

Self-citation rate and impact factor in pediatrics

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Abstract A journal's impact factor (IF) may be boosted by increasing self-citations. We aimed to determine the self-citation rate (SCR) of pediatric journals registered in the Journal Citations Report (JCR), to evaluate the impact of SCR upon the IF and to determine the effect of the SCR of a journal on its IF. We found 117 journals categorized as pediatric journals by the JCR (as of 2013). The median and range of SCR, IF and corrected IF (IF without self-citations) were 9 % (0–30 %), 1.54 (0–6.35) and 1.37 (0–5.87) respectively. No differences were found between general and subspecialty journals in terms of SCR, IF or corrected IF. Spearman's ranked correlation showed that IF was significantly and inversely correlated with SCR ($r = -0.28$, $P = 0.002$; $R^2 = 0.08$). There was a significant difference between IF and corrected IF among all journals (1.74 ± 1.04 vs 1.59 ± 0.98 , $P < 0.001$). Self-citation is relatively rare in pediatric journals.

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Importantly and unlike other fields of medicine, self-citation was found to be more prevalent in journals with a lower IF and also with lower corrected IF.

Keywords Impact factor · Self-citation · Self-citation rate · Pediatrics

Abbreviations

IF	Impact factor
JCR	Journal of citation reports
SC	Self-citation
SCR	Self-citation rate

Introduction

The term “impact factor”(IF) was first established by Eugene Garfield in 1955 to help librarians and scientists identify the most influential journals based on the number of citations they received. The first official ranking of journals by IF was published in 1972 (Garfield 1972). The IF of a given journal, according to the journal of citation reports (JCR), is defined as the recorded number of citations within a certain year of the items published in the journal during the two preceding years, divided by the number of such items published in the same 2 years (Garfield 2006) (Fig. 1).

Today, the value of a scientific publication is increasingly judged by the IF of the journal in which it is published, leading many journals to display their IF on their website (Casadevall and Fang 2014). However, the IF has been heavily scrutinized, and alternative quantitative measurements for evaluating a journal’s impact have been suggested (Hansson 1995; Oosthuizen and Fenton 2014; Seglen 1997; Yang and Zhang 2013).

Reported methods of boosting a journal’s IF are publishing reviews (that are quoted often), publishing items that are not used in the denominator of IF calculation (e.g. letters, editorials etc.), using an open access platform (easily reached and thus easily quoted) and encouraging self-citation (SC) (Ramin and Shirazi 2012). The self-citation rate (SCR) of journals has been shown to correlate with their IF in several fields of medicine such as anesthesia (Fassoulaki et al. 2000), orthopedics (Hakkalamani et al. 2006) and gastroenterology and hepatology (Karimi Elizee et al. 2012). However, a similar correlation was not found in otolaryngology (Motamed et al. 2002). As such, a corrected IF (the IF of a journal after removal of self-citations) may perhaps be a better indicator of journal quality as it is not manipulated by self-citations. In fact, a “self-citation free” IF is now provided by the Journal Citations Reports.

We conducted this study in order to: (1) determine the SCR of pediatric journals registered in the JCR; (2) evaluate the impact of SCR upon the IF of these journals; (3) determine the effect of the SCR of a given journal on its own IF; and (4) compare IF and SCR of English and non-English journals. Our hypothesis was that the SCR of subspecialty pediatric journals is higher than that of general pediatric journals and that the IF of a journal after removal of self-citations (corrected IF) correlates with its SCR.

$$\text{2013 Impact Factor of a journal} = \frac{\text{\# of articles published in the journal in 2011-2012 that were cited in 2013}}{\text{\# of articles published in the journal in 2011-2012}}$$

Fig. 1 Impact factor calculation

Methods

We retrieved all pediatric journals registered in the 2013 JCR database (supplementary Table 1). We collected the following characteristics of each journal from the JCR report: IF, number of publications that were used to calculate the IF of the journal, the total number of citations used to calculate the IF, the number of self-citations that were incorporated in the calculation of the IF (SC), the self-citation rate (SCR) and the corrected IF (IF recalculated without self-citations). SCR was defined as (self-citations/total citations) × 100.

Two of the investigators (MM and AMB) independently reviewed each journal in order to classify it as a general pediatric journal or a subspecialty pediatric journal. A subspecialty journal was defined as one which declared in its “aims and scope” that its main focus was on a specific area or subject within pediatrics. We excluded all journals that did not allow reading a full-text English version of their articles from the subspecialty analysis. As “Archives of Pediatrics & Adolescent Medicine” changed its name to “JAMA Pediatrics” in the year 2013, potentially leading to unreliable citation data, it was excluded from all analyses. In order to rule out the age of the journal as a potential confounder, the year in which each journal began its publication was collected from PubMed.

The Minitab statistical package version 16.1 (State College, PA, USA) was used for analysis. Data are presented as *n* (%) for categorical variables. We used the Kolmogorov–Smirnov test to identify normality of distribution and found a non-normal distribution in both SCR and IF. Thus, we used nonparametric tests (Kruskal–Wallis or Spearman’s ranked correlation). Two-sided *P* values were calculated. A *P* value <0.05 was considered significant.

Results

There were 117 journals that were categorized as pediatric journals by the JCR. Five journals did not offer full English text. The median and range SCR, IF and corrected IF were 9 % (0–30 %), 1.54 (0–6.35) and 1.37 (0–5.87) respectively.

Table 1 Comparison of self-citation rate, impact factor (IF) and corrected IF (median, range) by journal type and language

	Self-citation rate (%)	Impact factor	Corrected IF
Journal type			
General journals (<i>n</i> = 31)	7.11 (0–29.69)	1.46 (0–5.30)	1.28 (0–4.92)
Subspecialty journals (<i>n</i> = 81)	9.08 (0–25)	1.61 (0.29–6.35)	1.40 (0.29–5.87)
<i>P</i> value*	0.46	0.41	0.39
Journal language			
English journals (<i>n</i> = 112)	8.78 (0–28.57)	1.56 (0–6.35)	1.39 (0–5.87)
Foreign language journals (<i>n</i> = 5)	24.44 (18.18–29.69)	0.41 (0.28–0.72)	0.33 (0.21–0.55)
<i>P</i> value*	0.001	0.001	0.001

Data provided as median (range)

*Kruskal–Wallis

The journal with the highest SCR (30 %) was the Iranian Journal of Pediatrics (IF of 0.344, ranking 112 out of 117 journals). At the other end of SCR ranking were four different journals with an IF greater than 1 and a SCR of 0 %.

No differences were found between general and subspecialty journals in terms of SCR, IF and corrected IF (Table 1).

Spearman's ranked correlation showed that IF was significantly and inversely correlated with SCR ($r = -0.28$, $P = 0.002$; $R^2 = 0.08$) (Fig. 2). There was a significant difference between IF and corrected IF among all journals (1.74 ± 1.04 vs 1.59 ± 0.98 , $P < 0.001$).

Pediatric journals that offered full English text had a higher median IF and corrected IF despite having a lower SCR compared to journals that did not offer full English text (Table 1).

Spearman's ranked correlation showed that the journal age and SCR were significantly correlated ($r = 0.13$, $P = 0.02$, $R^2 = 0.04$).

Discussion

In this study, we found SCRs ranging from 0 to 30 % in pediatric journals. When comparing the SCR of pediatric journals to other fields of medicine, we found that pediatric journals had a lower average SCR (10 %) than that reported by studies in the fields of ophthalmology, (Mimouni and Segal 2014) anesthesia (Fassoulaki et al. 2000) orthopedics (Hakkalamani et al. 2006) and otolaryngology (Motamed et al. 2002) (15, 30, 23 and 31 % respectively). The lower SCR in the field of pediatrics may be partially explained by the fact that several of the aforementioned studies only included citations from a subset of journals in their field (Fassoulaki et al. 2000; Hakkalamani et al. 2006; Motamed et al. 2002). However, our group previously described a 15 % SCR in the field of ophthalmology using a similar methodology (Mimouni and Segal 2014). Pediatrics and ophthalmology

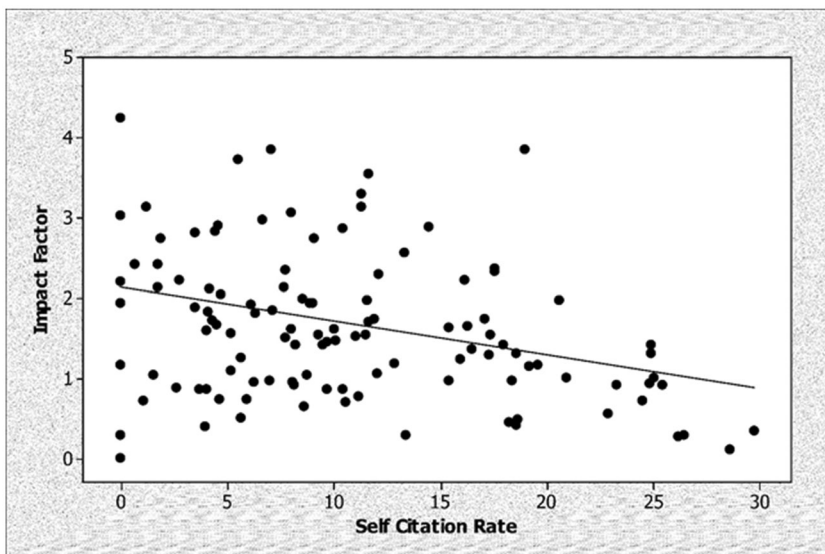


Fig. 2 Impact factor versus self-citation rate of all of the 117 journals provided by the JCR

greatly differ in the number of journals listed in the JCR, 117 in pediatrics and 58 in ophthalmology. We speculate that this fact alone may explain why a given pediatric journal is more likely to receive citations from other journals than from itself. In support of this speculation is a study in the field of dermatology that demonstrated that an increase in the number of dermatology journals was accompanied by a concurrent increase in IF of the dermatology journals, presumably due to higher opportunity for citation (Jemec 2001).

As opposed to findings in the field of ophthalmology (Mimouni and Segal 2014), the SCR was not affected by the type of journal (subspecialty as opposed to general journals). Again, this may be due to the relatively lower proportion of subspecialty journals in ophthalmology than in pediatrics (55 vs 72 %), which may increase the likelihood of self-citation in ophthalmology. Similar to the ophthalmology study, no differences in terms of IF ($P = 0.41$) or corrected IF ($P = 0.39$) were found (Mimouni and Segal 2014).

The IF inversely correlated with the SCR in pediatric journals ($R^2 = 0.078$, $P < 0.001$). This finding is in contrast to similar studies conducted in the fields of anesthesia (Fasoulaki et al. 2000), orthopedics (Hakkalamani et al. 2006) and gastroenterology and hepatology (Karimi Elizee et al. 2012). Taken together with the fact that there was a significant difference between IF and corrected IF, it seems that self-citations contribute significantly to the IF of journals with a lower IF. We speculate that this is related to the fact that articles published in a given journal are more likely to be quoted again in the same journal due to the special interest of the journal in a specific topic.

Interestingly, journals that did not offer a full-text version of their publication in English had lower IF and higher SCR values. This may be the result of authors not being familiar or proficient with the language or being unable to access the full text of publications in foreign language journals (Fung 2008).

Obviously, the conclusions obtained from our findings cannot be applied to other pediatric journals not registered in the JCR. Also, since only 1 year was studied (2013), nothing can be said about temporal trends in pediatric SCR. Moreover, our study does not allow determining what an appropriate SCR should be and how to keep it low. One must bear in mind that a high SCR does not mean that the journals have bad intentions and are attempting to artificially increase their IF. In fact, it may simply mean that a paper in the journal was read and cited by another paper in the same journal indicating that the topic and scope of the journal was relevant to the authors of both the citing and cited articles. In addition, journals with a lower IF would also have an expected lower number of total citations, therefore increasing the proportion of self-citations per total citations without necessarily implying that the lower IF journals tend to cite themselves more. Finally, although IF was inversely corrected with SCR, the low r value indicates a relatively small effect size.

Despite numerous attempts to identify alternative journal metrics, the IF still remains the most highly regarded indicator of a journal's quality (Casadevall and Fang 2014). In fact, such attempts most often compare the suggested indices to IF, rendering it the gold standard of its bibliometric field (Bradshaw and Brook 2016; Azer et al. 2016).

In summary, self-citation is questionable in particular when the journal itself suggests or even requires that a revised manuscript include references to another recent article in the same journal (Falagas and Alexiou 2008). This study showed that self-citation is much rarer in pediatric journals as compared to other fields of medicine. On the contrary, the IF of pediatric journals was inversely correlated with their SCR. We speculate that the field of pediatrics is rather remote from systematic manipulations of IF through SC.

Compliance with ethical standards

Conflict of interest There is no conflict of interest for any of the authors.

Authors contribution Michael Mimouni: Dr. Mimouni conceptualized and designed the study, participated in data analysis, drafted the initial manuscript, and approved the final manuscript as submitted. Motti Ratmansky, Yaron Sacher, Sharon Aharoni: Drs. Ratmansky, Sacher and Aharoni carried out the data collection and analysis, reviewed and revised the initial manuscript, and approved the final manuscript as submitted. Aviva Mimouni-Bloch: Dr. Mimouni-Bloch conceptualized and designed the study, participated in data analysis, drafted the initial manuscript, and approved the final manuscript as submitted.

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