist to this indicator, as well as its influence in the academic, scientific and publishing areas.

Three editors of scientific journals in Brazil participated in this article, considering the time as relevant for this type of disclosure, which requires a deep reflection on the editorial theme in publishing, academic and scientific level.

BIBLIOMETRIC TOOLS

Bibliometrics is the study of quantitative aspects of intellectual production, dissemination and use of information recorded [3].

Scientometrics is the science that seeks to comprehensively examine the scientific and technological production, using a variety of indicators and mathematical bibliometric tools in order to measure and understand the scale of the universe. It is the study of quantitative aspects of science as a discipline or economic activity. The scientometrics is considered a segment of the sociology of science, being applied in the development of scientific policies. It involves quantitative studies of scientific activities including publications, and thus overlapping the bibliometrics [3]. IF of scientific journals is one of the bibliometric tools available, and has as main objective to measure the abilities of writers, the quality of publications and, presumptively classify the journals included in the Journal Citations Reports (JCR) from ISI [4].

Scientific knowledge and the beginning of the forms of standardized coding and organization of documentation for consultation, and use and purpose of the information, dates back to 1873 in the United States with the advent of Shepards Citations, from company of the same name in Colorado Springs. The journal was designed to collect law documentation from American proceedings, and was based on precedents that gradually summed to proceedings that were taking place in 48 states at that time. In addition to this publication, Shepards Citations Incorporation edited special publications, and among them there was one called Journal of the Patient Office Society [5].

In 1927, Gross & Gross suggested that there might be counting the number of citations of each article or study, in order to classify and determine the importance of scientific journals at that time [6].

Vanevar Bush in 1945, was the first author to propose the method of collection, organization and retrieval of data [7]. As a result, it has been started a project of the United States government called Welsh Project, which resulted in the organization of the National Library of Medicine the way we know it today, with the participation of Eugene Garfield [5]. This author, with this activity and knowledge of previous experience, was the creator of the IF in 1955 and founder of ISI [8]. Soon after, Genetics Citation Index was published, a publication that provided the appearance in 1961, of Science Citation Index, and from it derived the Journal Impact Factor (JIF), or simply IF, aiming at creating an instrument of selection and assessment of scientific journals, as previously described [9].

The IF calculation of a journal for a given year X (Table 1) is obtained by dividing the number of citations of articles in a journal in all journals included in the ISI

database, divided by that was published by this journal previous two years. Thus, to exemplify and using the example of CLINICS, the first impact factor of the journal will be published in 2011 and referring to 2010, because the years that will count for the calculation will be the years 2009 and 2010.

Table 1. Formula for calculation of Impact Factor

IF of the year X =
$\frac{\text{N}^\circ \text{ of citations of the journal obtained in the two previous years}}{\text{N}^\circ \text{ of articles (substantial*) published in the two previous years}}$

There are more than 30 indexes for measurements currently, in addition to the IF and, among all, the Immediacy Index (II) remains the most widely used, in addition to the rate of obsolescence such as the mean life of articles, all of which reported in the JCR, which is currently in the portfolio of Thomson Reuters Company.

The Immediacy Index (II), also known as Immediaticity Index or Immediate Impact Factor, refers to the frequency of which articles in a journal are cited by other journals in the same year of its publication. The calculation of this index is simple and obtained by dividing the total citations from the referred journal in the periodicals covered by ISI, divided by the total number of articles published by the journal in that year. This index is the first to be released by the ISI and is published in the first year of indexation of a journal in its database.

The h-index is another bibliometric index that aims to quantify the productivity and impact of scientists based on their most cited articles.

The aim of the index is to assess the productivity and impact of one or even a group of scientists. The index, proposed in 2005 by Jorge E. Hirsch, aimed to be a tool to determine the quality of the studies from theoretical physicists. Despite having to overcome other indexes and traditional determination such as the enumeration of the number of articles published by one author, the total number of citations from articles by this author and assessment of the impact of journals in which the author publishes his study, this index has been steadily gaining adepts.

The h-index is calculated by observation of the number of articles with citations greater than or equal to a certain number. For example: a researcher will have an 5 h-index if he has on his curriculum at least 5 articles that have received 5 or more citations. This index has as the main attribute the overall assessment of the productivity of the author, regardless of journal of publication. Thus, an author who has published only two articles, one in Nature - where this

article got a total of 238 citations - and another in an obscure and unknown journal where it obtained only two citations; with this performance, the h-index of the author would be 2 because he would not have more than 2 articles with more than two citations.

This is the main critic to the h-index because the performance of the author with the increase of his production, depending on where this author publishes the articles may fall, and it may be pertinent to publish to disclosure and be cited in order to not be forgotten and this index serves as an example for global measurement of an author or a group of researchers. Publishing to exist and be cited in order not to disappear or not to be forgotten [10].

IMPACT FACTOR AND ITS RELEVANCE

As we exemplified above, the IF of a given year has in its composition the number of citations of articles or scientific communication of a particular scientific periodical in the universe of all periodicals in the two previous years as the numerator, and as denominator the articles published in this periodical in this same period [9]. Its importance to the publishing industry can be measured by the history of that happened to the Journal of the American Medical Association (JAMA) in the early 80's. Considered a scientific periodical of high reputation in the 60's, George Lundberg, the new editor at that time, noted a drop in popularity of the journal by the reduction of citations of journal's articles and the consequent reduction in IF. With this observation, the editor proposed changes in the journal's editorial policy, covering the content, form of submission and acceptance of articles, in addition to create new sections to the journal. The editor became to give great care with respect to the articles submitted, particularly the likely to be cited or with potential to be calculated by IF.

The editor has also become more aggressive in contact with the authors considered opinion leaders, with the ultimate objective of attracting articles and have articles published in JAMA by these authors cited in other periodicals indexed in the ISI database. This initiative has become classic, and is still the paradigm of action of scientific editors in publishing market. Another aspect to be noted is the frisson of the middle of the year in which the journal editors and publishers from around the world anxiously await the release of the IF in Philadelphia - USA, by ISI.

The IF as a simple measure of journal quality over time has been used as a tool for assessing academic productivity and to raise funds. Thus, governments and funding agencies of several countries began to use the IF as a decision making tool for allocating resources to researchers. In short, it became a guide of science policy. This trend

was observed for several years in the United Kingdom, where the index has been used extensively in research and education [11,12]. This fact is also happening in Brazil, where the IF gradually evolved to represent both the impact factor of the periodical as well as the productivity of the author. The index is now used to assess the authors and is also used as a tool for classification of the researchers and professors who became to be classified according to their publications in periodicals with high, low or no impact of their publications.

As an example of the mentioned above, the Coordination for the Improvement of Higher Education Personnel (CAPES) published last year a new form of classification and stratification of scientific national and international periodicals. The classification for all thematic areas is composed of 8 levels, ranging from A1 to A2, considered the highest levels and those with little journals with this rating; and B1 to B5 up to level C, considered the lowest [13].

For this stratification, the formal parameters of assessment of the scientific periodical was used, such as format, a record number in the International Standard Serial Number (ISSN), periodicity, representative scientific content, editorial board with expertise and in the case of the articles were published in the periodical by the peer-reviewed method, in addition to meeting of the rules of the World Association of Medical Editors (WAME) - former Vancouver.

It also assessed the inclusion of journals in the databases of the National Library of Medicine, PubMed/MEDLINE, ISI and SciELO, Lilacs and others.

Among the bibliometric indexes to stratify the journals, the most important among the used ones was the IF, which put all the national periodicals of the area of Health Sciences below B2 because the national periodicals have a IF below 1.5. The periodicals that are not in the database of ISI were considered B4 and those who are in SciELO below B5.

Thus, the IF has guided the behavior of CAPES and it has begun to influence all postgraduation programs in the country, which have been reclassified. The postgraduation program in various institutions has begun, after this new classification, to review the productivity of its professors and guide its advisors according to the new rule. In several institutions, new objectives were drawn, forcing advisors and advised students to publish their results in journals that have the highest ratings. In some institutions there are reports on enforce for completion of doctoral thesis for publication in journals rated B1 or higher, which is equivalent to publication in journals with IF higher than 3.0.

As noted, the IF has begun to permeate, conduct and interfere with academic and scientific production in the country.

DISCUSSION

The IF, initially conceived as a bibliographic system for science literature with the aim to eliminate citations that were not careful, fraudulent, incomplete or that contained old data for school use or future articles [8], extrapolated this function over time. In addition to be a tool for qualification of journals, it has also begun to be the guiding of educational, academic and basis measurements for many countries, like Brazil, and especially parameter of decisions of funding agencies in directing scientific research fund to researchers.

In the last decade, the popularity of IF distorted editorial decisions. Poor manuscripts - but that could be cited - have been published, with errors considered infamous in journals with high IF rather than manuscripts of high scientific value. That is why, in the opinion of several authors, the IF has a negative and worrying influence not just to scientific journals but also for the development of science.

The IF and its method of counting and determination, according to several authors, is poorly constructed and poorly used as a measure of scientific quality. Below, we cited some points commonly raised to justify the statement above that consider the aforementioned index as inappropriate [10,14-16].

- The quality of the published material can not be measured over time. The quantification of citations for a period of two years, is arbitrary and was determined by ISI. The articles that comprise the denominator of the IF calculation are also determined by the ISI and the rule of choice of these articles is also not clear and is doubtful.

- The number of periodicals included in the database is minimal compared to what is published indeed.

- Review articles are usually the most often cited when compared to the original articles, and this data is in favor of periodicals that opts for regular publication of such type of contribution as part of their editorial strategy.

- The IF does not discriminate citation of the own authors of their articles, and they actually represent about 1/3 of all citations counted.

- The number of errors in reference lists is common and this occurs in approximately a quarter of all references cited in the articles, which inevitably affect the accuracy of the IF.

- Takin a positive connectivity between the citations and the article produced is misleading, and often the article cites the articles suspected or of dubious quality. The citation is not considered quality assurance nor the article or articles cited.

There is exacerbated criticism on IF in respect to the fact that it should not be used as a tool for assessing research [16,17], because it is determined by technicality and does not correlate with the scientific quality or content

of the articles. In addition to the obstacles mentioned before, the IF depends on the area of coverage and publication of the journal. The perspectives on periodicals of basic areas are larger than others and which are not related to issues of success or evidence at any given time [16] as currently occurs with the area of cell therapy or stem cells.

Notwithstanding the above mentioned, the editorial policies adopted have been affecting the evolution of IF of scientific journals [18]. An analysis of seven general medical periodicals (Arch Intern Med, BMJ, CMAJ, JAMA, Lancet, Med J Aust o N Engl J Med) over a period of 12 years [18] has shown that publishers have actively participated in recruiting articles with high impact and providing and improving facilities to these authors. By observing, for example, the Swiss Medical Weekly (SMW), it is common to find on its pages the offer of support for statistical and other facilities to attract contributions, in addition to what it boasts in respect to its IF exceeds 1.5 and is increasing. Thus, it encourages the submission of contributions.

This policy is questioned and certain approaches beyond the limits of ethics in which the clear objective is to manipulate the IF [19]. These facts are reported in the SMW, where the manipulation of IF is questioned and it is wondered if this is an obligation of the editor. It is also mentioned some ethical deviations which we will reported below.

In the first case, a hematologist accused an editor of a hematology journal who forced him to inflate the number of references with articles published in the journal. In another case, the associate editors of a journal were denounced by forcing an author to cite irrelevant articles from other journals on the study submitted. Authors received requests from editors to cite the article submitted to other journals. Re-submissions and additions of references to letter to the editor are also mentioned [19].

Following this discussion, several other proposals for replacement or change of use of IF have been suggested and one of them is the coefficient of weight, Weight Impact Factor [20]. This index does not differ much from the traditional IF, but values the articles published in journals of higher weight, with $weight > 1$ and evaluates the articles in a 3-year period, differentiating and adding value to the original articles. Another proposed index is the index of prestige or Prestige factor (Pf) which is similar to the aforementioned index [10].

Despite all the criticisms mentioned in 2006, JCR analyzed 6088 journals with an increase of 32% within 10 years [21] and there is recent growth and greater flexibility in accepting new journals, mainly from Latin America – until now under-represented in ISI [22]. Objectively, the IF is considered an imperfect tool for measuring the quality

and its use for assessment of researchers is not free of risks [21,23]. The combination of bibliometric tools for this purpose is essential [24-26] and studies have shown that this combination should there be especially by involving new methodologies due to the increase of electronic journals and access to articles are more frequent by this way [27,28].

CONCLUSION

Among the many conflicting opinions on the IF [29,30] there is a consensus that it is not considered a perfect tool to measure the quality of an article or even the abilities of researchers and professors, but alone, there is nothing better [30] and that is the reason such index should be considered today as a good technical resource for scientific assessment.

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