

COMMENTARY

Self-citations in six anaesthesia journals and their significance in determining the impact factor

A. Fassoulaki*, A. Paraskeva, K. Papilas and G. Karabinis

Department of Anaesthesia, St Savas Hospital, 171 Alexandra's Ave, 11522 Athens, Greece

*Corresponding author: 57–59 Raftopoulou Street, 11744 Athens, Greece

Self-citation of a journal may affect its impact factor. We investigated self-citations in the 1995 and 1996 issues of six anaesthesia journals by calculating the self-citing and self-cited rates for each journal. Self-citing rate relates a journal's self-citations to its total number of references. We defined self-cited rate as the ratio of a journal's self-citations to the number of times it is cited by the six anaesthesia journals. We also correlated self-citing rates with the impact factor of the six journals for 1997. Citations among the six journals differed significantly ($P < 0.0001$). *Anesthesiology* had the highest self-citing rate (57%). *Anaesthesia*, *Anesthesiology*, *Anesthesia and Analgesia*, *British Journal of Anaesthesia*, *Canadian Journal of Anaesthesia* and the *European Journal of Anaesthesiology* had self-citing rates of 28%, 28%, 30%, 11% and 4% respectively. The self-cited rates were 31%, 35%, 34%, 27%, 31% and 17% for *Anaesthesia*, *Anesthesiology*, *Anesthesia and Analgesia*, *British Journal of Anaesthesia*, *Canadian Journal of Anaesthesia* and the *European Journal of Anaesthesiology*, respectively. North America journals cited the North America literature. This also occurred, to a lesser extent, in the European anaesthesia journals. A significant correlation between self-citing rates and impact factors was found ($r = 0.899$, $P = 0.015$). A high self-citing rate of a journal may positively affect its impact factor.

Br J Anaesth 2000; **84**: 266–9

Keywords: anaesthesia, journals; publications, impact factor; publications, anaesthesia

Accepted for publication: September 24, 1999

The impact factor of a journal represents the frequency with which its articles have been cited for a given period of time. It is calculated by dividing the number of all current citations of source items from a journal during the previous 2 yr by the number of articles published in that journal during those 2 yr.^{1,2} However, the frequency of self-citations of a journal may affect its impact factor.

In this study, we have investigated the self-citation frequency of six anaesthesia journals and its possible effect on their impact factors.

Methods

Self-citations during 1995 and 1996 were investigated in six anaesthesia journals: *Anaesthesia*, *Anesthesiology*, *Anesthesia and Analgesia*, *British Journal of Anaesthesia*, *Canadian Journal of Anaesthesia* and *European Journal of Anaesthesiology*. Abstracts, supplement issues, letters and editorials were excluded.

We calculated the self-citing rate, which relates a journal's self-citations to its total number of references.¹ For example,

the journal *Anesthesiology* made references to 7157 items, including 4074 of its own articles. Its self-citing rate is $4074/7157 = 57\%$.

The self-citing rates of the six anaesthesia journals in 1995 and 1996 were correlated with their impact factors for the year 1997, taken from the SCI of Journal Citation Report.¹ These impact factors were: 1.489, 4.625, 2.830, 2.241, 1.316 and 0.914 for *Anaesthesia*, *Anesthesiology*, *Anesthesia and Analgesia*, *British Journal of Anaesthesia*, *Canadian Journal of Anaesthesia* and *European Journal of Anaesthesiology*, respectively.

We also calculated the self-cited rate for the six anaesthesia journals, that is the ratio of a journal's self-citations to the number of times it is cited by the six anaesthesia journals, including itself.¹ For example, during the 2-yr period, *Anesthesiology* was cited 11 540 times by all six journals, including 4074 times it cited itself. Its self-cited rate is $4074/11540$ or 35%. As we only included the six anaesthesia journals, the calculated self-cited rate differs from the standard definition derived from the Institute for

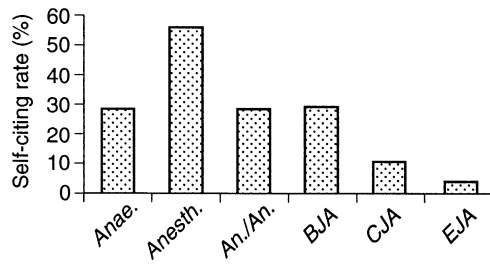


Fig 1 Self-citing rates (%) of *Anaesthesia* (Ana.), *Anesthesiology* (Anesth.), *Anesthesia and Analgesia* (An./An.), *British Journal of Anaesthesia* (BJA), *Canadian Journal of Anaesthesia* (CJA) and *European Journal of Anaesthesiology* (EJA) for 1995 and 1996.

Scientific Information (ISI). The ISI defines self-cited rate as the ratio of journal self-citations to the number of times it is cited by all other journals, including itself.¹

Statistical analysis

Statistical analysis was performed using SPSS for Windows (Statistical Package for the Social Sciences) 8.0. The citations attributed to each journal by the other five journals were compared among the six journals using the chi-square test. To identify the contribution of different cells to the significance of this chi-square, we used adjusted standardized residuals. The adjusted standardized residuals followed the *t* distribution. For standardized residuals >1.96 , $P < 0.05$ and for standardized residuals >2.56 , $P < 0.01$. Spearman's rank (r_s) correlation coefficient was used to assess the correlation between the self-citing rates of the journals and their impact factors.

Results

The total number of publications investigated in the six anaesthesia journals for the years 1995 and 1996 was 3144. The total number of citations was 27 683. *Anesthesiology* had the highest self-citing rate. *Anaesthesia*, *Anesthesia and Analgesia* and *British Journal of Anaesthesia* followed with similar self-citing rates (28%, 28% and 30%, respectively). The *Canadian Journal of Anaesthesia* and *European Journal of Anaesthesiology* had much lower self-citing rates (11% and 4%, respectively) (Fig. 1). There was a significant correlation between self-citing rates and impact factors for the six anaesthesia journals ($r = 0.899$, $P = 0.015$) (Fig. 2).

Individual comparisons showed that *Anaesthesia* favoured itself, the *British Journal of Anaesthesia* and the *European Journal of Anaesthesiology* (adjusted residuals 33.7, 12.9 and 3.6, respectively), but had no significant effect on the *Canadian Journal of Anaesthesia*, and a negative effect on *Anesthesiology* and *Anesthesia and Analgesia*. *Anesthesiology* favoured itself (adjusted residual 30.4), was indifferent to *Anesthesia and Analgesia* and had a negative impact on the remaining four journals. *Anesthesia and Analgesia* favoured itself and *Anesthesiology* and had a negative effect on the three European journals, *Anaesthesia*,

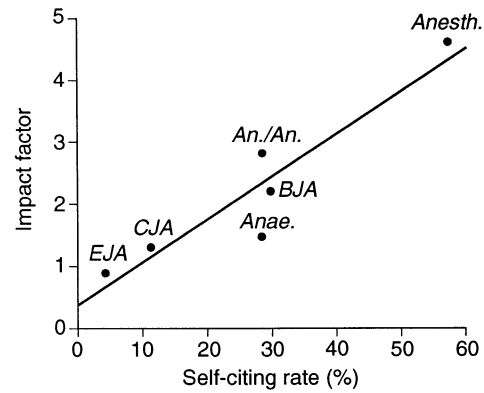


Fig 2 Correlation between self-citing rates and impact factors of the six anaesthesia journals (*Anaesthesia* (Ana.), *Anesthesiology* (Anesth.), *Anesthesia and Analgesia* (An./An.), *British Journal of Anaesthesia* (BJA), *Canadian Journal of Anaesthesia* (CJA) and *European Journal of Anaesthesiology* (EJA)).

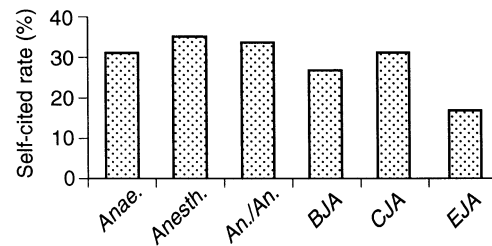


Fig 3 Self-cited rates of *Anaesthesia* (Ana.), *Anesthesiology* (Anesth.), *Anesthesia and Analgesia* (An./An.), *British Journal of Anaesthesia* (BJA), *Canadian Journal of Anaesthesia* (CJA) and *European Journal of Anaesthesiology* (EJA) for 1995 and 1996.

British Journal of Anaesthesia and the *European Journal of Anaesthesiology*. The *British Journal of Anaesthesia* showed similar behaviour as *Anaesthesia*. It favoured itself (adjusted standardized residual 21.2) and the *European Journal of Anaesthesiology*, and had a negative impact on *Anesthesiology*, *Anesthesia and Analgesia* and the *Canadian Journal of Anaesthesia*. The *European Journal of Anaesthesiology* favoured itself, *Anaesthesia* and the *British Journal of Anaesthesia*. It had a negative impact regarding the citations it gave to *Anesthesiology* and *Anesthesia and Analgesia* and had no effect on the *Canadian Journal of Anaesthesia*.

The self-cited rates for *Anaesthesia*, *Anesthesiology*, *Anesthesia and Analgesia*, *British Journal of Anaesthesia*, *Canadian Journal of Anaesthesia* and *European Journal of Anaesthesiology* were 31%, 35%, 34%, 27%, 30% and 17%, respectively (Fig. 3).

The citations each journal gave to other journals, including itself, and the citations each journal received from the other journals differed significantly among the six journals (chi-square=3526, df=23, $P < 0.0001$) (Table 1).

Table 1 Citations each journal gave to other journals, including itself (rows), and the citations each journal received from the other journals (columns) (*Anaesthesia* (*Anae.*), *Anesthesiology* (*Anesth.*), *Anesthesia and Analgesia* (*An./An.*), *British Journal of Anaesthesia* (*BJA*), *Canadian Journal of Anaesthesia* (*CJA*) and *European Journal of Anaesthesiology* (*EJA*)). Chi-square=3526,12, df=23, $P<0.0001$. For adjusted residuals ≥ 1.96 , $P<0.05$

	<i>Anae.</i>	<i>Anesth.</i>	<i>An./An.</i>	<i>BJA</i>	<i>CJA</i>	<i>EJA</i>	Total
<i>Anae.</i>	962	803	487	909	156	64	3381
Citations							
Adjusted residual	33.7	-22.6	-11.5	12.9	-0.9	3.6	
<i>Anesth.</i>							
Citations	351	4074	1535	910	233	54	7157
Adjusted residual	-19.8	30.4	-1.6	-15.2	-7.6	-4.3	
<i>An./An.</i>							
Citations	613	3252	2110	1055	316	59	7405
Adjusted residuals	-9.5	4.5	15.5	-11.6	-3.0	-4.0	
<i>BJA</i>							
Citations	559	1654	873	1412	179	80	4757
Adjusted residual	1.1	-10.6	-6.9	21.2	-4.1	3.0	
<i>CJA</i>							
Citations	412	1336	905	588	418	28	3687
Adjusted residual	-0.2	-7.2	3.8	-4.7	19.4	-2.8	
<i>EJA</i>							
Citations	225	421	210	321	60	59	1296
Adjusted residual	7.1	-6.9	-5.2	5.7	-0.5	11.0	
Total							
Citations	3122	11 540	6120	5195	1362	344	27 683

Discussion

All six anaesthesia journals had a self-citing rate higher than the citing rates they gave to the other journals. *Anesthesiology* favoured itself more than the other journals. This means that its self-citations may contribute to a greater extent to the number of times it was cited during the years 1995 and 1996 compared with *Anesthesia and Analgesia* or the *British Journal of Anaesthesia*. It had no positive impact on any of the other journals, including those from North America. *Anaesthesia*, *Anesthesia and Analgesia* and the *British Journal of Anaesthesia* had similar self-citing rates, which were relatively close to their self-cited rates. Thus the rate these journals were cited by all journals, including themselves, did not appear to be affected positively by their self-citations.

Overall, we may identify a mutual 'support' or at least neutral behaviour among the three European journals, *Anaesthesia*, *British Journal of Anaesthesia* and the *European Journal of Anaesthesiology*. In contrast, *Anesthesiology* exhibited a negative impact towards all other journals, except *Anesthesia and Analgesia*, to which it was indifferent, and was 'supported' only by *Anesthesia and Analgesia*. *Anesthesia and Analgesia* was 'supported' only by the *Canadian Journal of Anaesthesia*, to which *Anaesthesia* and the *European Journal of Anaesthesiology* had a neutral attitude. The remaining three journals had a negative effect on the *Canadian Journal of Anaesthesia*.

We examined six anaesthesia journals, three representing North America and three from Europe. A common characteristic is that they are highly rated in terms of impact factor for the specialty they represent. We chose to study these

journals because of easy access, which was the same reason we included them in a previous study.³

The impact factor, the citation rate of a given journal for a 2-yr period, is used to quantify a journal's performance. It has been criticized extensively as it has several flaws. Differences between scientific fields, poor correlations between article citedness and journal impact, incomplete journal coverage and misprinting^{1 2 4} are thought to affect negatively the value of the impact factor. None the less, the impact factor is used to rank journals in the same field. It is also used to assess a nation's publication activity in important anaesthesia journals by multiplying the impact factor by the number of articles published in a journal and the number which originated from the country(ies) assessed.⁵

High self-citing frequency may have various causes. For example, an author may prefer to submit his article on a particular topic to a journal that has previously published relevant work in that area. Therefore, more references in the author's article will be derived from articles in that particular journal. The significant correlation between self-citing rates and impact factors of the six anaesthesia journals may indicate a significant influence of self-citations on their impact factors. If the self-citing rate significantly supersedes the self-cited rate, then the journal's impact factor may be favoured by its own self-citations. But a journal's high self-citation rate may mean that a particular field of its interest is of limited scope. Low self-citation rates characterize multidisciplinary journals.¹

In summary, a high self-citing rate may significantly affect the impact factor of a journal compared with the

impact factors of other journals of the same scientific discipline. This problem could be overcome by calculating impact factors after eliminating self-citations, or correcting them by a factor for self-citations.

References

- 1 Science Citation Index, Journal Citation Reports. Institute for Scientific Information, Philadelphia, Pennsylvania, USA: 1997
- 2 Smith G. Impact factors in anaesthesia journals. *Br J Anaesth* 1996; **76**: 753–4
- 3 Sarantopoulos C, Fassoulaki A. Accuracy of subject and author indexes in five anaesthesia journals. *Br J Anaesth* 1995; **74**: 104–6
- 4 Seglen PO. Causal relationship between article citedness and journal impact. *J Am Soc Inform Sci* 1994; **45**: 1–11
- 5 Boldt J, Maleck W, Koetter KP. Which countries publish in important anaesthesia and critical care journals? *Anesth Analg* 1999; **88**: 1175–80