International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Bibliometric Analysis of The Olympic Games and Doping Research

Mustafa Ertan TABUK [*1]

[1] *Hitit University, Sport Science Faculty, Sport Management Department, Çorum, Türkiye*
*Corresponding author: ertantabuk@gmail.com

Abstract

Doping controls are carried out in all international mega sports organizations such as the Olympic Games to determine the use of doping. Prevention of doping use is carried out by the "Anti-doping Organization", WADA, which has an international participation structure. However, issues such as use of doping, doping agents, and using methods attract the attention of researchers. The research aims to analyze all scientific publications between 1980 and 2021 and to make a holistic analysis on doping using data obtained within the scope of the study, information graphics and explanatory bibliometric networks were created. This research is a kind of qualitative research method conducted to determine the researches between the Olympics and doping studies. According to the results, most used keywords were found to be "doping", "Olympic Games" and "doping control". There are a total of 96 journals evaluated within the scope of our study. "*British Journal of Sports Medicine*", "*Deutsche Zeitschrift Für Sportmedizin*" and "International Journal of The History of Sport" are most cited journals. Top publishing institutes are "University of Western Australia", "German Sport University Cologne" and "National and Kapodistrian University of Athens". Finally, and in turn, top broadcasting countries are USA, United Kingdom, Germany, Australia, and Switzerland. According to the results of the research, most of the research on doping focuses on chemical analysis of substances used as doping. It may be useful to conduct research on the physical, social and moral reasons and possible legal consequences of doping use and its effect on sports.

Keywords
Doping, Olympic Games, Bibliometry, Scientometric

INTRODUCTION

The use of doping, which is a way that athletes have used to win games since ancient Olympics to present time, is an understanding against the Olympic philosophy. Various methods have been used to increase performance even in ancient times. Gladiators (athletes) used stimulants extracted from various plants in the Greek, Egyptian and Roman periods (Verroken, 2005). Use of vitamins and minerals are widely seen today as a situation that normalizes the supplement consumption of athletes (Millman, 2003) for reasons such as the substitution of energy loss due to high performance, compensation for malnutrition, preservation of health, providing extra energy and increasing performance (Burke, 1993).

With the establishment of the IOC in Paris in 1894, the modern Olympics have started in 1896. Composed of a body of equal representatives from the Olympic Movement and public authorities, *The World Anti-Doping Agency* is established in 1999 on the initiative of International Olympic Committee as a foundation with the Lausanne Declaration published at the Doping Conference in Sport – which was organized for the first time by the International Olympic Committee in Lausanne, Switzerland between 2-4 Feb 1999 – to encourage and coordinate the fight against doping in sports at the international level with the support and participation of governments, public authorities

Received: 25 March 2022 ; **Accepted:** 28 May 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0002-6192-5731

and other public/private organizations fighting doping in sports. Its core activities include education, building anti-doping capacities, scientific research and monitoring the World Anti-Doping Code, which harmonizes anti-doping policies in all sports and all countries. With the WADA-Code, published by WADA in 2004, it has ensured that standard applications are made worldwide (Houlihan, 2014).

In addition, the World Anti-Doping Program has been established within the scope of fighting doping in the world. First stage of the program is Anti-Doping Code. It is a basic and universal document created to advance the struggle against doping, trying to achieve universal harmony on which anti-doping elements are based on World Anti-Doping Program in Sports (WADA, 2015). According to WADA records, number of samples analyzed in all sports branches in 2019 is 278,047 (Olympic Sports n = 228,560, Non-Olympic Sports, n = 49,487). 310,543 (urine sample n = 252,708, blood sample n = 25,339) samples were analyzed in 31 WADA Laboratories around the world (WADA, 2019). Fight against doping continues to expand with the studies within the scope of WADA.

The term of bibliometrics was first coined by Pritchard to replace the ambiguous term of ‘‘*statistical bibliography’’* (Pritchard, 1969). Bibliometrics is widely used in the social sciences and it is a developing scientific branch providing analyses of academic literature in a certain field (Diem and Wolter, 2013; Dominko and Verbič, 2019; Ellegaard and Wallin, 2015; Flores Kanter, 2017; Ivanović and Ho, 2019; McMillan and Hamilton, 2000; Mamdapur and Şenel, 2020). In miscellaneous settings, the best available information can be searched through bibliometric analysis of schools or scholars (Klein and Bloom, 2005). It is also used to analyze many data such as the features of the articles, citations, number of authors, productivity of the literature. Although there are many studies in different fields, literature lacks a scientometric review of doping. In this study, it is aimed to perform a bibliometric analysis of doping research associated with Olympic Games. This study aims to provide a systematic analysis of the researches on doping in the light of obtained data. Through analysis made, this search tries to provide systematic and specific information on the country, institute, journal information, authors and keywords etc. for new researches.

MATERIALS AND METHODS

Data collection procedure

In this study, academic studies on the Olympic games and doping in the "Web of Science Core Collection" (n=262) database were searched and indexed. “Doping” and “Olympic Games” keywords is used for our search including all publications between 1980 and 2021. According to the United Nations classification, studies published in Ireland, England, and Scotland are classified under the title of United Kingdom. (United Nations, 2019). An Infographic of bibliometric networks was created using descriptive bibliometric networks (Vosviewer n.d.).

RESULTS

Data analysis

A total of 262 articles - published between 1980 and 2021 - are found in our search. Most researched areas of doping literature related to Olympic Games are found to be Science Technology, Life Sciences Biomedicine, and Social Sciences. There is an increase in the number of publications as of 2007, with the highest number of publications in 2017 (n=23, Figure 1). Web of Science database is leading of the literatüre. The types of documents on this subject are original articles, reviews, others, editorials, and meeting reports (87.40, 19.84, 14.12, 7.63 and 7.63 respectively; Table 1) mostly.

Table 1. Top ten authors, countries, institutions and journals indexed in Web of Science database between 1980 and 2021.

Document Types	Records count	Percentages
Article	229	87.40
Review	52	19.84
Other	37	14.12
Editorial	20	7.63
Meeting Reports	20	7.63
Abstract	7	2.67
Book	5	1.90
Letter	5	1.90
Case Report	3	1.14
Top Authors		
Fitch, Kenneth Duncan	30	11.45
Georgakopoulos, Costas	16	6.10
Kazlauskas, Rymantas	9	1.90
Catlin, Don H.	8	3.05
Budgett, Richard	7	1.52
Schanzer, Wilhelm	5	1.90
Ljungqvist, Arne	4	1.52
Lyris, Emmanouil	4	1.52
Pereira, Henrique M. G.	4	1.52
Segura, Jordi	4	1.52
Most Productive Countries		
United States of America	40	15,26
United Kingdom	38	14,5
Germany	27	10,3
Australia	26	9,92
Switzerland	23	8,77
Canada	19	7,25
Greece	16	6,1
Brazil	13	4,96
Italy	12	4,58
People Republiz of China	11	4,19
Most Productive Institutions		
University of Western Australia	25	9.54
German Sport University Cologne	14	5.34
National and Kapodistrian	6	2.29
University of Athens	6	2.29
University of London (UK)	6	2.29
Universidade Federal Do Rio De	5	1.90
University of California System	5	1.90
Antidoping Lab Qatar	4	1.52
Freie University Of Berlin	4	1.52
International Olympic Committee	4	1.52
Most Productive Journals		
British Journal of Sports Medicine	13	4.96
Deutsche Zeitschrift Für	13	4.96
International Journal of The	12	4.58
Clinical Journal of Sport Medicine	12	4.58
Drug Testing and Analysis	11	4.19
Sports Medicine	10	3.81
Bioanalysis	8	3.05
The Journal of Sports and	7	2.67
Clinical Chemistry	6	2.29
Sport in Society	6	2.29

Authors' Productivity, Countries, Institutes and Journals

A total of 262 researches in doping studies related to Olympic Games are determined. As seen in Table 1, it is observed that authors named Fıtch KD. (n=30) and Georgakopoulos C. (n=16) lead the researches. The United States (USA) took part in the first conversation with 40 articles followed by United Kingdom, Germany, Australia and Switzerland (40, 38, 27, 26 and 23; Table 1). In terms of institutes contributing to the doping literature, Australia leads with the highest number (n=25) of publications. Greece contributed to literature by researches of two institutes (n=12). Most contributing journals to doping studies related to Olympic Games are "British Journal of Sports Medicine", "International Journal of The History of Sport and Drug Testing and Analysis" (n = 13, 12 and 11 respectively; Table 1).

Citation analyses

The h-index of Doping literature is calculated as 31 and an average citation per item is measured to be 14.53 times (Table 2). The most cited document "*Hormonal Doping and Androgenization of Athletes: A Secret Program of the German Democratic Republic Government*" written by Franke and Berendonk was an original article (Franke & Berendonk 1997). This article is published in 1997 and received citations 258 times (10.32 times per year; Table 2).

Keyword and bibliometric network analyses

Keyword analysis (Table 2) reveals that "Doping", "Olympic Games", "Doping Control", "World Anti-Doping Agency" and "Asthma" (s=54, 44, 20, 17 and 16, respectively) are most commonly used words. Vosviever application was used to create bibliometric network analysis and info graphics. Results show us three keyword centers are seen in the literature. These are "Doping", "Olympic Games" and "Doping Control". The word doping is one of the central keywords linked to "Olympic Games", "Banned Substances" and "Doping Control" whereas "Olympic Games" keyword seems to be more related to "Doping Control", "Athletes" and "Test Methods".

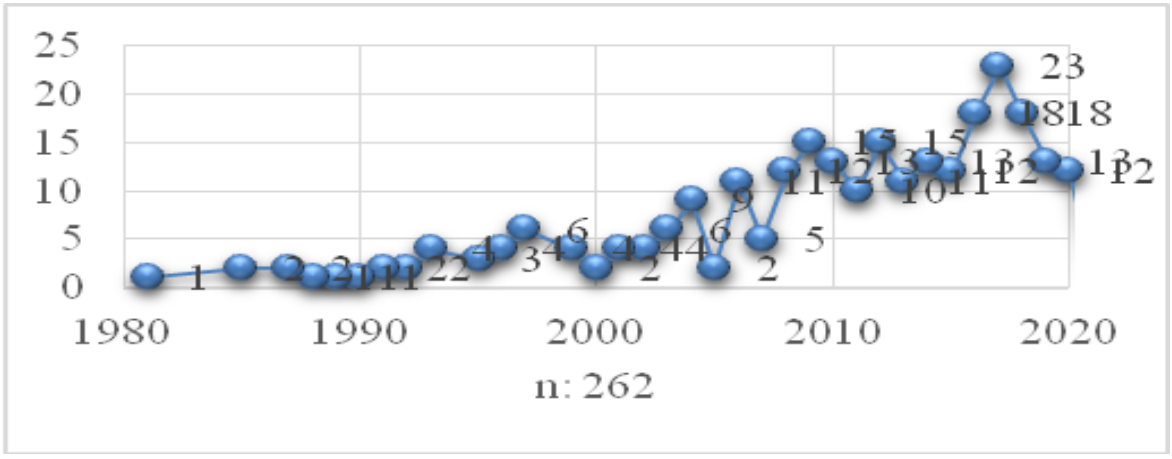

Figure 1. Total number of publications of Doping and Olympic Games literature by year.

Table 2. Citation changes, h-index, most cited articles and keywords of Doping and Olympic Games literature between 1980 and 2021.

h-index and citation changes					
WoS Database Publication Period	**n**	**h-index**	**Average citation per item**	**Sum of citation without self-citations**	**Sum of citing articles without self-citations**
1980-1989	7	4	24.43	171	166
1990-1999	26	14	32.12	824	710
2000-2009	70	22	25.56	1743	1430
2010-2020	156	18	6.47	976	847
1980-2021	262	31	14.57	3584	2815

Ten most cited articles				
Title	**Authors**	**Year**	**TC**	**ACPY**
Hormonal Doping and Androgenization of Athletes: A Secret Program of the German Democratic Republic Government	Franke, WW; Berendonk, B.	1997	258	10.32
Second-generation Blood Tests to Detect Erythropoietin Abuse by Athletes	Gore, CJ; et al.	2003	168	8.84
Asthma and the Elite Athlete: Summary of the International Olympic Committee's Consensus Conference, Lausanne, Switzerland, January 22-24, 2008	Fitch, KD; Sue-Chu, M; et al.	2008	143	10.21
The Use of Dietary Supplements and Medications by Canadian Athletes at the Atlanta and Sydney Olympic Games	Huang, SH; Johnson, K; Pipe, AL	2006	135	8.44
Medication Use in Athletes Selected for Doping Control at the Sydney Olympics (2000)	Corrigan, B; Kazlauskas, F	2003	114	6
Analytical-Chemistry At The Games Of The Xxiiird Olympiad in Los-Angeles, 1984	Catlin, DH; et al.	1987	109	3.11
The Use of Drugs and Nutritional Supplements in Top-Level Track and Field Athletes	Tscholl, P; et al.	2010	94	7.83
Ultra High Performance Liquid Chromatography Tandem Mass Spectrometry Determination and Profiling of Prohibited Steroids in Human Biological Matrices. A review	Gosetti, F; et al.	2013	82	9.11
Preventive Doping Control Analysis: Liquid and Gas Chromatography Time-of-Flight Mass Spectrometry for Detection of Designer Steroids	Georgakopoulos, C; et al.	2007	79	5.27

Table 2. Continue

TC (total citations), ACPY(average citation per year)			
Most used 20 keywords			
1	Doping (54)	11	Designer Steroids (10)
2	Olympic Games (44)	12	Lc-Ms (10)
3	Doping Control(20)	13	Nutritional Supplements (10)
4	World Anti-Doping Agency - WADA (17)	14	Sports (10)
5	Asthma (16)	15	Mass Spectrometry (9)
6	Beta(2)-Agonists (16)	16	Ioc (9)
7	Athletes (13)	17	Anabolic Steroids (8)
8	Airway Hyper responsiveness (12)	18	Anti-Doping (8)
9	Olympics (12)	19	Bronchial Provocation (8)
10	Olympic Games Sydney 2000 (11)	20	Endurance Training (8)

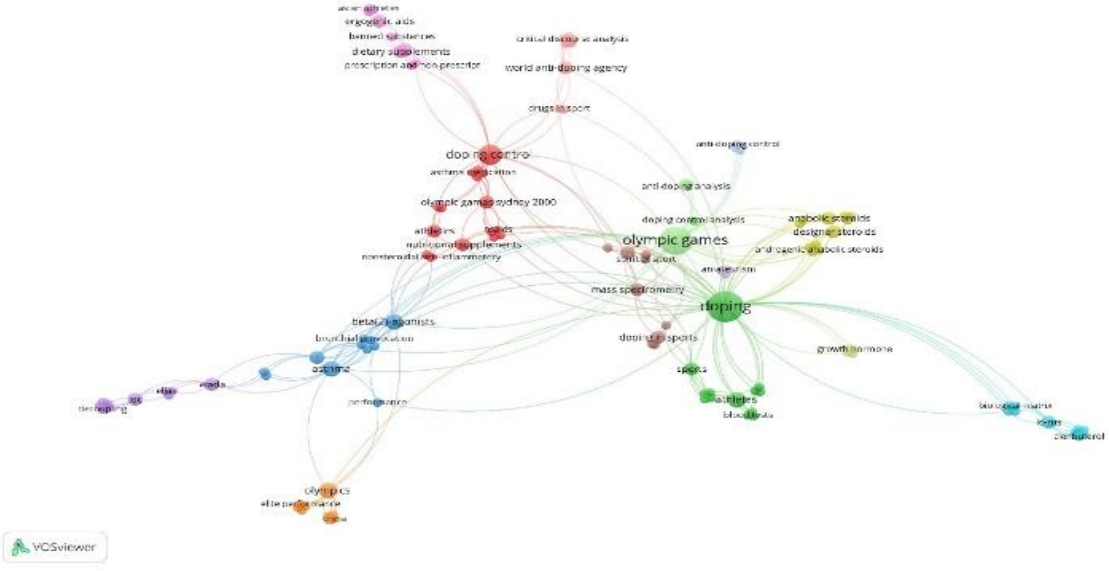

Figure 2. Keyword network of Doping literature related to Olympic Games.

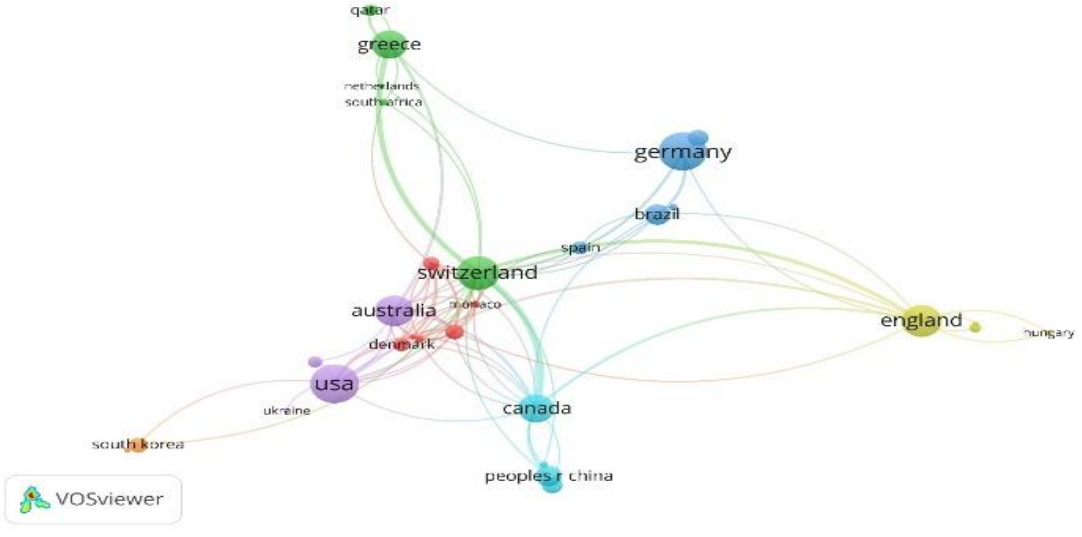

Figure 3. Bibliometric network of the countries publishing doping literature related to Olympic Games.

DISCUSSION

In this study, a bibliometric analysis is conducted in order to reveal relationships between concepts in keywords and abstracts, the most cited authors, the most cited journals and countries with highest number of academic studies in doping studies. H-Index of doping and Olympic Games are measured as 31 with a total number of 3,804 citations. A great connection between "Doping" and "Olympic Games" keywords is identified.

Results show that most used keywords are "doping", "doping control", "Olympic Games" and "nutritional supplements". Citation analysis reveals that Fitch and Georgakopoulos are most cited authors. There are a total of 100 journals in the data. "*British Journal of Sports Medicine", "International Journal of The History of Sport, Drug Testing and Analysis"* are most cited journals. Top publishing institutes are "*The University of Western Australia*" and "*German Sport University Cologne*".

Finally and respectively, top publishing countries are USA, UK, Germany, Australia and Switzerland. Based on all of our results and literature discussion, suggestions for authors are presented below:

The limitations of the study; firstly, we preferred only WoS database. The other databases "*KCI-Korean Journal Database, SciELO Citation Index and Russian Science Citation Index, PubMed, Scopus, Index Copernicus or DOAJ*" was not used in this article. Secondly, we are only able to reach documents published back in 1980 since WoS could not provide items before this. Thirdly, Since the keywords used in bibliometric research are mostly focused on researcher preferences and a similar study has not been found, a comparison of the research findings could not be made. This research is the first bibliometric research to include doping and the Olympic games. Researchers should be encouraged and supported to carry out for more articles in the subject of doping.

The studies mostly focus on elite athletes' treatment of respiratory diseases (Fitch. et al., 2008), methods of doping control (Trout, & Kazlauskas, 2004; Georgakopoulos, et al. 2007) athletes' use of supplementation and athlete habits (Huang, Johnson, & Pipe, AL 2006; Tsitsimpikou, et al, 2009).

Researchers are recommended to conduct studies involving mega events such as world cups in other sports. Furthermore, researchers can also focus on the design of training programs on issues such as banned substance use that may potentially occur during use of dietary supplements in elite athletes.

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

Ethical approval is not required due to the use of open source databases in the research. All stages of the study were carried out in accordance with the Principles of the Declaration of Helsinki.

REFERENCES

Burke, L.M. & Read, R.S. (1993). Dietary supplements in sport. *Sports Medicine, 15*(1), 43-46.

Diem, A. & Wolter, S.C. (2013). The use of bibliometrics to measure research performance in education sciences. *Research in higher education, 54*(1), 86-114.

Dominko, M. & Verbič, M. (2019). The economics of subjective well-being: A bibliometric analysis. *Journal of Happiness Studies*, *20*(6), 1973-1994.

Fitch, K.D., Sue-Chu, M., Anderson, S.D., Boulet, L.P., Hancox, R.J., McKenzie, D.C. & Ljungqvist, A. (2008). Asthma and the elite athlete: summary of the International Olympic Committee's consensus conference, Lausanne, Switzerland, January 22-24, 2008. *Journal of Allergy and Clinical Immunology*, *122*(2), 254-260.

Georgakopoulos, C.G., Vonaparti, A., Stamou, M., Kiousi, P., Lyris, E., Angelis, Y.S., ... & Koupparis, M. (2007). Preventive doping control analysis: liquid and gas chromatography time of flight mass spectrometry for detection of designer steroids. *Rapid Communications in Mass Spectrometry: An International Journal Devoted to the Rapid Dissemination of Up to the Minute Research in Mass Spectrometry*, *21*(15), 2439-2446.

Houlihan, B. (2014). Achieving compliance in international anti-doping policy: An analysis of the 2009 World Anti-Doping

Code. *Sport Management Review*, *17*(3), 265-276.

Huang, S.H.S., Johnson, K. & Pipe, A. L. (2006). The use of dietary supplements and medications by Canadian athletes at the Atlanta and Sydney Olympic Games. *Clinical Journal of Sport Medicine*, *16*(1), 27-33.

Ivanović, L. & Ho, Y.S. (2019). Highly cited articles in the education and educational research category in the social science citation Index: A bibliometric analysis. *Educational Review*, *71*(3), 277-286.

Klein, W.C. & Bloom, M. (2005). Bibliometrics: The best available information?. *Social Work in Health Care*, *41*(3-4), 117-121.

McMillan, G.S. & Hamilton Iii, R.D. (2000). Using bibliometrics to measure firm knowledge: an analysis of the US pharmaceutical industry. *Technology Analysis & Strategic Management*, *12*(4), 465-475.

Millman, R.B., & Ross, E.J. (2003). Steroid and nutritional supplement use in professional athletes. *The American Journal on Addictions*, *12*, S48-S54.

Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of Documentation*, *25*(4), 348-349.

Senel, E. & Mamdapur, G.M.N. (2020). A Holistic Evaluation of Buddhism Literature: A Bibliometric Analysis of Global Publications Related to Buddhism Between 1975 and 2017. *Library Philosophy and Practice*, 1-14.

Trout, G.J. & Kazlauskas, R. (2004). Sports drug testing–an analyst's perspective. *Chemical Society Reviews*, *33*(1), 1-13.

Tsitsimpikou, C., Tsiokanos, A., Tsarouhas, K., Schamasch, P., Fitch, K.D., Valasiadis, D., & Jamurtas, A. (2009). Medication use by athletes at the Athens 2004 Summer Olympic Games. *Clinical Journal of Sport Medicine*, *19*(1), 33-38.

Verroken, M. (2000). Drug use and abuse in sport. *Best Practice & Research Clinical Endocrinology & Metabolism*, *14*(1), 1-23.

Vosviewer. (n.d.). VOSviewer - Visualizing Scientific Landscapes. https://www.vosviewer.com/. Accessed 10 January 2021.

WADA. (2015). World Anti-Doping Code, World Anti-Doping Agency, p. 14, Canada. Montreal.

How to cite this article: Tabuk M.E. (2022). Bibliometric Analysis of The Olympic Games and Doping Research. *Int J Disabil Sports Health Sci*; 5(1):49-55.https://doi.org/10.33438/ijdshs.1093414