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Relationship Between the Journal Self-Citation and Author Self-Citation and the Impact Factor in Iranian, American, and European Institute for Scientific Information Indexed Medical Journals in 2014-2021

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Abstract

Background: Author and journal self-citation contributes to the overall citation count of an article and the impact factor (IF) of the journal in which it appears. However, little is known about the extent of self-citation in the general clinical medicine literature. This study aimed to determine the effect of self-citation (journal and author) on the IF of Iranian, American, and European English medical journals. **Materials and Methods:** IF, IF without self-citations (corrected IF), journal self-citation rate, and author self-citation rate for medical journals were investigated from 2014–2021 by reviewing the Journal Citation Report (JCR). Twenty Iranian medical journals (published in English) in the web of science indexed were selected and compared with 20 American and 20 European medical journals. The correlation between the journal self-citation and author self-citation with IF was obtained. We used Spearman's correlation coefficient for the correlation of self-citation and IF. **Results:** The overall journal citations were higher in the American and European journals compared to the Iranian ones between 2014 and 2021. There was a significant relationship between journal self-citation rates and IF ($P<0.001$). The findings demonstrated that the rate of author self-citation was higher in the European and American journals compared to the Iranian ones. Findings also showed a significant difference between the author's self-citation and IF in Iranian, American, and European medical journals that published in English ($P<0.001$). **Conclusions:** The self-citation rate positively affects the IF in medical journals. A high concentration of self-citation of some journals could distort the ranking among medical surgery journals in general.

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Introduction

The ideological goal of each journal is to disseminate internationally famous indexes [1]. Citation indexing databases allow the journals to index their citations if the journal's format coincides with the database platform and if a valid number of citations are contained in the journal.

To achieve a more extensive scholarly reputation, authors need to present their names in these databases [2]. Journal impact factor (IF) is the most popular measurement use by Thomson Reuters in the comparative assessment of the function of the journal. This criterion is an aspect of the mean value of every article in that journal. It is calculated by dividing the number of current year citations to the source items published in that journal during the previous two years. In science assessment or citation analysis, self-citation is one of the controversial topics [3].

Self-citation is a natural occurrence, but in citation research, this should not be ignored. The self-citation of the journal provides a reference to articles published in a specific journal. This phenomenon can be seen either positively or negatively [4]. In Tolisano *et al*. [5] study (2016), the authors reviewed five high-impact otolaryngology journals over three months to determine the prevalence of author self-citations.

Nearly two-thirds of the articles contained at least one self-citation, with an average of 2.6 self-citations per article. Self-citations accounted for almost 10% of the total citations [5]. Self-citation of the author refers to citing one's previous publications in a new journal. Self-citation of the author exists when at least one author is typical in the citation and the cited papers [6]. Some studies suggest that self-citation has a positive effect on the IF. In other words, they have reported a positive correlation between this citation behavior and the IF, but different results have been shown in some studies [4, 7]. To evaluate the importance of articles, the scientific community uses bibliometric data, including citation counts of articles and IFs of the journals in which the articles were published.

Academic promotion committees similarly use these data to assess the scientific production of faculty members and the scientific merits of their work. Author self-citations are not removed from the calculation of IF or the citation counts. As a result, the importance of individual articles may be misrepresented by author self-citations, skew the analysis of journal IF and bias perceptions of the importance of a publication [8].

The effects of the self-citation of the author on the research and discovery process are unknown and potentially significant. This study aimed to identify the correlation between journal and author self-citation rate and IF, separately, in Iranian, American, and European medical journals that published in English to distinguish whether the results of self-citation would have an effect on the IF of the journal and also to find out two types of self-citations would have an impact on indexing in any of the journals.

Materials and Methods

This study was carried out through citation analysis. The sample of this study included all Iranian medical journals with IF that were published in English. For every Iranian journal, we selected an American and a European journal based on the IF estimation and scope of the journal. Finally, only 20 Iranian journals had an IF. Then, 20 Iranian journals with 20 American journals and 20 European journals with similar scopes and IFs were compared for research purposes.

Data Collection

We used JCR Science Edition for collecting the IFs and modified IFs (IF without journal self-citation) limited to Iranian journals in the web of science (WoS). Journal IF without journal self-citations was extracted from JCR; the author's self-citation was excluded from the calculation. The IF of the journals was finally calculated and recorded.

Accounting Author Self-Citation

Considering a large number of the articles, some journal titles were randomly selected and explored in order to determine the

author's self-citation. The study sample size was estimated using the table of random numbers. Due to the vast number of articles, the journals with less than 200 article titles during the study period were selected. After all, 12 Iranian, 12 American, and 12 European journal titles were investigated. In each journal, three Iranian authors, three American ones, and three European ones in medicine were evaluated between 2016 and 2020. To assess the effect of the author's self-citation on the journal's IF in 2021, we took the journals' five-year IFs into account because of the overlap of consecutive years in evaluation of citations, and the number of articles using the two-year IF could result in a computation bias. It should be noted that the authors with at least 20 articles in WoS-indexed journals during 2016-2020 were enrolled in the analysis. Data were collected, coded, and entered into SPSS Version 25 (SPSS Inc. Chicago, Illinois, USA), and a P-value less than 0.05 was considered as significant difference. The volume of fewer than 30 samples in each category of journals, the Shapiro-Wilk test was used for data normality. Descriptive statistics were used to describe the data, and the Spearman correlation test was used to examine the correlations between variables.

Results

Eighty-three Iranian medical journals were indexed in WoS from 2014 to 2021. Only 20 journals had IF in this period. As shown in Table-1, the overall journal citations were higher in the American and European journals than the Iranian ones between 2014 and 2021. Additionally, the overall journal citations were higher in the European journals in comparison to the American ones.

The mean of self-citation was 16.84±2.87 in the Iranian journals, 8.9±1.3 in the European ones, and 5.85±1 in the American ones.

Table 1. The Descriptive Statistics of the Iranian, American, and European Journals in 2014-2021

Journals origin	Year	TC		SC		SCR		IF		IF without self-citation	
		Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD
Iranian	2021	510.15	21.25	21.14	2.16	6	1.08	1.60	0.1	1.49	0.01
	2020	490.11	27.25	23.9	2.15	6.18	1.12	1.52	0.08	1.41	0.16
	2019	445.22	26.23	24.11	2.76	6.43	2	1.48	0.01	1.37	0.15
	2018	424.21	28.63	25	2.06	6.57	2.1	1.44	0.16	1.33	0.16
	2017	499.95	33.2	29.57	2.89	7.55	3.84	1.20	0.14	1.12	0.06
	2016	501.78	34.03	33.31	3.47	8.15	2.4	0.92	0.14	0.85	0.12
	2015	408.84	27.52	43.63	4.01	11.76	2.99	0.78	0.11	0.66	0.17
	2014	30.73	21.22	39.52	41.42	13.15	4.86	0.72	0.06	0.57	0.1
European	2021	645.66	34.45	90.13	3.1	7.21	1.11	1.87	0.16	1.75	0.12
	2020	655.21	43.25	88.64	11.13	8.9	1.81	1.79	0.19	1.66	0.34
	2019	555.01	23.12	87.31	10.22	8.12	1.9	1.62	0.44	1.5	0.13
	2018	424.21	28.63	93.25	12.48	8.07	1.6	1.5	0.08	1.34	0.15
	2017	668.25	91.76	42.7	15.28	7.68	2.25	1.27	0.07	1.12	0.15
	2016	651.05	92.19	59.35	10.7	9.17	1.41	1.16	0.03	1.02	0.23
	2015	563.45	76.92	52.65	11.04	8.04	2.3	1.04	0.63	0.93	0.55
	2014	469.4	55.55	33.95	18.91	6.91	0.73	1.78	0.63	1.68	0.63
American	2021	693.35	44.14	17	2.7	4.04	1.98	1.62	0.24	1.52	0.26
	2020	660.16	45.32	17.11	2.56	4.13	1.55	1.6	0.22	1.5	0.23
	2019	621.12	44.17	18.31	2.45	4.46	1.23	1.55	0.19	1.42	0.2
	2018	554.65	47.61	18.55	2.4	4.63	1.43	1.51	0.19	1.41	0.05
	2017	533.9	47.42	24.1	2.87	5.44	1.32	1.48	0.01	1.38	0.05
	2016	516.5	47.68	23	2.03	4.84	1.57	1.55	0.24	1.47	0.19
	2015	507.8	47.55	22.05	2.48	5.82	1.47	1.5	0.25	1.42	0.21
	2014	495.35	50.84	26.75	2.83	8.53	1.25	1.36	0.47	1.26	0.41

TC: Total Citation; **SC**:Self-Citation; **SCR**:Self-Citation Rate; **IF**:Impact Factor

Overall, the journal self-citation comprised 7.94±6.63 of the total citations. The highest and lowest self-citation rates among the Iranian journals were related to the International Journal of Radiation Research (27%) and Cell Journal (1%), respectively. Among the European journals, the highest and lowest self-citation rates belonged to Allergologie (28%) and Advances in Anatomy Embryology and Cell Biology (0%), respectively.

As to American journals, these measures were related to Comparative Parasitology (21%) and American Journal of the Medical Sciences (0%), respectively. The results also indicated that the self-citation rate followed an ascending trend in the Iranian and American journals but a constant trend in the European ones.

Besides, the self-citation rate was higher in the Iranian journals than in the American and European ones. The correlations of the journal self-citation and IF in the Iranian, American, and European journals indexed in 2014-2021 using Spearman's correlation test are presented in Table-2.

Our results show a significant positive relationship between the journal self-citation and IF in the Iranian, European, and American journals between 2014 and 2021 (P=0.0001). The mean of author-citation in the Iranian journals was 34.81±1.27 in 2016, 31.53±1.22 in 2017, 31.51±4.42 in 2018, 27.9±8.18 in 2019, and 27.18±1.09 in 2020. In addition, the mean of self-citation in the Iranian journals was 29.25±3.1. The highest and lowest rates of author self-citation belonged to the Iranian Journal of Allergy, Asthma, and Immunology (53.51%) in 2016 and the Journal of Research in Medical Sciences (0%) in 2020.

Nonetheless, the rate of author self-citation followed a descending trend in the Iranian journals. The mean of the author-citation in the European journals was 37.23±1.07 in 2016, 36.51±1.16 in 2017, 34.34±2.51 in 2018, 33.84+2.13 in 2019, and 28.96±2.38 in 2020. Moreover, the mean of self-citation in the European journals was 34.44±1.18 between 2016 and 2020. The highest and lowest rates of author self-citation belonged to Der Radiologe (65%) in 216 and the Journal of Public Health Policy in 2020, respectively. The mean of the author-citation in the American Journals was 36.94±1.4 in 2016, 36.76±2.37 in 2017, 32.18±0.55 in 2018, 31.64±0.6 in 2019, and 27.91±1.09 in 2020. Besides, the mean of self-citation in the American journals was 32.85±1.32 between 2016 and 2020.

The highest and lowest rates of author self-citation were related to the Journal of Pharmaceutical Innovation (53.4%) and Comparative Parasitology (0%), respectively.

The findings demonstrated that the rate of author self-citation was higher in the European and American journals than in Iranian ones. However, no significant difference was observed among the Iranian, American, and European journals in this regard (p>0.05). In these journals, the rates of self-citation varied from 0% to 70%. The results of the Shapiro-Wilk test revealed that the data did not follow the normal distribution. Therefore, Spearman's correlation test was employed to investigate the correlations between the author's self-citation and IF in the Iranian, European, and American journals between 2014 and 2021; the results are presented in Table-3. Accordingly, there was a significant relationship between the author's self-citation and IF of the Iranian, European, and American journals in 2014-2021(P=0.001).

Discussion

The present study aimed to determine the self-citation of journals and authors, and to assess the correlation between the IF and self-citation in the Iranian medical journals indexed in WoS as well as in the equivalent European and American journals. The results indicated that the overall rate of self-citation was higher in European and American journals than in Iranian journals in 2014-2021. In the same line, Abdekhoda *et al.* [9] conducted a study on the rate of self-citation in English scientific-research medical journals indexed in Scopus and revealed that the mean rate of self-citation was 29.64%. In addition, self-citation comprised 14.43% of the total citations [9]. Hence, journals were recommended to reduce this rate and attempt to gain citations from other journals. Generally, some citations are related to the articles that have been previously published in a journal.

Although this can prove the journal's

Table 2. The Relationship Between the Journal Self-Citation and IF in the Iranian, European, and American Journals Indexed in 2014-2021

Journals origin	Year	Spearman correlation	P-value
Iranian	2021	0.99	0.0001
	2020	0.99	0.0001
	2019	0.98	0.0001
	2018	0.98	0.0001
	2017	0.99	0.0001
	2016	0.99	0.0001
	2015	0.96	0.0001
	2014	0.93	0.0001
European	2021	0.96	0.0001
	2020	0.97	0.0001
	2019	0.96	0.0001
	2018	0.97	0.0001
	2017	0.96	0.0001
	2016	0.97	0.0001
	2015	0.98	0.0001
	2014	0.99	0.0001
American	2021	0.99	0.0001
	2020	0.98	0.0001
	2019	0.98	0.0001
	2018	0.99	0.0001
	2017	0.99	0.0001
	2016	0.99	0.0001
	2015	0.97	0.0001
	2014	0.93	0.0001

Table 3. The Relationship Between the Author Self-Citation and IF of the Iranian, European, and American Journals in 2016-2020

Journals origin	Spearman correlation	P-value
Iranian	0.84	0.0001
European	0.94	0.0001
American	0.98	0.0001

interaction with its thematic literature, it can raise criticisms against the IF. In this context, some people believe that self-citation enhances the journal's IF superficially and, consequently, presents a biased estimate of the journal's worthiness. Self-citation (journal/author) is one of the dimensions of referencing.

It can be claimed that all journals and authors have at least some references to their previous works.

According to the JCR, the maximum rate of self-citation should be at most 20% in scientific information institutes and 3-63% in other types of research. In this regard, Noroozi Chakoli *et al*. [10] performed a study to analyze the relationship between self-citation and the quality of 76 journals in the humanities indexed in the Islamic World Science Citation Center database. The results showed that the mean rate of self-citation was 24.45% in the journals with selected IFs in 2000.

Furthermore, among the 76 journals under investigation, the self-citation rate was less than 20% in 23 journals and more than 20% in

20 other journals. After removing the effective self-citations in IF, immediacy index, Mathew Value, and citation ratio, a reduction in rank were detected in 65.91% of the journals [10].

The present study findings revealed an ascending trend in the Iranian journal's self-citation rate. Consistently, Abdekhoda *et al*. [9] reported that self-citation rate increased from 13.9% in 2005 to 42.34% in 2009 in the Scopus-indexed Iranian scientific-research journals [9]. In contrast, Mehrad and Goltaji found that the self-citation rate followed a descending trend in the medical journals in the JCR database [11].

In the current study, the rate of self-citation followed an almost constant trend in the European journals and an ascending trend in the American ones. Nonetheless, the rate of self-citation was higher in the Iranian journals than the European and American ones. Hence, it can be concluded that the rate of self-citation is increasing in Iranian journals. Even though self-citation is inevitable, reliable databases can detect it if it turns into abnormal behavior.Thus, the authorities must monitor the articles more seriously because such behavior can affect the scientific indices and reveal numerous superficial values, thereby removing journals from accredited databases.

Moreover, the current study findings revealed a significant positive correlation between the journal self-citation and IF in the Iranian, European, and American journals indexed in 2014-2020. In the same way, Mehrad and Goltaji found a significant relationship between self-citation and IF in the Persian journals in medical sciences [11]. Almokhtar *et al*. [12] also researched to determine the association between self-citation and IF in 44 Iranian WoS-indexed journal titles in the JCR database up to the end of 2014.

The results revealed a significant relationship between IF and self-citation. In other words, an increase in the self-citation rate was accompanied by an increase in the journal IFs. Additionally, the self-citation rate followed an ascending trend in the database, as mentioned earlier, which was directly associated with the journal IFs.

Therefore, the utilization of inappropriate methods like mandatory self-citations for improvement of IF was recommended to be prevented. Instead, strategies including sharing articles in scientific and international networks were suggested to achieve accurate citations [12].

Although low and moderate levels of self-citation related to the journal thematic literature are predictable, the effect of self-citation on IF can be worrying. The situation can be exacerbated in case researchers are valued based on the journals in which they publish their articles rather than the research they carry out. In the current research, the rate of author self-citation was assessed for the English-language Iranian, European, and American journals in a single area.

The results showed no significant difference among the journals concerning the mean rate of author self-citation. The mean rate of author self-citation in these journals varied from 0% to 70%. Moreover, the author's self-citation was found not to play a critical role in evaluating and comparing the journal IFs in the three countries.

Hence, the difference might be attributed to the proportions of the thematic areas in the journals and the differences in the rate of received citations. This has been confirmed in the studies performed by Yalpani *et al*. (2016) [13], Jowkar and Goltaji (2010) [14], and Aksnes *et al*. (2003) [15]. They believed that the author's self-citation was affected by thematic factors. In the same line, Larcombe *et al*. [16] indicated that the rate of the author self-citation was 15% in the research articles published in ten journals by the Physiological Society during 2000-2010.

Moreover, the last authors had the highest rates of self-citation [16]. According to the researchers, this mainly resulted from the nature of scientific research in a particular field and the individuals' tendency to benefit from the advantages of scientific cooperation. Generally, a rate of self-citation below 20% has been accepted. In contrast, higher rates may attract the reviewers' attention to the negative aspects of self-citation, including the tendency to increase the number of citations and visibility of one's research works [6].

In the present study, the rate of the author's self-citation was higher in specialized journals. However, this rate should be decreased for the authors' presence in this

database to be acceptable. In this regard, interdisciplinary issues can create a stronger citation relationship among the sub-branches and receive more citations from other topics. Turabian and Ghane [17] conducted a study on 31 open-access journals in The Directory of Open Access Journals (DOAJ) database selected via random sampling. They reported that the author's self-citation was significantly associated with the IFs of these journals in the WoS. In that study, the rate of the author's self-citation was equal to 30% [17].

Ghazi Mirsaeid *et al*. [18] also investigated the effect of the author's self-citation on the IFs of Iranian medical journals in the WoS and the ISC Databases.

The findings showed no significant difference between the two databases concerning the rate of the author's self-citation. In that study, the author's self-citation rate contributed significantly to the journals' IFs [18].

Overall, studies have described various dimensions of the author's self-citation. Some have criticized the author's self-citation by expressing that it mainly originates from political reasons and self-praise. In contrast, some others have shown a positive viewpoint towards this phenomenon and have considered it as the manifestation of the author's continuous activity in a particular field. In any event, high levels of self-citation are inevitable for hardworking and highly efficient authors, and it is difficult to identify a balance point between the acceptable and questionable levels of self-citation.

Conclusion

Because self-citation is an essential topic in bibliometric and scientometric databases, adhering to the standards is paramount for journals. Since the present study's findings revealed relatively high rates of self-citation of journals and authors, specific policies have to be made by journals' editorial boards to reduce these rates and attract citations from other journals.

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Conflict of Interest

The authors declare that they have no comping interests.

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