

ORIGINAL ARTICLE

An Adjusted h-index: A New Recipe to Evaluate the Researcher's Productivity

*Anwar Hamdi, M.D., Ph.D.

ABSTRACT

Objectives: To present an equation that will solve some of the problems related to the utilization of h-index in researcher's evaluation. **Methods:** Adjusted h-index TOTAL = (Ad h-index1) + (Ad h-index2) + (Ad h-index3) and so on till (Ad h-index N) (N = Number of last publication). (Ad h-index1: for the First (1) publication); (Ad h-index1) = $(A1) \cdot (B1) \cdot (C1) / (D1)$; A1 = H-index of the journal where the publication (1) had been published; B1 = the number of citations for publication (1); C1 = $\{(\text{number of authors} + 1) - (\text{order of author})\} / (\text{number of authors for publication 1})$; D1 = 1 + current year - year of publication (1). **Results:** The obtained results enlightening the superiority of the new equation to furnish the appropriate recognition to a scientist. **Conclusion:** The proposed equation will solve many of the problems linked to the h-index.

Keywords: h-index; researcher's evaluation; adjusted h-index

INTRODUCTION

The h-index assesses at once the quality and importance of scientific output of a researcher. However; it is not an ideal one.

In 2005, Hirsch introduced the h-index in a successful attempt to measure instantaneously the excellence and magnitude of scientific productivity of a researcher.¹ The h-index is identified by how many h of a researcher's publications (Np) have at least h citations

each. The higher the number of significant papers, the higher the h-index.

However; the h-index is not a faultless one. Some of the limitations and weaknesses of the h-index are:²⁻⁴ a) It overlooks the number and position of authors on a paper which in certain scientific areas is important. b) It restrains authors by the total number of publications does not taking into consideration the effects of research period.

*Department of Pharmacology, College of Pharmacy, King Khalid University, Abha , Kingdom of Saudi Arabia

Correspondence should be addressed to:

Anwar Hamdi, MD, PhD

Department of Pharmacology, College of Pharmacy,

King Khalid University, Saudi Arabia

P.O. Box 1882 Abha , Saudi Arabia

E mail: anwhan_81@yahoo.com; Mobile Number: +966501314758

c) It has somewhat low resolution in that several researchers end up in the same range since it becomes progressively hard to raise the h-index the higher it becomes. d) It does not lessen with time and consequently cannot reveal the fading research productivity of a researcher. e) It may possibly give rise to misrepresentative information about a scientist's input. f) It completely ignores where the work had been published.

A number of variants of the h-index had been suggested to surmount some of its drawbacks.

The m-index, which is expressed as the h-index divided by the number of years since the researcher's first publication, was suggested to normalize the h-index so that early- and late-stage scientists can be contrasted.¹

The g-index^{5,6} was work up in an effort to provide more weight to highly-cited papers and the appropriate acknowledgment for a researcher who had published a milestone article.

In spite of this; there is no single modified h-index on hand to offer a reliable way to overcome the above

flaws. Here is an attempt to present an equation that will solve many of the problems of the h-index.

METHOD

Adjusted h-index TOTAL = (Ad h-index1) + (Ad h-index2) + (Ad h-index3) and so on till (Ad h-index N) (N = Number of last publication).

(Ad h-index1: for the First (1) publication)

(Ad h-index2: for the Second (2) publication)

And so on till

(Ad h-index N: = for the Last (N) publication)

(Ad h-index1) = (A1)*(B1)*(C1)/(D1)

A1 = H –index of the journal where the publication (1) had been published.

B1 = the number of citations for publication (1)

C1 = {(number of authors +1) – (order of author)}/(number of authors for publication 1)

D1 = 1 + current year-year of publication (1)

RESULTS

An example:

Let consider the following two researchers (A and B) who had published their research papers as follow:

Table 1: Summary Indicators of Two Researchers' Publications

Year of Publication	Researcher <u>A</u>				Researcher <u>B</u>			
	h-index for the journal	Number of authors	Position of author	Number of citation Till 2015	h-index for the journal	Number of authors	Position of author	Number of citation Till 2015
2005	25	5	3	10	40	4	2	8
2007	20	7	1	3	30	2	1	2
2012	30	3	3	3	50	3	2	2
2013	32	2	1	1	30	3	2	2
2014	25	2	2	1	20	2	1	2

As of this table (Table 1), it will be simply calculated the following indexes and subsequently extra recognition will be acknowledged to researcher A.

Researcher A: h-index = 3, m-index = 0.3 and g-index = 4

Researcher B: h-index = 2, m-index = 0.2 and g-index = 3

But; by applying the proposed equation, it will be obvious that the surplus credit should be granted to researcher B as follows:

(Ad h-index TOTAL for Researcher A)

(Ad h-index1) = (A1)*(B1)*(C1)/(D1)

A1 = H –index of the journal where the publication (1) had been published = 25

B1 = the number of citations for publication (1) = 10

C1 = {(number of authors +1) – (order of author)}/(number of authors for publication 1) = (5+1 – 3)/5 = 3/5

D1 = 1 + current year-year of publication (1) = 1 +2015 – 2005 = 11

(Ad h-index1) = (25)*(10)*(3/5)/(11) = 13.64

Then

(Ad h-index2) = (20)*(3)*(1)/(9) = 6.67

(Ad h-index3) = (30)*(3)*(1/3)/(4) = 7.50

(Ad h-index4) = (32)*(1)*(1)/(3) = 10.67

(Ad h-index N=5) = (AN)*(BN)*(CN)/(DN)

(Ad h-index N) = (25)*(1)*(1/2)/(2) = 6.25

Adjusted h-index TOTAL for researcher A = (13.64) + (6.67) + (7.50) + (10.67) + (6.25) = 44.73

(Ad h-index TOTAL for Researcher B)

(Ad h-index1) = (A1)*(B1)*(C1)/(D1)

A1 = H –index of the journal where the publication (1) had been published = 40

B1 = the number of citations for publication (1) = 8

C1 = {(number of authors +1) – (order of author)}/(number of authors for publication 1) = (4+1 – 2)/4 = 3/4

D1 = 1 + current year-year of publication (1) = 1 +2015 – 2005 = 11

(Ad h-index1) = (40)*(8)*(3/4)/(11) = 21.82

Then

(Ad h-index2) = (30)*(2)*(1)/(9) = 6.67

(Ad h-index3) = (50)*(2)*(2/3)/(4) = 16.67

(Ad h-index4) = (30)*(2)*(2/3)/(3) = 13.33

(Ad h-index N=5) = (AN)*(BN)*(CN)/(DN)

(Ad h-index N) = (20)*(2)*(1)/(2) = 20

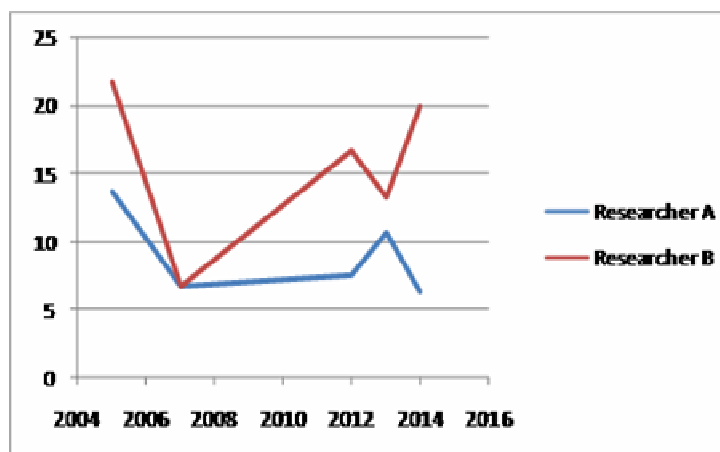
Adjusted h-index TOTAL for researcher B = (21.82) + (6.67) + (16.67) + (13.33) + (20) = 78.49

Adjusted h-index TOTAL for researcher A = 44.73

Adjusted h-index TOTAL for researcher B = 78.49

In addition, the above results revealing in an obvious way that the productivity of the researcher B was always better than the productivity of researcher A (except for year 2007). Moreover; while researcher B was showing clear improvement over the years (after 2007), researcher A was not. (Figure 1)

Figure 1: The fluctuation of the adjusted h-index throughout periods of productivity for two researchers



DISCUSSION

This Adjusted h-index will be taking care of an important areas in science's publication related to a) The number and position of authors. b) The effects of research period. c) The yearly research productivity for a researcher. d) The real contribution of a researcher. e) A very important issue that is related to where the research output had been published.

Journal ranking is broadly utilized in academic circles in the assessment of an academic journal's influence and excellence. Journal rankings are proposed to indicate the position of a journal within its field, the relative difficulty of being published in that journal, and the notability associated with it. Consequently, it ought to be used as official research appraisal means.

Quite a few journal-level metrics have been suggested, nearly all citation-based:

Expert survey,⁷ Publication power approach (PPA),⁸ Altmetrics,⁹ diamScore,¹⁰ Impact factor, Eigen factor, SCImago Journal Rank and h-index.¹¹⁻¹⁴

Numerous researchers worldwide make use of the selective ISI (Institute for Scientific Information known as Thomson ISI database) group of journals as both their major source of scientific information and as their preferred way for publishing research results. There are 22878 journals index in ISI database.¹⁵ H-index for these journals starts from 0 to 890. About 72.44% of these journals have h-index less than 30 and only 0.62% has h-index above 200.¹⁵ It is unquestionable that publishing in high h-index journal is very distinguished and it is big achievement for any researcher to get his work pass the tough reviewing procedures in such journals.

Usually, it is judged that the influence of a researcher's work is substantial on a given field if his/her articles are repeatedly quoted by other researchers. Valuable scientific papers are referring to more repeatedly in other papers than less important ones. A citation to papers indicates that someone realized that your work is merit enough to be pointed out. If a manuscript was not at all cited was it worth performing the research initially?

The number of citations for each publication of a researcher is easily obtainable from different sources,

e.g., Web of Science (Web of Knowledge), Google Scholar and Scopus.

There are a number of methods suggested to integrate the proportional input of every author to a paper, for example by order of contributors' names.¹⁶⁻¹⁹ The proposed equation, in my opinion, makes available an easy approach to estimate the credit linked with the sequence of authors' names.

As a final point, the D part of the equation $\{(Ad \text{ h-index } n) = (An)*(Bn)*(Cn)/ (Dn)\}$ which was calculated as $Dn = 1 + \text{current year-year of publication number } n$, will permit the comparisons among researchers with different time spans in the academic professions. Additionally, it will allow tracking the author's productivity throughout the years of his/her career.

CONCLUSION

The described equation takes into consideration several values that measure the different qualities of the researcher accomplishment.

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