

Comparison between Impact factor, SCImago journal rank indicator and Eigenfactor score of nuclear medicine journals

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Abstract

Despite its widespread acceptance in the scientific world, impact factor (IF) has been criticized recently on many accounts: including lack of quality assessment of the citations, influence of self citation, English language bias, etc. In the current study, we evaluated three indices of journal scientific impact: (IF), Eigenfactor Score (ES), and SCImago Journal rank indicator (SJR) of nuclear medicine journals. Overall 13 nuclear medicine journals are indexed in ISI and SCOPUS and 7 in SCOPUS only. Self citations, Citations to non-English articles, citations to non-citable items and citations to review articles contribute to IFs of some journals very prominently, which can be better detected by ES and SJR to some extent. Considering all three indices while judging quality of the nuclear medicine journals would be a better strategy due to several shortcomings of IF.

KEY words: Impact factor, Eigenfactor score, SCImago journal rank indicator, nuclear medicine, journal quality

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Introduction

The “Impact Factor” (IF) is the major indicator of scientific importance of journals [1]. IF is calculated annually by Institute for Scientific Information (ISI) and by definition in any given year is the ratio of the number of articles cited all citable documents published in the two previous years to all citable documents in the same period of time[2].

Despite its widespread acceptance in the scientific world, IF has been criticized recently on many accounts [3–6]: including lack of quality assessment of the citations, influence of self citation, English language bias, etc.

Eigenfactor score (ES) is another index of journal scientific impact which uses the similar algorithm as Google’s PageRank. For calculating ES an iterative method is used and journals are considered to be influential if they are cited more often by other prestigious journals [1]. ESs are available in the special website of Washington University [7].

SCImago journal rank indicator (SJR) is another index which uses similar method as the ES. However, this index is based on SCOPUS database which has much wider indexed journals compared to ISI [6, 8, 9].

In the current study, we briefly reviewed the three above-mentioned indices of scientific importance of nuclear medicine journals.

Source of information

Specific nuclear medicine journals were identified in the journal ranking section of SCImago journal and country ranking website and JCR. 2010 IFs and ESs were retrieved from JCR. Self citations, citations to the non-English articles, citations to non-citable items (articles other than review articles and original articles), citations to review articles and contribution of these four items to the 2010 IFs were evaluated. 2010 SJRs were retrieved from its dedicated website [9]. Potential IFs of the journals indexed

only in SCOPUS if they had been indexed in ISI were calculated using citation overview of the SCOPUS (however only citations from ISI indexed journals were used for calculation of potential impact factor). Ranking of the journals according to all three indices were compared. Correlations between indices were evaluated using Pearson correlation. All analyses were performed using SPSS 11.5.

Overall 20 journals were identified with nuclear medicine as the specific scope. 13 journals were indexed in ISI and SCOPUS and 7 were indexed in SCOPUS only. Table 1 shows the information of the ISI indexed nuclear medicine journals. Rankings of the nuclear medicine journals according to SCImago, IF, and ES in 2010 are available in Table 2. Figure 1 shows scatter plots of these 3 indices. Pearson correlation coefficients between 2010 IF and ES, as well as SJR were 0.833 and 0.919 and between ES and SJR was 0.845.

IF, its shortcomings and differences with SJR and ES

IF is a traditional index used by researchers for ranking scientific journals. Despite its widespread use, several shortcomings of the IF have been brought up and new indices of journal quality are being used in addition to IF. Two of these indices are SJR and ES. For calculation of SJR and ES, the same algorithm similar to Google page rank is used with the major advantage of incorporating the source of citations: citations by more prestigious journals would have more influence compared to other journals [10]. The main difference between these two indicators is databases they use for citation analysis. ISI is used for ES and SCOPUS is used for SJR. Another major difference is the time window of ES and SJR calculations. ES uses five previous years and SJR uses three previous years as the time window. Both SJR and ES are freely available [7, 9] which can make them more available than IF.

Overall, correlations between the above-mentioned indices of journal quality are high [11] and this was also true for nuclear medicine discipline (all correlations more than 0.8). This shows that for ISI indexed nuclear medicine journals all these 3 indices can be used interchangeably.

Nuclear medicine journals not indexed in ISI

Not all nuclear medicine journals are indexed in ISI and nuclear medicine specialists should be aware of methods to estimate their quality too. SJR is an excellent index for this purpose. As shown in Table 2. seven nuclear medicine journals are indexed only in SCOPUS. We calculated potential IFs of these journals if they had been indexed in ISI. Journal of Nuclear Medicine Technology, Nuclear Medicine Review, and Iranian Journal of Nuclear Medicine would have potential IFs of 0.951, 0.37, 0.354 which would have ranked them 11th, 14th, and 15th among nuclear medicine journals. This shows that nuclear medicine journals which are only indexed in SCOPUS can also have high visibility among researchers and using IF as the sole indicator of quality should be discouraged.

English language bias

A major shortcoming of IF is English language bias. Journals published in English would get cited more frequently [6, 12, 13]. Our result also showed that this notion is to some extent

Table 1. Information of the ISI indexed nuclear medicine journals including 2010 IFs, and other important citation analysis information

Journal	2010 Impact factor	2010 Eigenfactor score	Total citations to 2008 and 2009 articles in 2010	Citable items in 2008 and 2009	Citations to non-English articles of 2008 and 2009 in 2010	Citations to non citable items of 2008 and 2009 in 2010	Self citations of the journal to 2008 and 2009 articles in 2010	Citations to review articles of 2008 and 2009 in 2010
Journal of Nuclear Medicine	7,022	0,04712	3834	546	N/A	350	378	347
European Journal of Nuclear Medicine and Molecular Imaging	5,036	0,02392	2266	450	N/A	150	339	141
Seminars in Nuclear Medicine	4,571	0,00405	352	77	N/A	2	12	327
Clinical Nuclear Medicine	3,766	0,00396	482	128	N/A	348	204	0
Journal of Nuclear Cardiology	2,811	0,00619	520	185	N/A	98	118	31
Nuclear Medicine and Biology	2,62	0,00829	579	221	N/A	28	50	86
Quarterly Journal of Nuclear Medicine and Molecular Imaging	2,537	0,00246	274	108	N/A	9	24	94
Nuklearmedizin	1,752	0,0011	177	101	59	28	82	13
Annals of Nuclear Medicine	1,386	0,00331	341	246	N/A	1	33	22
Nuclear Medicine Communications	1,367	0,00474	365	267	N/A	26	34	51
Hellenic Journal of Nuclear Medicine	0,838	0,0003	62	74	2	24	24	7
Revista Espanola de Medicina Nuclear	0,77	0,00038	67	87	44	19	28	2
Medecine Nuclaire	0,227	0,00011	42	185	42	5	25	9

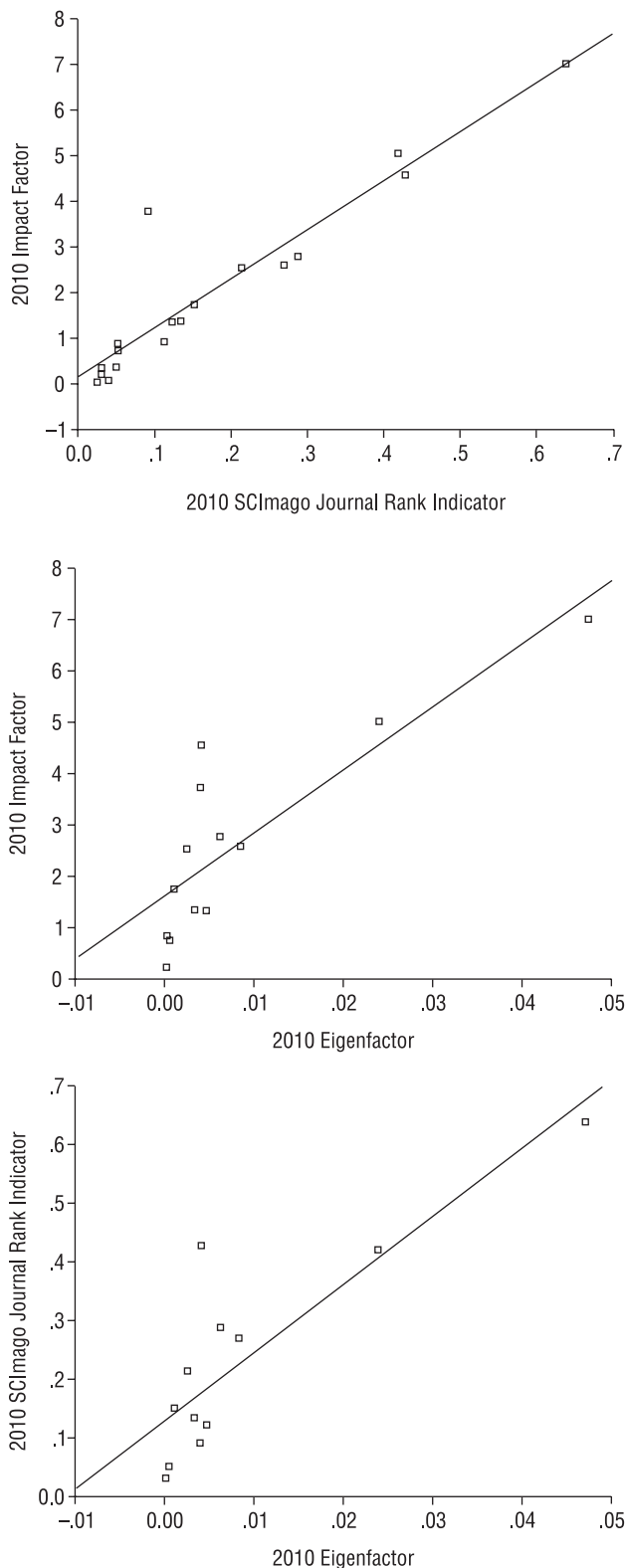


Figure 1. Scatter plots of three indices evaluated in the current study in correlation to each other as well as their fit lines

true in nuclear medicine discipline, as *Medecine Nucleaire* which is published only in French ranks last in the 2010 ISI ranking and 16 out of 17 in SCImago ranking. Three bilingual nuclear medicine journals (*Nuklearmedizin*, *Revista Espanola de Medicina Nuclear*,

and *Hellenic Journal of Nuclear Medicine*) had higher IFs and better ranks. Contribution of the non-English articles to IF of these journals was 59/177, 44/67 and 2/62 citations in 2010 respectively. These results show that nuclear medicine communities (mostly German and Spanish) support their local journals and as suggested by Currie et al can demonstrate “micro-level language bias” [13].

Strategies to boost IF

Many editors use strategies to boost IFs of their journals. These strategies include self citation, tendency to publish review articles, and decreasing the number of citable articles (by decreasing the number of published articles or increasing items such as letter to editors, interesting images, etc which are not considered citable by ISI) [6].

Self citation

Self citation is a method to increase the IF. Highest self citations in nuclear medicine journals were in non-English journal of *Medecine Nucleaire* (59.5%), bilingual journals [*Nuklearmedizin* (46.3%), *Revista Espanola de Medicina Nuclear* (41.7%), and *Hellenic Journal of Nuclear Medicine* (38.7%)], and *Clinical Nuclear Medicine* (42.3%). High self citation in journals publishing non-English articles can support the suggestion of “micro-level language bias” which means that local nuclear medicine communities tend to publish in their own language in their local journals. High self citation in *Clinical Nuclear Medicine* is most likely due to regular publication of case reports as it is more probable that case reports would cite previous case reports. SJR and ES are not affected by self citations [6, 14]. This can be one of the reasons that *Clinical Nuclear Medicine* ranked 11th and 7th in SJR and ES metrics despite being 4th in 2010 IF ranking.

Publishing review articles

Generally review articles receive twice as many citations as original articles [15] and journals mainly publishing review articles can have very high IF. *Seminars in Nuclear Medicine* and *Quarterly Journal of Nuclear Medicine and Molecular Imaging* mainly publish review articles (92.8% and 34.3% of 2010 citations to 2008 and 2009 items, cited review articles). None of the three metrics we evaluated takes into account the type of cited articles. However ES does not have any denominator and journals with lower number of citable articles tend to have lower ES [16]. Since the number of citable items in journals publishing only review articles is low, ES can indirectly account for the type of the cited articles. *Seminars in Nuclear Medicine* publishes only review articles and had only 77 citable items in 2008 and 2009. 2010 rank of this journal dropped from 3rd for IF ranking to 6th for ES ranking.

Effect of non-citable items

ISI considers original articles and review articles as the only citable items in each journal and other types of items are not used in the denominator of IF. Some journals publish considerable amount of the articles as correspondence, interesting image, and letter to editors which can increase the IF. *Clinical Nuclear Medicine*, *Hellenic Journal of Nuclear Medicine*, and *Revista Espanola de Medicina Nuclear* use this strategy to boost their IF (72.1%, 38.7%, and 28.3% of total 2010 citation to 2008 and 2009 items). SJR uses a denominator which includes almost all types of items.

Table 2. Rankings of the nuclear medicine journals in 2010 according to SCImago, IF, and Eigenfactor score

Journal	2010 IF	2010 IF rank	2010 Eigenfactor score	2010 Eigenfactor score rank	2010 SJR	2010 SCImago rank
Journal of Nuclear Medicine	7,022	1	0,04712	1	0,637	1
European Journal of Nuclear Medicine and Molecular Imaging	5,036	2	0,02392	2	0,419	3
Seminars in Nuclear Medicine	4,571	3	0,00405	6	0,427	2
Clinical Nuclear Medicine	3,766	4	0,00396	7	0,09	11
Journal of Nuclear Cardiology	2,811	5	0,00619	4	0,287	4
Nuclear Medicine and Biology	2,62	6	0,00829	3	0,269	5
Quarterly Journal of Nuclear Medicine and Molecular Imaging	2,537	7	0,00246	9	0,214	6
Nuklearmedizin	1,752	8	0,0011	10	0,151	7
Annals of Nuclear Medicine	1,386	9	0,00331	8	0,134	8
Nuclear Medicine Communications	1,367	10	0,00474	5	0,123	9
Hellenic Journal of Nuclear Medicine	0,838	11	0,0003	12	0,051	12
Revista Espanola de Medicina Nuclear	0,77	12	0,00038	11	0,051	13
Medecine Nucleaire	0,227	13	0,00011	13	0,031	16
Journal of Nuclear Medicine Technology	.951*	N/A	N/A	N/A	0,112	10
Nuclear Medicine Review	.370*	N/A	N/A	N/A	0,049	14
Iranian Journal of Nuclear Medicine	.354*	N/A	N/A	N/A	0,03	17
The Japanese journal of nuclear medicine	.074*	N/A	N/A	N/A	0,039	15
ANZ Nuclear Medicine	.034*	N/A	N/A	N/A	0,025	18
Indian Journal of Nuclear Medicine	-	N/A	N/A	N/A	0†	N/A
Nuclear Medicine and Molecular Imaging	-	N/A	N/A	N/A	0†	N/A

*These impact factors are potential IFs if the corresponding journals had been indexed in ISI. These were calculated using citation analysis of SCOPUS and ISI

†These two journals are indexed in SCOPUS less than 3 years and do not have SJR yet

For example citable items for Clinical Nuclear Medicine in 2008 and 2009 were 128 as reported by ISI and 600 as reported by SCImago journal and country ranking website. This shows that SJR is less influenced by these "non-citable" items and can be a better indicator for journals using the above-mentioned strategy to boost the IF. For example Clinical Nuclear Medicine ranked 11 using SJR despite 4th place in ISI ranking of nuclear medicine journals and 2010 SJR of Hellenic Journal of Nuclear Medicine was equal to Revista Espanola de Medicina Nuclear despite higher 2010 IF of the former (which is most likely due to higher citations in 2010 to non-citable items of the 2008 and 2009).

Open access policy

An important issue which can affect all three evaluated indices is whether journal articles are free or need subscription since open access journals usually get more citations [17]. Journal of Nuclear Medicine (for articles published > 1 year ago), Quarterly Journal of Nuclear Medicine and Molecular Imaging (for articles published > 2 years ago), Nuklearmedizin (most of the German articles), Hellenic Journal of Nuclear Medicine, Journal of Nuclear Medicine Technology, Nuclear Medicine Review, Iranian Journal of Nuclear Medicine, Nuclear Medicine and Molecular Imaging, and Indian Journal of Nuclear Medicine are open access. Increasing IF of the Journal of Nuclear Medicine in the recent years, high citations of

German articles of Nuklearmedizin, getting a respectable first IF by Hellenic Journal of Nuclear Medicine, and having high citations by Journal of Nuclear Medicine Technology and Nuclear Medicine Review can be to some extent due to their open access strategy.

Indexing in Medline and its importance

An important database indexing medical journals is MEDLINE. Since MEDLINE is freely available, journals indexed in PubMed usually have high visibility. Among nuclear medicine journals indexed in ISI only Medecine Nucleaire is not being indexed in MEDLINE. It can be predicted that by indexing in MEDLINE, this journal can get more citations and improve its IF. Journal of Nuclear Medicine Technology and Nuclear Medicine Review both are indexed in MEDLINE and this can be another reason of their fairly high citations.

Other nuclear medicine journals not indexed in ISI or SCOPUS

It is worth mentioning that we retrieved information of the current study from ISI and SCOPUS. Several other nuclear medicine journals exist such as Open Nuclear Medicine Journal, World Journal of Nuclear Medicine, American Journal of Nuclear Medicine and Molecular Imaging, and The Internet Nuclear Medicine Journal (all indexed in Directory of Open Access Journals (DOAJ))

or PubMed central) [18, 19] which are not currently indexed in ISI or SCOPUS. We can predict that in the upcoming years these journals can have higher impact in the nuclear medicine discipline due to their open access policy.

Summary

Despite widespread use of IF as the quality indicator of nuclear medicine journals, several shortcomings of IF should be born in mind while using this index. Several nuclear medicine journals are only indexed in SCOPUS and their only measure of quality would be SJR. SJR and ES can be more accurate quality index in certain conditions. We recommend considering all these indices while judging quality of the nuclear medicine journals.

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