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Introduction

The journal impact factor (IF), an important bibliometric indicator, is used ever more widely to evaluate the influence and academic level of a journal, directly or indirectly, whether in China or elsewhere, since Garfield¹ first presented it in 1955. In recent times, sponsors and journal editors and editorial boards have tried their best to improve the IF of their own journal. Many factors can affect IF, self-citation being one of them, and increasing self-citation can rapidly increase the IF. Journal self-citation and excessive self-citation in China have been reported,^{2,3} but few comparative studies on Chinese and other countries' journals have been reported. We selected journals included by SCI database from China, Japan, India, and Korea from 2007 to 2009, and analyzed the self-citation rate.

Method

The exact procedure followed for interrogating the database was: logon to the official web of ISI Web of Knowledge; choose the key 'other resource' and enter 'Journal Citation Reports'; from 'Select a JCR edition and year', select the 'JCR Science Edition' 2007–2009 in turn; from 'Select an option', choose 'View a group of journals by Country/Territory', then submit it; entering 'Country/Territory Selection', choose 'PEOPLES R CHINA', 'JAPAN', 'INDIA', 'KOREA'; on the column of 'Select one or more countries/territories from the list to filter journals', then submit it. Finally the system will show the general situation of periodicals included by the SCI database of the four countries from 2007 to 2009 automatically and respectively, including journal numbers, abbreviated journal names, ISSN, IFs, total cited frequency, etc., and calculates its self-citation rate. It deals with the research data statistically via SPSS 17.0, and self-citation rate is compared by multiple

Self-citation rates of scientific and technical journals in SCI from China, Japan, India, and Korea

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ABSTRACT. *We analyze the self-citation rates of scientific and technical journals in the SCI database from China, Japan, India, and Korea from 2007 to 2009. Korea has the highest self-citation rate, Japan the lowest. Compared with 2007, the overall level of self-citation rate declined across all four countries in 2008. In 2009, however, the self-citation rate of the three countries other than China rose a little. The total cited frequency and impact factor of excessive self-citing journals and zero self-citation journal in China, Japan, India, and Korea are all lower than those of the mean of all journals included in the SCI in 2009. It appears that the academic influence of journals whose self-citation rates is either too low or too high is small.*

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Table 1. Overall level of self-citation rate in the four countries from 2007 to 2009

Country	2007		2008		2009	
	No.	Self-citation rate	No.	Self-citation rate	No.	Self-citation rate
Japan	170	0.117 ± 0.115	175	0.094 ± 0.084	200	0.109 ± 0.106
China	94	0.216 ± 0.155	98	0.182 ± 0.143	139	0.169 ± 0.149
India	47	0.144 ± 0.136	45	0.124 ± 0.112	68	0.176 ± 0.215
Korea	38	0.260 ± 0.199	40	0.236 ± 0.214	64	0.272 ± 0.224

Table 2 Multiple comparisons about the self-citation rate of journal in the four countries from 2007 to 2009 (P values)

Country	Japan			India			Korea		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
China	0.00	0.00	0.00	0.02	0.12	0.75	0.98	0.89	0.10
Japan				0.74	0.55	0.30	0.00	0.00	0.00
India							0.03	0.06	0.02

$P < 0.05$ means that there is a significant difference in self-citation between two countries.

independent samples of non-parametric tests (Kruskal–Wallis H -test), and the self-citation rate between any two countries is compared through the Nemenyi rank-sum test. Inspection level: $\alpha = 0.05$.

Results

Overall level of self-citation rate in the four countries

The overall level of self-citation rate from 2007 to 2009 is shown in Table 1.

From Table 1, Korea has the highest self-cited rate for each of the years 2007 to 2009, while Japan has the lowest. Compared with 2007, the overall level of self-citation rate declined in the four countries in 2008. In 2009,

however, the self-citation rate of the three countries other than China increased again.

The results of multiple comparisons on self-citation are shown in Table 2.

Excessive self-citation journal of the four countries in 2009

Testing the 7,347 journal self-citation rates which were selected from the journals included in SCI in 2009, the data show an abnormal distribution. Therefore, percentile methods are used to determine the upper limit of the journal self-citation rate. We identify the 90th percentile unilateral upper limit of normal as 0.25. If the value of the self-citation rate is more than 0.25, it is identified as excessive. Based on this standard, the excessive

Table 3 Journals with excessive self-citation frequency, and their impact factor in 2009 (mean ± SD)

Country	No.	%	Self-citation rate	Total cited frequency	Impact factor
China	33	23.7	0.389±0.123	968±1246	0.712±0.637
Japan	20	10.0	0.354±0.110	717±1421	0.917±1.274
India	13	19.1	0.542±0.240	272±392	0.214±0.214
Korea	29	45.3	0.471±0.173	276±364	0.762±0.741

Table 4. Zero self-citation journals for China, Japan, India, and Korea

	2007	2008	2009
China	1	4	13
Japan	1	8	9
India	2	2	3
Korea	0	1	4

self-citation journals in the four countries in 2009 are shown in Table 3.

From Table 3, we can see that Japan has the lowest proportion of excessive self-citing journals, followed by India, China, and Korea. The

country which has the highest overall level of self-citation rate is India, followed by Korea, China, and Japan. China has the highest overall level of self-citation frequency, followed by Japan, Korea, and India. Japan has the highest overall level of IF, followed by Korea, China, and India.

Zero self-citation journals

The numbers of zero self-citation journals from 2007 to 2009 for China, Japan, India, and Korea are shown in Table 4. Over all three years, the mean number value of whole zero self-citation journals is 356, 564, 360,

Table 5. A comparison comparison of zero self-citation journals

Journal title	Publication year	Country	Impact factor	Total cited frequency	Eigenfactor
<i>Acta Phytotaxon Sin</i>	2009	China	0.333	427	0.00080
<i>Episodes</i>	2009	China	2.122	1134	0.00333
<i>Int J Min Met Mater</i>	2009	China	0	1	0
<i>J China Univ Geosci</i>	2009	China	0.210	173	0.00058
<i>J Univ Sci Technol B</i>	2009	China	0.416	453	0.00127
<i>Numer Math-Theory Me</i>	2009	China	0.696	24	0.00018
<i>China Part</i>	2009	China	1.102	183	0.00077
<i>Chinese J Astron Ast</i>	2009	China	0.888	543	0.00368
<i>Chinese Phys</i>	2009	China	1.343	2846	0.00733
<i>Res Astron Astrophys</i>	2009	China	0	33	0
<i>High Energ Phys Nuc</i>	2009	China	0.233	343	0.00118
<i>J Chin Inst Chem Eng</i>	2009	China	1.412	429	0.00124
<i>J Taiwan Inst Chem E</i>	2009	China	0	15	0
<i>J Jpn Soc Tribologis</i>	2009	Japan	0.048	93	0.00036
<i>Jpn J Math</i>	2009	Japan	1.071	255	0.00130
<i>K Yushu J Math</i>	2009	Japan	0.463	95	0.00118
<i>New Diam Front C Ter</i>	2009	Japan	0.739	140	0.00053
<i>Optim Method Softw</i>	2009	Japan	0.866	682	0.00340
<i>Electron Comm Jpn 1</i>	2009	Japan	0.188	63	0.00047
<i>Electron Comm Jpn 2</i>	2009	Japan	0.180	116	0.00056
<i>Electron Comm Jpn 3</i>	2009	Japan	0.141	84	0.00018
<i>J Jpn Soc Food Sci</i>	2009	Japan	0.153	294	0.00055
<i>J Spacecr Technol</i>	2009	India	0.034	6	0
<i>Orient Insects</i>	2009	India	0.230	140	0.00028
<i>B Astron Soc India</i>	2009	India	0.310	140	0.00063
<i>J Korean Meteor Soc</i>	2009	Korea	0.550	85	0.00040
<i>Korean J Genetic</i>	2009	Korea	0.310	82	0.00028
<i>J Biochem Mol Biol</i>	2009	Korea	2.020	1394	0.00545
<i>J Commun Netw-S Kor</i>	2009	Korea	0.220	171	0.00082
Summation (39)			0.561±0.582	360±578	0.0013±0.0017

and the mean value of impact factor is 0.336, 0.396 and 0.561.

A comparison of zero self-citation journals in China, Japan, Indian and Korea is shown in Table 5.

Analysis and discussion

The self-citation rate of a journal

With the wide application of IFs, many journal editors are single-mindedly trying to improve their journal's self-citation rate in order to improve the journal impact factor. Liu² and others have studied the self-citation rate of Chinese medical journals, showing that there are large differences there. At the same time, related research showed that the average self-citation rate was significantly higher than that of foreign medical journals for the years 2005–2007.^{3–5} But how do Chinese journals compare with others in Asia if we look at those journals covered by SCI? In Asia, Japan and Korea are developed countries, while China and India are developing rapidly. This comparison can therefore help us not only to know the difference between China and other countries in Asia, but also provide some useful information for the journals in China, perhaps helping them to take some appropriate measures to improve their academic influence in an attempt to get more journals included by international authoritative database and retrieval institutions.

The self-citation rate of journal is influenced by many factors, among which the influence of the journal itself (i.e. whether it contains items worthy of citation) is the most important. Among the four countries studied here, Japan has the lowest journal self-citation rate, which is related to its high level of economy and scientific research on the one hand, and on the other hand, with the great number of Japanese journals included in the SCI database which makes it easy to cite among journals in the same country. However, Korea, which is also a developed country, has few journals included in the SCI database, and its overall level of self-citation is higher than that of Japan. However, in China, the quantity of journals included in the SCI database increased substantially year on year from 2007 to 2009, and the overall level of self-citation

is also undergoing a decline year on year. By 2009, the upper limit of self-citation rate was higher only than that of Japan. We also suggest that the strength of scientific research in China is progressively improving, and the level of science and technology itself and national influence is also gradually improved. Liu⁶ also draws the same conclusion.

Excessive self-citation of a journal

Almost by definition the excessive self-citation of a journal has an obvious influence on IF, which will result in the IF not accurately reflecting its influence. The self-citation rate of many well-known international journals is mostly below 0.15. According to the Journal Self-citation Analysis Report of SCI, a journal will be regarded as a high self-citation journal once its self-citation rate is above 0.20. In this study, we defined and analysed as excessive self-citation journals whose self-citation rate is above 0.25. The results show that Korea has the highest number of excessive self-citation journals followed by China, India, and Japan. The large proportion of excessive self-citation journals in China partly reflects the fact that the influence of Chinese journals included by SCI all around the world is still limited and few journals are cited by others included by SCI. However, on overall level of excessive self-citation and IF, only Japan is superior, and the average citation frequency ranks first, which suggests that Chinese academic impact is improving continuously.

On the zero self-citation journal

The total cited frequency and the average value of the IF of zero self-citation journals in the four countries is all low, and far lower than those of all the journals covered by SCI in 2009. In addition, the value of the eigenfactor is also obviously low, most of which are zero, which suggests that these journals have few citations from other journals. These zero self-citation journals are not all top international journals, while top journals such as *Nature* and *Science* have a certain self-citation rate, and appropriate self-citation is reasonable, and even necessary for improving the influence of a journal. In China, the number of zero self-citation journals included by the SCI database increased year on year from 2007 to

2009, which was related to the fact that self-citation had been controlled by the scientific journal field in China. However, on the other hand, zero self-citations can reflect the instability of the authors of the journal, and zero self-citation journals should appropriately encourage authors to refer to other relevant professional journals, and at the same time, cite properly the relevant papers which have been published in their own journal in order to improve the journal impact. It is clear that a balance is needed. Therefore, the emergence of zero self-citation journals is also unreasonable, and the journals should maintain a certain amount of self-citations.

The academic influence of a journal whose self-citation rate is either too low or too high is likely to be low. Since the total quantity of both excessive self-citation journals and zero self-citation journals is high in China, the management departments of journals in China should work hard to increase the influence of the journal and avoid both an excess and absence of self-citation.

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