A Newer Approach to Assessing a Researcher's Scientific Impact: Ramana's Researcher Index (r-Index)

K V Ramana^{*}, Sabitha Kandi

Department of Microbiology, Prathima Institute of Medical Sciences, Karimnagar, Andhrapradesh, India *Corresponding author: ramana_20021@rediffmail.com

Received September 10, 2013; Revised November 02, 2013; Accepted November 05, 2013

Abstract Measuring the quality of scientist/researchers is necessary during university/research appointments and increments to evaluate their professional career. Such evaluation of the individuals scientific output was determined based on the Impact factor of journals in which one publishes his/her research work. With many journals not being indexed for Thompson Reuters, ISI index for impact factor (IF), and with the emergence of open access publications, it becomes imperative that there is a need for a method to assess an individual's research contribution/impact to the scientific world. There are only few such evaluation methods available having some limitations.

Keywords: researcher index, citation index, publications

Cite This Article: K V Ramana, and Sabitha Kandi, "A Newer Approach to Assessing a Researcher's Scientific Impact: Ramana's Researcher Index (r-Index)." *Biomedicine and Biotechnology* 1, no. 2 (2013): 9-10. doi: 10.12691/bb-1-2-2.

1. Introduction

Scientific communications following a research work leads to publications. Results of a research can be published in journals/books. Initially such scientific literature was available only in few journals and most was in printed format. Now with the advancement in information technology, there has been an upsurge in the number of publishers and many publications are available online. In the world of open access publication, it now becomes imperative that we should have a method to assess the effect of a scientific communication and measure of the researchers impact. From the time when a person's research impact was considered as directly proportional to the impact factor of a journal in which his research is published, we now use many other indices including the h-index [1,2]. Considering the fact that quality measure of a researcher is more significant than quantity of output, assessment of the а researcher/scientist's is calculated taking in to consideration, the number of citation as a measure of impact. Of the available scientometrics, the Hirsh's hindex is now widely used [3].

2. A Review of H-Index

A person's h-index is calculated as a figure that emerges after counting the number of papers cited among the ones that are published by a researcher to the minimum number of times it is cited in a set number of papers. For examples if a scientist publishes 50 papers, among them 40 are cited, and the ones that are cited, each paper is cited not less than 10 times, then his h-index equals to 10. The drawback of such calculation is that though you may have many papers that are hugely cited, it considers only those papers that are cited to a minimum number as your h-index and for your h-index to improve citations of your other papers should increase. Another issue with h-index was that, it takes a lot of time for a researcher's h-index to raise even a single number. It does not consider the years of work of researchers and those who are active or inactive. It also ignores your highly cited papers. Modifications of h-index have emerged to the benefit of some researchers that consider scientists heavily cited publications and are called as g-index, m quotient, a-index and ar-index [4]. Other modifications of h-index include hc-index and h-rate. hc-index was designed to benefit current researcher's and active scientists. h-rate was considered as a modification to consider scientists who work for a short period resulting in high impact. Studies have evaluated the usage of h-index and have found it correlating well with the quality of publications [5,6]. A previous study has clearly shown how two scientists (one with heavily cited papers and the other with papers cited only fewer times) with same number of publications have similar h-index. This shows the disadvantage of h-index in not considering your highly cited papers, neither taking in to account the total number of citations [7].

I propose a newer and simpler means to calculate the impact of a researcher; this is called as Ramana's researcher index (r-index). This method uses researchers total number of total number of citations and total number of papers published with the number of years in research.

Total Citations(c) \div Publication points(p) ×Years of research(y) = r - index The number of years in research is calculated as: First ≤5 years=1; 6-10 years=2; 11-15 years=3; 16-20 years=4; 21-25 years=5 and so on

2.1. Author Credits

Second author, third, fourth, fifth author and so on except last author in each paper results in an addition of 0.2 points, 0.3, 0.4, and 0.5 to the number of publications. The last author in many publications is considered as the senior most as well as the corresponding author will add only 0.1 points to the publications.

The advantage of this type of assessment is that it takes in to account all your publications, uses all the citations, the lowest to the highest (total citations) and the number of years in research where scientists with more number of research years and more citations have a chance to score more. This method also tries to solve the problem of authorship.

2.2. Examples

Case I: A scientist with 25 publications and 50 total citations in 5 years will have an r-index of 2, whereas the scientist with fewer publications (15) and more citations (50) to his credit with same years (5years) of research has a more r-index (3.3).

Case II: we include scientists with 10 research years and consider one has 45 publications and 150 total citations resulting in r-index of 6.6, and the other has comparatively less publications (35) and more citations (150) giving him a high r-index of 8.4.

Case III: r-index of a researcher with 15 years of work is 7.8 including 75 publications and 200 citations to his credit. Another scientist with same years of research work having 60 papers and 200 total citations will have an rindex of 9.9.

Case IV: A researcher with 20 years work has to his credit 100 publications and 300 total citations, amongst them he is first author for 40 of them, 2^{nd} author for 25 papers and third author for 15 papers and last author for 20 papers. Total number of publications is calculated as below.

Total publication points are

$$40+25+(25\times0.2)+15+(15\times0.3) +20+(20\times0.1)=110$$

r-index = c/p×y
 $300/110\times4=10.9$

2.3. My r-Index

Publications (35), Citations (59), 2nd author in 2 and last author in 1 paper, 11y (3) of research

Publication points (p) = $32 + 2 + (2 \times 0.2) + 1(1 \times 0.1) = 35.5$ r = $59 / 35.5 \times 3 = 4.98$ As evidenced by the above case examples, the number of citations and years of research influence the scientific impact of a scientist as calculated by Ramana's researchers' index (r-index).

A scientist with an r-index of >5 after 10 years, >15 after 20 years should be considered as a successful researcher.

3. Conclusion

Researcher impact is considered as directly proportional to the citation index i.e. the number of times a scientist's research work has been cited. It has been noted that citation index and impact factor do not correlate well with the quality of a researcher and that it does not take in to consideration the contribution of authors [8,9]. A recent paper has highlighted the bibliographic databases that have to be screened for calculation of citations of a researcher, that includes google scholar, JSTOR, academic search premier, scopus, psycINFO, enginefactor score pubmed and the web of knowledge [10]. Considering the fact that there are only fewer such methods to assess the quality of researchers worldwide, I believe that this method needs extensive evaluation by experts in the related fields. Advantage of r-index is that it does address the multiple author publications as tried by another study in the past [11,12]. Future such evaluation of a researcher index needs to take in to account the scientific credit of a particular author in a given publications to make this assessment even more meaningful.

References

- Garfield, E. Citation analysis as a tool in journal evaluation. Science 1972; 178: 471-479.
- [2] Hirsch JE. An index to quantify an individuals' scientific output. PNAS 2005; 102(46): 1659-1672.
- [3] Sidiropoulos, A., Katsaros, D. and Manolopoulos, Y. (2006). Generalized h-index for disclosing latent facts in citation networks, arXiv:cs.DL/0607066 v1.
- [4] Egghe, L. Theory and practice of the g- index. *Scientometrics* 2006; **69**: 131-152.
- [5] Burrell, Q. Hirsch index or Hirsch rate? Some thoughts arising from Liang's data. *Scientometrics* 2007; 73: 19-28.
- [6] Chun-Ting Zhang. A proposal for calculating weighted citations based on author rank. EMBO reports 2009; 10(9): 416-417.
- [7] Bornmann L, Daniel HD, The state of *h* index research. EMBO Rep 2009; 10: 2-6.
- [8] Joseph Loscalzo. Can scientific quality be quantified? Circulation 2011; 123: 947-950.
- [9] J A Sahel. Quality versus quantity: assessing individual research performance Sci Transl Med 2011; 84cm, 13.
- [10] Robin Kear and Danielle Colbert-Lewis. Citation searching and bibliometric measures resources for ranking and tracking. C&RL News 2011, 470-474.
- [11] Hagen NT. Credit for coauthors. Science 2009; 323: 583.
- [12] van Raan, A. Comparison of the hirsch-index with standard bibliometric indicators and with peer judgement for 147 chemistry research groups. *Scientometrics* 2005; 67: 491-502.