A Scientometric Analysis of Iranian Research on Sports Medicine in Islamic World Science Citation Center

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Original Article

Abstract

Introduction: Applying bibliometric indicators, this study aims at investigating the status of Persian sports medicine research based on the records in the Islamic World Science Citation Database (ISC).

Materials and Methods: This was a scientometric applied study in which the bibliometric techniques and social network analysis were used in conducting the investigations. The study population consisted of 1566 Persian articles published in the field of sports medicine indexed in ISC database until 2018. BibExcel, UCINet, Netdraw, and VOSviewer were among the software that were used for analyzing data and drawing maps in the study.

Results: Initial analysis of the data showed that 1566 articles under study received a total of 266 citations, with an average of 0.17 citations per article, which is a very low level. "Sadeghi H", "Alizadeh M", and "Rajabi R" were considered to be the Iranian top researchers in the field of sports medicine in terms of the number of articles. "Ebrahimi Takamjani E" owned the best position in the network. Finally, the results uncovered that 8 thematic clusters were formed in sports medicine research.

Conclusion: The results showed a relatively steady growth in the number of sports medicine articles indexed in ISC in 2010s. Moreover, according to the authorship patterns, it seems that sports medicine researchers are very interested in participatory activities. Moreover, given the subject clusters of co-word analysis, research in this field seems to cover a wide range of topics.

Keywords: Sports medicine; Scientometrics; H-index; Co-authorship; Centrality; Co-word analysis; Research evaluation

Introduction

Scientometrics is the knowledge that studies how scientific activities are measured and evaluated. Methods of measuring knowledge in scientometrics include a set of scientific principles that examine the structure and characteristics of scientific information and how information is related. For this reason, the necessity of using scientometric tools to measure and evaluate scientific products at different levels is evident. The need to identify and analyze thematic trends of study fields in terms of bibliographic data led scientometric experts to use the capability of co-occurrence analysis for mapping and analyzing patterns based on the intellectual structure of knowledge since the 1970s (1-4).

Physical education and sports science is one of the broad, complex, and interdisciplinary subject areas (5-7) and is one of the most important and influential areas in the world of research that deals with topics related to health, hygiene, physical activity, disease, medicine, and life style (8). For this reason, studies in this field have a wide variety of topics and can be viewed from different points of view. Physiologically, sports science is a discipline that examines how different parts of the body work together during exercise and how this organ involvement affects the improvement of health or fitness from different perspectives. Sociologically, athletes need to engage with coaches and ultimately, through multidisciplinary teamwork, improve performance through knowledge

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sharing and team decision-making. Operationally, sport requires four elements: "skill, team strategy, physical ability, and mental ability." In essence, the formation of sports science depends on the application of technologies and achievements of several disciplines such as electrophysiology and biomechanics (9). Today, sports science needs specialists from other fields to help in the development of this field (10).

According to the above, research in the field of physical education and sports science is very extensive today, and sports medicine is one of the most important and attractive branches in physical education and sports science research, which in recent years has increasingly attracted the attention of researchers worldwide. Persian studies have not been an exception to this rule and in recent years, issues related to sports medicine have been the subject of numerous studies (7,10-12). Now that several years have passed since the beginning of this wave, it seems that it is time to evaluate these studies in the shade of scientometric techniques and provide a clear and comprehensive picture of the general situation in this field. Therefore, the study of Persian language studies conducted in this field can contain interesting points and scientometric indicators and techniques can be used to achieve the above goal.

Today, many promotion committees use these indicators at various levels to assess the influence of their researchers and their effects. For this reason, scientometric indicators have attracted the attention of many scientific circles in recent years (5,6,12). A review of the studies conducted using scientometric techniques in the field of sports medicine shows that although this field has been considered by various researchers in some countries in recent years, the study of the status, position, and role of Persian language studies has not been a research topic in the field of sports medicine. Therefore, the present study is conducted with the aim to analyze the status of Persian language studies carried out in the field of sports medicine in the Islamic World Science Citation Center (ISC) using scientometric techniques.

Materials and Methods

This was an applied study performed using scientometric techniques and indicators. The statistical population consisted of all studies in the field of sports medicine that were indexed in Persian in the ISC database. Due to the comprehensiveness of the present study, no time limit was imposed on the records and all articles were searched from the beginning of 2000 to 2018. Although the search and retrieval of articles took place in May 2019, due to the fact that the articles entered the ISC database with a delay, the records related to 2018 were not complete. To obtain the initial data, first, the advanced search section in the "Iranian Science Citation Index" at https://sci.isc.gov.ir/advancedSearch.aspx?la=0 was referred to. The data were then identified and retrieved using the two search strategies mentioned in the following. The searches carried out in the "Iranian Science Citation Index" are described in detail in the "Reference" section.

a. Initially, the main and core journals related to sports medicine were identified in the ISC database, and all articles that were indexed from the journals in the database were identified and retrieved by entering the journal name in the "Reference" section of the Iranian Science Citation Index. These four journals were "University of Tehran Sports Medicine, Sports Medicine Studies, Sports Medicine and Technology Research, and Sports Rehabilitation Research". Based on a search of the Iranian Science Citation Index, it was found that 436 articles from the four journals were indexed at the time of the present study in the database.

b. Sports medicine articles published in other possible journals were also identified in the second stage. To this end, other journals that occasionally published articles related to sports medicine were identified in each of their issues.

Then, all the articles published in them were reviewed by a subject-matter expert (SME) and articles related to the field of sports medicine were identified and the information of each of them was extracted from the ISC database. These journals are presented in table 1 along with the number of their articles.

Table 1. Sports medicine articles in the core journals of this field

Name of journal	Year	Total number of articles	Sports medicine articles	Description
Research in rehabilitation sciences	2007-2017	657	380	-
Scientific-research journal of rehabilitation	2000-2020	713	237	-
Scientific-research journal of rehabilitation medicine	2012-2018	500	289	-
New rehabilitation	2007-2015	331	224	It should be noted that the language of the articles published in this journal has changed from Persian to English since 2016.
Total	-	2201	1130	-

c. By combining parts a and b, a total of 1566 articles in the field of sports medicine were identified, which was the basis of the analysis performed in the present study. Although the advanced user interface of the ISC database has fewer search fields and features compared to the user interface of international examples (including Web of Science, Scopus, PubMed, etc.), it is expected that with the above strategy, a large part of studies related to sports medicine (which is indexed in Persian in ISC journals), have the ability to provide a relatively comprehensive picture of these studies.

After retrieving the records, the data were analyzed based on the objectives and questions of the study. Given the study objectives, a combination of Excel (version 2017), BibExcel (version 2017), UCINET (version 6), NetDraw (version 2.054), and VOSviewer (version 1.6.9) software was used to analyze the data.

To be more precise, BibExcel software was used for cases such as calculating the H index. Calculations for co-authorship centrality were performed using UCINET software. The co-authorship network was mapped using NetDraw software and the topics were clustered using VOSviewer software.

Results

Preliminary analysis of the data showed that the 1566 articles reviewed received a total of only 266 citations, with an average of about 0.17 citations per article, which is a very low rate. In the meantime, the article entitled "Study of the relationship between self-esteem and achievement motivation in successful and unsuccessful athletes of West Azerbaijan Province, Iran" which was published in 2011 by "Maleki et al." in the journal "Research in Rehabilitation Sciences", was the most cited article among all studies on sports medicine on the ISC database. This article had received 11 citations in the ISC until the time of data collection in the study. Data analysis showed that in all studies in the field of sports medicine in Iran in the ISC database, "Sadeghi H" was the most active researcher in sports medicine in Iran, with the authorship and participation in 71 articles. "Alizadeh M" and "Rajabi R" were also in the second and third ranks with 52 and 51 articles, respectively, with a big difference compared to the first person. Data related to the most cited studies also indicated that "Mohammadzadeh H" and "Sazmand A", who had 5 and 4 articles in the field of sports medicine, respectively, with 13 citations, were the most cited researchers in the field of sports medicine in Iran in the ISC database, in addition, "Zamani Thani H" (who had 28 articles on sports medicine) was in the third place in this regard. The calculation of the authors' H index and their ranking indicated that Iranian sports medicine researchers had a low H index, one of the main reasons of which is the low number of citations to Persian articles.

Based on the data presented in table 2, the top researchers in this field have not been able to obtain an H index higher than 2. This value of the H index means that 2 of the total articles of these researchers each received at least 2 citations. Information on top researchers in terms of number of articles, number of citations, and highest H-index is presented in table 2.

Table 2. Top sports medicine researchers by number of articles, citations, and H index

Rank based on article			Rank based on citation			Rank based on H index		
Rank	Name of researcher	Number of articles	Rank	Name of researcher	Number of articles	Rank	Name of researcher	H index
1	Sadeghi H	71	1	Mohammadzadeh H	13	1	Rajabi R	2
2	Alizadeh M	52	2	Sazmand A	13	2	Ebrahimi Takamjani E	2
3	Rajabi R*	51	3	Zamani Thani H	12	3	Daneshmandi H	2
4	Talebian S	49	4	Qasemi Gh	11	4	Bagheri H	2
5	Ebrahimi Takamjani E	47	5	Karimlu M	11	5	Qasemi Gh	2
6	Akbarzadeh B	43	6	Maleki B	11	6	Norasteh A	2
7	Rahnama N	40	7	Seyyed Ameri M	11	7	Abdolvahhab M	2
8	Olyayi Gh	39	8	Daneshmandi H	10	8	Hadiyan M	2
9	Daneshmandi H*	36	9	Sadeghi H	10	9	Jalili M	2
10	Minounejad H	35	10	Farsi A	9	10	Hosseini M	2
11	Jamshidi A	34	11	Shokhrokhi H	9	11	Faghihzadeh S	2
12	Salavati M	34	12	Alizadeh M	9	12	Farsi A	2
13	Anbarian M	33	13	Rajabi R	8	13	Mahdavinejad R	2
14	Bagheri H	32	14	Mahdavinejad R	8	14	Rahgozar M	2
15	Sahebazzamani M	31	15	Anbarian M	8	15	Karimlu M	2
16	Jalayi Sh	30	16	Norasteh A	7	16	Abdoli B	2
17	Khademi Kalantari Kh	29	17	Abdolvahhab M	7	17	Shahrokhi H	2
18	Shojaadin S	29	18	Jalayi M	7	18	Soortji H	2
19	Norasteh A*	28	19	Rahgozar M	7	19	Mohammadzadeh H	2
20	Qasemi Gh*	28	20	Abdoli B	7	20	Sazmand A	2

*Top people in terms of article number, number of citations, and high H index

Individuals who were in the top three in all respects are marked with an *. Interesting points in this table include, for example, researchers such as "Talebian S" and "Akbarzadeh B" who, despite having a very good performance in terms of the number of articles and being ranked fourth and sixth, were not of a suitable position given the number of citations; So that based on the data analysis, the articles of "Talebian S" received only 1 citation in total and the articles of "Akbarzadeh B" received 2 citations and could not improve the quality of their works along their quantity.

In order to perform the co-authorship analysis, first all the authors of the studied documents were extracted. Then the stage of editing, correcting, and matching the authors was performed and the preferred name of the individuals whose names were written in several ways was adopted. For example, depending on the specific characteristics of Persian characters, sometimes a single name was written differently in two or more ways (for example: Jalaei and Jalayi or Olyaei and Olyayi). Additionally, in many cases, due to the application or non-application of "half-space", a single name appeared in two forms as the author in the articles (for example: Letafatkar, LetafatKar, and Letafat Kar), which were corrected after confirming the authenticity of the author. The initial results showed that 1566 articles indexed in the ISC database in the field of sports medicine had a total of 5763 authors with an average of 3.68 people per article.

Next, the co-authorship of sports medicine studies was mapped using NetDraw software (Figure 1). This map consisted of a coherent and interconnected network. The thickness of the lines (links) between the authors indicated the extent of their cooperation and co-authorship in writing and presenting sports medicine articles. The extent of interaction and cooperation of sports medicine

researchers in this network is largely clear.

For analysis, it was necessary to examine the figure based on three important types of centrality. For this purpose, UCINET software was employed to determine the central people in the co-authorship network using three types of centrality: degree, betweenness, and closeness. Data for the top 20 researchers in sports medicine based on the types of centrality are presented in table 3. Individuals in the top 20 researchers in all three types of centralities were marked with an *. Moreover, people who were in the top 20 researchers in the two types of centralities were marked with a #.

Given the data in table 3, "Bagheri H" had the best situation in terms of centrality, and "Ebrahimi Takamjani A" and "Talebian S" were in the second and third ranks in this regard. Figure 1 also shows well that these researchers have established a high communication with other researchers in sports medicine. In the centrality of betweenness and closeness, "Ebrahimi Takamjani A" was able to achieve the best situation and create a strategic position for himself. He has been able to connect several researchers. From "Bagheri H", "Ebrahimi Takamjani A", "Talebian S", "Rajabi R", "Shadmehr A", "Alizadeh M", "Jamshidi A", and "Rahimi A" could be considered as other top researchers in the field of sports medicine who were able to perform well in all three types of centralities. These people have had the greatest impact on the formation of a network of research interactions in the field of sports medicine; So that the communication channels of many other researchers (nodes) pass through these researchers. Furthermore, these people had the highest closeness to other researchers in the field of sports medicine and, therefore, had the most influential power in the network.
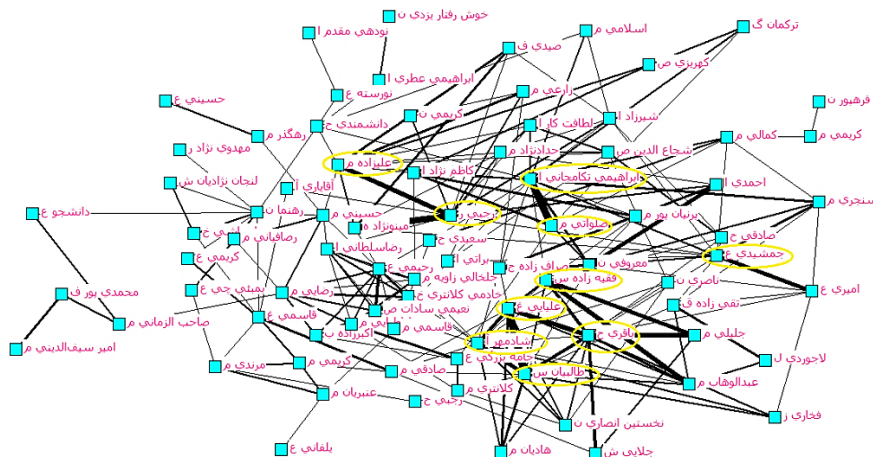

Figure 1. Co-authorship network of researchers in the field of sports medicine

Table 3. Ranking of sports medicine researchers based on degree, betweenness, and closeness centralities

Rank based on degree centrality			Rank based on betweenness centrality			Rank based on closeness centrality		
Rank	Name of researcher	Degree centrality	Rank	Name of researcher	Betweenness centrality	Rank	Name of researcher	Closeness centrality
1	Bagheri H[*]	57	1	Ebrahimi Takamjani E	15.95	1	Ebrahimi Takamjani E	10.719
2	Ebrahimi Takamjani E[*]	54	2	Daneshmandi H	11.15	2	Jamshidi A	10.599
3	Talebian S[*]	54	3	Jamshidi A	7.78	3	Rajabi R	10.481
4	Olyayi Gh	52	4	Rahnama N	7.77	4	Alizadeh M	10.468
5	Rajabi R[*]	42	5	Alizadeh M	7.38	5	Rahimi A	10.423
6	Salavati M[#]	38	6	Rajabi R	6.32	6	Shadmehr A	10.379
7	Faghihzadeh S[#]	38	7	Kamali M	5.69	7	Maroufi N[#]	10.379
8	Shadmehr A[*]	34	8	Rahimi A	5.39	8	Faghihzadeh S	10.372
9	Alizadeh M[*]	34	9	Sadeghi H	5.08	9	Sanjari M[#]	10.328
10	Jamshidi A[*]	31	10	Taghizadeh Gh[#]	4.85	10	Bagheri Gh	10.322
11	Maroufi N[#]	30	11	Hosseini M	4.58	11	Daneshmandi H	10.316
12	Rahimi A[*]	29	12	Shadmehr A	4.39	12	Rezasoltani A	10.303
13	Tabatabaei M[#]	29	13	Tabatabaei M[#]	4.37	13	Kamali M	10.297
14	Khademi Kalantari Kh[#]	27	14	Rezayi M[#]	4.27	14	Talebian S	10.284
15	Jalili M	26	15	Marandi M	4.22	15	Kazemnejad A[#]	10.266
16	Naeimi Sadat S	25	16	Bagheri H	4.21	16	Khademi Kalantari Kh[#]	10.260
17	Abdolvahhab M	24	17	Talebian S	4.07	17	Ekhvatiyan F	10.247
18	Rezayi M[#]	23	18	Anbariyan M	3.72	18	Sarrafzadeh J	10.247
19	Taghizadeh Gh[#]	22	19	Karimi M	3.54	19	[#]Salavati M	10.247
20	Kazemnejad A[#]	21	20	Rezasoltani A	3.51	20	Mousavi Sh	10.241

[*]Top researchers in terms of three types of centrality, [#]Top researchers in terms of two types of centrality

Analysis of keywords used in sports medicine studies suggested that in 1566 articles indexed in the ISC database, 3317 unique keywords were used, which were repeated a total of 5649 times, and each article contained an average of 3.61 keywords. The 20 keywords with the highest frequency are presented in table 4, and as it turns out, the keyword "Balance" with 98 repetitions, had the highest frequency among all keywords. "Electromyography" and "Dynamic balance" were in the second and third ranks with 62 and 59 repetitions, respectively.

Clustering obtained from co-occurrence analysis of keywords used in articles in the field of sports medicine using VOSviewer software revealed that Iranian sports medicine research was composed of eight main clusters including "Patellofemoral syndrome in the elderly, chronic low back pain, flat feet, stretching programs, balance and performance, muscle strength and fatigue, and cerebral palsy and organ function" (Figure 2).

Discussion

Sports medicine is a broad field in which the prevention and treatment of diseases and physical injuries is performed using methods related to sports. In many respects, the subject of sports medicine is more limited to the treatment of injuries and rehabilitation of the injured and controlling the general health of athletes.

Table 4. Ranking of frequently used keywords in the field of sports medicine based on frequency

| Rank	Keyword	Frequency	Rank	Keyword	Frequency
1	Balance	98	11	Elderly	32
2	Electromyography	62	12	Kinematics	30
3	Dynamic balance	59	13	Multiple sclerosis	29
4	Gait	50	14	Knee osteoarthritis	28
5	Static balance	47	15	Kyphosis	28
6	Cerebral palsy	40	16	Fatigue	28
7	Quality of life	38	17	Athletes	27
8	Proprioception	37	18	Flat feet	27
9	Range of motion	33	19	Postural control	26
10	Chronic low back pain	32	20	Low back pain	26
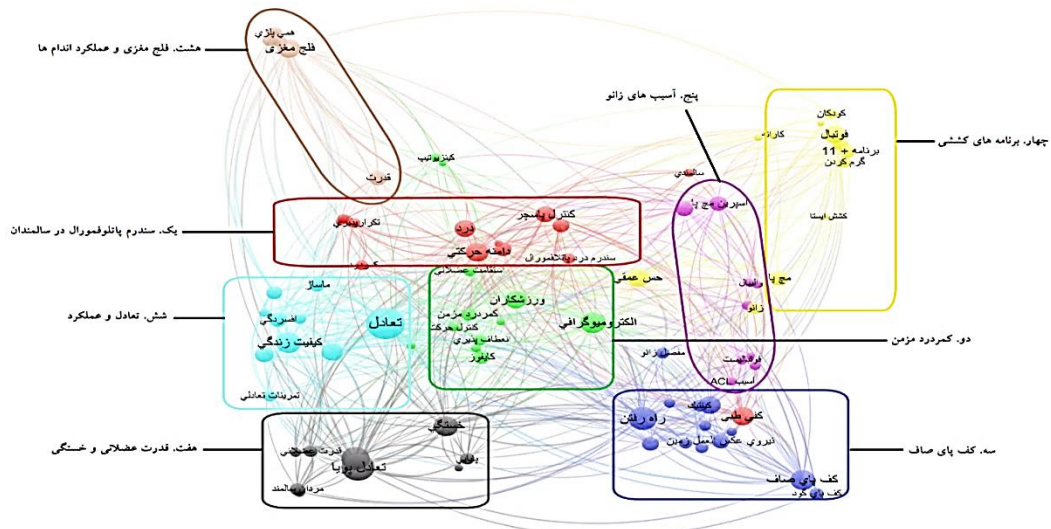
Figure 2. Co-occurrence network of keywords in the field of sports medicine

However, gradually the scope of this science has expanded and involved subjects such as sports physiology and body adaptation conditions in various conditions, physiotherapy and sports injury rehabilitation, biomechanics of body movements, and detection of error movements to achieve maximum efficiency and minimum injury, sports injuries (diagnosis and treatment of injuries), disorders and diseases caused by exercise and how to deal with them, cardiopulmonary rehabilitation of patients, exercise therapy for patients with chronic diseases, sports nutrition and authorized sports and food supplements, sports psychology, exercise in patients and people with physical and mental disabilities, exercise in children and adolescents, how to identify the use of drugs and unauthorized performance-enhancing drugs in sports, and exercise in individuals with physical and mental disabilities (9,13).

In the present study, using scientometric techniques, it was tried to present a relatively comprehensive picture of the status of Persian language studies conducted in the field of sports medicine in the ISC database over a period of eighteen years (from 2000 to 2018).

Additionally, the top researchers of sports medicine in terms of number of articles, number of citations, and H index and the most influential researchers in the field of sports medicine were identified and introduced based on the co-authorship centrality indicators. Moreover, the status of Persian language studies in sports medicine was examined in terms of keywords used and the map obtained from these studies was drawn along with the thematic clusters formed. Given the data analysis, it was found that based on the search

strategy used in the present study, 1566 articles in the field of sports medicine were indexed in the ISC database. In the last two decades, Persian research in the field of sports medicine has had a fluctuating trend. Of course, in the 2010s, the quantitative growth of articles has been more evident; because sports medicine is directly related to community health and is able to identify and diagnose postural abnormalities and then provide methods to prevent and correct these abnormalities. It also has the ability to plan corrective movements appropriate to different individuals. Furthermore, it plays an important role in providing counseling services related to corrective movements for students, staff, and sports clubs. Recently, with the efforts made by the trustees of this field and holding corrective movement coaching courses and obtaining the approval of the establishment of a corrective movements club, the graduates of this field can legally establish a club and play their role in improving the health of the community.

Another application of this field is in the area of championship, where a corrective movement specialist can improve the performance of a professional athlete in his/her field by corrective movements and exercises (5,14). It seems that the increase in the number of scientific productions in the field of sports medicine in 2011 was not beyond expectation. Beside, this field has gained increasing capacity for admission of students in higher education degrees in universities and creation of new fields in recent years in physiotherapy, corrective movements, athletic trainers (ATs), and special physical education for the disabled, which has led researchers and a significant number of postgraduate students to this area.

Given the authors with the highest number of productions, the initial analysis of the data indicated that in all studies in the field of sports medicine in Iran in the ISC database, "Sadeghi H" was the most active researcher in sports medicine in Iran by writing and participating in 71 articles. "Alizadeh M" and "Rajabi R" were also in the second and third ranks with 52 and 51 articles, respectively, with a big difference compared to the first person. "Sadeghi H" is a professor in the Department of Physical Education and Sports Sciences, Kharazmi University, Tehran, Iran, and considering his background, mastery in the field of sports medicine, and his access to postgraduate and doctoral students, was the most active researcher in the field of sports medicine. The results indicated that Iranian sports medicine researchers have a low H index, one of the main reasons of which is the low number of citations to Persian articles. Moreover, top researchers in this field have not been able to obtain an H index higher than 2. An H index of 2 means that 2 of the total articles by these researchers each received at least 2 citations. Interesting points in this regard include, for example, researchers such as "Talebian S" and "Akbarzadeh B" who, despite having a very good performance in terms of the number of articles and being ranked fourth and sixth, were not of a suitable position given the number of citations; So that based on the data analysis, the articles of "Talebian S" received only 1 citation in total and the articles of "Akbarzadeh B" received 2 citations and could not improve the quality of their works along their quantity.

Data analysis showed that out of 1566 articles reviewed, a total of only 266 citations were received, with an average of about 0.17 citations per article, which is a very low rate. In addition, in the category of co-authorship network in articles in the field of sports medicine, the findings suggested that 1566 articles indexed in the ISI database in the field of sports medicine, have a total of 5763 authors with an average of 3.68 people contributed to each article. This number shows that most of the articles in this field have been written in the form of scientific cooperation and researchers in the field of sports medicine have a good spirit of scientific participation. In drawing the co-authorship maps, it was revealed that from "Bagheri H", "Ebrahimi Takamjani A", "Talebian S", "Rajabi R", "Shadmehr A", "Alizadeh M", "Jamshidi A", and "Rahimi A" could be considered as other top researchers in the field of sports medicine who were able to perform well in all three types of centralities. These people have had the greatest impact on the formation of a network of research interactions in the field of sports medicine; So that the communication channels of many other researchers (nodes) pass through these researchers. Furthermore, these people had the highest closeness to other researchers in the field of sports medicine and, therefore, had the most influential power in the network. The results in the most frequent keywords in the field of sports medicine, showed that in 1566 articles indexed in the field of sports medicine in the ISI database, 3317 unique keywords were used, which were repeated a total of 5649 times, and each article contained an average of 3.61 keywords. Moreover, the clustering results of co-word analysis suggested that studies in the field of sports medicine laid in eight main clusters including "Patellofemoral syndrome in the elderly, chronic low back pain, flat feet, stretching programs, balance and performance, muscle strength and fatigue, and cerebral palsy and organ function".

Cluster one (Patellofemoral syndrome) includes subtypes of knee osteoarthritis, ultrasonography, reproducibility, range of motion, pain, aging, postural control, medical insole, low back pain, and center of pressure. Patellofemoral syndrome is mainly manifested as anterior knee pain and cryptampone, especially in weight-bearing movements such as going up and down stairs, sitting with bent knees, squats, running and walking, and is sometimes associated with functional instability of the knee (giving way knee) and knee lock, which in the absence of a history of previous trauma and injury, these symptoms should not be attributed to meniscus ligament rupture (15). Heidari et al. reported that 10-25% of referrals to clinics for pain and musculoskeletal injuries are patellofemoral syndrome (the most common cause of knee pain complaints) and are 2-3 times more common in women than men. The results of a two-year study on 282 people found that people with patellofemoral syndrome during this period were mainly those with lower social support, more focus on their illness, and knee dysfunction was also more observed in this group compared to the control group (16).

Cluster two was the chronic low back pain. Low back pain that lasts more than three months is called chronic low back pain (10). The cause of low back pain is trauma or injury to the spine, any chronic disease in different parts of the body, and known psychological stress and the type of pain can be bone, nerve or muscle pain. Factors influencing the development of chronic low back pain include weakness of the muscular endurance of the lumbar region, scoliosis abnormality, decreased flexibility of the back muscles, kyphosis

abnormality, postural abnormality, and postural oscillation (15). One of the causes of low back pain is muscle pressure, which is the most common cause of chronic low back pain. This happens when a person suddenly bends over, lifts a heavy object (hugging children is a common factor), sits for long periods of time, or drives long distances without stopping, stands awkwardly, or sit improperly at work or at home. The above puts pressure on the back muscles and so-called "cramps" or swells. It takes several weeks for this muscle cramp to relieve, but it may get worse over time (5).

Cluster three, known as flat feet, is a type of anomaly in which patients lack standard arches in the sole of the feet. The arches in the sole of the foot reduce the forces exerted on the body by the ground and do not allow all the forces to enter the body, but in people with flat feet, a large amount of these forces is applied to the body due to lack of arch and it can lead to a chain of complications in all joints of the body, especially the spine (17). Factors contributing to this deformity and pes cavus include kinematics and biomechanics of walking and running, lower limb abnormalities, improper landings on the feet, misalignment of the knee joint in sports activities, and ground reaction force (GRF) (4,17). Regarding the reasons for the reduction of sole arches in different people, it can be said that genetic factors are one of the most common reasons for individuals with flat feet. A person may have hereditary flat feet and his offspring may have the same problem. Flat feet can be acquired. Weight gain, hamstring muscle shortness, and Achilles tendon shortness, inflammatory diseases such as rheumatoid arthritis, and diabetes may also reduce the arch of the foot (6).

Cluster four is known as ankle injuries. The most common sports injury in athletes is ankle sprains. Ankle sprain is a condition in which the soft tissues and ligaments of the ankle are damaged and torn. In this case, the ligament that is most affected is the lateral ligament. The lateral ligament prevents severe rotation of the foot and ankle inwards (4,5). Factors influencing ankle injuries include the anthropometric status of the person, the status of proprioceptive receptors, weakness in static stretching, history of sports injuries, maturity or immaturity of the athlete and the sports field, especially football (4). The history of previous ankle sprains, if left untreated, can lead to multiple subsequent sprains. In some cases, sprains alter the individual's gait and increase the risk of falls and other injuries (8).

Cluster five is known as knee injuries. The knee is the largest joint in the body that connects the leg to the thigh and bears all the body weight. In the knee, on the one hand, the femur is articulated with the tibia, and on the other hand, the patella and the femur together form a joint (15). Sports injuries are an important and common cause of knee joint problems. Factors influencing knee joint injuries include rupture of the anterior cruciate ligament (ACL), exercise, postural misalignment such as head forward, and weakness in the strength and function of the muscles around the knee (8,15). Movements such as sudden changes in gait, abrupt stopping when running, or improper lower limb impact with the ground when jumping can damage this ligament (16). This injury occurs as a slight stretch or tear in the tendon, or it can be a complete ligament rupture. These injuries are common in skiing, basketball, and soccer (8).

Cluster six is known as balance and performance. Balance is a typical motor reaction that depends on the integration of stimuli received from the visual and sensory systems. The visual sense tells you what the relative position of your body is in the environment. Motion sensor data from the body's internal receptors tells you how the various organs and parts of the body are in a position relative to each other. Factors influencing the reduction of balance and exercise performance include lack of balance exercises in athletes' programs, poor motor function, quality of life (mechanical life), elderly and aging, multiple sclerosis, and not performing pilates exercises (18). Balance problems increase by 30% in people over 70 years of age or older (11). Physiotherapists develop personalized physical activity programs to help improve the strength, stability, and mobility of people with balance problems (5).

The seventh cluster was muscle strength and fatigue. The ability to apply the force of a muscle or group of muscles at once and with maximum effort against a resistance is called strength. Researchers consider physical training to be the most important factor in sports skills (17). Factors affecting muscle strength include premature fatigue, lack of mental training during recovery, and decreased static and dynamic balance. The results show that strength training should be performed according to motor skills (7). To increase mobility in the elbow flexor muscles, exercises should be chosen that cause concentric and eccentric contractions of these muscles. Besides, to increase muscle strength, movements should be performed with high intensity and low repetition; while to increase muscular endurance, movements with low moderate intensity and high repetitions are recommended. Increasing strength to isokinetic exercise may be limited to

trained speeds or slower. Therefore, strength training programs should activate specific muscle groups and be as similar as possible to the exercise movement patterns (11).

Cluster eight, known with cerebral palsy and organ function, is a group of persistent non-progressive movement disorders caused by congenital anomalies or damage to the brain in the early stages of development. Some people have only mobility impairment and no other disorder, but other patients may have symptoms associated with these disorders, which include learning, hearing, seeing, and seizure problems. The state of intelligence varies depending on the location of the injury. Hemiplegia or diplegia, decreased limb function, cerebral palsy, and spasticity can be mentioned as effective factors in the occurrence of this abnormality. Cerebral palsy affects the control of coordination between muscles, and simple movements such as standing become difficult. Other vital functions that involve the motor and muscular systems include breathing, bladder and bowel control, eating, and learning. Other medical problems include sleep disorders, osteoporosis, behavioral disorders, visual and hearing impairments, food aspiration, and gastroesophageal reflux disease (GERD) (19-21).

Limitations

The research scope of the present study was related to studies on sports medicine in the ISI database and the generalization of the results to other areas should be performed with caution. Moreover, the small sample size was one of the limitations that may have affected some of the research findings.

Recommendations

It It is suggested that a scientometric analysis be carried out on Iranian sports medicine studies in the ISI citation database in various fields of physical education and sports sciences, including the management of sports organizations, sports nutrition and metabolism, and sports psychology.

Conclusion

The achievements of the present study, which is one of the first studies conducted on Persian articles in the field of sports medicine in the ISI database, provides the knowledge for researchers interested in this field to gain a good picture and insight of the process and content of this field in Iran, and if interested, adapt it to international sports medicine studies and gain a relatively good understanding of the content and speed of Persian language studies in this field.

Authors' Contribution

Hossein Ashoury: study design and ideation, support, executive, and scientific study services, providing study equipment and samples, data collection, analysis and interpretation of results, specialized statistics services, manuscript preparation, specialized manuscript evaluation in terms of scientific concepts, final manuscript approval to be submitted to the journal office, the responsibility to maintain the integrity of the study process from the beginning to the publication, and responding to the referees' comments; Aliakbar Khasseh: study design and ideation, data collection, analysis and interpretation of results, specialized statistics services, manuscript preparation, specialized manuscript evaluation in terms of scientific concepts, final manuscript approval to be submitted to the journal office, the responsibility to maintain the integrity of the study process from the beginning to the publication, and responding to the referees' comments.

Conflict of Interest

The authors declare no conflict of interest. Hossein Ashoury attracted funding related to basic studies associated with this study from Payame Noor University of Hamadan Province, and has been working as a faculty member (instructor) in the Department of Sports Pathology and Corrective Exercises since 2009. Dr. Aliakbar Khasseh has been working as an assistant professor in the Department of Information Science and Knowledge at Payame Noor University of Guilan Province since 2007 and collaborated in this project.

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