

Do journals raise their impact factor or SCImago ranking by self-citing in editorials? A bibliometric analysis of trauma and orthopaedic journals

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Key words

impact factor, journal metrics, self-citation, trauma and orthopaedics.

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Accepted for publication 6 December 2020.

doi: 10.1111/ans.16546

Introduction

Since its inception in the 1960s, impact factor (IF) has been recognized as a significant metric of a journal's ranking and value.¹ In recent years, even though other metrics have emerged, IF still remains a major determinant of journals for readers. It is calculated as the ratio of citations in the two preceding years to the number of citable articles in a specific year.¹ Whilst IF provides a metric of a journal's prestige, it has limitations including difficulty in drawing comparisons between different scientific areas and a difference in the quality of citations across publications in journals with a low readership.^{2–4}

The calculation itself may also be increased by reducing the number of citable articles in journals and citation within journal

Abstract

Background: Impact factor (IF) is widely accepted as a measure of a journal's quality but it can be influenced by self-citation. However, the SCImago Journal Rank (SJR) is based on journal prestige, excludes self-citation and considers quality of citations of a journal. This study aimed to investigate journal editors' use of self-citation and whether this correlated with IFs or SJR in trauma and orthopaedic (T&O) journals.

Methods: T&O journals on the SJR database were identified. From each journal, data including country of publication, number of annual issues, IF, SJR indicator and citable articles were extracted. The editorial(s) of each issue in 2018 were reviewed. The total number of times the editors cited their own previous work or their journal (in the preceding 2 years, 2016–2017) were identified. Regression analyses were performed to investigate the association of editorial self-citation with journal IF or SJR indicator.

Results: Of the 270 journals identified, 43 T&O journals with 151 editorials were included in the final analysis. A positive correlation between journal self-citation in the editorial and IF ($P = 0.02$) and SJR indicator ($P = 0.02$) was found. Citation by editors of their own publications within editorials also positively correlated with IF ($P = 0.04$) but not for SJR indicator ($P = 0.19$). There was a positive linear relationship between journal IF and SJR indicators ($P < 0.01$).

Conclusion: Editor self-citation influences the IF and SJR indicators in T&O journals. Therefore, these metrics should be considered in conjunction with other factors such as audience, topics included and international presence when evaluating journals.

papers and editorials of articles in their own journals in the preceding 2 years.⁵ To address this, the SCImago Journal Rank (SJR) indicator was developed which excludes self-citations and ranks journals based on the quality of the citations, rather than just absolute numbers.⁶ SJR weighs citations by the SJR of the citing journal. Citations from high SJR journals carry more weight than those from low SJR journals.

The SJR indicator is a numeric value derived from the average number of weighted citations received during a selected year per document published during the previous 3 years. The numeric value is derived using an algorithm that assigns an identical amount of prestige to each journal and then redistributes the prestige with an iterative process such that a journal transfers its prestige to

another journal through citations until normalization is reached with a size-independent measure of prestige.⁶

A correlation between citing a journal's own articles or an author citing their own articles and IF has previously been undertaken in other medical fields.^{5,7–11} These reported a trend in increased IF based on journals citing their own articles in plastic surgery and anaesthesia but not in dermatology journals.

An analysis of orthopaedic journals found a strong correlation between journals citing their own journal articles and the 2007 IF. Orthopaedic sub-specialty journals were also found to have a higher self-citation rate. However, this was not significant due to the study's small sample size ($n = 18$ journals).⁵ No recent studies have examined the effect of citation in editorials of articles published within the preceding 2 years or articles published by the editors.

Journal editorials are an important part of an academic journal. They provide the editor with an opportunity to highlight contemporary topics related to the papers within their journal. Editorials will thus cite the work within that issue. However, with the potential association of a journal citing its own journal articles from the preceding 2 years causing an increase in its IF, it is important to determine whether there is a relationship between these two factors.

There has been a paucity of evidence assessing the relationship between IF and SJR in the orthopaedic literature, with no analyses exploring the relationship between editorials citing articles published in the last 2 years by the journal and IF with SJR. This study therefore aims to explore the relationship between editors citing both their own journal and/or their own publications and the association with IF and SJR indicators in trauma and orthopaedic (T&O) surgery journals.

Whilst there are different factors that will determine a journal's reputation, IF remains an influential determinant and will inadvertently be taken into consideration.

Methods

All journals listed on the SCImago Journal & Country Rank website⁶ developed by the SCImago research group under the orthopaedic and sports medicine category in 2018 were identified on 26 January 2020. The analysis was confined to journals only and did not include other categories available on the SCImago Journal & Country Rank website, such as conferences and proceedings.

T&O journals in the orthopaedic and sports medicine category within the SCImago Journal & Country Rank website were included. Journals were excluded if they were not in English or they were in fields of radiology, sports medicine, nursing physiotherapy, podiatry or basic sciences. Journals without an IF were also excluded.

Journals were accessed online. Data extracted from each journal included the number of issues per year, the country of publication, IF, SJR indicator and the number of citable articles. The editorial(s) for each issue of each journal from the year 2018 were reviewed and the number of citations identified from each editorial reference list was determined for the preceding 2 years (2016–2017) by two reviewers (AJ and KSK) independently. Citations of previous

editorials were excluded as these do not contribute to the calculation of IF.

Self-citation was defined as: (i) the citation of the editorial author's own publications, whether published in that journal or (ii) the citation of articles by the 2018 editorials published in the journal in 2016 and 2017. Citations of articles within the index issue by the editorial were considered accepted practice and not included in the final analysis. The editorial author was defined as the Editor-in-Chief, Associate Editor, Guest Editor or an author of an editorial invited by the editorial team.

Data analysis

All data were analysed through summary statistics (frequency, mean and standard deviation (SD)). A Shapiro–Wilks test was undertaken to assess the data distribution. This indicated that all data were normally distributed.

The research questions to be determined from the statistical analyses were:

- (1) Is there an association between journal IF or SJR indicator and the frequency of journal citation in editorials or the frequency of editors citing their own papers in editorials?
- (2) Is there an association between journal IF and SJR indicator?

To answer the first research question, a linear regression model was undertaken, adjusting for the number of editorial articles per year per journal. Data were presented with beta coefficients and 95% confidence intervals (CIs). The second question was answered with a Pearson's correlation coefficient analysis. A P -value of <0.05 was deemed statistically significant. All analyses were undertaken on Stata (Stata version 16.0; StataCorp, College Station, Texas, United States).

Results

Of the 270 journals listed, 169 journals were excluded as they were either: not in English ($n = 43$); or were journals in fields of physiotherapy ($n = 20$) or basic sciences ($n = 31$); or were in non-surgical journals such as radiology, podiatry or nursing ($n = 75$). Consequently, of the remaining 101 T&O surgical journals, 58 did not have a published IF, and were excluded. Forty-three T&O journals in the orthopaedic and sports medicine category within the SCImago Journal & Country Rank website were included in the final analysis.

Of the 43 journals reviewed, 151 editorials were published and subsequently screened. Of these, the mean number of issues per year across the 43 journals was 9 (mean 8.9; SD 5.6). Journals most frequently originated from the USA (39%), with 24% from the UK and 27% from Europe. The mean IF for the 43 journals analysed was 2.03 (SD 1.06), whilst the mean SJR indicator was 1.07 (SD 0.61).

From the 43 journals analysed, 17 journals (39.5%) cited their own journal articles within editorials (Tables 1,2). The mean number of journal self-citations in each editorial was 19.2 (SD 49.5). There was a statistically significant positive association between journal IF, SJR indicator and citation of a journal's own articles in editorials. There was an increase in IF score by 0.01 points, for

every one or more citation of the journal's own articles in the preceding 2 years (beta 0.007; 95% CI: 0.00–0.01; $P = 0.02$). For the SJR indicator, there was an increase in SJR by 0.004 points, for every one or more citation of the journal's own articles in the preceding 2 years (beta 0.004; 95% CI 0.00–0.01; $P = 0.02$).

The number of editorials published in 43 journals over the study period ranged from 0 to 18, with 11 journals (25.6%) having no editorials.

With respect to editor citation, 13 journals (30%) included one or more editorials where the editor had cited their own personal work within an editorial. The mean number of editor self-citations within editorials was 5 (mean 5.0; SD 9.9). There was a statistically significant positive association between journal IF and editors self-citing but not for SJR indicator in orthopaedic editorials. There was an increase in IF score by 0.03 points, for every one or more editor

self-citing in orthopaedic editorials (beta 0.03; 95% CI 0.00–0.07; $P = 0.04$). For SJR indicator, there was no association between SJR and editor self-citation (beta 0.013; 95% CI –0.01 to 0.03; $P = 0.19$).

There was a positive linear relationship between journal IF and SJR indicator across the 43 journals ($R = 0.88$; $P < 0.01$).

Discussion

The findings of this bibliometric analysis of T&O surgery journals showed that there was a relationship between editor citation of their journal or their own publications and journal IF of that specific journal. Whilst readers consider other factors when evaluating journals, IF remains widely used as a gauge of journal prestige, value and quality.^{1,2} Some readers may place considerable

Table 1 Journals evaluated in this analysis and basic characteristics

Title	Impact factor	SJR	Issues per year
<i>Journal of Bone and Joint Surgery – Series A</i>	4.583	2239	24
<i>Arthroscopy – Journal of Arthroscopic and Related Surgery</i>	4.33	2357	12
<i>Clinical Orthopaedics and Related Research</i>	4.091	1570	12
<i>Bone and Joint Journal</i>	3.581	2427	12
<i>Journal of Arthroplasty</i>	3.338	2282	12
<i>Knee Surgery, Sports Traumatology, Arthroscopy</i>	3.21	1867	12
<i>Spine Journal</i>	3.119	1093	12
<i>Acta Orthopaedica</i>	3.076	2031	6
<i>Journal of Shoulder and Elbow Surgery</i>	2.849	2000	12
<i>Spine</i>	2.792	1742	24
<i>Orthopedic Clinics of North America</i>	2.672	1134	4
<i>Journal of Hand Surgery (European Vol)</i>	2.648	1101	12
<i>The Journal of the American Academy of Orthopaedic Surgeons</i>	2.638	1265	24
<i>European Spine Journal</i>	2.634	1368	12
<i>Journal of Orthopaedic Trauma</i>	2.381	1151	12
<i>International Orthopaedics</i>	2.377	1129	12
<i>Journal of Spinal Disorders and Techniques</i>	2.31	1154	10
<i>Injury</i>	2.199	841	12
<i>The Journal of Knee Surgery</i>	2.079	920	10
<i>Clinical Spine Surgery</i>	1.987	819	10
<i>Archives of Orthopaedic and Trauma Surgery</i>	1.967	1200	12
<i>Knee</i>	1.903	1028	6
<i>Journal of Pediatric Orthopaedics</i>	1.853	970	10
<i>Sports Medicine and Arthroscopy Review</i>	1.766	657	4
<i>European Journal of Trauma and Emergency Surgery</i>	1.704	450	6
<i>Foot and Ankle International</i>	1.683	1389	12
<i>Journal of Foot and Ankle Research</i>	1.683	783	1
<i>Journal of Orthopaedic Surgery and Research</i>	1.61	767	1
<i>Orthopedics</i>	1.463	852	4
<i>Foot and Ankle Surgery</i>	1.458	615	6
<i>HIP International</i>	1.276	807	6
<i>Journal of Orthopaedic Science</i>	1.264	599	6
<i>Hand Clinics</i>	1.171	511	4
<i>Orthopaedic surgery</i>	1.147	522	4
<i>Journal of Children's Orthopaedics</i>	1.092	558	6
<i>Indian Journal of Orthopaedics</i>	0.98	367	6
<i>Journal of Orthopaedics and Traumatology</i>	0.872	1149	1
<i>Foot and Ankle Clinics</i>	0.871	650	4
<i>Acta Orthopaedica et Traumatologica Turcica</i>	0.637	402	6
<i>Journal of Pediatric Orthopaedics Part B</i>	0.61	439	6
<i>Acta Orthopaedica Belgica</i>	0.542	355	4
<i>Operative Techniques in Sports Medicine</i>	0.337	178	4
<i>Hand Surgery and Rehabilitation</i>	0.308	343	6

SJR, SCImago Journal Rank.

Table 2 Characteristics of included journals

Characteristic	
Number of journals	43
Number of editorials	151
Mean number of issues annually (SD)	8.9 (5.6)
Country of origin (%)	
UK	11 (25.6)
USA	14 (32.6)
Europe (excluding UK)	15 (34.9)
Other	3 (7)
100% open access journal (yes; %)	10 (16.1)
Mean impact factor (SD)	2.03 (1.06)
Mean SJR indicator (SD)	1.07 (0.61)
Mean number of journal self-citations (SD)	19.2 (49.5)
Frequency of journal self-citation (%)	17 (39.5)
Mean number of editor self-citations (SD)	5.0 (9.9)
Frequency of editor citation (%)	13 (30.2)

SD, standard deviation; SJR, SCImago Journal Rank.

importance on IF, and therefore place more weight on the findings of an article published in a higher IF journal compared to a lower ranked journal.

Siebelt *et al.*⁵ reported a relationship between self-citation and the 2017 IF in 18 major orthopaedic journals. As our results show a significant positive correlation with editor's citation of their journal and their own publications and journal IF in T&O, this suggests that editors are able to influence IF either directly or indirectly such as by influencing the readership to cite the same articles. We also noted that only 30% of the journals analysed had editor self-citation. However, when this did occur, it was at a high frequency (mean of 5). This suggests that a proportion of the journals self-cite frequently. This may be due to variation of editor practice but it may be also be explained by niche journals or articles developing on previous research. Whilst appropriate self-citation is a legitimate practice and would be expected from an expert in a particular topic or authors building upon previous work, unnecessary self-citation should not be supported. We would encourage readers to evaluate citations critically. For example, they may wish to consider whether the author is an expert or whether the topic is niche and therefore warrants self-citations. They may also want to give thought to the number of self-citations and whether this seems reasonable. This a subjective process but awareness is key to improving research practice and evaluation. Furthermore, perhaps in the future IF calculation can include two parts – one with and one without self-citation.

The SJR indicator has been proposed as an alternative measure to the IF.^{4,5,12} However, as illustrated by Siebelt *et al.*⁵ and the findings from this analysis, similar challenges as encountered with increased IF may exist with this instrument. The Eigen factor, article influence score and the Source Normalized Impact per Paper metrics may also be alternatives, although the latter two have also previously demonstrated a positive correlation with IF.^{12,13} Self-citation can also influence other metrics such as the *H*-index and *Z*-index that measure the impact of scientists rather than journals.^{12,13} However, whilst the SJR indicator excludes self-citation and considers prestige of citations of a journal, this does not seem to have significantly changed the interpretation of IF given the positive correlation between the two as reported in our study.

Comparing our results to those of Siebelt *et al.*⁵ who analysed the influence of self-citation on the 2007 IF and SJR indicators, we have shown an increase in the number of T&O journals over the ensuing 11 years to 2018. We have also shown a statistically significant positive correlation between self-citation and IF compared to Siebelt *et al.*'s⁵ findings, which did not reach statistical significance. This difference may also be explained by the greater numbers of journals resulting in more competition for readership and article submissions. The relationship between IF and SJR indicator has been replicated in this analysis.

There was a close correlation between self-citation and both SJR and IF indicating that as well as self-citation, there may be other factors associated with both metrics influencing their final value. This was supported by an increase in IF score by 0.03 points, for every one or more editor self-citing in orthopaedic editorials. Therefore, whilst this study has shown an association of self-citation and journal metrics, further exploratory analyses are warranted to attempt to identify other potential confounders.

This analysis has three key limitations. First, it was not possible to determine the frequency with which editorials were cited and whether they contributed to the IF or SJR. However, the analysis does show an association between the two. Analysing specific citation frequencies, thereby re-calculating the two metrics, would be one approach to overcome this, although practically this would need to be made of a smaller number of journals which may reduce the generalizability of the findings. Second, there were a number of instances where self-citation may be appropriate and unavoidable. We were unable to determine at what threshold self-citation should be considered an appropriate practice, and what should be considered inappropriate. It is difficult to establish an exact number of self-citations that is acceptable. Instead, we suggest that the reason for self-citation or journal citation is more relevant, rather than the actual frequency of self-citation. However, this would be an interesting area for further research. Finally, we originally planned to assess for an association between self-citation and journal metric with the highest 10 journals based on IF. However, since only 151 editorials were identified in total, such an analysis would have been underpowered and inappropriate. This may be negated by increasing the scope of future analyses by widening the time period of assessment, thereby increasing the number of editorials within a given analysis. We also acknowledge that in general T&O journals have a low IF; however, it is also worthwhile exploring the effect of self-citation on IF.

Over the past decade, the importance of online platforms has increased and different metrics now exist to describe scientific impact in a digital era. Newer metrics such as 'altmetrics' capture social platforms, policy documents and bookmarks providing an alternative to traditional metrics.¹⁴ This may render more traditional metrics redundant in the digital age.¹⁵

In conclusion, we identified an association between self-citation by editors of T&O surgery journals and increased IF and SJR. Future consideration on how to account for this in estimating journal performance is warranted. We suggest a repeat of this study in the future to evaluate whether practices have changed with the increasing awareness of the limitations of IF.

Acknowledgement

Dr TOS is supported by funding from the National Institute for Health Research (NIHR) Oxford Health Biomedical Research Centre.

Author Contributions

Aanchal Jain: Conceptualization; data curation; methodology; project administration; resources; validation; visualization; writing-original draft; writing-review and editing. **Keng Suan Khor:** Conceptualization; data curation; methodology; project administration; resources; validation; visualization; writing-original draft; writing-review and editing. **David Beard:** Conceptualization; methodology; project administration; supervision; validation; visualization; writing-original draft; writing-review and editing. **Toby Smith:** Conceptualization; formal analysis; methodology; project administration; software; supervision; validation; visualization; writing-original draft; writing-review and editing. **Caroline Hing:** Conceptualization; methodology; project administration; resources; supervision; validation; visualization; writing-original draft; writing-review and editing.

Conflicts of interest

TOS is an Associate Editor and CBH is Editor-in-Chief of the *Knee* journal.

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