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**Worldwide orthopaedic research activity 2010-2014: Publication rates in the top 15 orthopaedic journals**

Hohmann E *et al*. Worldwide orthopaedic research activity

**Erik Hohmann, Vaida Glatt, Kevin Tetsworth**

**Erik Hohmann,** Medical School, University of Queensland,Herston 4006, Australia

**Erik Hohmann, Medical School,** Faculty of Health, University of Pretoria, Pretoria 0002, South Africa

**Erik Hohmann,** Department of Orthopedic Surgery and Sports Medicine,Valiant Clinic/Houston Methodist Group, Dubai 414296, United Arab Emirates

**Vaida Glatt,** University of Texas Health Science Center, San Antonio, TX 78229, United States

**Kevin Tetsworth,** Department of Orthopaedic Surgery, Royal Brisbane Hospital, Herston 4006, Australia

**Kevin Tetsworth,** Department of Surgery, School of Medicine, University of Queensland, Herston 4006, Australia

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**Correspondence to: Erik Hohmann, FRCS, FRCS (Tr&Orth), MD, PhD,** Department of Orthopedic Surgery and Sports Medicine, Valiant Clinic/Houston Methodist Group, Dubai 414296, United Arab Emirates. [ehohmann@hotmail.com](mailto:ehohmann@hotmail.com)

**Telephone:** +971-4-3788818

**Fax:** +971-4-3788718

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**Abstract**

***AIM***

To perform a bibliometric analysis of publications rates in orthopedics in the top 15 orthopaedic journals.

***METHODS***

Based on their 2015 impact factor, the fifteen highest ranked orthopaedic journals between January 2010 and December 2014 were used to establish the total number of publications; cumulative impact factor points (IF) per country were determined, and normalized to population size, GDP, and GDP/capita, comparison to the median country output and the global leader.

***RESULTS***

twenty-three thousand and twenty-one orthopaedic articles were published, with 66 countries publishing. The United States had 8149 publications, followed by the United Kingdom (1644) and Japan (1467). The highest IF was achieved by the United States (24744), United Kingdom (4776), and Japan (4053). Normalized by population size Switzerland lead. Normalized by GDP, Croatia was the top achiever. Adjusting GDP/capita, for publications and IF, China, India, and the United States were the leaders. Adjusting for population size and GDP, 28 countries achieved numbers of publications to be considered at least equivalent with the median academic output. Adjusting GDP/capita only China and India reached the number of publications to be considered equivalent to the current global leader, the United States.

***CONCLUSION***

Five countries were responsible for 60% of the orthopaedic research output over this 5-year period. After correcting for GDP/capita, only 28 of 66 countries achieved a publication rate equivalent to the median country. The United States, United Kingdom, South Korea, Japan, and Germany were the top five countries for both publication totals and cumulative impact factor points.

**Key words:** Bibliometrics; Orthopedic surgery; Impact factor; Publication productivity

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**Core Tip:** The total number of publications by a country is one of the best indicators of research output and productivity, and is an important aspect of clinical excellence. Our results demonstrate that the United States collectively published more articles and accumulated the highest number of impact factors during the study period, and confirms its overwhelming dominacn of publications in the fifteen highest ranked journals in orthopaedics. However, after adjusting for population size, Switzerland was the most academically productive nation. Similarily, after adjusting the number of publications with respect to GDP, Croatia was the most productive, and ‘cost effective’ country.

Hohmann E, Glatt V, Tetsworth K. Worldwide orthopaedic research activity 2010-2014: Publication rates in the top 15 orthopaedic journals related to population size and gross domestic product. *World J Orthop* 2017; in press

**INTRODUCTION**

The total number of publications by a country is one of the best indicators of research output and productivity[1], and is an important aspect of clinical excellence[2,3]. Prior bibliographic analyses of orthopaedic academic output have concentrated on the total number of publications per country over various periods ranging from five to ten years[4-6]. The United States, United Kingdom, Germany, Japan, and South Korea have all consistently ranked among the five most productive countries.

The availability of funding has been shown to result in higher publication output, favoring those countries with a larger population size and more powerful economies[6,7]. However, no prior bibliographic analysis of orthopaedic research and publications has accounted for population size or economic discrepancies. To adjust for these inconsistencies, the use of the gross domestic product (GDP) and gross domestic product per capita (GDP/capita) may provide a more meaningful result, and allow for a better comparison between countries[8]. Although the number of publications per capita is one simple way to minimize this inherent bias, it is not the only approach that can be used to determine how academically productive various nations have been. The reciprocal, population size per publication for example, is an equally valid metric that perhaps better expresses this relationship. This reciprocal approach has been employed instead in various iterations throughout this study, to more directly investigate how academically active each nation has been in the field of orthopaedics over the past five years.

Using the fifteen highest rated orthopaedic journals over a five year period, based on the 2015 impact factor, the purpose of this study was threefold: First, to investigate the number of publications and total impact factor from each country, and to then relate these variables to population size, GDP, and GDP per capita. Second, to determine the minimum number of publications required to be comparable to the country producing the median number of publications, when normalized for GDP per capita. Finally, to establish the number of publications that would be required from each country to be equivalent to the country having the highest research output, when normalized for GDP per capita.

**Materials and methods**

The 2015 Journal Citation report was accessed on the Web of Science (Thomson Reuters, New York, United States)[9] , and the fifteen highest ranked journals based on their 2015 impact factor were selected from the category “orthopedics”. Journals were excluded from this list if they were not directly related to the field of orthopedics, or if their main purpose was to provide narrative review articles (Table 1). The abstracts of all articles published in these 15 journals between January 2010 and December 2014 were screened *via* the journals’ websites. Letters to the editor, editorials, editorial comments, historical articles, errata, proceeding papers, meeting abstracts, and notes were excluded. Only research articles (level 1-4), systematic reviews, meta-analyses, non-solicited review articles, and case reports were included. The level of evidence was recorded for each published article; if the journal did not assign the level of evidence, the levels of evidence chart published by the Journal of Bone and Joint Surgery was used[10]. Each publication was assigned a country of origin defined by the location of the the authors’ principal institution, or defined by the country of origin of the corresponding author if the manuscript did not provide details about study location. Any discrepancies were resolved by agreement between the two senior authors. The total number of publications and the total number of impact factor points per country were collated.

GDP and GDP per capita were sourced from the World Bank website[11], and population size was extracted from the CIA World Factbook[12]. To describe the relationship between population size and the number of publications from a given nation, the population size of that country was divided by their total number of publications. The resulting value describes the population size per publication (PSPP) for that nation; in other words, the calculated value defines the population size per published article, allowing for a better and more direct comparison accounting for population size. Likewise, to define the population size per impact factor point (PSIP) from a given nation the population of that country was divided by their total impact factor points.

Extending this analysis, the gross domestic product was also divided by the total number of publications and impact factor points. These values provide an overview of the gross cost associated with producing a manuscript (GDPP), as well as the gross cost associated with producing one impact factor point (GDPI) for each country. Finally, to simultaneously adjust for population size and economic strength, the GDP per capita was divided by either the total number of publications or by cumulative impact factor points. These values then provide information regarding the gross cost per capita associated with producing a manuscript (GDPCP), or the gross cost per capita associated with producing one impact factor point (GDPCI) for each country.

The list for GDPCP was next ranked lowest to highest to identify the median country. This median country then served as the benchmark, and a correction coefficient was calculated that was normalized to this median country. In this way the number of publications of the median country could then be used to calculate the number of publications every country would need to produce to be considered equivalent to that median country. Dividing the GDPCP of each country by this normalizing coefficient, (NCmed) determined the number of publications that would be necessary for each country to produce to be considered equivalent to the median country. This provides an excellent measure, corrected for economic power (GDP/capita) and population size, of the expected academic output of different countries, normalized to the output of the median nation.

Finally, a very similar process was followed where a correction coefficient was determined that was instead normalized to the publication output of the current global leader in orthopaedic research. The most active country then served as the benchmark, and a coefficient was calculated that was normalized to the academic activity of that country (NCtop). This value was then used to calculate the number of publications every country would need to produce to be considered equivalent to the global leader. Dividing the GDPCP of each country by this NCtop thus determines the number of publications that would be necessary for each country to produce to be considered equivalent to the global leader. This provides an excellent measure, corrected for economic power (GDP/capita) and population size, of the expected academic output of different countries, normalized to the ouput of the leading nation.

**RESULTS**

A total of 23021 orthopaedic articles were published in the 15 highest ranked orthopaedic surgery journals during the study period, between January 2010 and December 2014 (Table 1). Table 2 demonstrates the top ten countries for each of the fifteen journals, in terms of number of publications. The United States was consistently the leading country in ten of the fifteen journals, and was also the most productive country with a total of 8149 publications; they were followed by the United Kingdom and Japan, having 1644 and 1467 publications, respectively. A total of 66 countries had published at least one article (Table 3) during the study period. Similar to the number of publications, the United States also accumulated the largest number of impact factor points (24744) followed by the United Kingdom (4776) and Japan (4053) (Table 3). Overall, the top five countries were the United States, United Kingdom, Japan, South Korea, and Germany, and these countries were together responsible for 60.4% of all publications, and 61.4% of all impact factor points.

However, when adjusted for population size (PSPP), Switzerland was the leading country with one publication per 15,300 people, followed by Norway with one publication per 21100, and Denmark with one publication per 22300. Switzerland was also the leader in the category of impact factor (PSPI), accumulating one impact factor point per 5400 people, followed by Norway with one impact factor point per 6700, and Holland with one impact factor point per 7800 (Table 4).

The number of publications, when normalized with respect to economic activity (GDPP), was highest for Croatia, with one publication per $772000, followed by Korea with $1042000, and Greece with $1294000. For impact factor (GDPI) Croatia was again the leader, and produced one impact factor point per $359000, followed by Korea with $375000, and Holland with $408000 (Table 5). When adjusting for both GDP and population simultaneously (GDPCP) China was the leader, producing one publication per $6200, followed by India with $6400, and the USA with $6700. The USA was the leader in the impact factor category (GDPCI), producing one impact factor point per $2200, followed by India with $2400 and China $2500 (Table 6). However, these results need to be interpreted carefully, and it is probable that the extremely large population size of both China and India resulted in data distortion.

When ranked with respect to GDPCP Poland was the median country, publishing 61 articles, and served as the median academic output benchmark. The results showed that 28 countries were able to achieve this academic output (Table 7). As an example, for the United States to achieve this benchmark a minimum of 235 publications were required; however, a total of 8149 publications were recorded, which was 3,468% greater than the requisite number. For Norway, to achieve this benchmark a minimum of 414 publications were required, but only 240 publications were recorded; this was only 58% of the number of publications necessary to have achieved an academic output equivalent to the median activity (Table 7).

The United States was the leader when ranked with respect to GDPCP, publishing 8,149 articles, and served as the leading academic output nation. Using the NCtop to calculate the required number of publications to be equivalent with the global research leader (US), only two other countries, China and India, were considered equivalent or superior (Table 8). For example, for Korea 4,174 publications would have been needed to have an academic ouput equivalent to that of the United States, but only 1354 articles (32%) were published. Again, these results need to be interpreted carefully, and it is highly probable that the large population size of both China and India resulted in data distorsion.

**DISCUSSION**

These results demonstrate that the United States collectively published more articles and accumulated the highest number of impact factor points during the study period from 2010 through 2014, and confirms its overwhelming dominance of publications in the fifteen highest ranked journals in the field of orthopaedics. However, after adjusting for population size, Switzerland was the most academically productive nation. Similarly, after adjusting the number of publications with respect to GDP, Croatia was the most productive, and “cost effective” country.

Over the last 30 years, English has become the international language of medical science[13]. Of the current top 50 highest impact journals in orthopaedics, 45 are based in English speaking countries; all 50 of these journals publish their manuscripts in English only[9]. The majority of those countries where English is the primary language also enjoy a high standard of living, and would appear to have advantages in terms of research funding and academic opportunity. Although this suggests an inherent bias towards authors from those countries where English is the principal language, over this 5-year period articles were published by a total of 66 different countries; in many of those countries English is not the main language. Strategies were employed here to attempt to eliminate or minimize any of these potential socio-economic advantages, and therefore obtain a better measure of the relative academic activity and orthopedic research ouput from various nations around the world. This study has revealed superior academic activity outcomes has been achieved by several of these countries, when adjusted for population size and GDP.

Both GDP and GDP per capita are indicators of economic strength, representing the value of all goods and services produced over a specified time period[7]. The cost of producing a research paper per GDP/capita is theoretically a better indicator of a country’s research productivity, one that takes into consideration some of the socio-economic conditions that might favor more populous or prosperous nations. After adjusting for GPD per capita both India and China were the leading countries, but due to their inordinately large population size the calculated figures are most likely biased. After eliminating these two countries, the United States, South Korea, Japan, Germany, and the United Kingdom ranked among the top five countries with the highest number of both publications and impact factor points. One possible explanation could be that the research output of these countries is directly related to economic vitality, although none of these five leading countries had the highest GDP per capita. For example, the United States, ranked 8th, Germany 15th, the United Kingdom 17th, Japan 23rd and South Korea 27th. Earlier research by Meo *et al*[7] and Halpenny *et al*[8] also failed to demonstrate a correlation between GDP per capita, total number of publications, and h-index in different science fields and social science disciplines. However, they were able to confirm a strong and positive correlation between the number of publications and the percentage of GDP spent on research.

This study introduced a new metric to bibliographic analysis, normalizing the collective publications and impact factor points of individual nations to that of the output of the median nation, after first correcting for both population size and economic activity. Although this measure has not been validated yet and may lack the robustness of standard citation and content analysis, it is nevertheless similar to other accepted bibliometric measures. In our opinion it facilitates a better comparison between countries, by defining the number of publications that would be necessary for a particular country to produce to have an ouput equivalent to that of the median nation.

After normalizing research output, 28 countries exceeded this benchmark, whereas 38 were below the level of the median nation. These findings unequivocally demonstrated the dominance of the United States compared to all other countries. To have an output equivalent to the median nation, Poland, it was necessary for the United States to publish 235 articles: however, they collectively published 8149 and were the global leader by an overwhelming margin. China and India were ranked even higher by this metric, but this might demonstrate an inherent limitation of this methodology related to population size. Those countries with a very low GDP per capita, a large population size, and a relatively large number of publications will most likely result in a ceiling effect, and normalizing research output to that of the median nation would thus be unreliable. Therefore, further research is required to better define the extent of this problem and to validate this approach.

Research output is an important determinant of economic growth, and an increase in service delivery, education, and innovation is often an indicator of a society’s shift from a producing economy to a knowledge-based economy[14]. In fact, publications of scientific literature can indicate a nation’s growth and progress in science and technology[5]. Moir, et al. observed a 21% increase in orthopaedic publications from 1980 to 1994 in six selected journals[15]. More recently, Bosker and Verheyen[4] also reported an increased number of orthopaedic publications in the 15 major clinical orthopaedic journals from 2000-2004, with a total of 13311 articles. The present bibliometric analysis counted over 23000 articles, representing a 73% increase over a 10 year interval. Several authors have previously performed subspecialty analyses[1,16]. Luo *et al*[1] showed that high income countries published 90% of all articles in foot and ankle research, with the United States publishing the highest number; however, Switzerland took the lead when it was normalized to population size and GDP. Liang *et al*[16] reported that the United States published the largest number of publications in the subspecialty of arthroscopy, but when adjusted for population size Switzerland was again the country with the highest number of publications. Similar findings were reflected in our results, although in their study Korea ranked first when academic output was adjusted for GDP.

Bibliometric analysis has also been performed by other disciplines. In emergency medicine, the United States was the most productive country followed by the UK and Australia. When normalized to population size, Australia had the highest number of articles per million persons, but Germany had the highest mean impact factor and citations[17,18]. In the specialty of critical care medicine, the United States has published the most articles, followed by the United Kingdom, Germany, France, and Australia. The United States also had the highest number of randomized controlled trial publications, the highest total impact factor points, and the highest total citations[17,18] . Halpenny *et al*[8] performed a bibliographic analysis in radiology. In their study, the United States published 42% of the 10,925 papers, followed by Germany and Japan. When corrected for GDP, Switzerland (0.925), Austria (0.694), and Belgium (0.648) produced the most publications per billion of GDP. Robert *et al*[19] evaluated the pain medicine literature over a period of 30 years and reported that the United States, the United Kingdom and Germany were the highest ranking countries. The pattern of publication rates are comparable to orthopaedics and these findings can possibly be generalized to other disciplines of medicine.

This study has recognized limitations. While the total number of articles and cumulative impact factor points was determined for each nation, the value of individual articles was not assessed; it is possible that there was a significant discrepancy in the manuscript quality between countries, potentially introducing selection bias. Even the selection of impact factor as an outcome measure to evaluate publication quality has been criticized, as it is determined by technicalities that are not related to the scientific value of the research studies themselves[20,21]. Citation analysis was also not performed, and it is acknowledged that the number of citations are a proxy measure of influence reflecting the recognition and quality of the published research by its peers[22]. However, using the impact factor reflects citation counts indirectly, as article citation rates ultimately determine the journal’s impact factor[20]. Nevertheless, overcitation, biased citing, audience size, biased data, and ignorance of the literature are additional common criticisms of bibliometric studies[23]. Another potential limitation of this method is that the research output of the median nation was based on data collected over a specific five-year period from the fifteen currently highest ranked orthopaedic journals. These results will almost certainly change if more journals are included, or the time interval is either extended or shortened.

In conclusion, the results of this study demonstrate that five countries were responsible for 60% of the research output in orthopaedic surgery over a 5 year period, when restricted to the 15 highest ranked journals specific to the field. Only 28 of 66 countries were able to achieve a publication rate equivalent to that of the median nation, after first correcting for GDP per capita. The United States was unequivocally the global leader when judged by this measure, and exceeded the median production by more than 34 times. Although China and India ranked the highest after correcting for both GDP and population size, this probably reflects the inordinately large populations of both countries. The United States, United Kingdom, South Korea, Japan, and Germany placed in the top five countries with respect to both publication totals and cumulative impact factor points.

**COMMENTS**

***Background***

Bibliographic analysis of academic output has been performed for many indications and can be an indicator for academic excellence. However most studies have focussed on the total number of publications without accounting for gross domestic product or economic discrepancies between countries. The primary aim of this study was therefore to investigate the number of publications and total impact factor from each country, and to then relate these variables to population size, gross domestic product (GDP), and GDP per capita. Secondly we determined the minimum number of publications required to be comparable to the country producing the median number of publications, when normalized for GDP per capita. The final aim was to establish the number of publications that would be required from each country to be equivalent to the country having the highest research output, when normalized for GDP per capita.

***Research frontiers***

Over the last 30 years English has become the international language of medical science. In Orthopedics 45 of the 50 highest impact orthopaedic journals are based in English countries. Based on these facts the majority of publications in these journals should come from primary English speaking countries.

***Innovations and breakthroughs***

Based on the total number of publications and impact points the United States was the undebated leader for both the total number of publications and impact points. However when adjusting for publication size and GDP per capita, it was Switzerland respectively Croatia which were the most productive nations. When using a newly introduced benchmark to adjust for both population size and GDP, 28 countries exceeded and 38 nations were below the median nation.

***Applications***

This review suggests that the total number of publications and impact points are not representative of true research output and other factors should be included into bibliometric analysis.

***Terminology***

Bibliometric analysis is based on quantitative variables such as number of publications, impact points and citation rates. Analysis can be performed at the macro-level comparing countries performances, at the middle level analzying Universities or other institutional output or at the microlevel investigating research output of departments or individuals.

***Peer-review***

The authors present a very interesting paper on the worldwide orthopaedic research activity. They relate the scientific production with the GDP, and per capita GDP. This sort of information, although known for general science, was unknown in the orthopaedic field. The relevance of this paper is not only related to science but also to politics.

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**P-Reviewer:** Drobetz H, Guerado E, Vaishya R **S-Editor:** Gong ZM

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**Table 1 Impact factors (2015 Journal Citation Reports - Thomson Reuters) and number of included publications from 2010-2014**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Journal | Impact points | Publications  2010-2014 |
| 1 | Journal of Bone and Joint – American Volume | 5.280 | 1833 |
| 2 | American Journal of Sports Medicine | 4.362 | 1561 |
| 3 | The Bone and Joint Journal | 3.309 | 1379 |
| 4 | Arthroscopy – The Journal of Arthroscopic and Related Surgery | 3.206 | 1072 |
| 5 | Knee Surgery Sports Traumatology Arthroscopy | 3.053 | 1747 |
| 6 | Journal of Orthopaedic Research | 2.986 | 1301 |
| 7 | Acta Orthopaedica | 2.771 | 565 |
| 8 | Clinical Orthopaedics and Related Research | 2.765 | 2027 |
| 9 | Journal of Arthroplasty | 2.666 | 1873 |
| 10 | Spine Journal | 2.426 | 1029 |
| 11 | Spine | 2.297 | 2848 |
| 12 | Journal of Shoulder and Elbow Surgery | 2.289 | 1324 |
| 13 | Injury – International Journal of the Care of the Injured | 2.137 | 1133 |
| 14 | International Orthopaedics | 2.110 | 1477 |
| 15 | European Spine Journal | 2.066 | 1852 |
|  | **Total number of publications** |  | **23021** |

Excluded Journals: Osteoarthritis Cartilage ( No. 3 - IF: 4.165); Journal of Physiotherapy (No.4 – IF: 3.708); Journal of Orthopaedic Sports Physiotherapy (No. 8 – IF: 3.011); Gait Posture (No. 12 – IF: 2.752); Journal of the American Academy of Orthopaedic Surgeons (No. 14 – IF: 2.527); Physical Therapy (No 15 – IF: 2.526); Clinical Journal Sports Medicine (No 19 – IF: 2.268)

**Table 2 Top 10 Number of publications per country for each of the 15 selected journals**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Journal** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| JBJS-Am | USA–1124 | Can-107 | KOR-84 | UK-75 | JAP-52 | HOL-46 | GER-45 | FRA-39 | SWIS-37 | AUS-27 |
| Am J Sports Med | USA-819 | KOR-117 | JAP-84 | GER-82 | UK-49 | AUS-40 | ITA-25 | CAN-34 | SWE-32 | SWIS-31 |
| BJJ | UK-545 | USA-115 | KOR-76 | JAP-75 | HOL-50 | CAN-46 | AUS-43 | GER-41 | CHINA-35 | SWIS-31 |
| Arthroscopy | USA-513 | KOR-105 | JAP-63 | GER-55 | CHINA-40 | CAN-34 | ITA-27 | UK-22 | FRA-18 | SPAIN-18 |
| KSSTA | USA-242 | GER-195 | KOR-157 | ITA-149 | JAP-144 | UK-85 | HOL-76 | TURK-70 | SWE-64 | CHINA-62 |
| J Orthopaedic Research | USA-535 | JAP-107 | GER-96 | CAN-69 | CHINA-67 | UK-48 | TAIW-45 | AUS-37 | KOR-31 | HOL-31 |
| Acta Orthopaedica | SWE-125 | DEN-76 | NOR-69 | HOL-59 | FIN-40 | GER-34 | UK-34 | USA-21 | JAP-17 | AUS-13 |
| CORR | USA-1155 | CAN-110 | KOR-98 | JAP-71 | UK-60 | SWIS-60 | GER-59 | FRA-49 | ITA-45 | HOL-33 |
| J Arthroplasty | USA-934 | JAP-136 | CAN-124 | UK-117 | KOR-114 | AUS-72 | CHINA-64 | GER-37 | SPAIN-29 | HOL-26 |
| Spine Journal | USA-491 | KOR-78 | CHINA-62 | JAP-56 | CAN-48 | HOL-29 | UK-24 | SWIS-23 | INDIA-21 | ITA-21 |
| Spine | USA-1168 | JAP-307 | CHINA-255 | CAN-166 | KOR-163 | UK-73 | GER-65 | AUS-59 | HOL-57 | TAIW-49 |
| J Shoulder Elbow Surg | USA-659 | JAP-79 | UK-72 | KOR-65 | CAN-60 | SWIS-49 | FRA-42 | GER-36 | ITA-35 | BELG-34 |
| Injury | UK-215 | USA-126 | GER-114 | ITA-89 | CHINA-78 | HOL-57 | GREEC-48 | SPAIN-37 | SWIS-34 | AUS-34 |
| International Orthopaedics | GER-232 | CHINA-198 | UK-101 | USA-97 | FRA-97 | JAP-81 | ITA-76 | A-76 | CRO-54 | SWIS-49 |
| European Spine Journal | CHINA-251 | JAP-182 | GER-161 | USA-150 | ITA-133 | UK-124 | FRA-104 | KOR-90 | SWIS-84 | HOL-81 |

Excluded Journals: Osteoarthritis Cartilage ( No. 3 - IF: 4.165); Journal of Physiotherapy (No.4 – IF: 3.708); Journal of Orthopaedic Sports Physiotherapy (No. 8 – IF: 3.011); Gait Posture (No. 12 – IF: 2.752); Journal of the American Academy of Orthopaedic Surgeons (No. 14 – IF: 2.527); Physical Therapy (No 15 – IF: 2.526); Clinical Journal Sports Medicine (No 19 – IF: 2.268)

**Table 3 Highest number of publications and impact points for each country**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rank** | **Country** | **Publications** | **Rank** | **Country** | **Impact points** |
| 1 | United States | 8149 | 1 | United States | 24744 |
| 2 | United Kingdom | 1644 | 2 | United Kingdom | 4776 |
| 3 | Japan | 1467 | 3 | Japan | 4053 |
| 4 | South Korea | 1354 | 4 | South Korea | 3765 |
| 5 | Germany | 1272 | 5 | Germany | 3491 |
| 6 | China | 1222 | 6 | China | 3034 |
| 7 | Canada | 930 | 7 | Canada | 2774 |
| 8 | Italy | 737 | 8 | Holland | 2155 |
| 9 | Holland | 663 | 9 | Italy | 1982 |
| 10 | France | 548 | 10 | Switzerland | 1507 |
| 11 | Switzerland | 527 | 11 | Australia | 1412 |
| 12 | Australia | 485 | 12 | France | 1382 |
| 13 | Sweden | 403 | 13 | Sweden | 1187 |
| 14 | Spain | 311 | 14 | Spain | 833 |
| 15 | Austria | 295 | 15 | Austria | 801 |
| 16 | Taiwan | 264 | 16 | Norway | 755 |
| 17 | Denmark | 254 | 17 | Taiwan | 729 |
| 18 | India | 246 | 18 | Denmark | 710 |
| 19 | Norway | 240 | 19 | India | 646 |
| 20 | Turkey | 235 | 20 | Turkey | 630 |
| 21 | Belgium | 219 | 21 | Belgium | 614 |
| 22 | Greece | 182 | 22 | Greece | 508 |
| 23 | Finland | 167 | 23 | Brazil | 408 |
| 24 | Brazil | 147 | 24 | Finland | 402 |
| 25 | Hong Kong | 130 | 25 | Hong Kong | 371 |
| 26 | Israel | 119 | 26 | Israel | 315 |
| 27 | Ireland | 98 | 27 | Singapore | 295 |
| 28 | Singapore | 84 | 28 | Ireland | 262 |
| 29 | New Zealand | 78 | 29 | New Zealand | 227 |
| 30 | Croatia | 74 | 30 | Iran | 174 |
| 31 | Egypt | 68 | 31 | Egypt | 168 |
| 32 | Iran | 65 | 32 | Croatia | 159 |
| 33 | Poland | 61 | 33 | Poland | 141 |
| 34 | Thailand | 52 | 34 | Thailand | 128 |
| 35 | Czech Republic | 39 |  | Slovenia | 128 |
| 36 | Slovenia | 32 | 35 | Czech Republic | 84 |
| 37 | Hungary | 29 | 36 | Hungary | 71 |
| 38 | Portugal | 25 | 37 | Portugal | 71 |
| 39 | Chile | 24 | 38 | Chile | 66 |
| 40 | Malaysia | 23 | 39 | Malaysia | 63 |
| 41 | South Africa | 21 | 40 | South Africa | 59 |
| 42 | Argentina | 20 | 41 | Argentina | 55 |
| 43 | Serbia | 19 | 42 | Serbia | 43 |
| 44 | Luxemburg | 14 | 43 | Luxemburg | 43 |
| 45 | Saudi Arabia | 12 | 44 | Saudi Arabia | 29 |
| 46 | Mexico | 10 | 45 | Mexico | 26 |
| 47 | Lebanon | 9 | 46 | Lebanon | 23 |
|  | Lithuania | 9 |  | Lithuania | 23 |
|  | Russia | 9 | 47 | Russia | 21 |
| 48 | Estonia | 7 | 48 | Estonia | 17 |
| 48 | Nigeria | 7 | 49 | Nigeria | 15 |
| 49 | Pakistan | 6 | 50 | Romania | 13 |
|  | Romania | 6 |  | Philippines | 13 |
| 50 | Columbia | 5 | 51 | Pakistan | 12 |
|  | Kuwait | 5 | 52 | Columbia | 11 |
|  | Philippines | 5 |  | Tunisia | 11 |
|  | Tunisia | 5 | 53 | Kuwait | 9 |
| 51 | Bulgaria | 3 | 54 | Iceland | 7 |
|  | Iceland | 3 | 55 | Bulgaria | 6 |
|  | Iraq | 3 |  | Iraq | 6 |
| 52 | Malawi | 2 | 56 | Malawi | 5 |
|  | Morocco | 2 |  | Nepal | 5 |
|  | Nepal | 2 |  | Uganda | 5 |
| 53 | Ethiopia | 1 | 57 | Morocco | 4 |
|  | Sudan | 1 | 58 | Ethiopia | 3 |
|  | Uganda | 1 |  | Sudan | 3 |

**Table 4 Number of publications (PSPP) and impact (PSPI) normalized for population size (publication/impact point per in thousand populations)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rank** | **Country** | **PSPP** | **Rank** | **Country** | **PSIP** |
| 1 | Switzerland | 15.3 | 1 | Switzerland | 5.4 |
| 2 | Norway | 21.1 | 2 | Norway | 6.7 |
| 3 | Denmark | 22.3 | 3 | Holland | 7.8 |
| 4 | Sweden | 24.1 | 4 | Denmark | 7.9 |
| 5 | Holland | 25.4 | 5 | Sweden | 8.2 |
| 6 | Austria | 28.7 | 6 | Austria | 10.6 |
| 7 | Finland | 32.3 | 7 | Canada | 12.1 |
| 8 | Canada | 35.9 | 8 | Luxemburg | 12.6 |
| 9 | Luxemburg | 38.9 | 9 | United States | 12.9 |
| 10 | South Korea | 38.9 | 10 | United Kingdom | 13.4 |
| 11 | United Kingdom | 38.9 | 11 | Finland | 13.4 |
| 12 | United States | 39.3 | 12 | South Korea | 13.6 |
| 13 | Australia | 44.3 | 13 | Australia | 15.2 |
| 14 | Belgium | 51.1 | 14 | Belgium | 18.2 |
| 15 | Hong Kong | 55.3 | 15 | Singapore | 18.3 |
| 16 | New Zealand | 57.3 | 16 | Hong Kong | 19.4 |
| 17 | Croatia | 57.8 | 17 | New Zealand | 19.7 |
| 18 | Greece | 60.4 | 18 | Greece | 21.6 |
| 19 | Germany | 63.1 | 19 | Germany | 23 |
| 20 | Singapore | 64.3 | 20 | Slovenia | 24 |
| 21 | Slovenia | 64.3 | 21 | Ireland | 24.3 |
| 22 | Ireland | 65.1 | 22 | Israel | 25.6 |
| 23 | Israel | 67.7 | 23 | Croatia | 27 |
| 24 | Italy | 82.4 | 24 | Italy | 30.7 |
| 25 | Japan | 86.8 | 25 | Japan | 31.4 |
| 26 | Taiwan | 88.4 | 26 | Taiwan | 32 |
| 27 | Iceland | 107.7 | 27 | Iceland | 46.1 |
| 28 | France | 121.5 | 28 | France | 48.1 |
| 29 | Spain | 151.9 | 29 | Spain | 56.7 |
| 30 | Estonia | 185.7 | 30 | Estonia | 76.5 |
| 31 | Czech Republic | 269.2 | 31 | Turkey | 121.7 |
| 32 | Turkey | 326.2 | 32 | Czech Republic | 125 |
| 33 | Lithuania | 333.3 | 33 | Lithuania | 130.4 |
| 34 | Hungary | 341.4 | 34 | Hungary | 139.4 |
| 35 | Serbia | 379.5 | 35 | Portugal | 147.3 |
| 36 | Portugal | 418.4 | 36 | Serbia | 167.7 |
| 37 | Lebanon | 551.8 | 37 | Lebanon | 215.9 |
| 38 | Poland | 631.6 | 38 | Chile | 247.6 |
| 39 | Kuwait | 673.8 | 39 | Poland | 272 |
| 40 | Chile | 680.8 | 40 | Kuwait | 374.3 |
| 41 | China | 1110.5 | 41 | Iran | 443.5 |
| 42 | Egypt | 1176.5 | 42 | China | 447.3 |
| 43 | Iran | 1187.3 | 43 | Malaysia | 471.7 |
| 44 | Thailand | 1283.1 | 44 | Egypt | 476.2 |
| 45 | Malaysia | 1292.1 | 45 | Brazil | 491.2 |
| 46 | Brazil | 1363.2 | 46 | Thailand | 521.2 |
| 47 | Argentina | 2072.5 | 47 | Argentina | 753.6 |
| 48 | Tunisia | 2178 | 48 | South Africa | 915.2 |
| 49 | Saudi Arabia | 2402.5 | 49 | Tunisia | 990 |
| 50 | Bulgaria | 2421.7 | 50 | Saudi Arabia | 12108.3 |
| 51 | South Africa | 2571.4 | 51 | Bulgaria | 15353.8 |
| 52 | Romania | 3326.7 | 52 | Romania | 15353.9 |
| 53 | India | 5089.4 | 53 | India | 19380.8 |
| 54 | Malawi | 8180 | 54 | Malawi | 32720 |
| 55 | Ethiopia | 9410 | 55 | Columbia | 43649 |
| 56 | Columbia | 9602.8 | 56 | Mexico | 45536.5 |
| 57 | Iraq | 11140 | 57 | Nepal | 55600 |
| 58 | Mexico | 11839.5 | 58 | Iraq | 55700 |
| 59 | Nepal | 13900 | 59 | Russia | 68333.3 |
| 60 | Russia | 15944.4 | 60 | Uganda | 75160 |
| 61 | Morocco | 16505 | 61 | Philippines | 75684.6 |
| 62 | Philippines | 19678 | 62 | Morocco | 82525 |
| 63 | Nigeria | 24800 | 63 | Nigeria | 115733.3 |
| 64 | Pakistan | 32695.7 | 64 | Sudan | 126533.3 |
| 65 | Uganda | 37580 | 65 | Pakistan | 163478.3 |
| 66 | Sudan | 37976 | 66 | Ethiopia | 313666.7 |

**Table 5 Number of publications (GDPP) and impact points (GDPI) related to GDP ( in thousand dollars)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rank** | **Country** | **GDPP** | **Rank** | **Country** | **GDPI** |
| 1 | Croatia | 772 | 1 | Croatia | 359 |
| 2 | South Korea | 1042 | 2 | South Korea | 375 |
| 3 | Greece | 1294 | 3 | Holland | 408 |
| 4 | Holland | 1326 | 4 | Greece | 464 |
| 5 | Switzerland | 1330 | 5 | Switzerland | 465 |
| 6 | Denmark | 1348 | 6 | Sweden | 481 |
| 7 | Sweden | 1417 | 7 | Denmark | 482 |
| 8 | Slovenia | 1417 | 8 | Slovenia | 576 |
| 9 | Austria | 1547 | 9 | Austria | 579 |
| 10 | Finland | 1630 | 10 | United Kingdom | 626 |
| 11 | United Kingdom | 1818 | 11 | Canada | 644 |
| 12 | Taiwan | 1852 | 12 | Norway | 662 |
| 13 | Canada | 1920 | 13 | Taiwan | 671 |
| 14 | Norway | 2083 | 14 | Finland | 677 |
| 15 | Malawi | 2129 | 15 | United States | 704 |
| 16 | United States | 2138 | 16 | Hong Kong | 784 |
| 17 | Hong Kong | 2237 | 17 | New Zealand | 829 |
| 18 | Serbia | 2309 | 18 | Malawi | 852 |
| 19 | New Zealand | 2412 | 19 | Belgium | 866 |
| 20 | Belgium | 2427 | 20 | Israel | 970 |
| 21 | Ireland | 2559 | 21 | Ireland | 975 |
| 22 | Israel | 2569 | 22 | Serbia | 1020 |
| 23 | Italy | 2905 | 23 | Australia | 1032 |
| 24 | Australia | 3003 | 24 | Singapore | 1044 |
| 25 | Germany | 3041 | 25 | Italy | 1080 |
| 26 | Japan | 3137 | 26 | Germany | 1108 |
| 27 | Turkey | 3398 | 27 | Japan | 1135 |
| 28 | Singapore | 3665 | 28 | Turkey | 1267 |
| 29 | Estonia | 3784 | 29 | Luxemburg | 1509 |
| 30 | Egypt | 4213 | 30 | Estonia | 1558 |
| 31 | Spain | 4442 | 31 | Spain | 1658 |
| 32 | Hungary | 4471 | 32 | Egypt | 1706 |
| 33 | Luxemburg | 4634 | 33 | Hungary | 1949 |
| 34 | Lebanon | 5081 | 34 | Lebanon | 1988 |
| 35 | France | 5163 | 35 | France | 2047 |
| 36 | Czech Republic | 5263 | 36 | Lithuania | 2102 |
| 37 | Lithuania | 5372 | 37 | Iceland | 2434 |
| 38 | Iceland | 5679 | 38 | Czech Republic | 2444 |
| 39 | Iran | 6543 |  | Iran | 2444 |
| 40 | Thailand | 7785 | 39 | Thailand | 3163 |
| 41 | India | 8327 | 40 | India | 3171 |
| 42 | China | 8474 | 41 | Portugal | 3241 |
| 43 | Poland | 8933 | 42 | China | 3413 |
| 44 | Portugal | 9204 | 43 | Poland | 3865 |
| 45 | Tunisia | 9722 | 44 | Chile | 3910 |
| 46 | Nepal | 9884 | 45 | Nepal | 3954 |
| 47 | Chile | 10752 | 46 | Tunisia | 4419 |
| 48 | Malaysia | 14700 | 47 | Malaysia | 5367 |
| 49 | Brazil | 15960 | 48 | Uganda | 5400 |
| 50 | South Africa | 16671 | 49 | Brazil | 5750 |
| 51 | Bulgaria | 18906 | 50 | South Africa | 5934 |
| 52 | Argentina | 26833 | 51 | Bulgaria | 9452 |
| 53 | Uganda | 26998 | 52 | Argentina | 9757 |
| 54 | Kuwait | 32722 | 53 | Romania | 15311 |
| 55 | Romania | 33174 | 54 | Kuwait | 18179 |
| 56 | Pakistan | 40605 | 55 | Ethiopia | 18540 |
| 57 | Morocco | 55004 | 56 | Pakistan | 20303 |
| 58 | Ethiopia | 55621 | 57 | Philippines | 21906 |
| 59 | Philippines | 56955 | 58 | Sudan | 24734 |
| 60 | Saudi Arabia | 62187 | 59 | Saudi Arabia | 25733 |
| 61 | Sudan | 74202 | 60 | Morocco | 27502 |
| 62 | Iraq | 74503 | 61 | Columbia | 34340 |
| 63 | Columbia | 75448 | 62 | Iraq | 37251 |
| 64 | Nigeria | 81215 | 63 | Nigeria | 37901 |
| 65 | Mexico | 129469 | 64 | Mexico | 49796 |
| 66 | Russia | 206733 | 65 | Russia | 88600 |

**Table 6 Number of publications (GDPCP) and impact points (GDPCI) related to GDP per capita ( in thousand dollars)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rank** | **Country** | **GDPP** | **Rank** | **Country** | **GDPI** |
| 1 | China | 6.2 | 1 | United States | 2.2 |
| 2 | India | 6.4 | 2 | India | 2.4 |
| 3 | United States | 6.7 | 3 | China | 2.5 |
| 4 | South Korea | 20.7 | 4 | South Korea | 7.4 |
| 5 | Japan | 24.7 | 5 | Japan | 8.9 |
| 6 | United Kingdom | 28.2 | 6 | United Kingdom | 9.7 |
| 7 | Germany | 37.6 | 7 | Germany | 13.7 |
| 8 | Turkey | 44.7 | 8 | Turkey | 16.7 |
| 9 | Egypt | 47 | 9 | Italy | 17.6 |
| 10 | Italy | 47.4 | 10 | Canada | 18.1 |
| 11 | Canada | 54 | 11 | Egypt | 19 |
| 12 | Brazil | 77.4 | 12 | Holland | 24.2 |
| 13 | France | 78 | 13 | Brazil | 27.9 |
| 14 | Holland | 78.7 | 14 | France | 30.9 |
| 15 | Iran | 83.7 | 15 | Iran | 31.3 |
| 16 | Spain | 95.4 | 16 | Spain | 35.6 |
| 17 | Thailand | 114.9 | 17 | Greece | 42.3 |
| 18 | Greece | 118.1 | 18 | Taiwan | 43.8 |
| 19 | Taiwan | 120.8 | 19 | Australia | 43.9 |
| 20 | Malawi | 127.5 | 20 | Thailand | 46.7 |
| 21 | Australia | 127.7 | 21 | Sweden | 49.6 |
| 22 | Sweden | 146.2 | 22 | Malawi | 51 |
| 23 | Switzerland | 162.4 | 23 | Switzerland | 56.8 |
| 24 | Austria | 173.5 | 24 | Austria | 63.9 |
| 25 | Croatia | 182.1 | 25 | Belgium | 77.1 |
| 26 | Belgium | 216.2 | 26 | Croatia | 84.7 |
| 27 | Pakistan | 219.5 | 27 | Denmark | 85.5 |
| 28 | Poland | 235.1 | 28 | Poland | 101.7 |
| 29 | Denmark | 239 | 29 | Hong Kong | 108.3 |
| 30 | Finland | 298.3 | 30 | Pakistan | 109.7 |
| 31 | South Africa | 308.7 | 31 | South Africa | 109.9 |
| 32 | Hong Kong | 309 | 32 | Israel | 118.1 |
| 33 | Israel | 312.7 | 33 | Finland | 123.9 |
| 34 | Serbia | 323.8 | 34 | Norway | 128.9 |
| 35 | Nepal | 351 | 35 | Nepal | 140.4 |
| 36 | Norway | 405.4 | 36 | Uganda |  |
| 37 | Nigeria | 457.6 | 37 | Serbia | 143.1 |
| 38 | Hungary | 483.7 | 38 | New Zealand | 166.9 |
| 39 | New Zealand | 485.8 | 39 | Malaysia | 179.5 |
| 40 | Malaysia | 491.6 | 40 | Singapore | 190.8 |
| 41 | Czech Republic | 500.8 | 41 | Ethiopia | 191.3 |
| 42 | Ireland | 554.8 | 42 | Hungary | 197.6 |
| 43 | Ethiopia | 574 | 43 | Ireland | 207.5 |
| 44 | Philippines | 574.4 | 44 | Nigeria | 213.5 |
| 45 | Chile | 605.3 | 45 | Chile | 220.1 |
| 46 | Argentina | 625.4 | 46 | Philippines | 220.9 |
| 47 | Singapore | 670 | 47 | Argentina | 227.4 |
| 48 | Uganda | 715 | 48 | Czech Republic | 232.5 |
| 49 | Slovenia | 750 | 49 | Slovenia | 279.1 |
| 50 | Tunisia | 884.2 | 50 | Portugal | 311.7 |
| 51 | Portugal | 885.3 | 51 | Sudan | 371.7 |
| 52 | Mexico | 1032.6 | 52 | Mexico | 397.1 |
| 53 | Sudan | 1115 | 53 | Tunisia | 401.9 |
| 54 | Lebanon | 1117.6 | 54 | Lebanon | 437.3 |
| 55 | Russia | 1415.1 | 55 | Russia | 606.5 |
| 56 | Columbia | 1580.8 | 56 | Lithuania | 717.8 |
| 57 | Morocco | 1595 | 57 | Columbia | 718.5 |
| 58 | Romania | 1666.2 | 58 | Romania | 769 |
| 59 | Lithuania | 1834.1 | 59 | Morocco | 797.5 |
| 60 | Saudi Arabia | 2013.4 | 60 | Saudi Arabia | 833.1 |
| 61 | Iraq | 2140 | 61 | Iraq | 1070 |
| 62 | Bulgaria | 2617 | 62 | Estonia | 1186 |
| 63 | Estonia | 2880.3 | 63 | Bulgaria | 1308.5 |
| 64 | Luxemburg | 8333.1 | 64 | Luxemburg | 2713.3 |
| 65 | Kuwait | 8718.8 | 65 | Kuwait | 4843.8 |
| 66 | Iceland | 17334.5 | 66 | Iceland | 7429.1 |

**Table 7 Number of publications required to equivalent with the median (Poland *n* = 61) using the benchmark measure**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Rank** | **Country** | **Published Publications 2010-2014** | **Papers to be published** | **Percentage of published papers** |
| 1 | China | 1222 | 32 | 3783 |
| 2 | India | 246 | 7 | 3656 |
| 3 | United States | 8149 | 235 | 3505 |
| 4 | South Korea | 1354 | 119 | 1137 |
| 5 | Japan | 1467 | 235 | 952 |
| 6 | United Kingdom | 1644 | 197 | 833 |
| 7 | Germany | 1272 | 203 | 625 |
| 8 | Turkey | 235 | 45 | 525 |
| 9 | Egypt | 68 | 14 | 499 |
| 10 | Italy | 737 | 148 | 496 |
| 11 | Canada | 930 | 214 | 435 |
| 12 | Brazil | 147 | 48 | 303 |
| 13 | France | 548 | 182 | 301 |
| 14 | Holland | 663 | 222 | 298 |
| 15 | Iran | 65 | 23 | 280 |
| 16 | Spain | 311 | 126 | 246 |
| 17 | Thailand | 52 | 25 | 204 |
| 18 | Greece | 182 | 91 | 198 |
| 19 | Taiwan | 264 | 136 | 194 |
| 20 | Malawi | 2 | 1 | 184 |
| 21 | Australia | 485 | 263 | 183 |
| 22 | Sweden | 403 | 251 | 160 |
| 23 | Switzerland | 527 | 364 | 145 |
| 24 | Austria | 295 | 218 | 135 |
| 25 | Croatia | 74 | 57 | 129 |
| 26 | Belgium | 219 | 201 | 109 |
| 27 | Pakistan | 6 | 6 | 100 |
| 28 | Poland | 61 | 61 | 100 |
| 29 | Denmark | 254 | 258 | 98 |
| 30 | Finland | 167 | 212 | 79 |
| 31 | South Africa | 21 | 28 | 76 |
| 32 | Hong Kong | 130 | 171 | 76 |
| 33 | Israel | 119 | 158 | 75 |
| 34 | Serbia | 19 | 26 | 72 |
| 35 | Nepal | 2 | 3 | 67 |
| 36 | Norway | 240 | 414 | 58 |
| 37 | Nigeria | 7 | 14 | 50 |
| 38 | Hungary | 29 | 60 | 49 |
| 39 | New Zealand | 78 | 161 | 48 |
| 40 | Malaysia | 23 | 48 | 47 |
| 41 | Czech Republic | 39 | 83 | 47 |
| 42 | Ireland | 98 | 231 | 42 |
| 43 | Ethiopia | 1 | 2 | 50 |
| 44 | Philippines | 5 | 12 | 41 |
| 45 | Chile | 24 | 62 | 39 |
| 46 | Argentina | 20 | 53 | 38 |
| 47 | Singapore | 84 | 239 | 35 |
| 48 | Uganda | 1 | 3 | 33 |
| 49 | Slovenia | 32 | 102 | 31 |
| 50 | Tunisia | 5 | 19 | 26 |
| 51 | Portugal | 25 | 94 | 26 |
| 52 | Mexico | 10 | 44 | 23 |
| 53 | Sudan | 1 | 5 | 20 |
| 54 | Lebanon | 9 | 43 | 21 |
| 55 | Russia | 9 | 54 | 17 |
| 56 | Columbia | 5 | 34 | 15 |
| 57 | Morocco | 2 | 14 | 15 |
| 58 | Romania | 6 | 42 | 14 |
| 59 | Lithuania | 9 | 70 | 13 |
| 60 | Saudi Arabia | 12 | 103 | 12 |
| 61 | Iraq | 3 | 27 | 11 |
| 62 | Bulgaria | 3 | 33 | 9 |
| 63 | Estonia | 7 | 86 | 8.1 |
| 64 | Luxemburg | 14 | 496 | 2.8 |
| 65 | Kuwait | 5 | 185 | 2.7 |
| 66 | Iceland | 3 | 221 | 1.4 |

**Table 8 Number of publications required to equivalent with the leader (United States) the benchmark measure**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Rank** | **Country** | **Published Publications 2010-2014** | **Papers to be published** | **Percentage of published papers** |
| 1 | China | 1222 | 1132 | 108 |
| 2 | India | 246 | 236 | 104 |
| 3 | United States | 8149 | 8149 | 100 |
| 4 | South Korea | 1354 | 4174 | 32 |
| 5 | Japan | 1467 | 5402 | 27 |
| 6 | United Kingdom | 1644 | 6915 | 24 |
| 7 | Germany | 1272 | 7138 | 18 |
| 8 | Turkey | 235 | 1569 | 15 |
| 9 | Egypt | 68 | 477 | 14 |
| 10 | Italy | 737 | 5210 | 14 |
| 11 | Canada | 930 | 7498 | 12 |
| 12 | Brazil | 147 | 1699 | 8.6 |
| 13 | France | 548 | 6378 | 8.6 |
| 14 | Holland | 663 | 7787 | 8.5 |
| 15 | Iran | 65 | 812 | 8 |
| 16 | Spain | 311 | 4429 | 7 |
| 17 | Thailand | 52 | 892 | 5.8 |
| 18 | Greece | 182 | 3208 | 5.6 |
| 19 | Taiwan | 264 | 892 | 5.5 |
| 20 | Malawi | 2 | 38 | 5.2 |
| 21 | Australia | 485 | 9243 | 5.1 |
| 22 | Sweden | 403 | 8797 | 4.6 |
| 23 | Switzerland | 527 | 12775 | 4.1 |
| 24 | Austria | 295 | 7640 | 3.9 |
| 25 | Croatia | 74 | 2011 | 3.7 |
| 26 | Belgium | 219 | 7068 | 3.1 |
| 27 | Pakistan | 6 | 197 | 3 |
| 28 | Poland | 61 | 2141 | 2.8 |
| 29 | Denmark | 254 | 9091 | 2.7 |
| 30 | Finland | 167 | 7436 | 2.2 |
| 31 | South Africa | 21 | 968 | 2.1 |
|  | Hong Kong | 130 | 5995 | 2.1 |
|  | Israel | 119 | 5553 | 2.1 |
|  | Serbia | 19 | 918 | 2.1 |
| 32 | Nepal | 2 | 105 | 1.9 |
| 33 | Norway | 240 | 14523 | 1.6 |
| 34 | Nigeria | 7 | 487 | 1.5 |
| 35 | Hungary | 29 | 2094 | 1.4 |
|  | New Zealand | 78 | 5656 | 1.4 |
|  | Malaysia | 23 | 1688 | 1.4 |
| 36 | Czech Republic | 39 | 2915 | 1.3 |
|  | Ireland | 98 | 8115 | 1.2 |
|  | Ethiopia | 1 | 86 | 1.2 |
|  | Philippines | 5 | 429 | 1.2 |
| 37 | Chile | 24 | 2168 | 1.1 |
|  | Argentina | 20 | 1867 | 1.1 |
| 38 | Singapore | 84 | 8401 | 1 |
| 39 | Uganda | 1 | 107 | 0.94 |
| 40 | Slovenia | 32 | 3582 | 0.89 |
| 41 | Tunisia | 5 | 660 | 0.76 |
| 42 | Portugal | 25 | 3303 | 0.75 |
| 43 | Mexico | 10 | 1541 | 0.65 |
| 44 | Sudan | 1 | 166 | 0.6 |
|  | Lebanon | 9 | 1502 | 0.6 |
| 45 | Russia | 9 | 1901 | 0.47 |
| 46 | Columbia | 5 | 1180 | 0.42 |
| 47 | Morocco | 2 | 476 | 0.42 |
| 48 | Romania | 6 | 1492 | 0.4 |
| 49 | Lithuania | 9 | 2464 | 0.36 |
| 50 | Saudi Arabia | 12 | 3606 | 0.33 |
| 51 | Iraq | 3 | 958 | 0.31 |
| 52 | Bulgaria | 3 | 1172 | 0.26 |
| 53 | Estonia | 7 | 3009 | 0.23 |
| 54 | Luxemburg | 14 | 17412 | 0.08 |
|  | Kuwait | 5 | 6507 | 0.08 |
| 55 | Iceland | 3 | 7762 | 0.04 |