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

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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, 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.

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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. 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. 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. 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. 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...
Self-citations in six anaesthesia journals

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. Anaesthesiology had the highest self-citing rate. Anaesthesia, Anesthesiology 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 Analgesia. Anesthesiology favoured itself (adjusted residual 30.4), was indifferent to Anaesthesia 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, 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, Analgesia and Anaesthesia 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 Analgesia and Anaesthesia and had no effect on the Canadian Journal of Anaesthesia.

The self-cited rates for Anaesthesia, Anesthesiology, Anaesthesia 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) (Anesthesiology (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.

<table>
<thead>
<tr>
<th></th>
<th>Anae.</th>
<th>Anesth.</th>
<th>An./An.</th>
<th>BJA</th>
<th>CJA</th>
<th>EJA</th>
<th>Total</th>
</tr>
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<tr>
<td>Citations</td>
<td>962</td>
<td>803</td>
<td>487</td>
<td>909</td>
<td>156</td>
<td>64</td>
<td>3381</td>
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<tr>
<td>Adjusted residual</td>
<td>33.7</td>
<td>–22.6</td>
<td>–11.5</td>
<td>12.9</td>
<td>–0.9</td>
<td>3.6</td>
<td></td>
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<tr>
<td>Anesth.</td>
<td>351</td>
<td>4074</td>
<td>1535</td>
<td>910</td>
<td>233</td>
<td>54</td>
<td>7157</td>
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<tr>
<td>Adjusted residual</td>
<td>–19.8</td>
<td>30.4</td>
<td>–1.6</td>
<td>–15.2</td>
<td>–7.6</td>
<td>–4.3</td>
<td></td>
</tr>
<tr>
<td>An./An.</td>
<td>613</td>
<td>3252</td>
<td>2110</td>
<td>1055</td>
<td>316</td>
<td>59</td>
<td>7405</td>
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<tr>
<td>Adjusted residuals</td>
<td>–9.5</td>
<td>4.5</td>
<td>15.6</td>
<td>–11.6</td>
<td>–3.0</td>
<td>–4.0</td>
<td></td>
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<tr>
<td>BJA</td>
<td>559</td>
<td>1654</td>
<td>873</td>
<td>1412</td>
<td>179</td>
<td>80</td>
<td>4757</td>
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<td>1.1</td>
<td>–10.6</td>
<td>–6.9</td>
<td>21.2</td>
<td>–4.1</td>
<td>3.0</td>
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<tr>
<td>CJA</td>
<td>412</td>
<td>1336</td>
<td>905</td>
<td>588</td>
<td>418</td>
<td>28</td>
<td>3687</td>
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<tr>
<td>Adjusted residual</td>
<td>–0.2</td>
<td>–7.2</td>
<td>3.8</td>
<td>–4.7</td>
<td>19.4</td>
<td>–2.8</td>
<td></td>
</tr>
<tr>
<td>EJA</td>
<td>225</td>
<td>421</td>
<td>210</td>
<td>321</td>
<td>60</td>
<td>59</td>
<td>1296</td>
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<tr>
<td>Adjusted residual</td>
<td>7.1</td>
<td>–6.9</td>
<td>–5.2</td>
<td>5.7</td>
<td>–0.5</td>
<td>11.0</td>
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<tr>
<td>Total</td>
<td>3122</td>
<td>11 540</td>
<td>6120</td>
<td>5195</td>
<td>1362</td>
<td>344</td>
<td>27 683</td>
</tr>
</tbody>
</table>

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. Anesthesia, Anaesthesia 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 Anaesthesia and Analgesia, to which it was indifferent, and was ‘supported’ only by Anaesthesia and Analgesia. Anaesthesia 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. For 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 limitations, such as the journal’s self-citation rate may mean that a particular journal may be highly rated in terms of impact factor 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 citation and journal impact, incomplete journal coverage and misprinting1 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.

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