

ANALYSIS OF THE SCIENTIFIC LITERATURE ON ARTISTIC GYMNASTICS IN SCOPUS DATABASE

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Abstract

The purpose of this article is to examine the current state of scientific production, collaboration, and the effects of research publications on artistic gymnastics, as well as the most active researchers pursuing this area of study. Documents acquired from the Scopus database served as the basis for our investigation. MS Excel as well as VOS viewer were used to carry out the bibliometric analysis and network design. As a result, 430 original articles and scientific reviews in 22 Scopus subject areas were found in 167 journals. Most articles were published in Science of Gymnastics Journal (76). These articles are also most cited (294). There are 28 authors with five to fifteen articles whose citation form most of the citation network. Most of the artistic gymnastics research is published in journals that cover subjects such as medicine, health professions, and social science, with the first receiving the most citations.

Keywords: *artistic gymnastics, bibliometrics, citation network, scientific literature*

INTRODUCTION

Artistic gymnastics stands as a widely embraced competitive sport, encompassing both male and female participants on the Olympic stage. This sport comprises four events for women (vault, uneven bars, balance beam, floor) and six events for men (floor, pommel horse, rings, vault, parallel bars, floor). In accordance with the findings of Arkhaev & Suchlin (2004), artistic gymnastics involves a diverse range of routines executed on equipment with varying motor skill requirements. The significance of artistic gymnastics lies in its capacity to foster physical well-being, mental resilience, aesthetic expression, teamwork, and cultural sensitivity. It plays

a pivotal role in holistic development, exerting enduring positive impacts on individuals and society at large. The International Gymnastics Federation (FIG) serves as the global governing body for artistic gymnastics and related disciplines.

The application of scientific research holds the potential to enhance training methodologies, elevate performance standards, and establish a safer milieu for gymnasts to excel. In essence, scientific inquiry within gymnastics contributes to the evolution and advancement of the sport, simultaneously aiding athletes in unlocking their utmost capabilities while ensuring their safety and overall welfare. In our

research, the bibliometric method will be used to better understand the current state of research in artistic gymnastics. Bibliometrics is the mathematical and statistical study of scientific literature (Pritchard, 1969). It identifies papers that are focused on a certain subject and reveal the social and logical connections between the key players (authors/scientists) in each scientific field. The basis for bibliometric research are the so-called primary sources of scientific information. These are publications that most often include articles and other papers published in academic journals, monographs/books, and papers published in academic journals and book proceedings (Jokić et al., 2012).

As far as we know an attempt to globally evaluate the current state of artistic gymnastics scientific research has not been published in a scientific journal to date. The only comparable study that we could find was research of the academic production on men's artistic gymnastics conducted by Pauline Iglesias Vargas and André Mendes Capraro (2020). The goal of their study was to outline the scholarly output of publications related to men's artistic gymnastics that were indexed in the Scopus and Web of Science databases. Authors conducted a non-specific date-range search on both platforms using the terms "men's artistic gymnastics" and "male artistic gymnastics" with the objective to highlight a panorama of the distinct academic production on men's artistic gymnastics through the application of the criteria.

Several bibliometric studies focusing on various sports have been published in the field of sport science. A bibliometric analysis of sports economics research between 1956 and 2009 revealed an increase in the quantity of published articles and journals, as well as the productivity of

this field of study (Santos & García, 2011). The research on bibliometric characteristics of articles can be found in the research by Peset et al. (2013) whose goal was to detect the status of the scientific production, collaboration, as well as impact of scientific papers on judo. Research by Prieto et al. (2015) provides a bibliometric review of the scientific production in handball. The same year Pérez-Gutiérrez et al. (2015) performed a bibliometric analysis of taekwondo articles indexed in the Web of Science between 1989 and 2013. They concluded that there weren't enough academics studying this martial art, despite the fact that taekwondo had seen a significant surge in scientific research. Ho & Ho in 2015 conducted a bibliometric analysis of scientific production in the field of dance by analysing papers published in journals indexed in Web of Science database from 1994 to 2013. In 2019, Wang and Ho conducted an analysis of dance performance reviews from the years 1992 to 2016. The analysis focused on various aspects, including languages, publication outputs, authors, and journals of publication. Another bibliometric analysis was completed between 1968 and 2018 (Huertas González-Serrano et al., 2020) with the goal of providing an examination of sport entrepreneurship in the Web of Science Core Collection. The "sport sciences" literature's bibliometric analysis of all articles pertaining to summer and winter Olympic sports offers useful and practical information for researchers, practitioners, and funding stakeholders to further the Olympic-based research agenda in the rapidly expanding interdisciplinary subject of sport sciences (Millet et al., 2021). Özkadı et al. (2022) gave a summary of 2392 publications published between

1980 and 2021 thorough bibliometric analysis on swimming.

The aim of our study is to find out the current state of scientific production, collaboration, and most active researchers in artistic gymnastics. The primary achievement of this study is pinpointing significant research topics that enhance comprehension of the publishing patterns within artistic gymnastics. Utilization of bibliometric analysis offers a thorough outline of the field's progress, by concentrating on noteworthy publications, journals, authors, and connections. This serves as a valuable step towards offering essential background for upcoming research and researchers.

METHODS

We chose Scopus (Elsevier) as the data source because it took into account the caliber of the literature as well as the

requirement for the right reference format. Since 2004, prestigious academic, commercial, and governmental organizations have chosen the Scopus database. The database combines the exceptional quality and coverage of Scopus data with cutting-edge analytics and technology. We employed the Scopus database to ensure the study's thoroughness due to its scope: it covers more than 23,452 top-notch peer-reviewed journals.

The approach to the search was as follows: the term “artistic gymnastics” was searched within the Article title, Abstract, Keywords (Figure 1). The focus of the study were the years 1975 to 2022. The earliest entry in the database dates to 1975. To ensure the accuracy of the analysis, the current year, 2023, has been omitted from consideration. The only acceptable publication types were (original) articles and reviews. A total of 430 articles were under investigation.

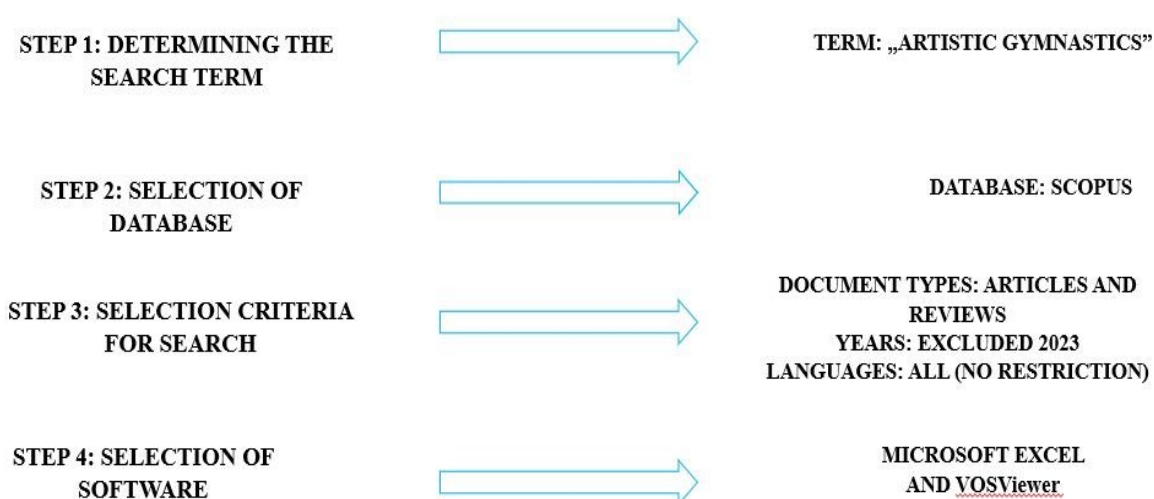


Figure 1. Scopus database selection criteria.

All results were downloaded with the record content of “Citation information”, “Bibliographical information” and “Abstract & keywords”, and exported in RIS format for further processing using Scopus's “Export Document Settings” option. A Microsoft Excel file was created and stored with a summary of the bibliographic data, which included the annual number of publications and citations, nations, institutions, authors, journals, funding agencies, research topics, keywords, and references.

The 2021 Scientific Journal Rankings served as the foundation for the SJR. Using VOSviewer 1.6.18, both qualitative and quantitative assessments were carried out. It was used in the present study to illustrate the co-authorship analysis of the authors and the co-occurrence analysis of the keywords. Graphs and descriptive statistical analyses were conducted using Microsoft Excel 2022.

The bibliometric analysis considered the following factors: document types and languages, the annual trend of articles published, the average number of authors

per article, research fields and topics, trends of publications in the most active research fields, top journals, author productivity, and country distribution of publications.

RESULTS

Figure 2 shows the analysis of document type. Reviews (N=23; 5.35%) were the second-most common form of publication after (original) articles (N=407), which accounted for 94.65% of the analyzed references.

Examining the language of publication (Figure 3), 84.88% of the 430 studied articles were written in English (N=365), significantly more than in any other publication language. Other languages included Portuguese (N=24 articles; 5.58% out of the total), Russian (N=19; 4.42%), Spanish (N=15; 3.49%), German (N=8; 1.86%), French (N=7; 1.63%), Slovenian (N=7; 1.63%), Croatian (N=4; 0.93%), Italian (N=3; 0.70%), Japanese (N=2; 0.47%), Chinese (N=1; 0.23%), Korean (N=1; 0.23%), Polish (N=1; 0.23%), and Turkish (N=1; 0.23%).

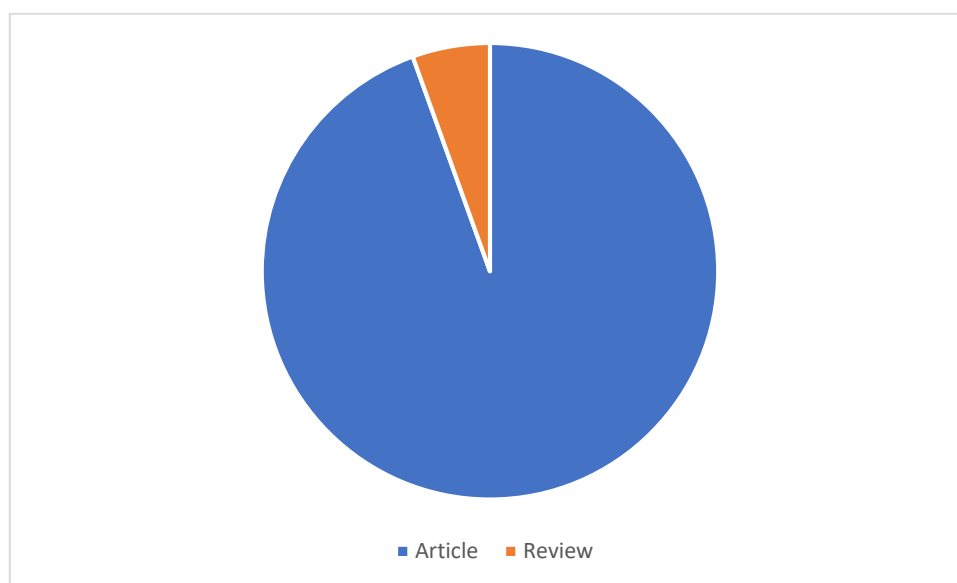


Figure 2. Total number of publications by document type

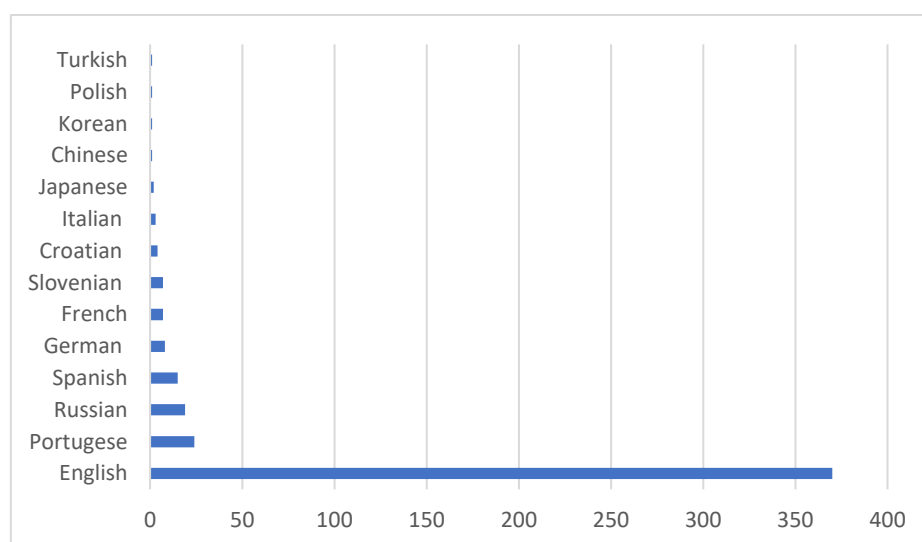


Figure 3. Total number of articles published by language.

Figure 4 displays the annual trend of articles that have been published. *Studies on the vertebral column in young female gymnasts (Wirbelsäulenuntersuchungen bei Jugendlichen Kunstturnerinnen)* was the first publication in artistic gymnastics research to be published (Meyer, 1975). From this year to 2010, the number of published articles remained in very low figures, with no more than 8 articles per year, and for several years there was only one published article per year. Since 2011,

there has been a steady rise in the number of articles, with some years (2014 and 2015) still seeing a fall in production. Nevertheless, there has been a definite upward trend, with the number of articles rising from 18 in 2012 to 41 in 2022. This pattern of publishing, particularly since 2011, when the number of published articles nearly tripled, demonstrates a significant advancement in artistic gymnastics research.

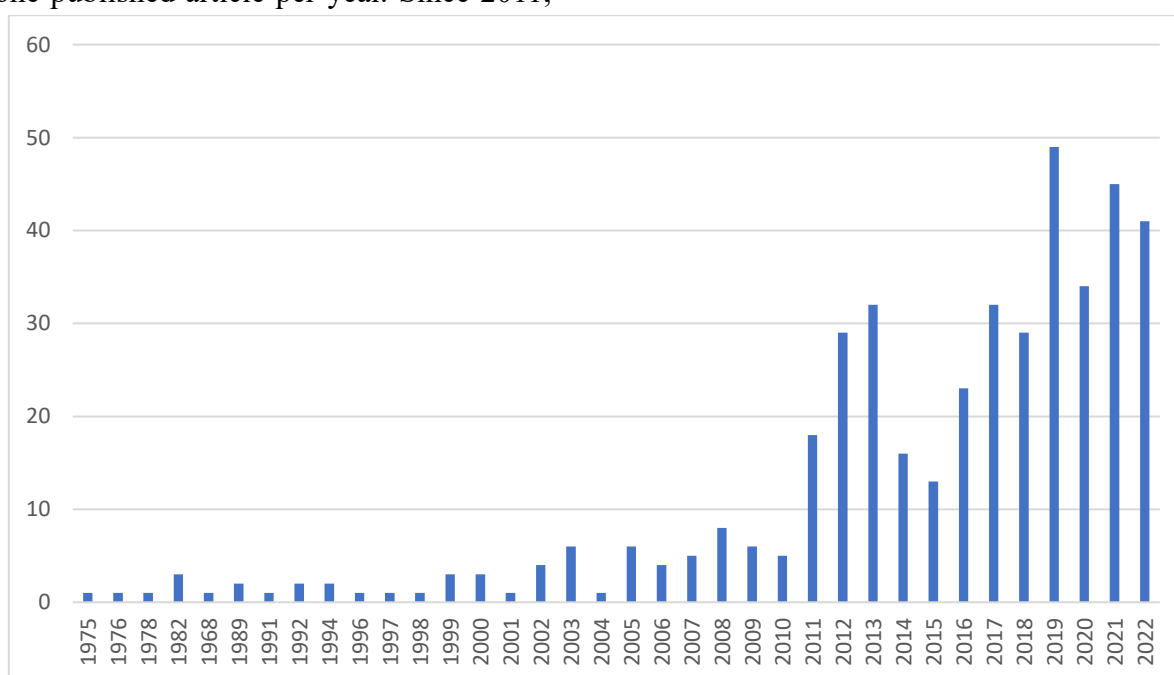


Figure 4. Number of published articles per year during 1975-2022.

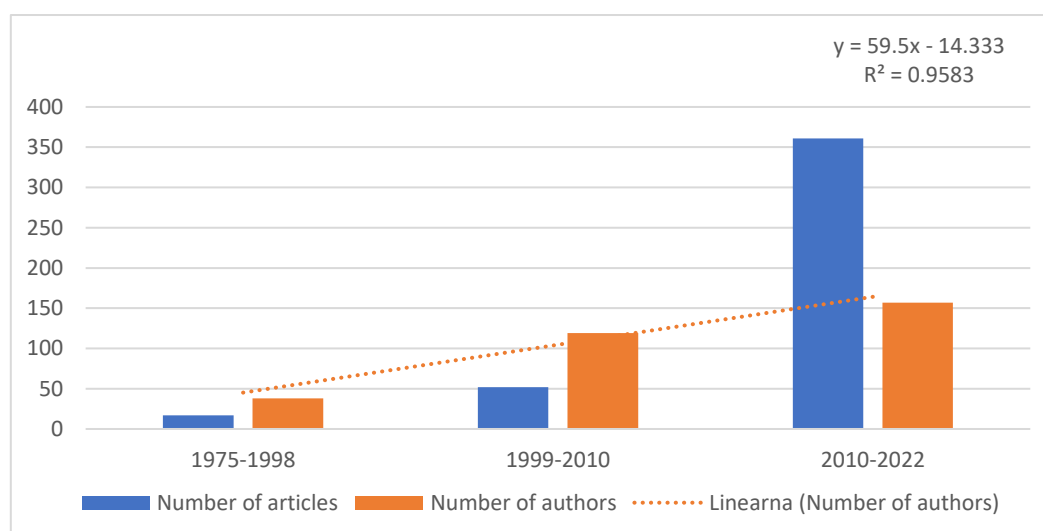


Figure 5. Average number of authors per article during 1975-2022.

Figure 5 illustrated the average number of authors per article. From 0.47 authors per article in the years 1975–1998 to 2.30 authors per article in the years 2010–2022, there was a significant rise in the average number of authors who contributed to articles. The linear trend line's R-squared value was 0.9583. The years with no articles published had a substantial impact on this number. Whatever the case, this demonstrates a significant level of cooperation in artistic gymnastics studies over time, particularly in recent years.

Table 1 shows the distribution of articles by area of study. Medicine emerged as the most productive, with the highest number of published articles (N=292, 67.91%), followed by health professions (N=250, 58.14%), social sciences (N=152, 44.71%), biochemistry, genetics, molecular biology (N=36, 8.37%), and engineering (N=24, 7.06%). Regarding article citations, medicine accumulated most citations (N=3533), followed by health professions (N=2345), social sciences (N=790), biochemistry, genetics and molecular biology (N=503), and engineering (N=148).

Regarding the 10 keywords that were most often used in the articles, (artistic)

gymnastics appeared 296 times, followed by human(s), physical education, female, adolescent, male, adult, sport, athlete, and biomechanics.

An article's title, abstract, and author-supplied keyword list are used to extract keywords from the text. The number of publications in which two keywords appear together in the title, abstract, or keyword list is known as the co-occurrence of the keywords.

Figure 6 shows the co-occurrence of keywords. According to outputs produced by the VOSviewer based on the Scopus data, the analysis of co-occurrence of all keywords (in title, abstract, or keyword list) returned 2016 results. 176 were selected based on the threshold of 5 co-occurrences. It was not surprising to find that "gymnastics" had the highest total link strength of any term. The proximity of keywords revealed a relationship between them; the further away from "gymnastics" they were, the further away the relationship or the less research was conducted on them. Gymnastics, bone strength, ankle injury, and shoulder joint, for instance, received less research.

Table 1 *Total number of published articles by research areas.*

Subject area	Number of articles	Citations
Medicine	292	3533
Health Professions	250	2345
Social Sciences	152	790
Biochemistry, Genetics and Molecular Biology	36	503
Engineering	24	148
Psychology	19	296
Arts and Humanities	13	107
Business, Management and Accounting	9	61
Computer Science	9	20
Material Science	8	18
Environmental Science	7	19
Multidisciplinary	7	35
Chemical Engineering	6	18
Agricultural and Biological Sciences	5	18
Mathematics	5	17
Nursing	4	72
Physics and Astronomy	4	6
Pharmacology, Toxicology and Pharmaceutics	2	36
Chemistry	1	36
Decision Sciences	1	15
Economics, Econometrics and Finance	1	3
Neuroscience	1	7

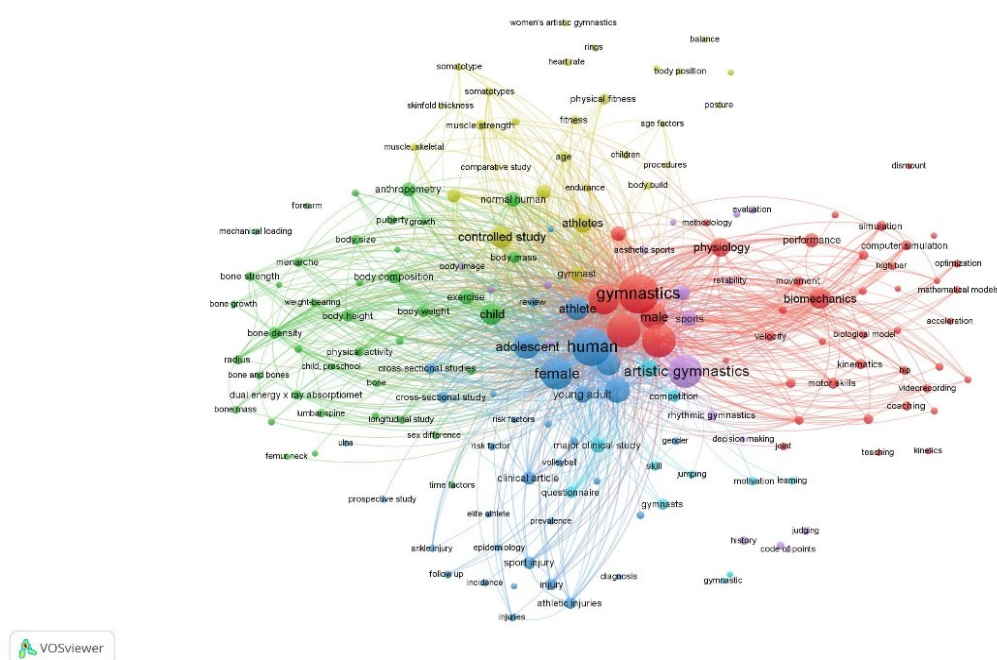


Figure 6. Co-occurrence analysis of keywords.

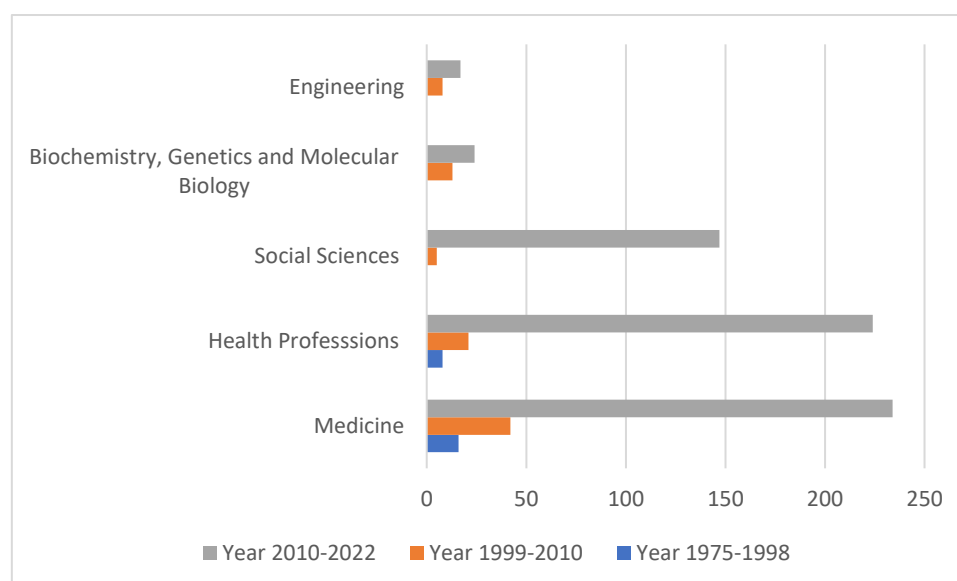


Figure 8. Number of published articles per research area.

The 430 articles under analysis were published in 167 journals overall. Table 2 lists the top 10 scientific journals for artistic gymnastics research along with statistics on the number of published articles, overall journal citations, average citations per article, and current journal rankings (SJR). Out of the 167 journals, the top 10 most active journals published a total of 175 articles, accounting for 40.70% of all articles published. *The Science of Gymnastics Journal* (76 articles; 6.43% of all published articles) and the *Journal of Physical Education and Sport* (24 articles; 5.58% of all published articles) stand out, followed by *Teorya i Praktika Fizicheskoy Kultury* with 14 articles (3.26%). The top 10 journals received 1,276 citations, or 29.98%, of the 4,256 citations that were received by all retrieved articles.

The fact that three of these journals—*Science of Gymnastics Journal*, *Journal of Sports Sciences*, and *Sports*

Biomechanics—account for 18.59% of all citations is also noteworthy. With only 7 papers published (1.63% of the total publications), the *Journal of Sports Medicine and Physical Fitness* garnered 177 citations (4.16% of the total citations), averaging 25.26 citations per article. This is primarily due to one article with 124 citations, regarded as strong evidence of its contribution (*The contribution of anthropometric characteristics to performance scores in elite female gymnasts*; Claessens, 1999). Other featured articles which were cited more than 100 times were: *The prevalence of spondylolysis in the Spanish elite athlete* (Tomása & Calderón, 2000); *In pursuit of an identity: A qualitative exploration of retirement from women's artistic gymnastics* (Lavalee & Robinson, 2007); and *Gymnastics injuries* (Caine & Nassar, 2005) with 189, 123 and 121 citations respectively.

Table 2 *Top ten most active journal.*

Journal title	Articles	Citations	Average citation per article	SJR
Science of Gymnastics Journal	76	294	3,9	0.283
Journal of Physical Education and Sport	24	60	2,5	0.393
Teorya i Praktika Fizicheskoy Kultury	14	8	0,6	0.204
Journal of Sports Sciences	12	248	20,7	1.162
Sports Biomechanics	10	249	24,9	0.783
Journal of Human Sport and Exercise	9	37	4,1	0.589
Journal of Human Kinetics	8	59	7,4	0.816
Journal of Sports Medicine and Physical Fitness	8	177	22,1	0.49
Journal of Biomechanics	7	117	16,7	0.747
Motriz Revista de Educacao Fisica	7	27	3,9	0.217

Table 3 *The ten most productive authors.*

Author	Country	Number of Articles	Leading Author Articles	Collaborated Articles	Citation Number	Average per article
Nunomura, M.	Brazil	15	5	15	101	6,73
Čuk, I.	Ljubljana	14	5	14	174	12,43
Kalinski, S. D.	Croatia	10	5	10	58	5,80
Barker-Ruchti, N.	Sweden	10	4	1	229	22,90
Atiković, A.	Bosnia and Herzegovina	9	5	8	39	4,33
Hiley, M. J.	United Kingdom	9	8	9	237	26,33
Irwin, G.	United Kingdom	9	3	9	125	13,89
Hübner, K.	Switzerland	8	0	8	31	3,88
Schärer, C.	Switzerland	8	8	8	31	3,88
Yeadon, M. R.	United Kingdom	8	1	8	229	28,63

In the observed period, articles produced by a sole author were in minority (39 articles; 9.07%). The high level of collaboration between scientists is reflected in multi-author articles, with 4 authors as the most frequent (201, 46.74%). There are

102 articles (23.72%) with two authors and 88 with 3 authors (20.47%). The 430 articles that were retrieved were signed by a total of 155 different authors. Table 3 lists the top ten authors in artistic gymnastics research in leading author publications and

collaborative publications, along with their home nations. These top-10 most productive authors contributed to 104 articles (24.19% of the total number of publications), making up 6.45% of all authors. This is consistent with findings in the majority of academic domains, where a small number of productive authors produce a sizable portion of publications. The fact that three of the top 10 writers were British highlights the significance of artistic gymnastics research in this nation.

A visual representation of research networks called co-authorship networks can show how collaborative a group of researchers are (e.g., grantees, international or industry collaborators, or faculty mentors). Vosviewer software was used to facilitate the analysis.

A cluster is a group or agglomeration that maintains a certain link, and each hue on the map denotes a cluster. Each hue represents a team of scientists who collaborate and research in the same field in this fashion. The size of the circles and the characters in the authors' names show how much writing each author has produced. Larger circles denote higher productivity. The lines between the circles show the

approximate co-authorship relationship, while the distance between them shows the relationships between the authors. Clusters near one another suggest closely connected fields (van Eck & Waltman, 2017).

In 430 publications that were examined for co-authorship, 155 collaborative authors were identified. To enhance data visualization, authors who have co-authored more than three articles were selected, resulting in a map featuring 70 results with 12 significant relations. The map reveals the presence of four clusters or groups of authors maintaining co-authorship relationships, distinguished by colors (Figure 9). Additionally, Čuk (Cuk) is notably interconnected with other authors across various clusters.

Analyzed articles were published by 50 different nations in total. Figure 10 lists ten nations with the highest levels of productivity. Brazil, the United States of America, and eight other European countries were in the top ten most productive nations. European nations contributed to 62.52% of the articles overall, showing just how important this continent is to artistic gymnastics study.

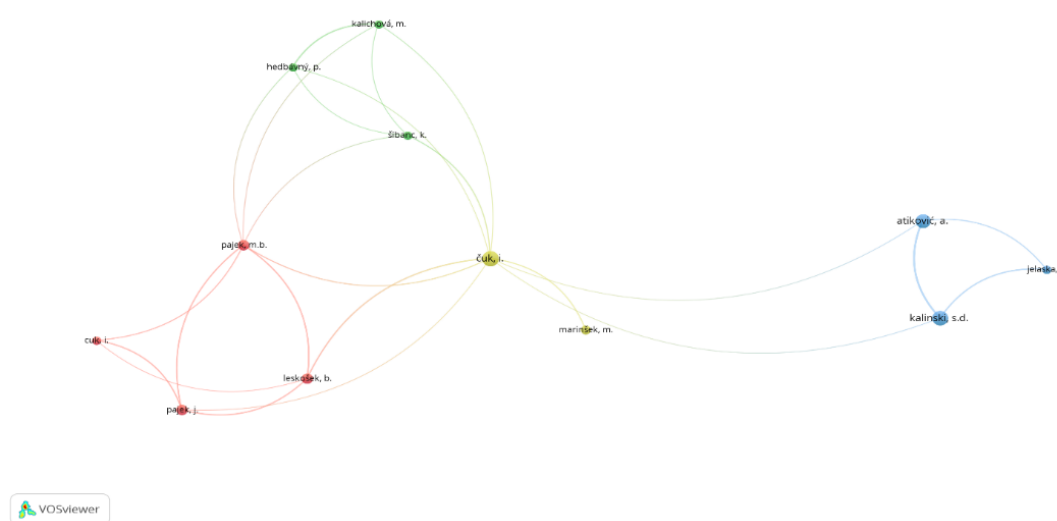


Figure 9. Map of co-authorship

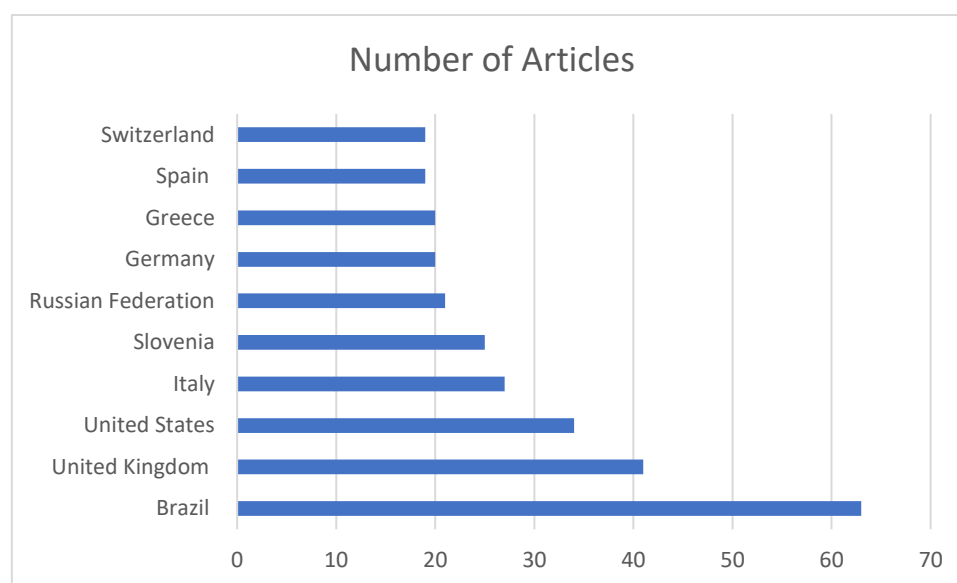


Figure 10. Top ten most productive countries.

DISCUSSION

While not as widespread as other sports, research on artistic gymnastics has expanded significantly in recent years. The goal of the current study was to conduct a bibliometric analysis of the body of research in artistic gymnastics. Publications from 1975 until 2022 were gathered from the Scopus databases. Original scientific articles were the most prevalent document type (N=407) and made up 94.65% of all publications. This demonstrates that researchers in the discipline of artistic gymnastics choose articles from scholarly journals as their primary medium for disseminating their most recent and significant results, which is consistent with most scientific research domains.

Of the 430 articles included in the research, 365 (84.88%) were written in English. Similar results can be found in the research on handball scientific production (Prieto et al., 2015). This confirms that English is the most widely used academic language and that the majority of scientific publications indexed in global academic databases are written in English. The

number of published articles from 1975, when the first scientific article on artistic gymnastics was published and indexed in Scopus, through 2010, stayed below 8 per year. Since 2010, the number of articles has gradually increased, particularly since 2017, when the number of published articles nearly tripled to reach an annual average of 30 articles. This demonstrates how artistic gymnastics has advanced significantly in recent years. The same conclusion was made by Vargas & Capraro (2020), and the reason for that was found in the global increase in academic output in tandem with the growth of search platforms.

With the evolution of collaborative research, there has been a consistent rise in the average author count per publication across all scientific fields since the 1980s (Hosseini et al., 2022). Within the examined dataset, a clear escalation in the authors per paper is evident, shifting from 0.47 authors to 2.30. According to the 2017 Taylor and Francis White paper, the rise in the number of authors could be attributed to the possibility that the nature of the research being carried out might require greater collaboration. The expansion of

interdisciplinary work, which gains advantages from diverse viewpoints, received notable emphasis. Additionally, emerging methodologies like participatory research are also exerting an impact. Knudson (2005) arrived at a similar finding through an analysis of applied biomechanics research. His conclusion aligns with the idea that there is an increasing inclination towards having a higher number of coauthors per paper. Moreover, there is an increase in the proportion of articles with six or more authors, while the percentage of articles authored by a single individual has been declining.

The scientific field with most publications was medicine, followed by the health professions, social science, biochemistry, genetics and molecular biology, engineering, and psychology. It draws attention to the fact that three of the top 10 disciplines (health profession, biochemistry, genetics and molecular biology, psychology) are in some way related to the medical sciences. This shows that artistic gymnastics is a sport with a high physical and psychological component where studies about injuries, physical capabilities, physiological components, etc., are common.

Various study areas in the field of medicine encompass topics such as eating disorders, vitamin D intake and bone density, sports injuries, strength, and motor skills, among others. The risk of spinal and other injuries is particularly high in artistic gymnastics due to its demanding nature, which increases with the level of performance. Research topics that are commonly explored include physical capabilities and conditions, physiological variable assessment, performance and success variables, male and female artistic

gymnastics, and sport technique. The predominance of the biological domain over the social domain is elucidated by Vargas & Capraro (2020). They suggest that this is not unexpected as there are generally fewer researchers and consequently fewer publications in the social aspects of sports.

The dominant trend in artistic gymnastics research publication are still articles published in the field of medicine, which has held the top spot every year throughout this period. In the same span of time, there was a considerable increase in biochemistry, genetics, and molecular biology, which emerged as the field with most articles published in 2003, 2005, and 2008. The same applies to the research area of social sciences, which had three indexed articles and 147 total publications in 2011.

VOSViewer's functionality for clustering keywords based on their co-occurrence is utilized for the analysis of keywords. Both author keywords and index keywords contribute to constructing a comprehensive overview of the diverse areas of study within the field of artistic gymnastics. The size of each node corresponds to the frequency of a particular keyword's occurrence, while the connections between nodes indicate the instances of these keywords co-occurring. A higher frequency of co-occurrence leads to a closer proximity between the associated keywords. Among the keywords exhibiting high frequencies, terms like "adolescents," "man," "adults," "women," "biomechanics," "physiology," and "performance" stand out. These frequencies suggest an increasing focus on researching the biomechanical and physiological aspects of artistic gymnastics, gender disparities, and various dimensions of artistic gymnastics concerning young individuals and adolescents. The outcomes of the keyword analysis align with the

prevailing trend of publications in the most active research domains, with medicine prominently holding the top position across different research periods.

The top three journals with the highest research activity in artistic gymnastics were *Science of Gymnastics Journal*, *Journal of Sports Sciences*, and *Sports Biomechanics*. The predominance of *Science of Gymnastics Journal* can be attributed to its specialization as an international gymnastics journal. Additionally, its affiliation with the gymnastics department of the University of Ljubljana and sponsorship by the Fédération Internationale de Gymnastique contribute to its prominence in publishing articles related to gymnastics (Vargas & Capraro, 2020).

The authorship pattern revealed that a small group of writers were responsible for a sizable portion of the publications. British authors made up three of the top ten most productive authors, demonstrating the significance of artistic gymnastics in this nation. In terms of region, European nations contributed to 22.09% of the articles. Aside from Brazil, the top 10 nations are almost predominantly European, demonstrating Europe's significant research presence in artistic gymnastics. This finding aligns with the results of the research conducted by Vargas & Capraro (2020), which also highlighted the predominance of the United Kingdom.

The top four productive authors, each with over ten published scientific papers in the field of artistic gymnastics, are Nunomura, M. (15), Čuk, I. (14), Kalinski, S. D. (10), and Barker-Ruchti, N. (10). The most cited articles are authored by Ivan Čuk, accumulating a total of 174 citations. All of these authors hold professorial positions at prestigious universities and specialize in artistic gymnastics.

Specifically, Myrian Nunomura is a professor at the School of Physical Education and Sport, University of Sao Paulo; Ivan Čuk is a professor at the Faculty of Sport, University of Ljubljana; Sunčica Delaš Kalinski is a professor at the Faculty of Kinesiology, University of Split; and Natalie Barker-Ruchti is a senior lecturer at the School of Health Sciences at Örebro University.

The co-authorship network offers insights into the structure of research within specific subjects, the progression of research networks over time, and the involvement of specific organizations or countries within these networks. Through co-authorship, we can observe the quantity of publications produced by authors and the connections between them. By employing co-authorship analysis, the prominent figure in the network was identified as Ivan Čuk. It's important to note that co-authorship data presents just one potential measure of scientific collaboration. Not all collaborative endeavors culminate in published works, and not all joint papers necessarily denote a sharing of knowledge among the authors. Nevertheless, it is generally assumed that co-authorship predominantly signifies active cooperation among partners that extends beyond mere material or information exchange.

When it comes to the overall scientific output concerning artistic gymnastics, Brazil stands out as the most productive nation. That's no surprise given that artistic gymnastics is very popular in Brazil, boasting a rich heritage and formidable global representation (Dindu, 2022). The administration of gymnastics in the country falls under the jurisdiction of the Brazilian Gymnastics Confederation (CBG), an affiliate of the International Gymnastics Federation (FIG). The nation has a track

record of accomplishments in artistic gymnastics, especially within the women's category. Among the prominent Brazilian gymnasts are individuals like Daiane dos Santos (Dindu, 2022), who secured a bronze medal during the 2004 Olympics, and Jade Barbosa, recognized for her multiple victories in the Pan American Games and various other global tournaments.

CONCLUSION

After describing the scholarly output on artistic gymnastics in journals listed in the Scopus database we came to the following conclusions: 1) the earliest article on the topic dates back to 1975, with 2019 being the year with the highest number of articles published; 2) English remains the dominant language in academic publications with 84.88% of the articles analyzed authored in English); 3) an increase in collaboration among authors was observed over time; 4) medical research comprises the majority of articles (67.91%) and also has the highest citation rate (82.64%); 5) four authors have authored more than 10 publications on this topic: one Brazilian (Nunomura, M.), one Slovenian (Čuk, I.), one Croatian (Kalinski, S. D.), and one Swedish (Barker-Ruchti, N.); 6) the *Science of Gymnastics Journal* leads in the number of articles on artistic gymnastics (17.67%), followed by the *Journal of Physical Education and Sport* (5.58%).

The purpose of this article is to encourage researchers to delve into the intricacies of artistic gymnastics and advocate for increased funding to advance scientific knowledge in this field. The information provided here can serve as a guide for researchers in deciding which journals to subscribe to and where to submit

their future articles. It can also aid new researchers in identifying key contributors and institutions in the realm of artistic gymnastics.

Acknowledging the limitations of the methodological approach, particularly in the selection of search engines and keywords, this study sought to offer an overview of the diverse academic production in artistic gymnastics within the methodological constraints. It underscores the importance of authors being meticulous in crafting the titles, keywords, and abstracts of their articles, as relevant research on this topic may have been inadvertently excluded by the search criteria employed in this study. Additionally, the preference for English-language journals is noted.

As bibliometric analysis is contingent upon the selected bibliographic sources, the findings and interpretations presented in this study are focused solely on evaluating the state of artistic gymnastics research utilizing the chosen Scopus database. We believe this research effectively serves as a comprehensive portrayal of the current landscape of artistic gymnastics research, given its primary objective of conducting an exploratory bibliometric analysis.

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