

## Opinion

## Read the Articles; Don't Count Them

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For many years journal impact factor has been used for the evaluation of researchers and research centers.<sup>1,2</sup> After proposal of *h-index* by Hirsch,<sup>3</sup> this metric has soon found its place and currently many authorities use it as a substitute for the journal impact factor for assessing the researchers and research centers or even journals. The Iranian Ministry of Health has recently decided to evaluate the faculties of Iranian Universities of Medical Sciences by comparing their *h-index*. However, the appropriateness of this index is questioned by some researchers. But, before continuing our discussion, let us examine what *h-index* is.

In 2005, Jorge E. Hirsch, a physicist at University of California, San Diego (USCD), proposed a metric for determining theoretical physicists' relative quality.<sup>3</sup> This metric was then referred to as "*h-index*." The *h-index* of a scientist is *h* if from the total of *N* articles he/she published, *h* articles have received at least *h* citations each; the remaining (*N* - *h*) articles have received at most *h* citations each.<sup>3</sup> As an example, according to the *Scopus*<sup>®</sup>, out of the 36 articles which one of the authors (FH) has published, 3 have received at least 3 citations and therefore, his *h-index* is 3. Although two of his remaining articles<sup>4,5</sup> have also received 3 citations, they could not increase his *h-index* for their fourth and fifth positions when the articles are sorted on the number of citations they received.

Obviously, in the calculation of the *h-index* we not only consider the number of published articles but also take into account the number of citations each of those published articles have received. However, like many other scientometrics, it carries an inculcated belief that "the more citation an

article receives, the higher the quality it has" which is not a concept accepted by all scholars. Furthermore, *h-index* has other limitations.

The very first step in the calculation of *h-index* is to recognize the articles published by a certain researcher. For several reasons, like common names and use of different spelling out of a certain name, this is not always a simple straight forward task.<sup>6</sup> Calculation of *h-index* depends seriously on the database in use. As an example, the *ISI Web of Science*<sup>®</sup> reports FH's total published articles as 22 and his *h-index* as 2; and *Harzing's Publish or Perish*<sup>®</sup>,<sup>7</sup> a software for the calculation of *h-index* which uses *Google Scholar*<sup>®</sup> as its database reports his total published articles as 84 and his *h-index* as 5. Even the number of citations each of the articles received is reported differently—the number of citations to one of FH's articles on "weighted impact factor"<sup>8</sup> was reported as 3 by *Scopus*<sup>®</sup>, one by *ISI Web of Science*<sup>®</sup>, and zero by *Harzing's Publish or Perish*<sup>®</sup>.

Another trouble with *h-index* is that if a researcher has contributed to science by publishing only one or two influential articles, his/her *h-index* does not really reflect his/her contributions proportionately. Some facts are so well-accepted that they are rarely cited; the Korotkoff sounds heard during the measurement of blood pressure is so familiar to health care personnel that no one generally cites the original article of Nikolai Korotkoff.<sup>9</sup> Consequently, the *h-index* of Korotkoff whose contribution to medicine is undeniable, is not more than 4.<sup>7</sup> For the very same reason, the *h-index* of Wilhelm Conrad Röntgen who won Nobel Prize in 1901 for his discovery and seminal work on X-ray is no more than 6.<sup>7</sup>

Another limitation of *h-index* is that it is subjected to manipulation. In the calculation of *h-index*, the number of citations is counted, no matter where is your place in the author list. In this way, being a member of a large prolific research group is a favorable factor in boosting up your *h-index*.

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Although, this may promote team work—which is a good thing—it may augment gifted/honorary authorship. We know a group of researchers who has made a deal that the names of all of them be mentioned on every manuscript submitted from each of the members, no matter how much the named authors contributed to the study. Moreover, through self-citations, sometimes, we can increase our *h-index*.<sup>10</sup> In this article, by intentionally citing some of FH's published articles, we increase his *h-index* from 3 (as reported by *Scopus*<sup>®</sup>) to 4! Most of you can do the same thing by a careful look at the pattern of citations to your published articles.

Considering the shortcomings of such metrics, it seems that although they might be used for some screening purposes, it is still premature to solely rely on them for evaluation of researchers and research centers and that the best available means is employing an honest peer review system. Citation does not always mean quality; many poorly-conducted research articles may be cited several times. Sometimes, one can make a substantial contribution by mentioning a single point not countable in our digital world. Considering the current tools we have in hand, we still believe it is better to read the articles and not count them.

### Conflict of Interests

We declare that we have no conflict of interests and that we have no known gain or benefit from a high or low *h-index*—we are not university faculties.

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