



Original Article

Trends in global acupuncture publications: An analysis of the Web of Science database from 1988 to 2015

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Received March 28, 2016; accepted December 31, 2016

Abstract

Background: Acupuncture is a rapidly growing medical specialty worldwide. This study aimed to analyze the acupuncture publications from 1988 to 2015 by using the Web of Science (WoS) database. Familiarity with the trend of acupuncture publications will facilitate a better understanding of existing academic research in acupuncture and its applications.

Methods: Academic articles published focusing on acupuncture were retrieved and analyzed from the WoS database which included articles published in Science Citation Index-Expanded and Social Science Citation Indexed journals from 1988 to 2015.

Results: A total of 7450 articles were published in the field of acupuncture during the period of 1988–2015. Annual article publications increased from 109 in 1988 to 670 in 2015. The People's Republic of China (published 2076 articles, 27.9%), USA (published 1638 articles, 22.0%) and South Korea (published 707 articles, 9.5%) were the most abundantly prolific countries. According to the WoS subject categories, 2591 articles (34.8%) were published in the category of Integrative and Complementary Medicine, followed by Neurosciences (1147 articles, 15.4%), and General Internal Medicine (918 articles, 12.3%). Kyung Hee University (South Korea) is the most prolific organization that is the source of acupuncture publications (365 articles, 4.9%). Fields within acupuncture with the most cited articles included mechanism, clinical trials, epidemiology, and a new research method of acupuncture.

Conclusion: Publications associated with acupuncture increased rapidly from 1988 to 2015. The different applications of acupuncture were extensive in multiple fields of medicine. It is important to maintain and even nourish a certain quantity and quality of published acupuncture papers, which can play an important role in developing a medical discipline for acupuncture.

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Keywords: Acupuncture; Qualitative method; Statistics

Abbreviations: SCI-E, Science Citation Index-Expanded; SSCI, Social Science Citation Index; SPSS, Statistical Product and Service Solutions; USA, United States of American; WoS, Web of Science.

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

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1. Introduction

Academic publication is a key factor in the successful development of a medical specialty or discipline. Acupuncture has attracted significant attention and research since its introduction to the Western world and it has become a rapidly growing medical field in academic publications.¹ To the best of our knowledge, there are few bibliometric analyses used to

examine the profile of publication activity related to acupuncture. Knowing the trend of acupuncture publications will be helpful in better understanding the acupuncture academic research and its applications.

Web of Science (WoS) is a powerful research database officially functioning since 2004 by the Thomson Scientific and Health Care Corporation. The WoS database contains not only the affiliation of all authors, but also provides the citation number of published articles. Additionally, WoS provides access to Thomson Reuter's multidisciplinary databases of bibliographic information such as the Science Citation Index-Expanded (SCI-E), Social Sciences Citation Index (SSCI), and the Arts and Humanities Citation Index and Journal Citation Report (JCR).^{2–4} Ultimately, WoS is a powerful web interface providing access to citation databases.

The aim of this study was to analyze the acupuncture publications from 1988 to 2015 by using WoS database to understand the current status of acupuncture research and its applications.

2. Methods

The WoS database was accessed through Taipei Veterans General Hospital Library website on March 10, 2016. In the first stage, “acupunctur*” OR “electroacupunct*” OR “acupoint*” OR “acupressure*” were combined to search worldwide acupuncture publications by Title. Publications in the SCI-E and SSCI from January 1, 1988 to December 31, 2015 were searched, including all article types. Then, publication types, including articles, letters, reviews, proceedings papers, editorial materials and notes were included in the second stage analyses. Publications of meeting abstracts, news item, corrections, correction addition, book chapters, book reviews, reprints, and biographical items were not included. WoS subject category, authors (including all authors), and organization/institute which published articles and the journal name of published articles were analyzed.

In order to analyze the citation number of published articles, we also obtained the citation number of each paper from WoS. The JCR impact factors (2014 version) were performed, after which the top ten most cited articles were calculated from 1988 to 2015.

3. Results

Using a comprehensive search of the WoS database, which included articles published in SCI-E and SSCI journals, we found a total of 8490 articles published about acupuncture worldwide during the period of 1988–2015. After excluding meeting abstracts, news items, corrections, correction additions, book chapters, book reviews, reprints, and biographical items, 7450 articles were included in the final analysis. **Table 1** shows the list of top ten prolific country/areas of articles published about acupuncture. The People's Republic of China (2076 articles, 27.9%), the USA (1638 articles, 22.0%) and South Korea (707 articles, 9.5%) were the countries responsible for the most published articles. Annual articles published

Table 1

Top ten prolific country/areas of published acupuncture articles from 1988 to 2015.

Country/Area	Articles published	% of 7450
People's Republic of China	2076	27.9%
USA	1638	22.0%
South Korea	707	9.5%
England	630	8.5%
Germany	480	6.4%
Taiwan	411	5.5%
Japan	347	4.7%
Sweden	232	3.1%
Australia	228	3.1%
Brazil	180	2.4%

Total of 7450 articles searched from the Web of Science database including articles published in SCI-E and SSCI journals.

from the field of acupuncture rapidly increased from 109 articles in 1988 to 670 articles in 2015.

According to the WoS subject categories, 2591 articles (34.8%) were published in the Integrative and Complementary Medicine category, followed by Neurosciences (1147 articles, 15.4%), General Internal Medicine (918 articles, 12.3%), Clinical Neurology (745 articles, 10.0%), and Anesthesiology (402 articles, 5.4%) (**Table 2**). Interestingly, 233 papers (3.1%) were published in the subject category of Veterinary Science. The top-most five prolific authors in the field of acupuncture publication included Ernst E (Edzard Ernst, UK), Lee H (Hyangsook Lee, South Korea), Park HJ (Hi-Joon Park, South Korea), Lin JG (Jaung-Geng Lin, Taiwan) and Lee MS (Myeong Soo Lee, South Korea) (**Table 3**).

Table 4 listed the top ten journals which published acupuncture articles. It shows that *Evidence Based Complementary and Alternative Medicine* published the most acupuncture articles (539 articles [7.2%]), followed by *Acupuncture in Medicine* (414 articles [5.6%]), and *Journal of Alternative and Complementary Medicine* (389 articles [5.2%]).

Kyung Hee University (South Korea) published the most acupuncture articles (365, 4.9%), followed by the Chinese Academy of Medical Sciences (175 articles, 2.3%), Harvard University (163 articles, 2.2%), China Medical University (140 articles, 1.9%), and Fudan University (139 articles, 1.9%) (**Table 5**).

Table 2

Acupuncture-related published articles in different research fields according to Web of Science subject category.

Web of Science subject category	Articles published	% of 7450
Integrative Complementary Medicine	2591	34.8%
Neurosciences	1147	15.4%
General Internal Medicine	918	12.3%
Clinical Neurology	745	10.0%
Anesthesiology	402	5.4%
Medicine Research Experimental	270	3.6%
Obstetrics Gynecology	237	3.2%
Veterinary Sciences	233	3.1%
Pharmacology Pharmacy	159	2.1%
Cell Biology	147	2.0%

Table 3
The most prolific authors who published articles in the field of acupuncture from 1988 to 2015.

Author name	Articles published	% of 7450
Ernst E	120	1.6%
Lee H	109	1.5%
Park HJ	105	1.4%
Lin JG	97	1.3%
Lee MS	96	1.3%
Lao LX	83	1.1%
Han JS	82	1.1%
Macpherson H	79	1.1%
Litscher G	69	0.9%
Wang Y	67	0.9%

Table 4
Top ten journals worldwide that published acupuncture-related articles from 1988 to 2015.

Journal name	Paper published	% of 7450
<i>Evidence Based Complementary and Alternative Medicine</i>	539	7.2%
<i>Acupuncture in Medicine</i>	414	5.6%
<i>Journal of Alternative and Complementary Medicine</i>	389	5.2%
<i>American Journal of Chinese Medicine</i>	241	3.2%
<i>Acupuncture Electrotherapeutics Research</i>	236	3.2%
<i>Complementary Therapies in Medicine</i>	137	1.8%
<i>Neuroscience Letters</i>	126	1.7%
<i>Journal of Traditional Chinese Medicine</i>	125	1.7%
<i>Neural Regeneration Research</i>	117	1.6%

According to cited numbers from 1988 to 2015, the fields with the top ten most cited articles included mechanism (5 articles), overall introduction (especially in epidemiology) (2 articles), clinical trials (2 articles), and a new research method of acupuncture (1 article) (Table 6). Besides, the mean impact factor of journals focusing on acupuncture from 1988 to 2015 was 3.06 ± 4.42 (Table 7). The mean impact factor of published journals in 1993–1998 was 4.73, significantly higher than that of other periods (from 3.29 to 3.60).

4. Discussion

Currently, due to the electronic publishing system, we can easily obtain information about academic publications from a

Table 5
Top ten organizations worldwide that published acupuncture articles from 1988 to 2015.

Organizations name	Paper published	% of 7450
Kyung Hee University	365	4.9%
Chinese Academy of Medical Sciences	175	2.3%
Harvard University	163	2.2%
China Medical University	140	1.9%
Fudan University	139	1.9%
Korea Institute of Oriental Medicine	136	1.8%
University of Exeter	133	1.8%
Beijing University of Chinese Medicine	126	1.7%
University System of Maryland	125	1.7%
Capital University of Medical Sciences	115	1.5%

medical specialty/discipline through the World Wide Web, and can make international or domestic comparisons of research productivity among countries/institutes, so as to realize the future direction of academic research. PubMed developed by the National Center for Biotechnology Information, part of the USA's National Library of Medicine, is a free, on-line and widely used system for literature searches. However, no citations of publications and co-authors' affiliation were provided in PubMed. Scopus developed by Elsevier in Netherlands, Google Scholar developed by Google Inc. in the USA, and WoS by the Thomson Scientific and Health Care Corp. in USA all can provide strong literature searches and citations of publications.^{2–5} The Impact factor in JCR developed by the Thomson Scientific and Health Care Corp. has been garnering more attention in recent years as a measure of journal quality, but its impact on academia is seldom demonstrated.^{6–10} Thus, we used WoS database and impact factor of journals from JCR to evaluate the acupuncture publications in this study to bridge their deficiency.

Our results showed that China and South Korea were the most active eastern countries in acupuncture research and publications, while the USA and England were the most active western countries for acupuncture research and publications. Besides, China, South Korea and USA are the major countries with agencies contributing funding to acupuncture research, according to the WoS database. This phenomenon may create a situation where elevated resource input of a country may influence the results of acupuncture publications.

According to our results, acupuncture publications are distributed among several medical disciplines including internal medicine, neuroscience, anesthesiology, obstetrics and gynecology, and rehabilitation. These diverse areas suggest that the actions and applications of acupuncture are extensive, and impact a variety of practice areas.¹¹ Besides, acupuncture is also applied to veterinary sciences, which may indicate that animal models utilized for acupuncture research were popular.^{12,13}

Bibliographic analyses of publications have been used to assess the scientific status of disciplines, research institutes and participating scientists. Our results showed that most of the acupuncture publications were generated at university departments or university affiliated/teaching hospitals which were responsible for teaching, research and clinical services. For example, Kyung Hee University is the most prolific organization for acupuncture publications. This may result from the national support and promotion of traditional Korean medicine due to higher clinical demands¹⁴ and the increasing emphasis of traditional Korean medicine education programs in Korean medical schools.^{15,16} Therefore, the cooperation of teaching, research and clinical services fellows in the field of acupuncture may be important for acupuncture research and publications.

From the top ten cited acupuncture articles from 1988 to 2015, the resulting array of articles included the neural mechanism of acupuncture (5 articles), clinical trials or applications of acupuncture (4 articles), and a new research method of acupuncture (1 article). Based on these articles, the

Table 6
Top ten cited acupuncture articles from 1988 to 2015.

Title	Authors	Journal (5-years impact factor)	Published year	Total cited numbers
Acupuncture	Ramsay, DJ; Bowman, MA; Greenman, PE; et al.	<i>JAMA – Journal of the American Medical Association</i> (31.026)	1998	485
Introducing a placebo needle into acupuncture research	Streitberger, K; Kleinhenz, J	<i>Lancet</i> (42.724)	1998	402
Acupuncture: neuropeptide release produced by electrical stimulation of different frequencies	Han, JS	<i>Trends in Neurosciences</i> (14.695)	2003	352
Acupuncture: Theory, efficacy, and practice	Kaptchuk, TJ	<i>Annals of Internal Medicine</i> (17.469)	2002	336
Acupuncture modulates the limbic system and subcortical gray structures of the human brain: evidence from fMRI studies in normal subjects	Hui, KKS; Liu, J; Makris, N; et al.	<i>Human Brain Mapping</i> (6.687)	2000	332
Electroacupuncture: Mechanisms and clinical application	Ulett, GA; Han, SP; Han, JS	<i>Biological Psychiatry</i> (10.359)	1998	317
Acupuncture and endorphins	Han, JS	<i>Neuroscience Letters</i> (2.169)	2004	284
Acupuncture for patients with migraine – A randomized controlled trial	Linde, K; Streng, A; Jurgens, S; et al.	<i>JAMA – Journal of the American Medical Association</i> (31.026)	2005	281
Acupuncture in patients with osteoarthritis of the knee: a randomised trial	Witt, C; Brinkhaus, B; Jena, S; et al.	<i>Lancet</i> (42.724)	2005	255
New findings of the correlation between acupoints and corresponding brain cortices using functional MRI (Retracted Article. See vol 103, pg 10527, 2006)	Cho, ZH; Chung, SC; Jones, JP; et al.	<i>Proceedings of the National Academy of Sciences of the United States of America</i> (10.563)	1998	251

Table 7
Impact factor (IF) of journal-published articles related to acupuncture from 1988 to 2015.

Published year	Mean IF	IF < 2 (articles numbers, percentage)	IF = 2–5	IF = 5–10	IF ≥ 10
1988–1992	3.29 ± 6.17	151 (36.56%)	222 (53.75%)	34 (8.23%)	6 (1.45%)
1993–1998	4.73 ± 8.65	199 (39.96%)	213 (42.77%)	43 (8.63%)	43 (8.63%)
1999–2004	3.60 ± 5.57	471 (43.69%)	391 (36.27%)	151 (14.01%)	65 (6.03%)
2005–2010	3.51 ± 5.26	1038 (46.59%)	863 (38.73%)	198 (8.89%)	129 (5.78%)
2011–2015	3.49 ± 5.03	1948 (64.63%)	782 (25.95%)	208 (6.90%)	76 (2.52%)
1988–2015	3.06 ± 4.42	3807 (52.65%)	2471 (34.17%)	634 (8.77%)	319 (4.41%)

trend of acupuncture will be spurred by public interest and concern in the future, and will focus on acupuncture guidelines for specific diseases based on high quality clinical trials, and improved elucidation of acupuncture mechanisms.

Our study confronted a limitation in that we used the key word “acupunctur*” (or “electroacupunct*” or “acupoint*” or “acupressure*”) in searching SCI or SSCI publications. Certain publications might be underestimated because articles from non-English publications or some acupuncture-related techniques (such as moxibustion) were not included. However, it is quite acceptable to find most articles utilizing the customary WoS database methods.

In conclusion, our research showed that publications focusing on acupuncture increased rapidly from 1988 to 2015. The diverse applications of acupuncture in the articles were extensive, encompassing multiple fields of medicine. Overall, it remains important to maintain a certain quantity and quality

of published acupuncture papers, which play a key role in developing a medical discipline for acupuncture.

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