

*Bibliometric Analysis*

**A Bibliometric Analysis of Human Consciousness Worldwide Over the Year 2000-2022**

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**Abstract:** The emergence of new technologies such as AI, machine learning, and so on drives the discussion over human consciousness among researchers from various disciplines, particularly those from philosophy of mind and computer science. This is true since certain academic theories argue that new technologies like those are much more efficient at simulating human tasks. This allows the discussion concerning human consciousness to acquire attention among researchers interested in learning more about human consciousness. As a result, this study provides a bibliometric analysis of human consciousness research from 2000 to 2022 to provide researchers and academics worldwide with an overview of the outcomes and trends in human consciousness research. A textual query on two databases; Scopus (1413 articles), and PubMed (258 papers) using the term “human consciousness” was conducted on 16 August 2022 by collecting 1671 academic works from 2000 to 2022 relating to human consciousness research for in-depth study. Bibliometric analyses were performed using Rstudio software version 4.2.0 and biblioshiny for bibliometrix to show the current of human consciousness research. This bibliometric study examined the yearly scientific publishing growth, the most productive authors, most often term that has been utilised, most renowned journal name, and which nation has the maximum cooperation with other country. According to the findings of the study, there is a significant inconsistency in worldwide patterns in yearly scientific output, with the number of publications growing and declining. Among all nations, United States of America (USA) published the most papers around human consciousness study. According to the research, it has shown that the most relevant contributors is Jun’ichi Takeno (Scopus), and Brian L Edlow (PubMed). Moreover, the most famous journal in human consciousness research includes Journal of Consciousness Studies (Scopus), and Frontiers in Psychology (PubMed). The significance of this study may aid new researchers in this area by offering information on important publications and authors to refer while undertaking research on this issue. Furthermore, this research helps other researchers understand current trends in this field of study. As an outcome, the objective for conducting this study is to give bibliometric analysis and to fulfill research gaps in bibliometric studies of human consciousness by giving information in the form of an overview, and suggestions.

**Keywords:** human consciousness; RStudio; bibliometric analysis; philosophy of mind; biblioshiny

**Introduction**

According to Heraclitus, human consciousness is a vast area whose limits, despite the fact that one might traverse each and every possible path, could never be discovered (Jaynes, 1976). Thomas Nagel (1974) asserts that a subjective quality may be ascribed to the consciousness. Every single creature that has ever been on our planet has had this quality of conscious thought. On the other hand, they are not identical to one another. A further type of thinking holds that consciousness itself is a mystery component. There are also an alternative points of view that contend that this consciousness is really an illusion (S. Blackmore, 2017; S. J. Blackmore, 2006; Chalmers, 2002). Despite this, there has been an increase in the number of academics researching this topic. At the close of the 19th century, researchers first started delving deeply into the subject of consciousness.

It was due to the fact that the matter at hand constituted a significant problem at that time. Beginning in the 19th century and continuing into the 20th, scientists have conducted study on many aspects of the human brain and consciousness (LeDoux et al., 2020).

So an efficient method that may be used to evaluate the growth of study topics, including themes and publications, in terms of the social, cognitive, and theoretical frameworks of the respective fields is called bibliometric analysis (Filho et al., 2022; Verma & Gustafsson, 2020). Moreover, according to Aria & Cuccurullo, (2017) the analysis provided by bibliometrics is more unbiased and reputable than other methods. It is also ideal for scientific mapping at a time when the focus on empirical contributions is creating extensive, dispersed, and contentious research areas. Beyond just compiling lists of scientific publications and citations, academic and professional communities make use of bibliometric methods in a variety of other applications. Research on bibliometrics may provide insight into the topic of current worldwide tendencies being studied in human consciousness research. It is possible that it will help us understand some of the current tendencies in the development of human consciousness. Academics and researchers will be able to use the findings of our study to better understand the current status of global knowledge about this topic by utilising Scopus and PubMed databases. Rstudio 4.2.1, the most stable version available, was used throughout the course of this study. In order to conduct bibliometrics study on human consciousness research, a the Rstudio is utilised by a researcher to access the biblioshiny web-interface.

As a potential outcome, this article will present a bibliometric analysis of human consciousness using two databases, Scopus and PubMed, in order to identify the research fields that have the greatest research output analysis of annual scientific publication, country scientific production, most relevant authors, most relevant journals, most frequent keywords used, and collaboration countries. The importance of this study lies in the fact that it has the potential to help new researchers in this subject by offering information on relevant publications and authors to get in touch with when undertaking research on this matter. The purpose of this research is to produce the first research article of its kind, in which a literature review is conducted on the concepts of human consciousness research; bibliometric analysis is used to evaluate the existing knowledge of human consciousness; and network analysis is used to identify due to its impact and research trends in order to gain a better understanding (Aria & Cuccurullo, 2017; Sun et al., 2018). The benefit of this research is that it may help researchers or academics who are new to the topic of human consciousness by supplying information on which publications and authors to refer while doing so. As a corollary of this, the researchers recommend that future study should evaluate and focus on publications from different databases to see whether equivalent patterns exist for human consciousness and to ensure that the topic receives more general exposure.

## Methodology

A thorough search was done on 16 August 2022, utilising the Scopus and PubMed online database. Searches was done out on a single day to avoid the potential bias created by daily database changes. For this retrospective review, researchers chose publications on the human consciousness that were indexed by Scopus and PubMed between 2000 and 2022. The selection procedures implemented in each database are detailed as below;

Topic: “Human consciousness”

Refined by: Document types in Scopus (There Was No Restriction On The Type).

: Document Types In Pubmed (There Was No Restriction On The Type)

Criteria : “titles, abstract and keywords (topic area)”

Time Span: 2000-2022.

Language: English only.

This study contains a bibliometric analysis of 1,671 articles related to “human consciousness”. Using the theme keywords “human consciousness”, a total of 1,797 articles from Scopus and 319 articles from PubMed were found. After a refine process in the context of the time range 2000-2022, with only English articles chosen, a total of 1,413 articles from the Scopus database and 258 articles from PubMed were retrieved. Bibliographic data has been obtained in .bib (Scopus) and .txt (PubMed) formats. In this bibliometric research, analyses were conducted by utilising R environment, i.e., RStudio 4.2.1, aided by

Bibliometrix package written by (Aria & Cuccurullo, 2017; Donthu et al., 2021). Afterwards, these databases were evaluated through graph web-interface “Biblioshiny”, a tool integrating the Bibliometrix software. It has also been used to evaluate and observe patterns in the form of bibliometric charts. It also can develop data sets and make them accessible to researcher and it also may give other resources. Table 1 below displays the title string that has been utilised on each platform to retrieve bibliographic data meanwhile Figure 1 shows the flow chart of this study. Table 2 shows summary of main information about metadata collected for this study.

Table 1. The title string utilised on each search string to retrieve bibliographic data

Search String	Search string strategy key term
Scopus	TITLE-ABS-KEY("human consciousness") AND (LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012) OR LIMIT-TO (PUBYEAR,2011) OR LIMIT-TO (PUBYEAR,2010) OR LIMIT-TO (PUBYEAR,2009) OR LIMIT-TO (PUBYEAR,2008) OR LIMIT-TO (PUBYEAR,2007) OR LIMIT-TO (PUBYEAR,2006) OR LIMIT-TO (PUBYEAR,2005) OR LIMIT-TO (PUBYEAR,2004) OR LIMIT-TO (PUBYEAR,2003) OR LIMIT-TO (PUBYEAR,2002) OR LIMIT-TO (PUBYEAR,2001) OR LIMIT-TO (PUBYEAR,2000)) AND (LIMIT-TO (LANGUAGE,"English"))
PubMed	("Human Consciousness"[All Fields]) AND ((2000:2022[pdat]) AND (english[Filter]))

Figure 1. Flowchart for study selection

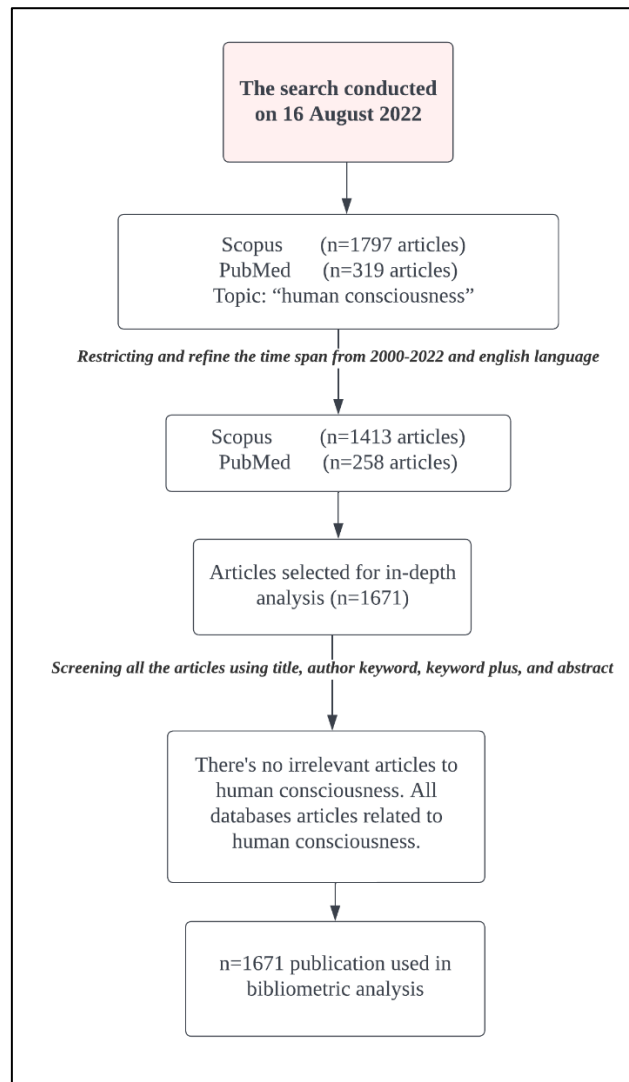


Table 2. Summary of main information about metadata collected from 1,671 publication on human consciousness

Main Information About Data	
Timespan	2000:2022
Sources (Journals, Books, etc.)	1,183
Documents	1,671
References	71,203
Authors	3,038
Authors of single-authored docs	940
Author's Keywords (DE)	4,719
Keyword Plus (ID)	4,460

**The Findings**

Researchers collected 1,671 libraries of publication in relevant subject to “human consciousness” in the year 2000 until 2022 by using the search method that has been specified above. These databases were retrieved from two distinct indexed sources, such as Scopus and PubMed.

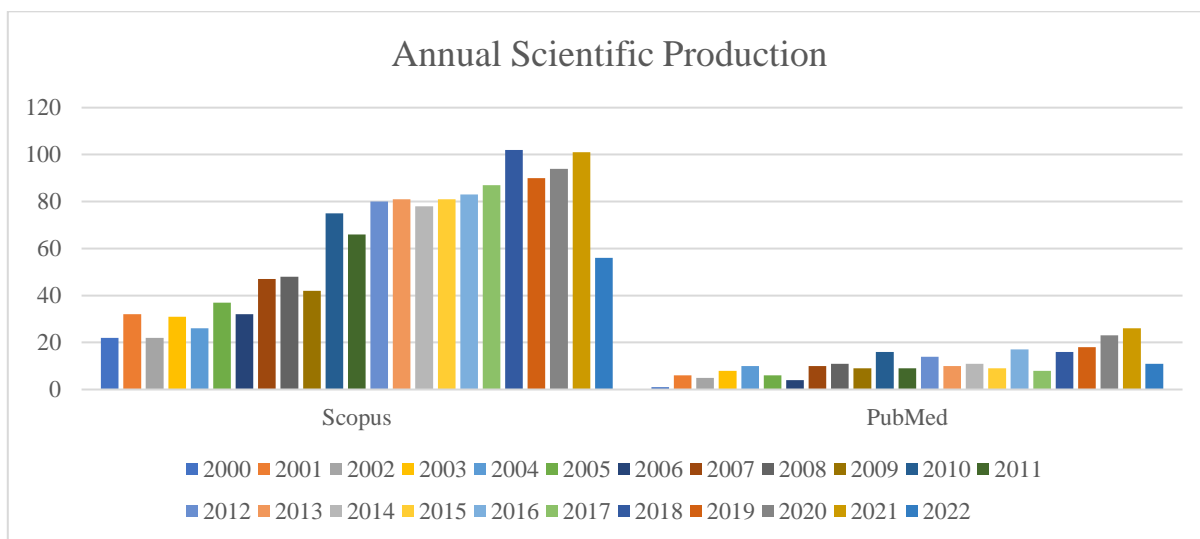
## 1. Annual Scientific Production

In the topic of human consciousness research, there were a total of 1,671 papers published between the years 2000 and 2022, of which around 1413 publications were indexed in Scopus and approximately 258 publications were indexed in PubMed. The year 2018 has seen the most articles added to the Scopus index, around 102 publication, followed by 2021, which is 101 publication, while the year 2000 and 2002 had the fewest added, that is, around 22 publications. Between the years 2000 and 2022, the year 2018 has seen the most articles added to the Scopus index than any other year, around 102 publication. While this is ongoing, the year 2000 has around one publication, while the year 2021 have 26 publications. The lowest number of publications is seen in the PubMed database. In addition, the pattern of publication that took place between the years 2000 and 2022 demonstrates a significant amount of inconsistency in the worldwide patterns in the yearly output of scientific research. During the course of this time frame, there was a rise in the total number of publications in addition to a corresponding fall in that total. This suggests that there is an overall upward trajectory. In addition, the rate of annual growth was shown to be 4.34% for Scopus and 11.52% for PubMed, respectively.

Table 3. Annual scientific production in human consciousness research

Year	Scopus	PubMed
2000	22	1
2001	32	6
2002	22	5
2003	31	8
2004	26	10
2005	37	6
2006	32	4
2007	47	10
2008	48	11
2009	42	9
2010	75	16
2011	66	9
2012	80	14
2013	81	10
2014	78	11
2015	81	9
2016	83	17
2017	87	8
2018	102	16
2019	90	18
2020	94	23
2021	101	26
2022	56	11

Figure 2. Annual scientific production in human consciousness research



## 2. Country Scientific Production

The findings of a worldwide analysis of the country scientific output are displayed in Table 4. The results from this research identify the top 10 countries throughout the globe in terms of the scientific productivity on the subject of human consciousness. The databases Scopus and PubMed identified the top 10 countries throughout the globe in terms of national scientific output that has been created between the years 2000 and 2022. The findings revealed that there were a total of 65 countries throughout the world that contributed to Scopus, but there were 35 countries that contributed to PubMed on this analysis output. The United States of America (USA) had published approximately 692 publications related to this study, making it the country that published the most articles in Scopus. Afterward, United Kingdom (UK) came in second with 223 articles, then China with 103 and Italy with 90 publishing respectively, and lastly Germany came in 10th with 51 publications. However, according to PubMed, USA is the nation with the most papers published globally, with about 149 total. It was subsequently followed by China, which had published roughly 68 publications, and Finland, which had 51 publications. After that came Italy with 38 publications, and India in 10th position, with 19 publications.

Table 4. Country scientific production in human consciousness research

No	Scopus		PubMed	
	Country	Frequency	Country	Frequency
1	USA	692	USA	149
2	UK	223	China	68
3	China	103	Finland	51
4	Italy	90	Italy	38
5	Canada	88	France	31
6	Australia	76	UK	28
7	India	66	Malaysia	24
8	Japan	60	Australia	23
9	Finland	54	Germany	23
10	Germany	51	India	19

Figure 3. Country scientific production indexed by Scopus

### Country Scientific Production

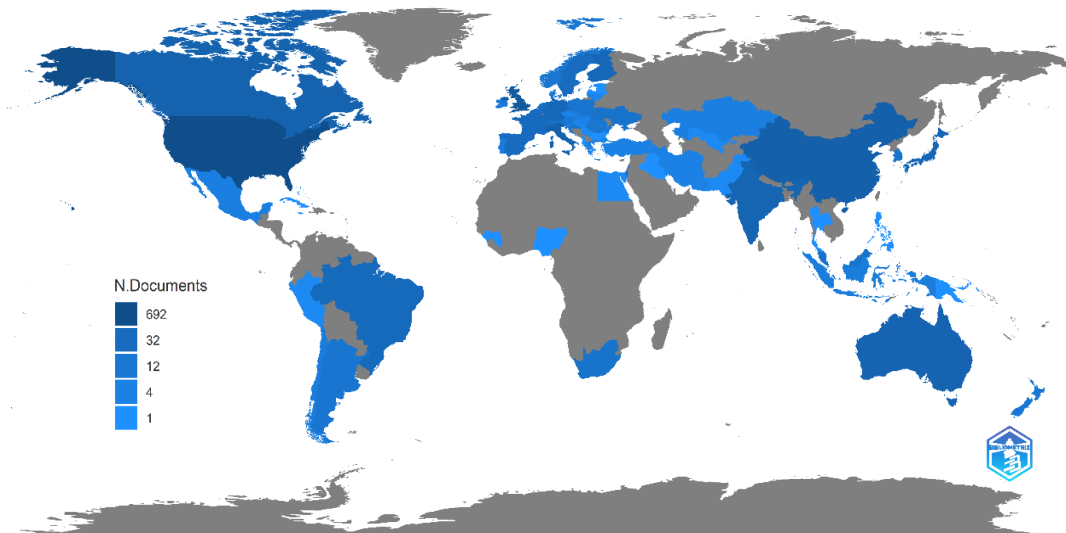
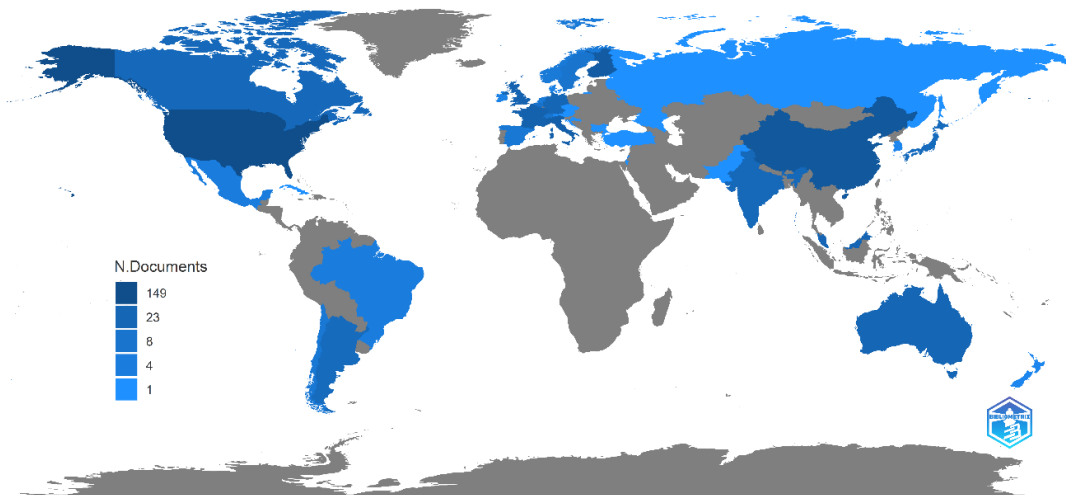


Figure 4. Country scientific production indexed by PubMed

### Country Scientific Production



### 3. Most Relevant Authors

The study of human consciousness research discovered a total of 2319 authors in the 1413 papers published in the Scopus database. The top 10 authors are listed in the table that can be seen below. Based on the results of the analysis, it was found that an author named Takeno J had written the most articles in this research field, with a total of 13. Edlow Bl, who had published 6 articles; and Helminiak Da and all other authors who had published 5 articles are among the top 10 most significant authors in human consciousness research. Next on the list are researcher Laureys S, who had published around 10 articles, and Tiller Wa, who published 8 articles respectively.

Table 5. Most relevant authors in human consciousness research in Scopus

Top 10 Most Relevant Author in Human Consciousness Research			
Authors	Articles	Articles Fractionalized	Percentage (%)
Takeno J	13	6.28	0.90
Laureys S	10	2.78	0.70
Tiller Wa	8	5.75	0.60
Edlow Bl	6	1.10	0.40
Helminiak Da	5	4.33	0.40
Inoue S	5	0.95	0.40
Mashour Ga	5	2.12	0.40
Scheinin H	5	0.75	0.40
Shanon B	5	5.00	0.40
Tagliazucchi E	5	0.96	0.40

In the 258 databases of human consciousness research papers that have been published in PubMed journals, there are a total of 719 authors identified (Table 6). The top 10 writers are shown below in the following list. According to the results of the study, Edlow Bl was the author who had the most article publications. He published a total of seven papers during the duration of his career. Laureys S, Mashour Ga, and Scheinin H, each of whom had published 5 papers; Lngsjo J, who has the fewest publications with just three; Laureys S, who had authored the most with 6 articles. These authors are considered to be among the most relevant in the field of human consciousness research publications.

Table 6. Most relevant authors in human consciousness research in PubMed

Top 10 Most Relevant Author in Human Consciousness Research			
Authors	Articles	Articles Fractionalized	Percentage (%)
Edlow Bl	7	2.10	2.70
Laureys S	6	1.60	2.30
Mashour Ga	5	2.12	1.90
Scheinin H	5	0.75	1.90
Tagliazucchi E	5	0.96	1.90
Zhang J	5	0.99	1.90
Hudetz Ag	4	1.75	1.60
Owen Am	4	0.74	1.60
Tiller Wa	4	3.25	1.60
Långsjö J	3	0.32	1.20



Figure 5. Most relevant authors in human consciousness research indexed by Scopus

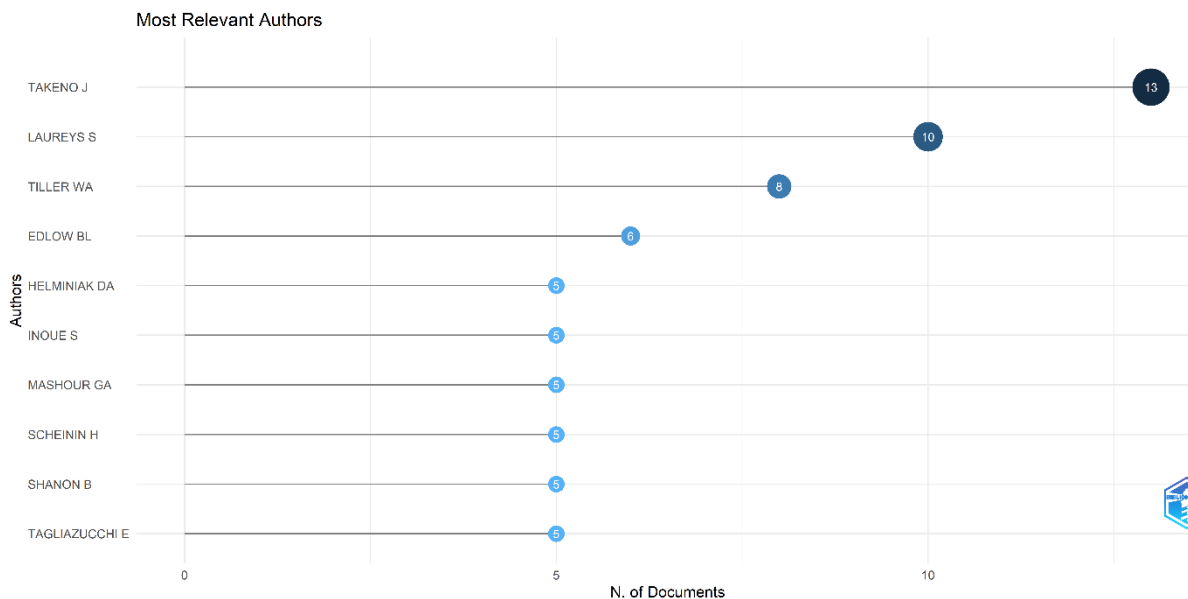
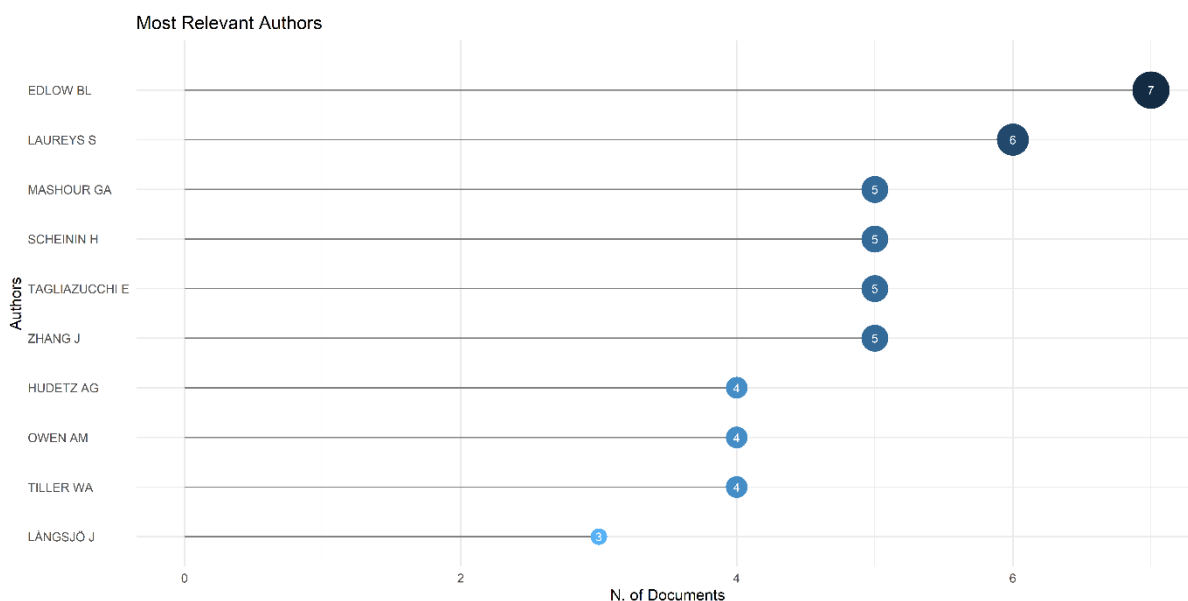


Figure 6. Most relevant authors in human consciousness research indexed by PubMed



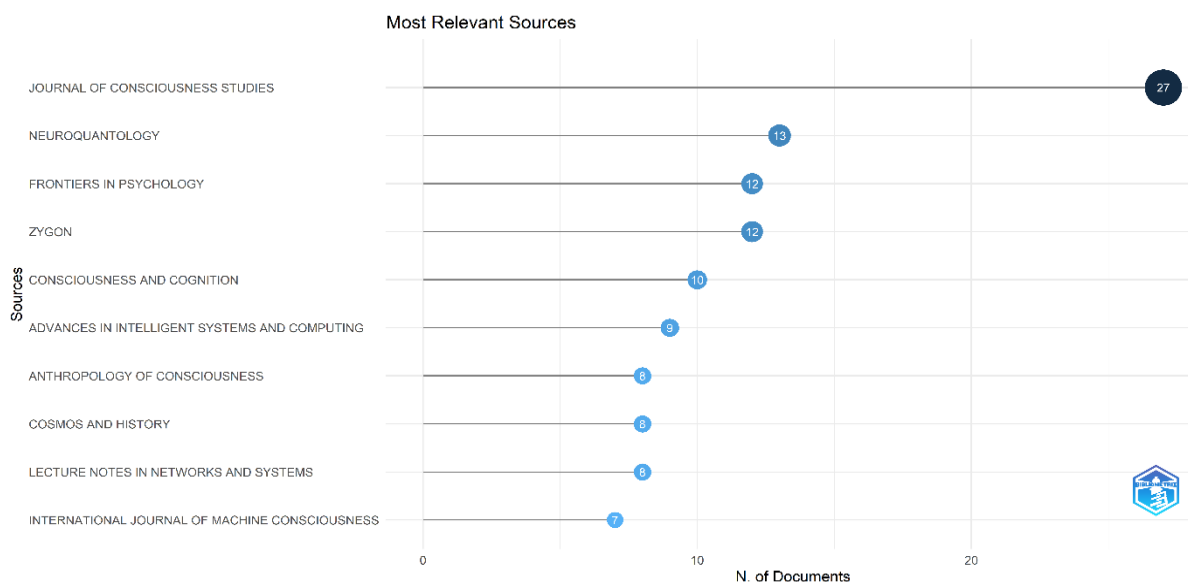
#### 4. Most Relevant Journals

According to the findings of the analysis for the most relevant journal articles in the field of human consciousness research, the Scopus database has around 1013 journals. The following table ranks, out of a total of 1013 journals, the top ten most relevant journals in research on human consciousness. According to the findings of the research, one of the most well-known publications is Journal of Consciousness Studies. This journal has 27 papers that have been published in it. The journal known as Neuroquantology came in number two with a total of 13 papers published, which was followed by the journal known as Frontiers in Psychology, which has a total of 12 articles, and so on. Consciousness journal came in tenth place, with seven articles.

Table 7. Most relevant journals in human consciousness research in Scopus

Most Relevant Journals In Human Consciousness Research in Scopus	
Sources	Articles
Journal Of Consciousness Studies	27
Neuroquantology	13
Frontiers In Psychology	12
Zygon	12
Consciousness And Cognition	10
Advances In Intelligent Systems And Computing	9
Anthropology Of Consciousness	8
Cosmos And History	8
Lecture Notes In Networks And Systems	8
International Journal Of Machine Consciousness	7

Figure 7. Most relevant journals in human consciousness research indexed by Scopus



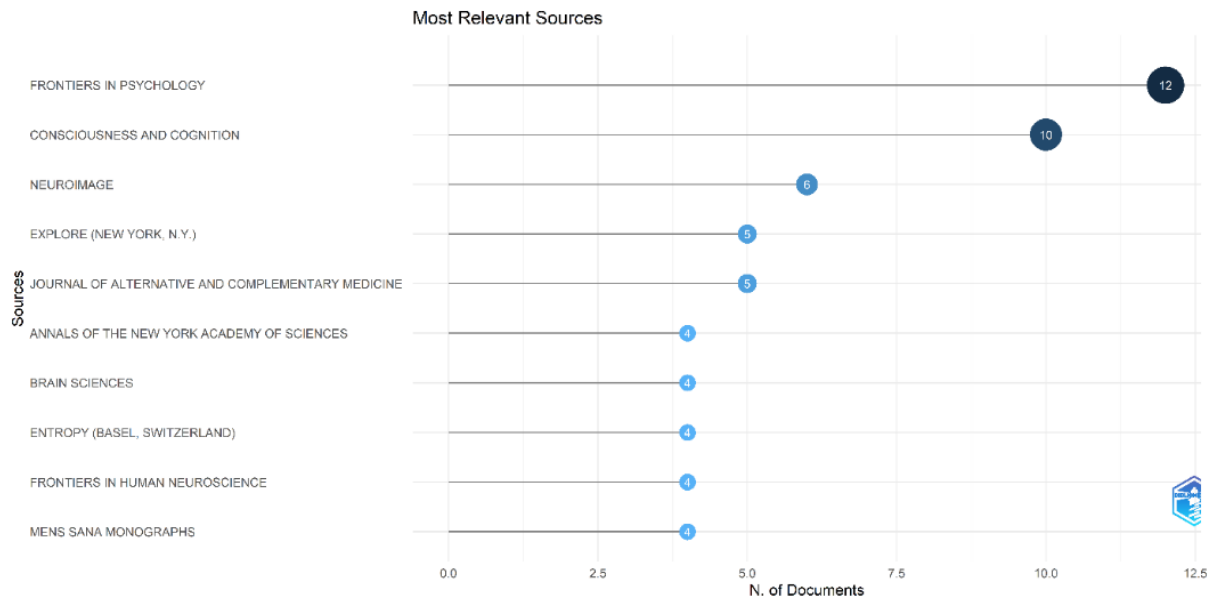
The scientific field of human consciousness consists of 169 distinct journals in PubMed database with 258 different published papers. This was discovered via an analysis of the most influential journal articles in the field. Out of a total of 169 journals, Table 8 lists the top ten journals in the study of human consciousness that are considered to be the most significant. These journals are listed in the order of their significance. According to the results of the inquiry, Frontiers In Psychology, which at the moment has 12 articles, is one of the journals that has been interested to publish the papers. This journal has received a lot of applications from researchers to publish their articles. The Consciousness and Cognition journals came in second place, having produced a total of ten papers. The Neuroimage journals came in at number three on the list, having published a total of six papers. Lastly, the Mens Sana Monographs journal is the last one on the list. It has four different articles that have been published.

Table 8. Most relevant journals in human consciousness research in PubMed

Most Relevant Journals In Human Consciousness Research in PubMed	
Sources	Articles
Frontiers In Psychology	12
Consciousness And Cognition	10
Neuroimage	6
Explore (New York, N.Y.)	5
Journal Of Alternative And Complementary Medicine (New York, N.Y.)	5

Annals Of The New York Academy Of Sciences	4
Brain Sciences	4
Entropy (Basel, Switzerland)	4
Frontiers In Human Neuroscience	4
Mens Sana Monographs	4

Figure 8. Most relevant journals in human consciousness research indexed by PubMed



### 5. Most Frequent Words On Human Consciousness Research

When doing research, keywords are one of the most crucial factors to consider when choosing a topic to investigate, and they may also provide light on emerging scientific trends. The Scopus database contains 1,413 publications that are connected to human consciousness research. From these articles, 3,824 keywords have been found to be utilised in human consciousness research by scholars from all over the globe. Table 9 displays the top 20 most often used keywords in research studies on human consciousness. These results were obtained by filtering Scopus database articles using the author's keyword. The terms "consciousness" (235 occurrences), "human consciousness" (39 occurrences), "artificial intelligence" (28 occurrences), and so on, are the ones that are used frequently in this article.

Table 9. Most frequent words on human consciousness research in Scopus

The top 20 most frequently utilized keywords in human consciousness research in Scopus	
Words	Occurrences
consciousness	235
human consciousness	39
artificial intelligence	28
evolution	21
phenomenology	21
brain	20
cognition	20
philosophy	17
language	15
ethics	14
psychology	14
religion	14
self	14
awareness	13
ontology	13
emergence	12
neuroscience	12
time	12
culture	11
epistemology	11

The PubMed database contains 258 papers linked to human consciousness research. Researchers from all around the country found 895 keywords used in human consciousness research. These keywords were discovered in the publications. Table 9 presents the top 20 keywords that are most often used in studies that investigate human consciousness, after having been filtered by the author's keyword. According to the findings of the research, the phrases "humans" (182 occurrences), "consciousness/physiology" (62 occurrences), "male" (49 occurrences), "consciousness" (43 occurrences), and "aged" (the last on the list) are the most frequently used keywords (eight occurrences).

Table 10. Most Frequent Words On Human Consciousness Research in PubMed

The top 20 most frequently utilized keywords in human consciousness research in PubMed	
Words	Occurrences
humans	182
consciousness/physiology	62
male	49
consciousness	43
animals	42
adult	39
female	38
brain/physiology	31
young adult	24
models neurological	19
middle aged	18
magnetic resonance imaging	17
brain mapping	16
biological evolution	12
cognition	10
magnetic resonance imaging/methods	10
electroencephalography	9

history 20th century	9
adolescent	8
aged	8

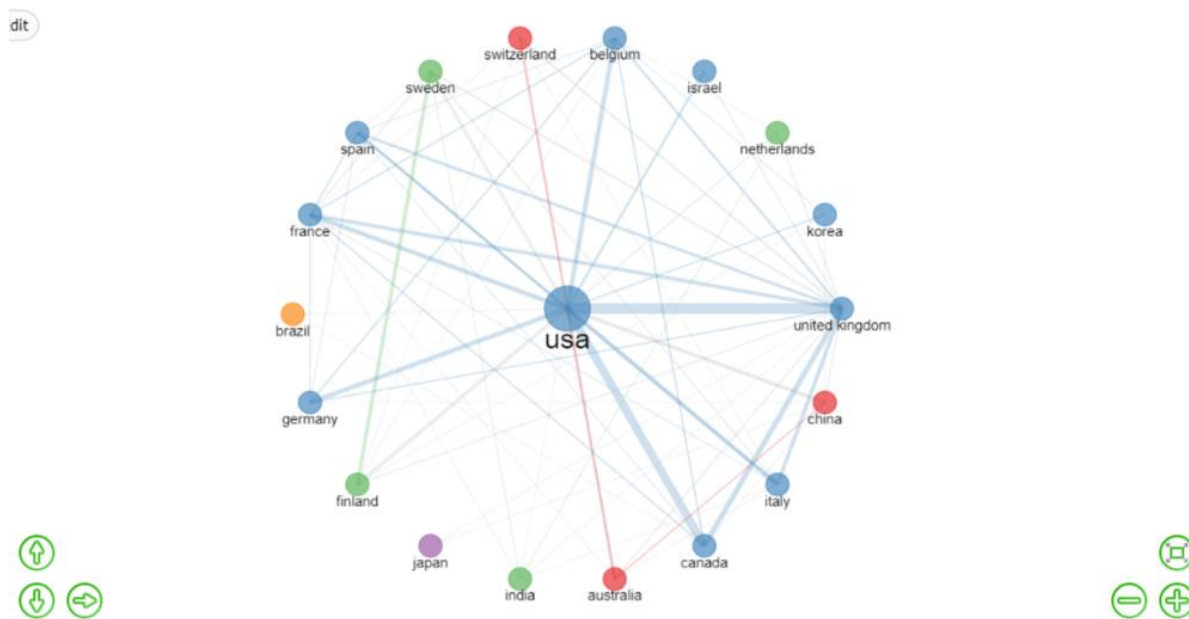
### 6. Collaboration among Countries in Human Consciousness Research

In this section, the researchers are exploring major trends at national level, as well as worldwide cooperation patterns. According to the findings of the study, the Scopus database has evidence of 133 international partnerships with nations engaged in the study of human consciousness in various parts of the globe. The top 20 nations that collaborated the most on human consciousness research are shown in Table 11. The United States of America (USA) and United Kingdom worked together for a total of 14 times during this period of time. The United States of America and Canada worked together 11 times during this period. The United Kingdom and Canada worked together a total of 7 times during this amount of time. Additionally, all of the other nations on the list, which begins with Australia and Switzerland and continues to the 20th place worldwide in terms of collaboration in human consciousness research, had collaborated three times with one another and had made significant headway.

Table 11. Collaboration among countries in human consciousness research in Scopus

Collaboration among countries in human consciousness research in Scopus		
From	To	Frequency
USA	United Kingdom	14
USA	Canada	11
United Kingdom	Canada	7
USA	Belgium	6
USA	France	6
USA	Germany	6
USA	Italy	6
Finland	Sweden	5
United Kingdom	France	5
United Kingdom	Italy	5
USA	China	5
USA	Finland	5
United Kingdom	Spain	4
USA	Spain	4
USA	Sweden	4
Australia	Switzerland	3
United Kingdom	Belgium	3
United Kingdom	Sweden	3
United Kingdom	Switzerland	3
USA	Australia	3

Figure 9. Collaboration among countries in human consciousness research in Scopus

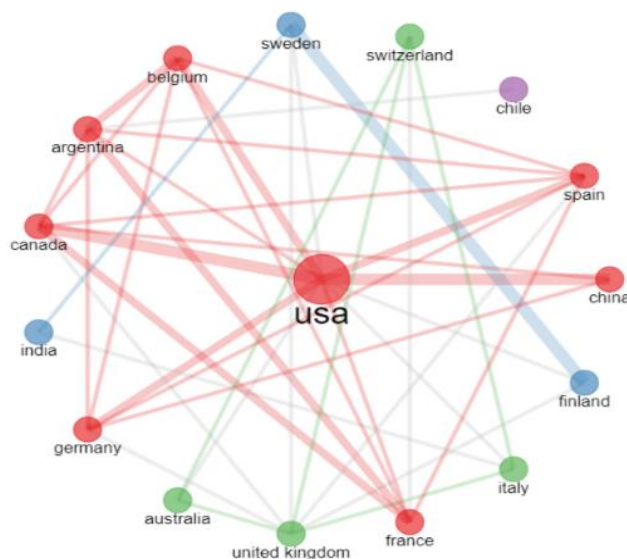


According to the researchers’ results, there are a total of 51 nations partnership in the subject of human consciousness in PubMed database worldwide. Table 12 lists the top 20 nations with the most cooperation on human consciousness research. The biggest frequency in partnership of countries is between Finland and Sweden; USA and Canada; while USA and China carry on equal number of cooperation with approximately three instances of collaboration. Other nations, from Argentina and Belgium through USA and Spain cooperated roughly two times. Finally, all other nations include at least one partnership appropriately.

Table 12. Collaboration among countries in human consciousness research in PubMed

Collaboration among countries in human consciousness research in PubMed		
From	To	Frequency
Finland	Sweden	3
USA	Canada	3
USA	China	3
Argentina	Belgium	2
France	Argentina	2
France	Canada	2
USA	Belgium	2
USA	Germany	2
USA	Spain	2
Argentina	Chile	1
Argentina	Spain	1
Australia	Pakistan	1
Australia	Switzerland	1
Belgium	Spain	1
Canada	Argentina	1
Canada	Belgium	1
Canada	Ireland	1
Canada	Spain	1
China	Canada	1
China	Germany	1

Figure 10. Collaboration among countries in human consciousness research in PubMed



## Discussion

A bibliometric study was done to examine worldwide trends in research on human consciousness, with an emphasis on certain issues within the discipline, throughout the course of a time period stretching from 2000 to 2022. This research was carried out with the purpose of giving an assessment of these patterns. This research was undertaken, to the best knowledge of researchers, with the purpose of filling the gaps left by an earlier study of bibliometric analysis on the global research on human consciousness using the Scopus and PubMed databases. Researchers utilised the phrases “human consciousness” as search subjects in Scopus and PubMed between the years 2000 and 2022 in order to compile a list of relevant papers. The purpose of the project is to focus on human consciousness research throughout the globe from the years 2000 to 2022. The study has no constraints set on the sorts of articles that may be utilised in the study, and in English only publication have been considered for desired outcome. Following the preliminary step, researchers had obtained 1671 papers from the databases mentioned earlier for considerable extent.

According to Sun et al., (2018), an intriguing bibliometric indicator that may indicate to the growth of an area of study is the number of academic publications in that subject. So, for the outcome of research that has been done, USA and United Kingdom (Scopus); and Finland and Sweden (PubMed) have the largest number in partnership with each other. Meanwhile, the keywords that has been utilised for this topic is largely consciousness (Scopus) and humans (PubMed) (PubMed). So if there is any other researcher doing or writing this issue, the researcher may utilise these terms for future reference. Furthermore, the most relevant journal or sources for Scopus is Journal Of Consciousness Studies which includes about 27 publication whilst for PubMed is Frontiers In Psychology, that contains around 12 publication. For country scientific production USA has the highest publishing approximately 692 (Scopus) and 149 (PubMed) articles. Last but not least, annual scientific production indicate inconsistent tendency for both databases. Finally, the maximum annual scientific production reveals that there are about 102 publication for Scopus in 2018, while 26 publication for PubMed in 2021, and the lowest publication for the two databases are in 2000 that is 22 (Scopus) and one (PubMed) .

## Conclusion

The goal of this article is to give a bibliometric study of research on the human consciousness to identify the most prolific writers, the most frequently used terms, the most reputable journals, and the countries that cooperate most with one another on this topic. A total of 1671 journal articles published between 2000 and 2022 were gathered from Scopus and PubMed for this bibliometric study. This article uses bibliometric approaches to organise, display, and evaluate the systematic flow of literature in the human consciousness. Key concerns in human consciousness research were identified using this bibliometric strategy, which may

also be utilised in the future to establish novelty in the field. For researchers to provide information in the form of an overview and guidance, they need to fill in the research gaps that exist due to the lack of bibliometric studies of human consciousness.

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