THE H-INDEX AS A MEASURE OF INDIVIDUAL RESEARCH OUTPUT

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NARRATIVE REVIEW

ABSTRACT

The h-index is a measure of productivity and the impact of citations on a scientist's or scholar's published work. The index is based on a scientist's most frequently cited papers, the number of times those papers have been cited in other works and the distribution of citations that those works have received. The h-index is significant to both individual users and scientific research organizations, academic institutions, and chief journal editors. This overview details the basics of H-index along with an emphasis on its strengths and limitations.

Keywords: *H-index, Impact, Research, Citations*

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INTRODUCTION

After articles have been accepted and published as scientific papers, which should be the outcome of serious study work, their quality, and relevance are evaluated primarily by trained academics who share or have similar professional interests. As members of the academic community, we frequently come across words like indexing and citations. According to Tibor Toth, "Indexing is a term that stems from the concept of the index of publications, such as Index Medicus, Science Citation Index, and Current Contents."[1,2]

H- INDEX AND ITS CALCULATION

The concept of this index was introduced in 2005 by Jorge E. Hirsch, serving as a tool for assessing the relative caliber of theoretical physicists. It is sometimes referred to as the Hirsch index or Hirsch number.[3]

The h-index measures a researcher's output and influence based on their highly cited papers. It extends to evaluating individuals or groups like departments, universities, or countries. It's a tool to assess scientific productivity and article impact by arranging publications chronologically by citation dates.[4]

According to Hirsch's formulation, a scientist possesses an index denoted as 'h' if 'h' of their total number of papers (Np) have received no fewer than 'h' citations each, while the remaining (Np - h) papers have accrued no more than 'h' citations each.

In other words, an academic who possesses an 'h-index' of 'h' has written 'h' papers, each of which has been referenced at least 'h' times in other scholarly publications. It is important to highlight that this index is most effective for comparing researchers within the same field, as citation practices vary significantly across differentacademic disciplines.

The h-index serves as an endeavor to quantify both the productivity and the impact of scientific output from researchers or students. Despite its relatively recent emergence (having been introduced in 2005), the h-index has swiftly evolved into a pivotal measure for evaluating career progression.

The records of an individual's publications and citations undoubtedly hold valuable information. This data encompasses various aspects, including the total number of papers ('Np') produced within a span of 'n' years, the citation count ('Nc') for each paper (‘j’), the journals in which these papers were published, and the respective impact factors as shown in Figure 1.[5]

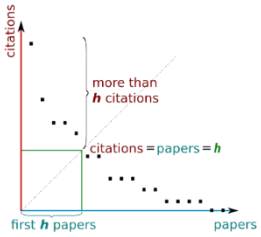

Figure 1H-index from a plot of decreasing citations for numbered papers

The h-index, as calculated through different platforms, encompasses distinct

considerations regarding the types of publications that contribute to its determination. Platforms like Google Scholar Citations and 'Publish or Perish' tend to yield higher h-factors. This is because they take into account a diverse array of citable content, including articles from a broader selection of journals, book chapters, and reports.

Google Scholar Citations offer a user-friendly method for authors to monitor citations to their published articles. Through this platform, authors can track who is referencing their work, visualize the trend of citations over time, and compute multiple citation-based metrics. Furthermore, the h-index can be computed using Google Scholar's functionalities.

For Web of Science, the h-factor only accounts for scientific articles that have been published in journals accredited with ISI recognition, as determined by Thomson Reuters. This implies that articles from sources beyond these specific journals, such as chapters in books, are not considered for citation.

On the other hand, the Scopus h-factor incorporates a broader spectrum of journals, thus encompassing a wider range of sources compared to the Web of Science.

Online scientific journals often offer abstract-only access, requiring payment or subscription for full-text content. Publishing in such journals may prompt uploading work to platforms like ResearchGate. Founded by Ijad Madisch in 2008, it utilizes a web crawler to source PDF

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articles from authors' and publishers' websites, providing free access upon registration.[7]

HOW TO IMPROVE H-INDEX

Universities exist within a highly competitive realm, where quantitative metrics like the h-index are progressively gaining significance in this rivalry. Methods for boosting citation indices include self-citation, potentially doubling the h-index; self-citations can stimulate external citations. Unrelated references can also impact the h-index. Strategies like double-publishing can raise the index, but plagiarism is unlawful and unethical for this purpose.

Collaborating with colleagues and citing each other can yield notable benefits. This cooperative approach extends to encompass larger groups of researchers, thus fostering expansive scientific communities and substantially augmenting citation counts. Nevertheless, caution is advised when selecting publication avenues, as opting for low-quality journals or conferences can diminish the validity of the h-index. Collaborating with renowned primary

authors can amplify citations, as every citation attributed to them also benefits co-authors. Participating in conferences fosters work promotion and collaboration; maintaining a blog also enhances work visibility.

Another significant element involves ensuring the accessibility of your papers for search and download. A paper's searchability is contingent on its discoverability via search engines like Google Scholar, PubMed, and ResearchGate. Opting for free-access publication can be advantageous, as it enhances the availability of your work to a broader audience. It's important to note that the paper in question did not explore the specific impact of open access on the h-index. However, openness often correlates with heightened citation rates.[4-6]

WEAKNESSES OF THE H-INDEX

Detractors of this metric propose that it has notable limitations in the following manners:

- It tallies a highly-cited paper without considering the context for which it is referenced, including instances where citations may be attributed for negative purposes.
- It fails to accommodate the disparities in the average number of publications and citations across different fields, where certain fields traditionally generate and reference fewer materials than others.
- It disregards both the quantity and the position of authors listed on a paper, neglecting potential variationsin individual contributions.
- It imposes constraints on authors based on the overall count of their publications, placing individuals with shorter career spans at a disadvantage.
- It exhibits relatively diminished precision, resulting in numerous scientists falling within the same range. As the h-index climbs, it becomes progressively harder to

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elevate, leading to many researchers converging at higher values (for instance, an h-index of 100 corresponds to a minimum of 10,000 citations).

Similar to all metrics, the h-index relies on historical data and might not necessarily serve as a reliable indicator for projecting future performance. Nonetheless, in a subsequent publication, Jorge Hirsch in papers, total citations, and citations per paper when it comes to forecastingfuture scientific accomplishments. Certain authors contend that incorporating time as a factor enhances the h-index's utility, as it offers a more comprehensive perspective on an individual scientist's career trajectory or a journal's output within a specific year.[6]

CONCLUSION

Numerous strategies exist to enhance one's h-score. While these approaches demand considerable effort to promote papers and journals, they are integral to a researcher's growth, fostering collaboration within their community and refining communication techniques. However, it's crucial to acknowledge that a subset of these methods could potentially be ethically questionable and unsuitable.

REFERENCES

1. Jones T, Huggett S, Kamalski J. Finding a Way Through the Scientific Literature: Indexes and Measures.World Neurosurg. 2011 Jul;76(1–2):36–8.

2. Hirsch JE. An index to quantify an individual's scientific research output. Proc Natl Acad Sci. 2005 Nov15;102(46):16569–72.

3. Lin, Thomas (16 January 2012). Cracking open the scientific process. The New York Times. Retrieved 26June 2014).

4. Masic I. Scientometric analysis: A technical need for medical science researchers either as authors or as peer reviewers. J Res Pharm Pract. 2016;5(1):1.

5. Hirsch JE. Does the *h* index have predictive power? Proc Natl Acad Sci. 2007 Dec 4;104(49):19193–8.

6. Egghe L. Dynamich-index: The Hirsch index in function of time. J Am Soc Inf Sci Technol. 2007 Feb1;58(3):452–4.

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