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Sports activities during the Covid 19 pandemic: A Bibliometric Analysis

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B. Acquisition of data
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Abstract. The sports industry has been one of the most negatively impacted by the COVID-19 pandemic. This bibliometric analysis aims to analyze the characteristics of the literature on sports activities during COVID-19 published in the Scopus database. Year of publication, type of publication, publication stage, language, country, institution, scientific source, author, and keywords are used as parameters in the analysis of sports activities and Covid-19. A thorough examination of 1480 documents from 2020 to 2023 (as of June 23, 2022) revealed four were issued and 1476 were analysed. According to the findings, the most publications occurred in 2021, with 805 documents. States became the most active country with a total of 302 documents. With 160 documents, the International Journal of Environmental Research and Public Health was the most productive scientific source. The most common type of article documents (n = 1,116, 75,61%) Publication status: final (n = 1374, 93.08%). Most types of sources are journals (n = 1,449, 98.17%). There is a wide gap in the productivity of publications in the field of sports activities during the COVID-19 pandemic between countries with strong and large sports traditions and countries with developing sports traditions.

Keywords: Sport activities, Covid-19, Scopus, Bibliometric Analysis

INTRODUCTION

Flexible strategies are required to enhance the general public's physical, mental, and emotional health in light of the ongoing COVID-19 pandemic. People should be able to participate in sports while maintaining a suitable distance from others and the adaptability to deal with changing situations and personal demands. (Lee et al., 2022). Numerous sports leagues are already taking action to halt the COVID-19 outbreak, which includes delaying or canceling sporting events (Parnell, et al., 2020). The COVID-19-related regulations have had a particularly detrimental effect on the sports business. The 2020 Tokyo Olympics and other sporting events of all sizes and interests have been postponed or canceled as a result of COVID-19, causing financial losses and unhappiness within the athlete community (Musumeci, 2022).

The closing of gyms, stadiums, swimming pools, dancing and fitness studios, physiotherapy clinics, parks, and playgrounds as a result of the global COVID-19 outbreak has a negative financial impact on people's ability and desire to exercise (Harangi-Rákos et al., 2022). The COVID-19 pandemic's effects have shown the sports system's flaws as well as its potential and benefits (Andrés, 2020). Physical activity, exercise, and COVID-19 have a pretty straight forward association (de Arajo, 2021), depending on personal intentions and efforts to meet physical needs. With the overarching goals of sport providing peace, wonderful lifestyles, and the impact of sport on the nation's economy, sport development faces challenges in the areas of sports policy, sports funding, and sports infrastructure, all of which are essential for sustainable sports (Oluwatoyin, et al., 2021). One of the biggest endeavors in human history is sport. Sport can also be utilized to show the rest of the world the advantages of cooperation between individuals and groups (Sofyan, et al., 2021).

The prevalence of sports activities that did not adhere to worldwide age requirements was 27.5 percent (95 percent confidence interval 25.0-32.2) in 2016, according to 358 surveys conducted in 168 countries with 1.9 million participants (Gulthod, et al., 2018). The number of people who have never exercised has dramatically increased, according to a cross-sector representative survey about the first and second waves of the COVID-19 pandemic in Hungary. Prior to the pandemic, the percentage was 64.17 %, but after the first wave, it increased to 78.33 % (Ács et al., 2020); during the second wave, it was 73.67% (Harangi-Rákos, et al., 2022).

As of March 21, 2022, the WHO had received reports of 469,212,705 confirmed COVID-19 cases, including 6,077,252 fatalities. As of March 17, 2022, a total of 10,925,055,390 doses of the vaccine had been given out (World Health Organization, 2022). In late 2019, an emerging disease, coronavirus disease 2019 (COVID-19), has affected several aspects of health, including physical activity (Jurecka, et al., 2021; Lesser & Nienhuis, 2020; Oliveira, et al., 2022; Pérez-Gisbert, et al., 2021; Strains, et al., 2022). In addition, the COVID-19 pandemic has changed levels and patterns of physical activity (Stockwell et al., 2020; Wunsch, et al., 2022). Changes in social and health determinants lead to changes in physical activity (Kaygsz, et al., 2020; Pombo, et al., 2020; Rhodes, et al., 2020). These factors can influence the characteristics and trends of research and publications in this field (Wattanapisit et al., 2022).

According to what we know, there is a gap in our comprehension of the literature on sports activities during the COVID-19 pandemic. In journals with a Scopus index, there are numerous studies on exercise and COVID-19. Understanding the shifting trends in published

research in this domain brought on by the COVID-19 pandemic is the first step in building research capacity on exercise activity. Based on the year of publication, type of publication, stage of publication, language used, country of publication, institutions, scientific sources, author, and keywords from sports activities and Covid-19, this study seeks to analyze the characteristics of the literature on sports activities during COVID-19. The findings of this study can be utilized as basic data to conserve and promote other research activities and publications connected to sports activities given the current unclear environmental conditions, where it is expected that the infectious disease Covid-19 will continue to spread.

METHODOLOGY

Data collection and retrieval

The primary goal of this bibliometric analysis is to examine the distribution of publications about sports activities during the COVID-19 pandemic in the Scopus database. The inquiry was finished in the context of descriptive analysis using the document inspection approach in the Scopus database. To access the Scopus database for this bibliometric analysis, keyword searches with the terms: TITLE ("sport" OR "physical activity" OR "physical exercise" OR "physical training" AND "COVID-19" OR "Coronavirus" OR "2019-nCoV" OR "SARS-CoV-2"). The records were 1480 records that were extracted from the Scopus database on June 23, 2022. The number of publications starts from 2020–2023. The Scopus database was chosen because it contains more documents than the Web of Science and Pubmed (Sweileh et al., 2017). This bibliometric analysis uses data in Comma-Separated Values (CSV) format for VOSviewer and Research Information Systems (RIS) for Publish or Perish, which is then exported to Microsoft Excel (Abdullah, 2021). The information gathered comprises the author's name, the source of the document, the publication's year and title, its scientific source, the subject matter, and the format of the publication. These guidelines ensure that the type of publishing selected will successfully gather trustworthy and accurate data in order to meet the study objectives (Abdullah & Sofyan, 2022).

The amounts of metadata that must be met for analysis varies greatly in bibliometric analysis (Sofyan, 2022). The minimum and maximum metadata standards that can be analyzed, as well as the quantity of metadata numbers for bibliometric analysis, are not stated. Each document requires the same total amount of papers to be fetched, and each paper can only be chosen once. 20, 50, 100, 200, 500, 1,000, and 2000 are the paper sample sizes (Rogers et al., 2020). To analyze bibliometrics, a minimum of 50 documents is required (Bornmann et al., 2014; Lehmann et al., 2008; Sjöstedt et al., 2015); 50-100 documents (Glänzel & Moed, 2012; Seglen, 1994; 100-300 documents (Snyder, 2019). The number of validated publications is anticipated to reach a minimum threshold of 300 papers in order to conduct a bibliometric analysis, and this study has satisfied the minimal requirements (Donthu et al., 2021). This indicates that it doesn't have any special metadata linked to it. In this study, 1476 records were deemed sufficient to conduct a bibliometric analysis on the subject of sports activity.

Data analysis

1476 articles on sports-related topics were found between 2020 and 2023. This review was initially exported in Comma-separated Values (CSV) and Research Information Systems (RIS) formats to Microsoft Excel, Publish or Perish (PoP), and VOSviewer software for additional

analysis. The data collected includes the author's name, the source of the document, the publishing year and title, the country, the journal, the subject matter, and the type of publication. The bibliometric analysis and mapping of articles on sports activities is possible with the Van Eck & Waltman tool (2010), VOSviewer. Van Eck and Waltman (2010; 2019) claim that VOSviewer transforms CSV data to diagrams or clusters using visual cues based on a mapping procedure.

RESULT AND DISCUSSION

Most Active Source Scientific

The top ten active journals with sports and COVID-19 papers are listed in Table 1. The scientific journal with the most articles, at 161, is the International Journal of Environmental Research and Public Health. The second-highest number of papers came from Frontiers In Psychology, with 65; the third-highest number came from Sustainability Switzerland, with 27 publications.

Tebel 1. Most Active Source Scientific

Source	Doc.	H-Index	SJR 2021	Country
International Journal of Environmental Research and Public Health	160	138	0.81	Switzerland
Frontiers in Psychology	64	133	0.87	Switzerland
Sustainability Switzerland	27	109	0.66	Switzerland
BMC Public Health	24	159	1.16	United Kingdom
Nutrients	21	143	1.29	Switzerland
British Journal of Sports Medicine	20	189	3.87	United Kingdom
Journal of Physical Education and Sport	17	30	0.39	Romania
Sport Sciences for Health	17	19	0,33	Italy
Journal of Physical Activity and Health	16	80	0.77	United States
Journal of Sports Medicine and Physical Fitness	16	68	0,49	Italy

Most Active Countries and Institutions

It has also been determined how much the nation contributed to the global research of sporting events during the COVID-19 epidemic. Table 2 lists 63 of the 124 most active nations along with the minimum number of papers that each nation owns. With 302 articles and 5633 citations, the United States contributed the most to the overall number of publications. With 211, 136, and 3833 papers, respectively, the United Kingdom and Spain came in second and third in the analysis of sports activities during the COVID-19 epidemic. 3662 references. Figure 1 also provides descriptions of additional nations.

Table 2. Most Active Countries

Country	Doc.	Cite	Country	Doc.	Cite	Country	Doc.	Cite
United States	302	5633	Sweden	28	407	Egypt	11	944
United Kingdom	211	3833	South Africa	28	157	Croatia	11	261
Italy	146	3190	Indonesia	28	96	Israel	11	113
Brazil	139	2145	Austria	27	842	Serbia	11	16
Spain	136	3662	Russian Federation	24	330	Jordan	10	1027
Germany	106	1707	India	22	157	Pakistan	10	53
Australia	90	1804	Mexico	22	156	Czech Republic	10	43
Canada	86	2005	Saudi Arabia	22	82	Taiwan	10	12

China	77	1444	Ireland	21	503	Hungary	9	204
France	56	1650	Qatar	20	1013	United Arab Emirates	8	843
Switzerland	49	569	Belgium	19	529	Bosnia and Herzegovina	8	87
Japan	47	410	Hongkong	18	215	Thailand	8	34
Iran	45	980	Malaysia	17	141	Morocco	6	43
Portugal	43	1153	Norway	17	128	Peru	6	6
Turkey	41	182	Tunisia	15	1027	Luxembourg	6	4
Poland	40	258	Singapore	15	136	Philippines	6	3
Chile	39	529	Slovenia	13	969	Ukraine	5	35
Greece	31	368	Finland	13	107	Kuwait	5	27
South Korea	30	325	New Zealand	12	117	Bangladesh	5	25
Netherlands	28	1315	Colombia	12	116	Lithuania	5	10
Denmark	28	1152	Romania	12	78	Malta	5	8

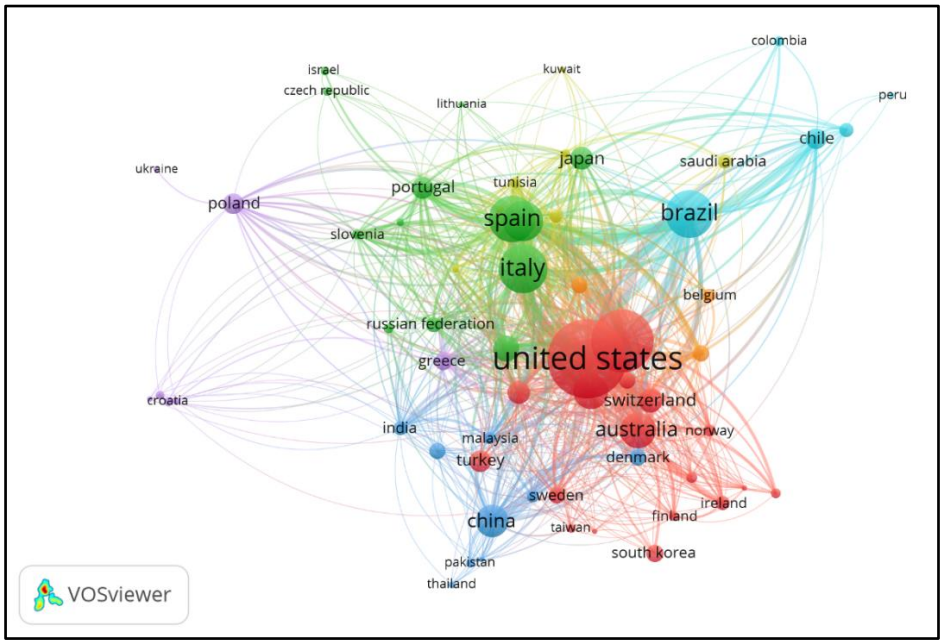

Figure 1. Network visualization country

With 402 citations, Temple University's Department of Biology at the Sbarro Institute for Cancer Research and Molecular Medicine in Philadelphia, United States, received the most references.

Table 3. Citation of documents in organizations

Instituions	Doc.	Cite
Department of Biology, Sbarro Institute for Cancer Research and Molecular Medicine, College of Science and Technology, Temple University, Philadelphia, United States	4	402
Faculty of Science and Engineering, Anglia Ruskin University, Cambridge, United Kingdom	3	335
Department of Sports Methods and Techniques, Federal University of Santa Maria, Santa Maria, Brazil	4	294
Department of Kinesiology, Iowa State University, Ames, United States	3	212
Institute of Mental Health Sciences, School of Health Sciences, Ulster University, Newtownabbey, United Kingdom	4	210
Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia	5	150
Faculty of Kinesiology, University of Split, Split, Croatia	4	130
Faculty of Human Sciences, University of Tsukuba, Otsuka, Bunkyo-Ku, Tokyo, Japan	3	129
The Cambridge Centre for Sport and Exercise Sciences, Anglia Ruskin University, Cambridge, United Kingdom	4	118

Department of Sports Methods and Techniques, Federal University of Santa Maria, Santa Maria, Brazil	3	105

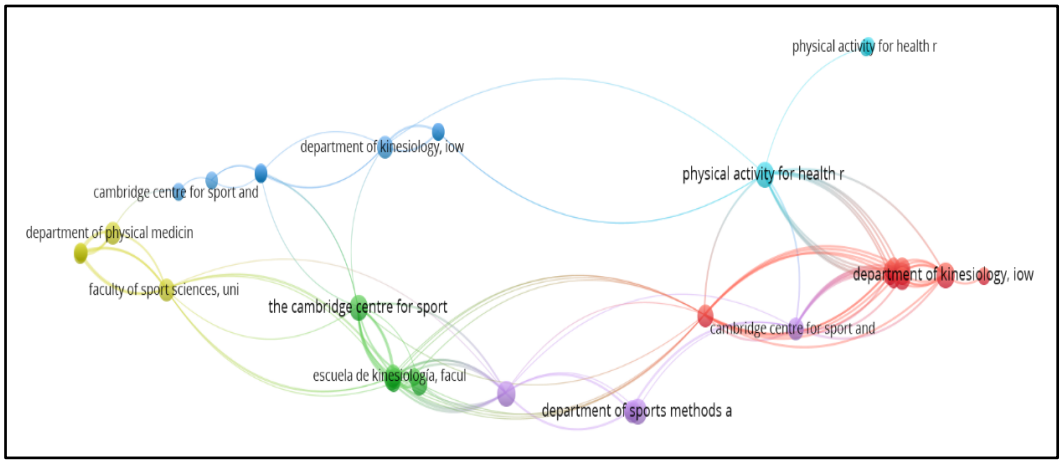

Figure 2. Network visualization for department citations

Author keywords

There are a total of 2776 keywords recorded in VOSviewer. Table 5 lists the 48 most frequently used keywords in sports activities abstracts during COVID-19. The keyword that came up the most was "Covid-19", which appeared 877 times and had a total link strength of 1569. Physical activity and exercise became the second and third most frequent keywords, with 536,180 times and 1158,394 total link strength. Figure 3 contains additional keywords from the VOSviewer output.

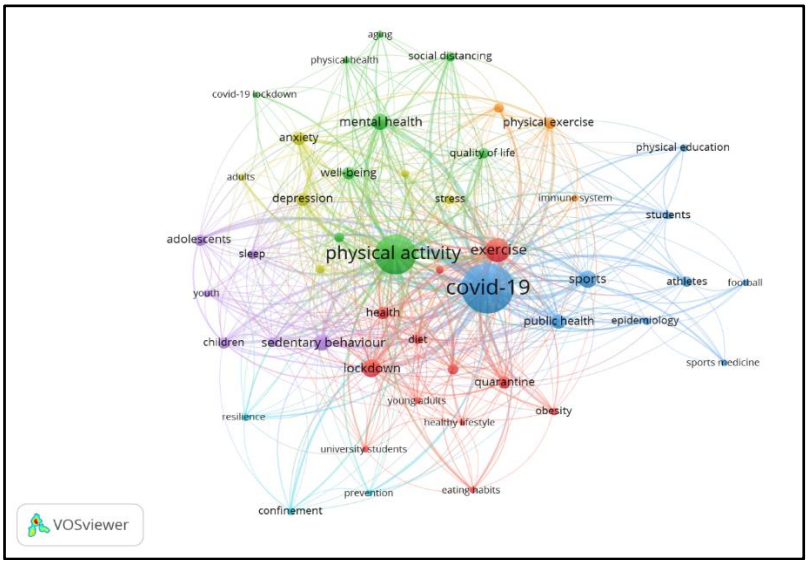

Figure 3. Network visualization for keyword

Author Citation

There are a total of 6625 authors recorded in VOSviewer, and 64 authors were found with a minimum of five published documents and at least one citation obtained. Figure 4 illustrates the citation author visualization network. Smith, I, with a total of 18 documents published, received 858 citations as the author with the highest number of citations on sports activities publications during the COVID-19 pandemic and a total link strength of 113.

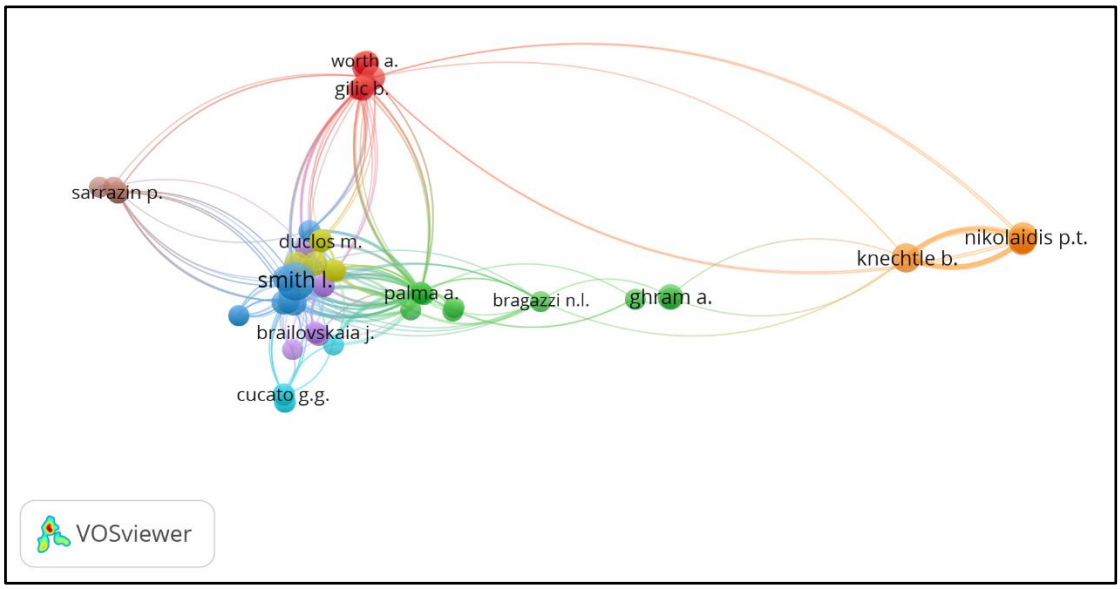

Figure 4. Network visualization for author citations

Table 4. Top 10 cited Articles

Cite	Auhtor	Title
747	A. Ammar, M. Brach, K. Trabelsi, H. Chtourou, O. Boukhris, L. Masmoudi, B. Bouaziz, E. Bentlage, D. How, M. Ahmed, P. MÃ¼ller, N. MÃ¼ller, A. Aloui, O. Hammouda, L.L. Paineiras-Domingos, A. Braakman-Jansen, C. Wrede, S. Bastoni, C.S. Pernambuco, L. Mataruna, M. Taheri, K. Irandoust, A. Khacharem, N.L. Bragazzi, K. Chamari, J.M. Glenn, N.T. Bott, F. Gargouri, L. Chaari, H. Batatia, G.M. Ali, O. Abdelkarim, M. Jarraya, K. El Abed, N. Souissi, L. Van Gemert-Pijnen, B.L. Riemann, L. Riemann, W. Moalla, J. GÃ³mez-Raja, M. Epstein, R. Sanderman, S.V.W. Schulz, A. Jerg, R. Al-Horani, T. Mansi, M. Jmail, F. Barbosa, F. Ferreira-Santos, B. Å imuniÄ	Effects of COVID-19 home confinement on eating behaviour and physical activity: Results of the ECLB-COVID19 international online survey
492	R. Stanton, Q.G. To, S. Khalesi, S.L. Williams, S.J. Alley, T.L. Thwaite, A.S. Fenning, C. Vandelanotte	Depression, anxiety and stress during COVID-19: Associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults
477	P. Chen, L. Mao, G.P. Nassis, P. Harmer, B.E. Ainsworth, F. Li	Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions
327	C. Pieh, S. Budimir, T. Probst	The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria
326	D. JimÃ©nez-PavÃ³n, A. Carbonell-Baeza, C.J. Lavie	Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people
305	G. Maugeri, P. Castrogiovanni, G. Battaglia, R. Pippi, V. D'Agata, A. Palma, M. Di Rosa, G. Musumeci	The impact of physical activity on psychological health during Covid-19 pandemic in Italy
299	G.H. Tison, R. Avram, P. Kuhar, S. Abreau, G.M. Marcus, M.J. Pletcher, J.E. Olgin	Worldwide effect of COVID-19 on physical activity: A descriptive study
276	I.A. Lesser, C.P. Nienhuis	The impact of COVID-19 on physical activity behavior and well-being of canadians
254	G.F. Dunton, B. Do, S.D. Wang	Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U.S.

221	S. Stockwell, M. Trott, M. Tully, J. Shin, Y. Barnett, L. Butler, D. McDermott, F. Schuch, L. Smith	Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: A systematic review

Our society is currently experiencing the worst public health crisis in more than a century as a result of the COVID-19 pandemic. Global governments are stepping in to break the virus's chain of transmission and stop the spread of illness by imposing lockdowns on the general populace and quarantining positive people. Managing COVID-19 is challenging due to the complex interplay between its biological and sociological components, as we have learned from experience. Society has been forever changed by this pandemic. Particularly affected are sports (Leng & Phua, 2020). The pandemic has not only forced the cancellation or postponement of numerous sporting events, but it has also shown that sports organizations' internal procedures need to be reviewed (Parnell, et al., 2020).

Of the 1,480 articles found, four were excluded because they were detected as duplicate files. Based on the type of document, most of the articles (n = 1,116, 75.61%), review articles (n = 114, 7.72%), letters (n = 76, 5.14%), notes (n = 57, 3,86%), editorial (56, 3,79%), erratum (19, 1.28%), conference paper (18, 1.21%), book chapter (14, 0.94%), short survey (4, 0.27%) and data paper (2, 0.13%). Based on the publication stage, most were final (n = 1374, 93.08%) and articles were in press (n = 102, 6.91). Based on the type of source, consisting of journals (n = 1,449, 98.17%), books (n = 12, 0.81%), book series (n = 8, 0.54%), and conference proceedings (n = 7, 0.47%). The languages used in each manuscript consist of English (n = 1415, 95.86%), Spanish (n = 40, 2.71%), German (n = 12, 0.81%), Italian (n = 9, 0.60%), Russian (n = 8, 0.54%), Portuguese (n = 6, 0.40%), French (n = 5.0.33%), Czech (n = 3, 0, 20%), Croatian (n = 2, 0.13%), Greek (n = 2, 0.13%), Japanese (n = 2, 0.13%), Persian (n = 2, 0.13%), and Chinese (n = 1, 0.06%).

Switzerland is the nation with the greatest number of scientific resources, the nation with the highest volume of publications in the area of sporting activities, and the nation with the top three suppliers of scientific resources in this area. With 302 documents and 5,633 citations, the United States rose to the position of nation with the most documents and citations.

CONCLUSION

The characteristics and trends of the literature on sports activities during the COVID-19 pandemic, published on Scopus up until June 23, 2022, are revealed by this bibliometric analysis. The publishing nations are those in North America, Europe, and those with long and storied histories in sports. During the COVID-19 pandemic, sports publications dominated. There are no publications by the principal author associated with organizations in nations with a weak history of growing sports. To boost global research productivity in the area of sports activity, research capacity must be built as well as supporting measures to encourage research productivity in nations with modest and developing sports activity traditions.

There are various restrictions on this study. One database is all we have. It is possible to use other databases, which might be able to contain more documents than Scopus, including PubMed, Google Scholar, or Web of Science (WoS). Because Scopus publishes papers in journals with high impact factors, we favor it.

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