

How Can We Assess Scientific Quality? Citation Index Only for Original Research and/or for Authorship in the Guidelines?

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Competing with others is inherent to human nature. Ratings are thus common practice in all areas, including research. As recording and communicating research results has been revolutionised and extended through internet development, quantitative analysis is of ultimate importance for evaluating scientific reports.

Bibliometrics, or scientometrics, is a set of methods developed to quantitatively analyse academic literature and the research performance of individual researchers, research groups, and departments. It was first introduced by Eugene Garfield, who described the idea of a citation index for the sciences.¹ Citation analysis is the first and most applied method in bibliometrics. Retraction rate is another quality measure that has received an enormous amount of attention recently, as retractions have increased sharply between 2000 and 2010.^{2,3} Interestingly, retraction rates have remained in parallel with the impact factors of 17 high impact journals over the last decade.⁴

Citation indexes are based on databases such as Thomson-Reuters' Web of Science (the first one), Elsevier's Scopus, and Google Scholar, which cannot really be compared as they are under continuous development. Several indicators have also been used, such as publication number,

total citations, impact factor, the Hirsch index, and a normalised or relative citation impact indicator; however, none of these is ideal, as they are biased by several factors.^{5,6} The Hirsch index (practically a median of the citations) is highly biased towards older researchers. Moreover, review articles and older publications tend to be cited more frequently than original research articles and recently published works. The research field also affects citations (e.g. an article examining the causes of endocarditis, although of significant clinical importance, may have only few citations as little research focuses on this field). Accordingly, a normalised index may address these bias factors.⁷

What answers can citation metrics provide and where should we focus?

Different metrics and different types of calculation can answer important questions. The first step is to decide the purpose of the evaluation, such as research performance, citation ranking, influence and recognition of the research, etc., which help institutions to evaluate their performance and to design their future strategy, to acquire research funding and to promote research accomplishments. This clarity of purpose determines which of the vast amount of data available

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Table 1. Different indicators of citation indexes.

Indicator	Measure
Counts of papers	Productivity
Citation counts	Total recognition/influence
Percent cited/uncited papers	Relative impact
Average citations per paper	Efficiency
Disciplinarity index	Multi- or interdisciplinarity
Time series (trend analysis)	Changes in impact over time
H-index	Practically a median. Combines publication activity and citation influence

from the citation index should be used, and the kind of analysis that will be performed. A representative overview of the several indicators is presented briefly in Table 1.

A second important issue is to decide which types of publication will be included in the citation index and whether a coefficient for correction of citation bias must be applied. Journals publish not only original research papers, but also editorials, review articles, and guidelines. The latter in particular are of substantial clinical importance, as they provide recommendations summarising the latest knowledge in the context of clinical practice; consequently, they are cited the most. Although guidelines are scientific documents, what really matters in science is original research.⁸ Accordingly, if the question is to evaluate research activity, the citation index should exclude publications that simply revise and summarise clinical practice.

Conclusions

The question is whether we can quantify research quality, and for the time being bibliometrics and citation indicators can evaluate research productivity, influence, recognition, impact, efficiency, etc. The citation index is only a sum, the content of which determines its quality and representativeness. As Thomas Lüscher, Editor of the *European Heart Journal*, and his coauthors recently stated:⁸ 1) citation has established itself as the most appropriate measure to assess the importance of publications, and 2) original personal research is really what matters in science.

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