

*Learned Publishing*, 23: 93–100  
doi:10.1087/20100203

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# Self-citation in Chinese biomedical journals

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## Introduction

Journal impact factor is one of the most important bibliometric indices for exploring the relation between citing and cited journals, and to evaluate the impact of academic journals.<sup>1,2</sup> Therefore, the impact factor has been widely used to evaluate the influence and academic levels of journals directly and indirectly in China and abroad.<sup>1–6</sup> However, the inappropriate use of impact factors can lead to, for example: unfair performance appraisal of researchers,<sup>7,8</sup> and inaccurate evaluation of the quality of journals<sup>9</sup> and research findings;<sup>10,11</sup> impact factors can also affect decisions for promotion, funding, and other financial support to researchers,<sup>12</sup> and even the award of post-graduate scholarships.<sup>13</sup> The impact factor should be used cautiously in evaluating technological research findings,<sup>14</sup> and the European Association of Science Editors has made a statement about the inappropriate use of impact factors on its website.<sup>15,16</sup> Studies have shown that the impact factor can be affected by the journal self-citation rate.\*<sup>17,18</sup> In order to correctly evaluate the influence of impact factor on academic journals, optional citation and standardization of impact factors has been investigated.<sup>19</sup> However, the negative effects of excessive self-citation have not been eliminated. The problem is how to define and determine excessive self-citation. We investigated the self-citation rates of 884 Chinese biomedical journals from 2005 to 2007 to determine a normal reference value of self-citation rate and to provide evidence for quantitatively evaluating excessive self-citation in Chinese biomedical journals.

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**ABSTRACT.** We investigated the self-citation rates of 884 Chinese biomedical journals, including 185 general medicine journals, 96 preventive medicine journals, 103 Chinese traditional medicine journals, 66 basic medicine journals, 370 clinical medicine journals, and 64 pharmaceutical journals. The average self-citation rates of these journals for the years 2005–2007 were  $0.113 \pm 0.124$ ,  $0.099 \pm 0.098$  and  $0.092 \pm 0.089$ , respectively, i.e. a downward trend year by year. The upper limits of normal values of self-citation rates for the same period were 0.316, 0.260 and 0.238, respectively. A significant difference was found in self-citation rate between biomedical journals of different subjects. 52 Chinese biomedical journals had no self-citation in 2007. The total citation frequency and impact factor of these 52 biomedical journals were 263 and 0.206, respectively, which were very much lower than the average levels of all Chinese biomedical journals in 2007. A self-citation rate higher than the upper limit was considered as excessive self-citation: 62 (7.01%), 68 (7.69%) and 66 (7.47%) biomedical journals showed excessive self-citation in the years 2005–2007, respectively. However, a certain amount of self-citation is reasonable and necessary.



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\* Note: the definition of 'self-citation' rate for a journal is the ratio of a journal's self-citation to the number of times it is cited by all journals; it contrasts with the 'self-citing' rate which is the ratio of a journal's self-citation to the total citations it makes.

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**Table 1. Self-citation rates of 884 Chinese biomedical journals from 2005 to 2007**

Group	n	Self-citation rate (mean $\pm$ SD)		
		2005	2006	2007
GM	185	0.082 $\pm$ 0.102	0.065 $\pm$ 0.079	0.064 $\pm$ 0.077
PM	96	0.150 $\pm$ 0.156	0.128 $\pm$ 0.112	0.118 $\pm$ 0.104
CTM	103	0.060 $\pm$ 0.060	0.057 $\pm$ 0.050	0.056 $\pm$ 0.060
BM	66	0.119 $\pm$ 0.110	0.102 $\pm$ 0.076	0.100 $\pm$ 0.064
CM	370	0.138 $\pm$ 0.136	0.123 $\pm$ 0.110	0.109 $\pm$ 0.096
PS	64	0.087 $\pm$ 0.081	0.080 $\pm$ 0.073	0.078 $\pm$ 0.079
Total	884	0.113 $\pm$ 0.124	0.099 $\pm$ 0.098	0.092 $\pm$ 0.089

GM, general medicine; PM, preventive medicine; CTM, Chinese traditional medicine; BM, basic medicine; CM, clinical medicine, PS, pharmaceutical sciences.  
Statistical test: paired-sample *t*-test.

### Methods

We examined Chinese and English-language biomedical journals published on the Chinese mainland. The self-citation rate was gathered from *Chinese Journal Citation Reports* 2006, 2007 and 2008, covering the years 2005–2007, published by the Institute of Scientific and Technical Information of China and Wanfang Data Co., Ltd. A total of 884 journals were included in these issues of *Chinese Journal Citation Reports*, including 185 (20.93%) in general medicine (GM), 96 (10.86%) in preventive medicine (PM), 103 (11.65%) in Chinese traditional medicine (CTM), 66 (7.47%) in basic medicine (BM), 370 (41.86%) in clinical medicine (CM, i.e. internal medicine, surgery, obstetrics and gynecology, pediatrics, phymatology, neurology and psychiatry, dermatology and venereology and organ science) and 64 (7.24%) in pharmaceutical science (PS). All data were analyzed by SPSS 17.

### Results and analysis

#### *Normal reference values of self-citation rates in Chinese biomedical journals*

The average levels (mean  $\pm$  SD) of self-citation rates in Chinese biomedical journals from 2005 to 2007 were 0.113  $\pm$  0.124, 0.099  $\pm$  0.098, and 0.092  $\pm$  0.089, respectively. There was a downward trend over the years and a significant difference ( $P < 0.01$ ). A normal distribution was found in data of self-citation rate with SPSS K-S analysis. As the normal reference value of self-citation

rate cannot be negative and the lower limit should be 0, the upper limit only need to be determined with  $\bar{x} \pm 1.64s$ . The upper limits of self-citation rates for the 884 biomedical journals for the years 2005–2007 were 0.316, 0.260, and 0.238, respectively. Thus, self-citation rates higher than 0.316 in 2005, 0.260 in 2006, and 0.238 in 2007 were considered as excessive self-citation. There were 62 (7.01%), 68 (7.69%), and 66 (7.47%) biomedical journals with excessive self-citation in the years 2005–2007, respectively. The maximum levels of self-citation rates were 0.790, 0.810, and 0.620 in the years 2005–2007, respectively.

#### *Self-citation rates of Chinese biomedical journals from 2005 to 2007*

The self-citation rates of the 884 Chinese biomedical journals from 2005 to 2007 are given in Table 1. There was a downward trend of self-citation rates in these journals ( $P = 0.000$ ), and also in each subject subset from 2005 to 2007. Paired-sample *t*-test showed that the largest difference in self-citation rates in biomedical journals for each subject subset was significant from 2005 to 2007, but the trends of self-citation rates in basic medicine and pharmaceutical journals were not statistically significant.

#### *Comparisons of self-citation rates among groups in 2007*

To evaluate the differences of self-citation rates among the subject subsets in 2007, analysis of variance and multiple compari-

*a total of 884 journals were included in these issues*

**Table 2 Comparisons of self-cited rates between each paired group in 2007 (P values)**

	PM	CTM	BM	CM	PS
GM	0.000	0.999	0.004	0.000	0.963
PM		0.000	0.918	1.000	0.083
CTM			0.000	0.000	0.599
BM				0.996	0.729
CM					0.084

$P < 0.05$  means that there is a significant difference in self-cited rates between two groups.

sons between each paired group were carried out. Heterogeneity of variance was found with homogeneity test of variance ( $F = 7.575$ ,  $P = 0.000$ ). The results showed that there was an obvious difference among groups ( $F = 14.829$ ,  $P = 0.000$ ). The comparisons of self-cited rates between each paired groups are given in Table 2.

#### **The 20 journals with the highest self-citation rates**

Table 3 lists the 20 journals with the highest self-citation rates.

#### **The total citation frequency and impact factor of 52 journals without self-citation in 2007**

There were 52 Chinese biomedical journals with no self-citation in 2007. The total citation frequency and impact factor of each journal are given in Table 4.

#### **Discussion**

Recently, the impact factor has been widely used to evaluate academic journals, research papers, and scientific researchers in China. Many have thought that editors of biomedical journals generally aim to improve the self-citation rate of their journals to achieve a higher impact factor. Thus, the higher self-citation rates of biomedical journals would become obvious. However, our study showed that the self-citation rates of Chinese biomedical journals had a downward trend rather than an increase from 2005 to 2007. The reasons may be that Chinese editors have become more rational about impact factor and self-citation so that the

improper way of raising impact factor by increasing self-citation is used less frequently; the source database includes more journals that can increase other-citation and decrease self-citation rate; and the average number of references in each biomedical journal has increased, which can elevate other-citation and lower self-citation rate. Other studies have shown that the average value of the self-citation rate of 15 overseas medical journals was 0.045 [20]. The self-citation rates of *Nature* were 0.013 and

*our study showed that the self-citation rates of Chinese biomedical journals had a downward trend rather than an increase*

**Table 3 The 20 journals with the highest self-citation rates in 2007**

Journal	Self-citation rate
GuojiYanke Zazhi	0.81
Yiliao Shebei Xinxi	0.70
Zhongguo Shaoshang Chuangyang Zazhi	0.67
Zhongguo CT He MRI Zazhi	0.55
Zhongguo Yiyuan Tongji	0.54
Zhongguo Tingli Yuyan Kangfu Kexue Zazhi	0.5
Yixue Yanjiusheng Xuebao	0.48
Shequ Weisheng Baojian	0.48
Linchuang Xinshen Jibing Zazhi	0.46
Zhonghua Weisheng Shachong Yaoxie	0.46
Zhongguo Meirong Yixue	0.45
Zhongguo Bingan	0.43
Zhongguo Fushe Weisheng	0.42
Xinxueguan Kangfu Yixue Zazhi	0.41
Linchuang Guke Zazhi	0.41
Zhongguo Xiandai Putong Waike Jinzhan	0.41
Redai Yixue Zazhi	0.41
Jujie Shoushu Zazhi	0.40
Zhongguo Xingwei Yixue Kexue	0.40

**Table 4 Total citation frequency and impact factor of 52 Chinese biomedical journals without self-citation in 2007**

Journal	TCF	IF	Journal	TCF	IF
<i>J Shanghai Second Med Univ</i>	18	0.102	<i>Heilongjiang Yixue</i>	689	0.217
<i>Chin Med Sci Journal</i>	193	0.338	<i>Jilin Yiyao Xueyuan Xuebao</i>	130	0.217
<i>J Acup Tuina Sci</i>	3	0.008	<i>Jiating Hushi</i>	30	0.000
<i>J Reprod Contracep</i>	2	0.000	<i>Kang Ai</i>	7	0.015
<i>J Trad Chin Med</i>	79	0.084	<i>Liaoning Yixue Zazhi</i>	298	0.228
<i>S China J Cardiol</i>	5	0.000	<i>Meiguo Yixuehui Zazhi</i>	40	0.049
<i>World J Acup-Moxib</i>	9	0.018	<i>Neimenggu Zhongyiyao</i>	304	0.042
<i>Aizheng Kangfu</i>	8	0.007	<i>Riben Yixue Jieshao</i>	409	0.201
<i>Anquan Yu Jiankang Yiliao Baojian</i>	69	0.061	<i>Shanxi Yiyao Zazhi</i>	44	0.000
<i>Baotou Yixue</i>	94	0.066	<i>Shanxi Zhigong Yixueyuan Xuebao</i>	153	0.140
<i>Dangdai Yixue</i>	11	0.000	<i>Jinggangshan Yizhuan Xuebao</i>	241	0.129
<i>Guoji Erkexue Zazhi</i>	838	0.556	<i>Shengjingbingxue Yu Jingshen Kangfuxue Zazhi</i>	26	0.065
<i>Guoji Jingshenbingxue Zazhi</i>	880	0.544	<i>Shiyong Yixue Yingxiang Zazhi</i>	225	0.248
<i>Guoji Kouqiang Yixue Zazhi</i>	622	0.252	<i>Shiyong Zhongxiyi Jiehe Linchuang</i>	343	0.258
<i>Guoji Neifenmi Daixie Zazhi</i>	1320	0.980	<i>Shiyong Zhongliuxue Zazhi</i>	502	0.369
<i>Guoji Pifubingxue Zazhi</i>	620	0.406	<i>Shoudu Yiyao</i>	415	0.239
<i>Guoji Xiaohuabing Zazhi</i>	472	0.430	<i>Sichuan Shengzhi Weisheng Xueyuan Xuebao</i>	6	0.006
<i>Guoji Xinxueguangbing Zazhi</i>	647	0.414	<i>Yan'an Daxue Xuebao</i>	40	0.000
<i>Guoji Yanke Zonglan</i>	791	0.454	<i>Yangsheng Yuekan</i>	15	0.002
<i>Guoji Yixue Fangshexue Zazhi</i>	68	0.342	<i>Yingguo Yixue Zazhi</i>	78	0.186
<i>Guoji Yizhi Yu Xueye Jinghua Zazhi</i>	87	0.295	<i>Zhongguo Chengxiang Qiye Weisheng</i>	67	0.082
<i>Guowai Yixue Jihua Shengyu/ Shengzhi Jiangkang Fenche</i>	303	0.377	<i>Zhongguo Chufangyao</i>	280	0.394
<i>Guowai Yixue Laonian Yixue Fenche</i>	256	0.233	<i>Zhongguo Kouqiang Yixue Jixu Jiaoyu Zazhi</i>	12	0.029
<i>Guowai Yixue Weishengxue Fenche</i>	826	0.856	<i>Zhongguo Weisheng</i>	134	0.182
<i>Guowai Yixue Fuchankexue Fenche</i>	843	0.295	<i>Zhongguo Yaodian</i>	45	0.030
<i>Jiating Zhongyiyao</i>	57	0.049	<i>Xiandai Yangsheng</i>	28	0.033
			<b>Average</b>	<b>263</b>	<b>0.206</b>

TCF, total cited frequency; IF, impact factor. Note: none of the journals in Tables 3 and 4 is covered by Thomson Reuters' Web of Science.

*the average self-citation rates of the 884 Chinese biomedical journals . . . are obviously higher than those of foreign journals*

0.012 in 2002 and 2003, the self-citation rates of *Science* were 0.012 and 0.011 in 2002 and 2003, and the average self-citation rate was 0.014 for journals whose impact factors were in top 10, and 0.094 for journals whose citation frequency was in the top 10 in 2002.<sup>21</sup> However, Biglu<sup>22</sup> reported that the self-citation rate of *Nature* was 0.058, and that of *Science* was 0.054 in 2005, which were significantly higher than that in 2003. The average self-citation rates of the 884

Chinese biomedical journals studied in this paper for the years 2005–2007 were  $0.113 \pm 0.124$ ,  $0.099 \pm 0.098$ , and  $0.092 \pm 0.089$ , respectively, which are obviously higher than those of foreign journals. The standard deviation of self-citation rates were 0.124, 0.098, and 0.089 for the years 2005–2007, respectively, showing that self-citation rate of Chinese biomedical journals varied widely and was different among different biomedical journals. Table 1 shows that the

self-citation rates in Chinese biomedical journals for different subjects had obvious differences: the PM journals had the highest, followed by CM, BM, PS, and GM journals, with CTM journals having the lowest rates.

### Excessive self-citation in Chinese biomedical journals

Excessive self-citation has a highly adverse effect on the value of impact factor as a measure.<sup>20</sup> However, we have long lacked a proper criterion of 'excessive'. We determined the upper limits of normal reference values of self-citation rates, which were 0.316, 0.260 and 0.238 for the years 2005–2007, respectively. Any self-citation rate which was higher than the upper limit we propose should be considered as excessive. There were 62, 68, and 66 biomedical journals with excessive self-citation for the years 2005–2007, respectively, and the highest self-citation rate was 0.81. We conjecture that this excessive self-citation is possibly fictitious, i.e. artificially created.

### Chinese biomedical journals without self-citation

Of the 884 journals we studied, 52 had no self-citation in 2007. Only *Foreign Medicine* series journals (now *International Medicine* series journals) had a high total citation frequency and impact factor; the others were without significant effect in these terms. These 52 were mostly *Foreign Medicine* series journals, which because of their aims and content seldom or never cite Chinese references. The average value of citation frequency in these 52 biomedical journals (263) was far lower than that of all biomedical journals (1120) according to *Chinese Journal Citation Reports 2008*, and the average value of impact factor (0.206) was much lower than that of 380 biomedical journals reported earlier (0.440) [23], which showed that the journal without self-citation did not have high other-citation either. The total citation frequency and impact factor were significantly lower than the average values of biomedical journals. Therefore journals with excessive self-citation or without self-citation are both abnormal. To a certain extent, an absence of self-citation indicates

that a journal lacks stability and continuity in content. It is both reasonable and necessary for good journals to have a certain amount of self-citation.

### Acknowledgements

Supported by the Scientific & Technical Development Plan of Xinxiang Medical University

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