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The Past, Present and Future of Safety Management in Sport: A Bibliometric Approach to Determine Performance in Scientific Mapping

Fatemeh Abdavi [1] | **Yaghob Badriazarin** [2] | **Hamed Azimi** [3]

1. Corresponding Author, Associate Professor, Faculty of Sport Sciences, University of Tabriz, Tabriz, Iran. Email: fatemehabdavi@tabrizu.ac.ir
2. Professor of Sport Sciences, University of Tabriz, Tabriz, Iran. Email: badriazarin-y@tabrizu.ac.ir
3. MA student of Management of sports events, University of Tabriz, Tabriz, Iran. Email: azimi.h1400@tabrizu.ac.ir

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ABSTRACT

The purpose of this paper is to list and briefly discuss the top authors, organizations, universities, nations, publications, and journals in the topic of sports safety management. It also aims to provide the most linked patterns in terms of co-citation, co-authorship, keyword co-occurrence, temporal proximity, and substantial terms and concepts in the field of safety management based on content analysis. 214 pertinent international publications from journals around the world that were published between 1993 and 2023 were found in the Scopus citation database and comprised the statistical population for this study, which followed a systematic review process. In this study, software tools like Publish or Perish, Excel, Vosviewer, Rstudio, R and Maxqda 2020 were used to identify, quantify, and evaluate safety management elements in sports.The results showed that the United States has the most influence in this sector, with the University of Florida (USA) being the most significant university and organization. "Recreational Sports" is the most prominent journal in the field of safety and risk management. Konnaughton, D.P., and Spengler, Jo are the most significant authors in this discipline. Finally, a comprehensive and eight-dimensional model of safety management was created by merging the essential terms that were taken from the examination of the top 20 articles in this sector. In conclusion, it can be said that safety and risk management in sports can reduce sports-related dangers and boost safety standards, resulting in a significant advancement in athlete safety and a reduction in risks related to sports.

Introduction

The prevention of sports injuries among athletes and all other participants in sports is one of the key concerns of sports managers in the modern day, and they work to do so by employing the proper techniques (Andersen, Courson, Kleiner, & McLoda, 2002). According to M. Bernardo & Venema, important events serve as a venue for public gatherings with attendees of various ages (Bernardo &

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Venema, 2004). All safety-related actions must be taken by event managers to reduce risks and injuries and to safeguard the health and safety of all attendees (Rew & Ferns, 2005). The management of sports must set up the competitive environment to be entirely safe, free of risk, and appropriate for the desired activity before organizing any type of sporting event (Finch, Brown, Readhead, Lambert, & Viljoen, 2017). Thus, one of the requirements is to create a safe and secure environment for a sporting event (Swan, Otago, Finch, & Payne, 2009). It is crucial to focus on various sports-related activities, including the development of acceptable and secure sports facilities, in order to host sporting events at various levels (Hall, Cooper, Marciani, & McGee, 2011). However, safety-related training can also be a means of lowering risky behaviors and enhancing the effectiveness of safety management (Chen, Ping, Zhang, & Yi, 2022).

Sports safety management is a key concern for sports administrators following the Hillsborough tragedy, which resulted in the deaths of 97 Liverpool fans due to inadequate safety rules (Frosdick & Walley, 2010). Generally speaking, safety management is a comprehensive set of all necessary instructions and guidelines that seek to anticipate and prevent unfortunate events for everyone involved, including the equipment used and the people present. It is aligned with all aspects of safety and health (Ban Matei, 2020). Sports safety management provides a secure platform for participants to engage in their sporting activities, with the primary objective of foreseeing and stopping the occurrence of risky variables (Severs, Whitlam, & Woodhouse, 2003). The necessity of safety and security measures in sports is now widely acknowledged, and the most sports administrators employ them (Poulos, Donaldson, & Finch, 2010). The September 11, 2001 tragedy and other terrorist acts are among the elements that have made safety and security management an essential and fundamental part of the planning of sporting events. Major sporting events now have strengthened security procedures as a result of these attempts, which still happen (Taylor & Toohey, 2007). However, sports managers need to improve the safety and security of sporting events in light of the concerns posed by terrorism, which are still present in sports (Cieslak, 2009).

In relation to the citation environment chosen for this research, it can be said that Scopus was introduced by Elsevier Publications at the beginning of the 21st century as a citation tool, and today, due to its greater coverage, faster indexing process, and the existence of newer articles, it has become one of the largest existing citation databases that researchers can use to quickly find original and reliable information with ease (Amaechi, Amaechi, Onumonu, & Kgosiemang, 2022). The first paper on safety management in sports was published in the reputable Scopus reference database at the turn of the 20th century (Laflamme & Eilert-Peterson, 1998). Numerous researchers have worked and conducted study in the area of safety and security management since the publication of this article.

Another subject that Schmidt and his colleagues have looked into in relation to safety management is having knowledge of safe play. After conducting the required research, they came to the conclusion that athletes' safety should be prioritized by coaches and other sports officials on the teams who are well-versed in the concepts of safe play, and on the other hand, they should take the necessary precautions to prevent sports injuries while practicing. Do this as well in order to deal with fewer bad situations (Schmidt, Pierce, Guskiewicz, Register-Mihalik, Pamukoff, & Mihalik, 2016). The findings from the studies of Diamond & his colleagues in the area of safety standards also show that the use of appropriate safety policies acts as a beacon for young people in the community so they can be diligent in sporting activities without worrying about fears of danger (Diamond, Dickinson, Fiscus, Heitmann, & Radman, 2019). Another aspect of safety management in sports that has been taken into account is a positive safety culture. Chen & his colleagues conducted research in this area and came to the conclusion that if safety-related awareness is given attention and weight, it can help athletes' long-term health to some extent. Additionally, a deeper knowledge of the advantages of fostering a positive safety culture among elite athletes resulted from the researchers' investigations for this study. The sports community can greatly lessen the number of injuries among athletes and set the stage for their long-term wellbeing by utilizing this culture (Chen, Buggy, & Kelly, 2019).

Regarding the usefulness of the systematic review method, it should be said that experts and academics have come to the conclusion that numerous studies do not solve the issue of conflicting results, bring contradictory results, and make it difficult to interpret the data. Instead, due to the

emergence of problems and a lack of coherence in many works, systematic and review techniques are needed (Cook, Sackett, & Spitzer, 1995). One of the main benefits of systematic reviews is that they generally synthesize numerous original studies, which prevents the application of the author's personal beliefs and preconceptions because of the weight of the evidence (Cook, Sackett, & Spitzer, 1995).

In order to effectively manage safety in sports, it is important to identify and introduce the most significant authors, institutions and universities, nations, articles, and publications. This article also introduces the most effective co-citation, co-authorship, synonymy, simultaneity, and keyword patterns based on content analysis in the field of safety management, which was carried out using a systematic review method.

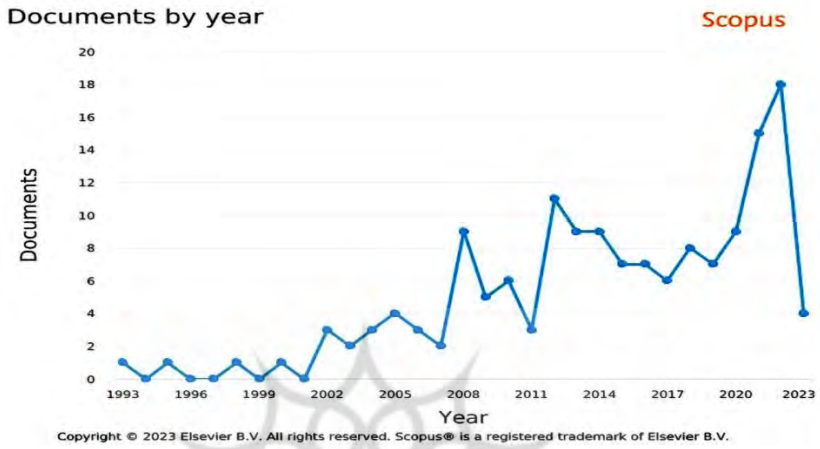

Chart 1. The Growth of Published Research Depends on The Publishing Year

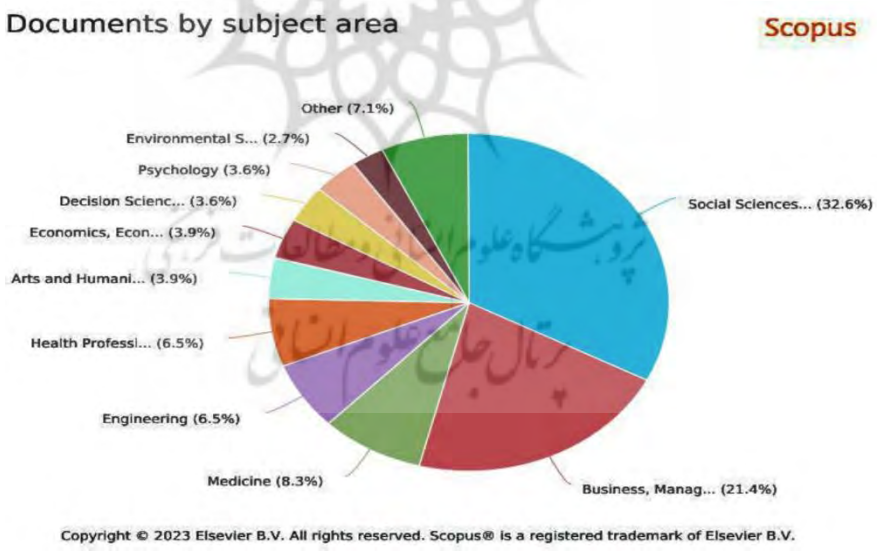

Chart 2. Fields With The Desired Field

According to Chart 1, research on safety management in sports is developing and growing annually. This growth in the number of papers published demonstrates the significance and need for diverse study in this area. On the other hand, Chart 2 demonstrates that it is crucial to carry out bibliographic research, discover knowledge gaps, and specify various researches in order to increase knowledge in this area. The breadth and diversity of study fields in this field should therefore be taken into consideration in order to maximize this process, and the required steps should be taken in order to identify the various research needs of various clients.

Methodology

Bibliography and Scientometrics

Review method is a methodical, step-by-step process to approach the research topic impartially. It should be a top priority for all researchers to assess the scientific literature (Tranfield, Denyer, & Smart, 2003). Researchers are responsible for the growth of science by using review research to update their knowledge (Aria & Cuccurullo, 2017). Bibliometrics has become a staple instrument in scientific management and policy over the past few decades (Roy & Basak, 2013). Managers and research managers, information experts and researchers, as well as the researchers themselves, also use the bibliometric method in research performance testing, which is especially common in government and university laboratories (Pendlebury, 2008). The research plan or strategy used in the bibliometric technique helps the researcher achieve their research objectives by using strategies and practices (Alcaide, 2021).

The methodological process of bibliometric studies

First step: Choosing the problem and the field of study

According to the data in Section 1, The researcher used Publish or Perish software to identify the parameters of his theoretical field (Harzing, 2007). Researchers use this technique to find and evaluate the top studies and papers in the topic of interest while developing a study plan. They focus on the reliability and correctness of quantitative research while examining the discrepancy in metric differentiation.

Second step: Setting Goals

This research aimed to improve the accuracy and quality of citation data by analyzing the qualitative content of citation data, in response to criticisms of the bibliometric method and its quantitative methods.

Functional or Descriptive objectives

1) Identifying the most influential author in the field of safety management in sports
2) Identifying the most influential publication in the field of safety management in sports
3) Identifying the most influential institution or university in the field of safety management in sports
4) Identifying the most influential country in the field of safety management in sports
5) Identifying the most influential article in the field of safety management in sports

Objectives of citation network analysis

1) Identifying the most effective co-referencing patterns in the field of safety management in sports
2) Identifying the most effective co-authorship patterns in the field of safety management in sports
3) Identifying the most effective patterns of synonyms in the field of safety management in sports
4) Identifying the most effective simultaneous patterns in the field of safety management in sports

Objectives of content analysis

1) Identification of keywords (gaps) based on content analysis in the field of safety management in sports
2) Identifying the dimensions of the target area based on content analysis in the field of safety management in sports

The third step: Determining the search strategy

Researchers need a search method to review material and use citation information in their research, which involves looking up citation information and choosing the most pertinent and excellent publications to obtain more transparent and accurate results.

Four primary steps are performed to gather and analyze citation data in the search strategy section:

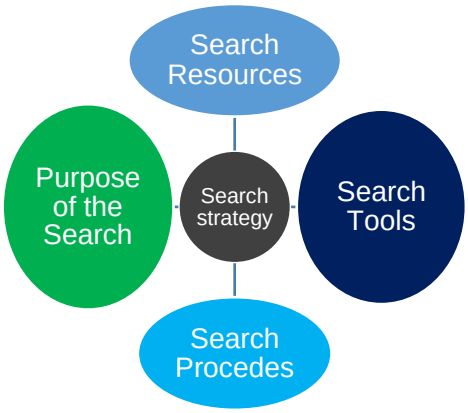

Figure 1. Components of The Citation Data Search Strategy

The first step: The purpose of the search

Searching for reliable citation information from reputable databases and search engines was used to assess the breadth, correctness, and clarity of studies in this area (Martin, Thelwall, Orduna-Malea, & Delgado, 2021).

Second step: Search sources

The researcher has selected the Scopus citation database as the most effective citation database in this subject, taking into account the accuracy and depth of sources and sources of information in the required field.

The third step: Search procedures

The necessary data has been gathered using tools for managing and organizing citation sources, like Zotero and its extensions. The primary search terms "safety management" and "sports" were chosen after studying the relevant literature. The search's results and associated criteria are displayed in Table 1 for your convenience.

Table 1. Procedures and Search Criteria For Reference Sources

Items	Description
Citation base	Scopus citation database
Keywords	"risk management" OR "safety management" AND "sport"
Search field in the library	Title, Abstract ,Keywords
Search command	TITLE-ABS-KEY ("risk management" OR "safety management" AND "sport")
Type of documents	Journal Articles
Search time frame	1993 – 2023

Fourth step: Search Tool

Due to the advancement of technology and the emergence of various websites and software, various methods are known to describe and analyze citation networks. As Table 2 illustrates, citation networks have been described and analyzed using a variety of software programs in this study.

Table 2. Information of Common Bibliometric Software

Tools	Analyzed Version	Year	Developer	Operative System	User Interface
Bibexcel	2017	2017	University of UME (Sweden)	Win	Desktop
Biblioshiny		2019	University of Naples Federico ll (Italy)	Runs in R	Web
VOSviewer	1.6.13	2019	Leiden University (The Netherlands)	Win, OSX, Linux	Desktop
R	4.2	2022	RStudio Team in Boston, USA	Win	Desktop
R studio	9.2	2021	Mathematics and statistics experts under the title of R software core team	Win, Linux	Desktop

- ***Publish or Perish software***

This software was created by Professor Harzing in 2007 to gather citation data from search engines. The 8th iteration of this program was employed in this project to identify the study area, the writers of the optimal works in that area, and to look for theoretical works in which to base the research (Harzing, 2007).

- ***Endnote software***

For managing and organizing research resources in this study, Endnote software version 20.4 for Windows 64-bit operating system is employed.

- ***Excel***

This application program has been used to create numerous diagrams and conform with the criteria in the Prisma protocol, such as recognizing redundant research, lacking important and helpful information, lacking English summaries, and unrelated to the study topic.

- ***Vosviewer*** software

The analysis of networks and their grouping has been done using this program. This software enables researchers to explore and evaluate their networks more thoroughly and precisely by presenting appealing and high-quality networks. This project makes use of the software's Windows 64-bit operating system version 1.6.19.

- R ***software***

In this investigation, R software version 4.2 was initially set up and launched, and then the free and open-source macros from RStudio 2022 were installed on R. For the optimum performance and network analysis, the Bibliometrix library was deployed in HTML format before the final data was processed. The Boston, Massachusetts, USA-based RStudio Team created this software.

- ***Maxqda software***

The content of the top 20 studies in this subject was qualitatively analyzed for this project using the content analysis software maxqda 2020.

The fourth step: Collecting information, sifting and extracting data

utilizing the data in Table No. 1, 214 studies were searched for in this research utilizing the Scopus database using the targeted keywords and certain operators. Some research were removed in

the first step after the studies were filtered based on the time period, document type, and other factors. The PRISMA procedure was used to screen the research, and in the second stage, duplicate studies, publications lacking English versions of titles, abstracts, or keywords, incorrect entries, and exemplary publications were removed. In the end, 154 studies were still in the database (Page et al., 2021).

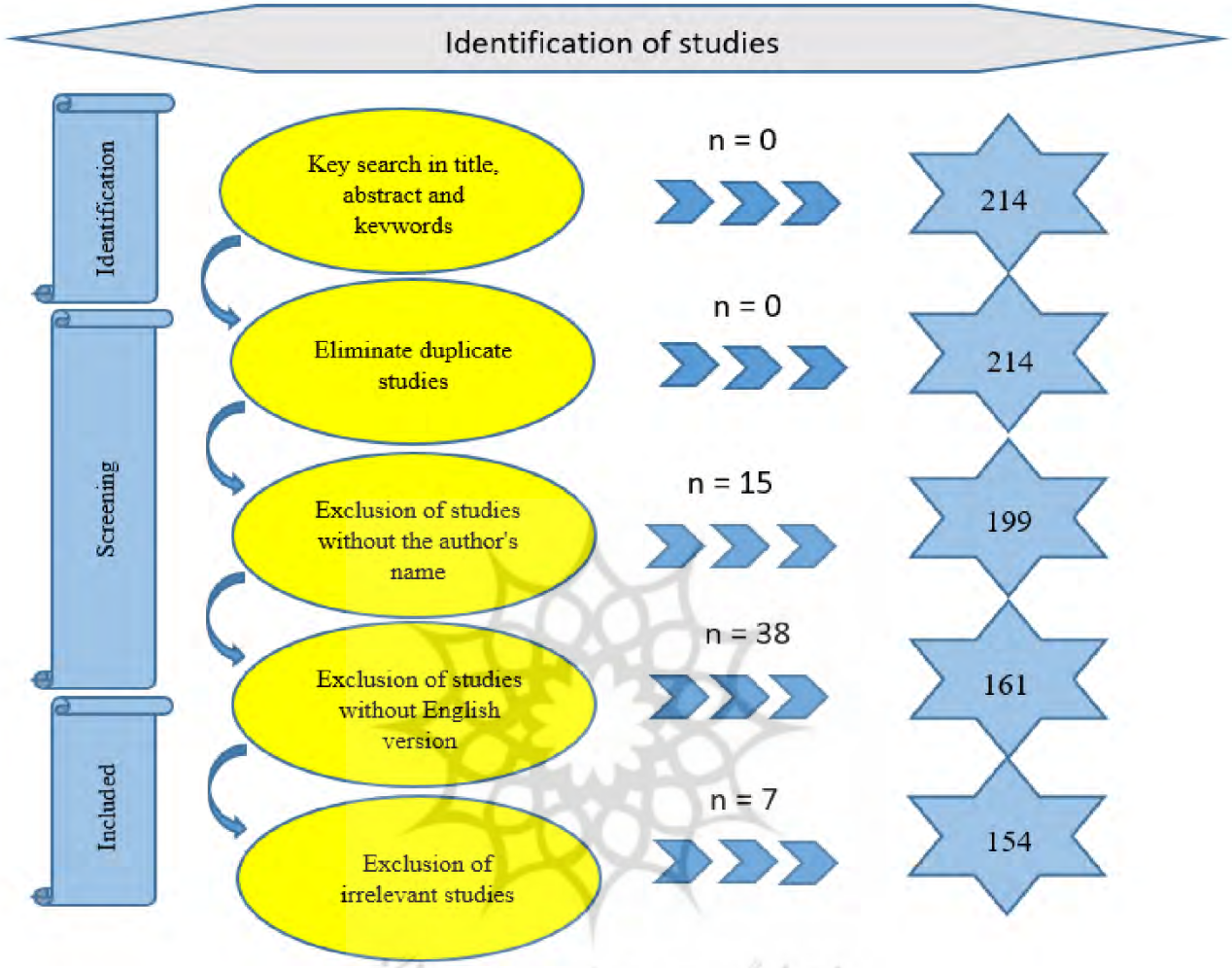

Figure 2. Agreement on The Study Selection Based on The PRISMA Protocol (Page et al., 2021)

Results

Functional results have been examined in descriptive form, network analysis, theme and content analysis, and before examining each of these parts, a general analysis is first evaluated in the remaining documents in the analysis portfolio (Moradi & Miralmasi, 2020). This is the sixth phase of the research methodology.

Table 3. Overview of Bibliometric Main Information

Description	Results
Timespan	1993:2023
Sources (Journals, Books, etc)	90
Documents	154
Annual Growth Rate %	4.73
Document Average Age	8.55

Average Citations Per Doc	11.75
References	6630
Document Contents	
Keywords Plus (ID)	643
Author's Keywords (DE)	502
Authors	
Authors	356
Authors of single-authored docs	28
Authors Collaboration	
Single-authored Docs	28
Co-Authors per Doc	2.73
International Co-authorships %	17.53
Document Types	
Article	154

Table 3 provides data on the number of publications published between 1993 and 2023 in the area of sports safety management. The analysis basket contains 154 documents released by 90 publications, with an average citation rate of 11.75%. However, there are some articles with fewer citations. Additionally, the numbers shown indicate that this field's annual growth in scientific output is 4.73%. Also, the numbers obtained in this table show that the impact of the journal, the number of citations, and the number of authors are crucial for the acceptance and citation of documents. Journals in fast-growing fields outperform journals in slow-growing or declining fields (Sjögårde & Didegah, 2022).

Authors classified their papers using 502 keywords, with 28 single-authored research on safety management and risk in sports. 2.73 writers contributed to 126 other works, with a 17.53 percent international collaboration rate. Only 18% of articles were written by a single author, while 72% were written in collaboration.

Functional analysis of documents and authors

The most important idea is to gather relevant documents and evaluate notable writers to gain insight into the subject area. This approach allows for a greater understanding of the target area by analyzing well-known authors who have access to more study findings (Han, Kang, Kim, & Kwon, 2020).

Table 4. 10 Best Studies in The Field of Safety Management in Sports

Paper	DOI	Total Citations	TC Per Year	Normalized Total Citations
Deck & Willinger (2008), International Journal of Crashworthiness	10.1080.1358826080241152 3	161	10.06	6.7 1
Ruedl G (2012), Accident Analysis and Prevention	10.1016.j.aap.2012.01.031	70	5.83	2.9 3
Taylor T (2007), Journal of Sport & Tourism	10.1080.1477508070165475 4	68	4.00	1.8 6
Salmon PM (2014), Accident Analysis and Prevention	10.1016.j.aap.2013.10.019	66	6.60	3.2 6
Taylor T (2006), Event Management	10.3727.1525995067767715 44	62	3.44	2.0 0

Toohey K (2003), Journal of Sport & Tourism	10.1080.14775080310001690495	61	2.90	2.00
Chen S (2010), Journal of Transportation Engineering	10.1061.(ASCE)TE.1943-5436.0000093	58	4.14	2.66
Ma X (2014), Information Systems Research	10.1287.isre.2014.0517	44	4.40	2.18
Lehman DW (2013), Management Science	10.1287.mnsc.1120.1574	44	4.00	2.10
Mackenzie S (2012), Journal of Sport & Tourism	10.1080.14775085.2012.729901	44	3.67	1.84

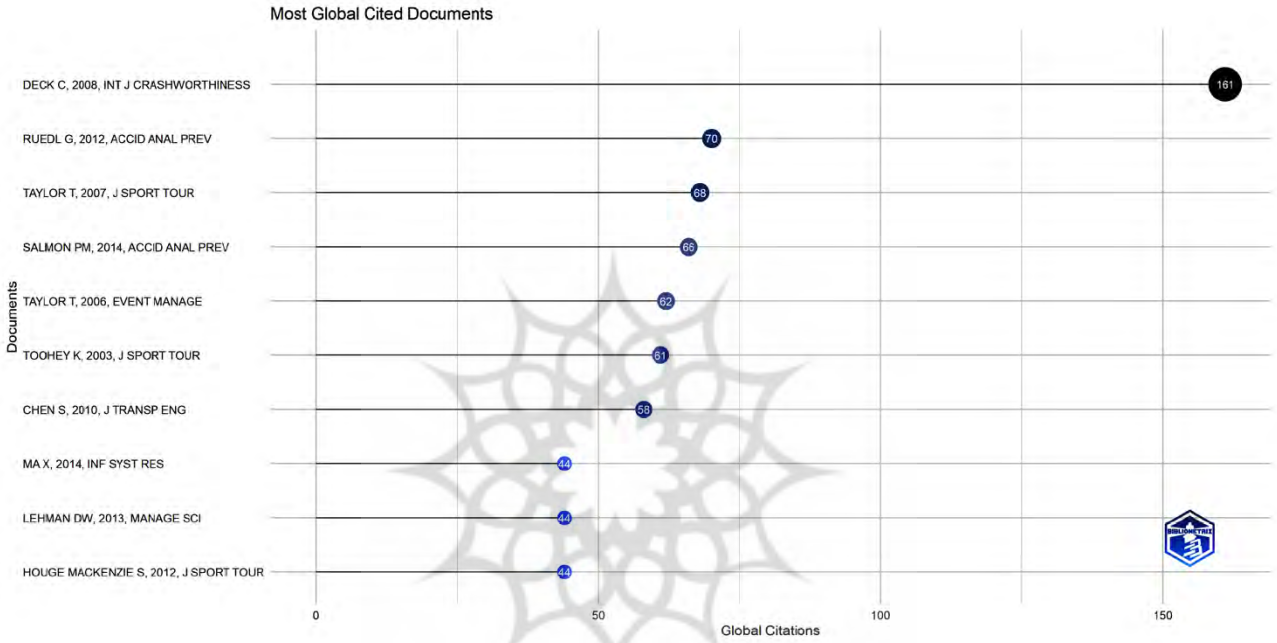

Figure 3. The 10 Best Research Papers in The Field of Sports Safety Management

The article titled "Improved head injury criteria based on head FE model" had the most citations, with more than twice as many as the second-ranked study, according to Table 4 and Fig 3. The most frequent and serious injury suffered by drivers, passengers, motorcyclists, pedestrians, and cyclists in traffic accidents is the head injury, which is the subject of this article. This injury accounts for over 40% of traffic fatalities in the European Union (EU). The development of techniques for evaluating head injuries is one efficient way to lower the potential hazards of severe and fatal brain injuries, according to study by Deck and Wilingger. These techniques use various impact situations to precisely and thoroughly analyze the possible risk of brain damage (Deck & Willinger, 2008).

One of the studies by Deck and Willinger that has received the most attention in the area of safety management, improvement, and health promotion In order to reduce sports-related injuries, it has created a framework for health promotion that is used to set up wellness programs and safety guidelines aimed at minimizing head injuries. It has provided tips for improving health and highlighted the link between mental and physical well-being (Deck & Willinger, 2008).

It's crucial to concentrate on authors' contributions and the relative quality of their works while conducting a bibliographic analysis. More recognition should be given to authors who have made the most significant contributions to an area. The value of publications is explained in Fig 4 based on the authors' names (Abramo & D'Angelo, 2016).

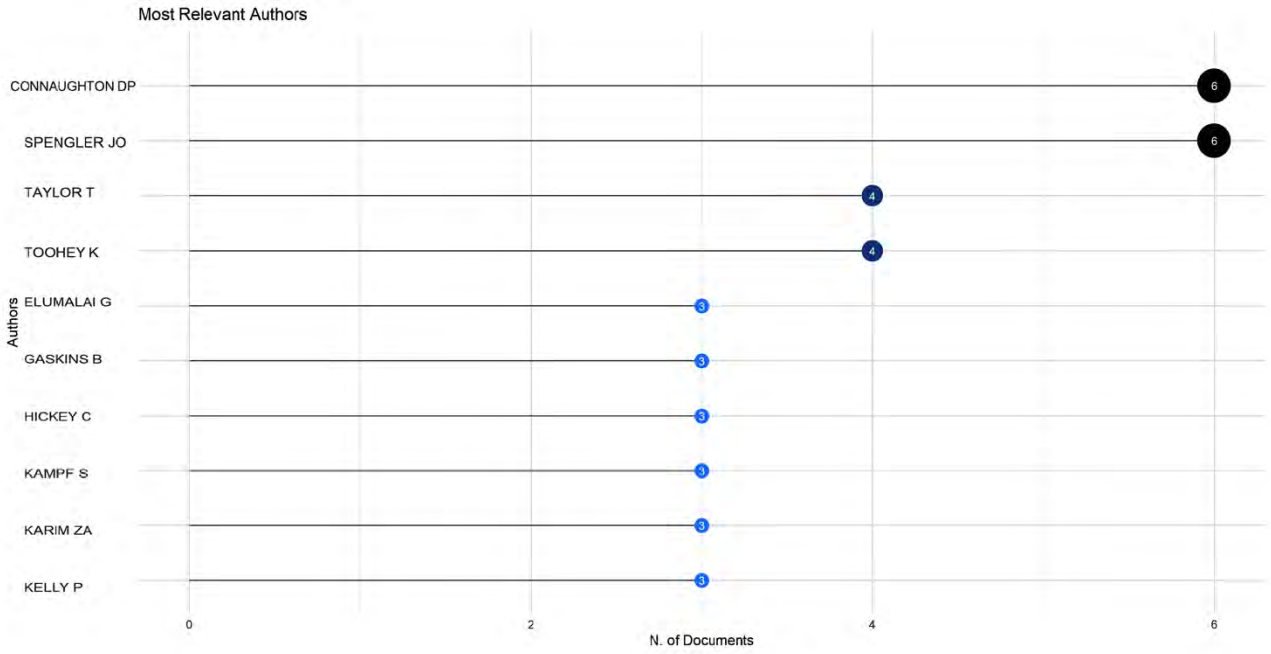

Figure 4. View of 10 Authors With The Largest Number of Scientific Productions in The Field of Safety Management in Sports

Figure 4 displays the top writers on the subject of risk management and safety in sports. These statistics show that Connaughton Dp and Spengler have six articles each, which is the most in this field. It should be noted, nevertheless, that not even the authors who receive the most citations across all of their publications make the list of the top 10 authors. This discovery demonstrates that merely producing more scholarly articles is insufficient. As a result, rather than emphasizing number, one should focus on the articles' quality and content (Aksnes, Langfeldt, & Wouters, 2019).

Functional analysis of Publications, Affiliations

These 154 investigations were published in 90 publications, as previously noted. Table 5 lists the top 10 publications in terms of scientific output in this significant sector. Of course, we should not ignore the numerous complaints leveled toward magazine impact factor-boosting tactics, some of which are immoral in an effort to boost readership (Archambault & Larivière, 2009).

Table 5. Top 10 Publications With The Most Scientific Production in The Field of Safety Management in Sports

Sources	Articles
Recreational Sports Journal	12
Accident Analysis and Prevention	5
Event Management	5
International Review For The Sociology of Sport	5
Journal of Risk and Financial Management	5
Journal of Sports and Tourism	5
Safety Science	5
World Leisure Journal	4
Ibima Business Review	3
International Journal of Human Movement and Sports Sciences	3

"Recreational Sports Journal" magazine is ranked #1 among the best publications relating to safety management and sports risks, with 12 published scientific and research operates. It was established by the NIRSA Foundation as a renowned scientific publication with the goal of offering resources for experimental, theoretical, and applied research in the area of recreational sports. This magazine's primary topics are organizational growth, programming, and student development. The publication follows ethical guidelines for publishing scientific articles and is a member of the Committee on Publication Ethics (COPE).

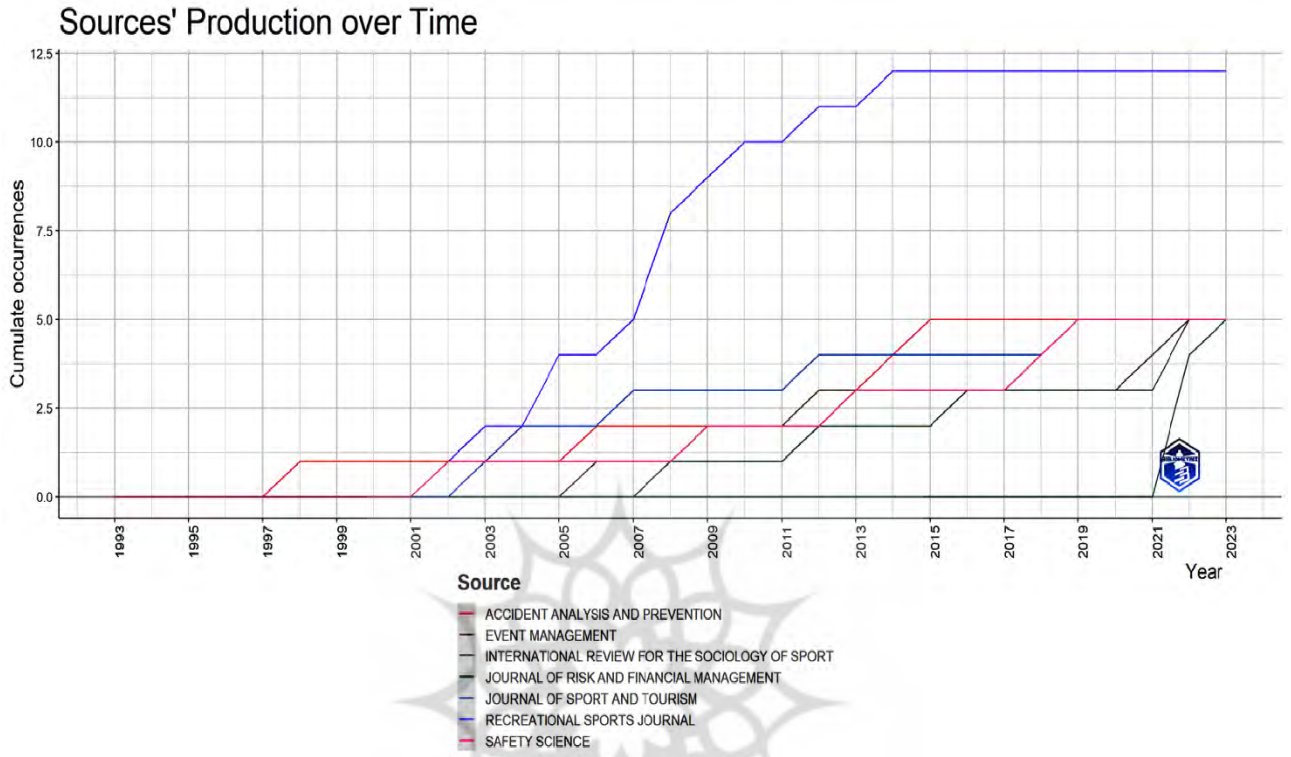

Chart 3. The Growth of Scientific Production in The Field of Safety Management in Sports in Publications

A current comparison of the top five journals in the fields of sports and safety management is shown in Chart 3, and it reveals that each journal's research output has grown significantly in recent years. Over 20% of the studies in the 154 documents examined were published in these top 5 journals, according to the overall results of the journal rankings, which also show that the 85 journals at the bottom of the table had very low publication rates compared to these top journals.

Table 6. 10 Top Affiliations With The Most Scientific Production in The Field of Safety Management in Sports

Affiliation	Articles
University of Florida	16
University of The Sunshine Coast	10
University of Innsbruck	8
University Pendidikan Sultan Idris	7
University Gadjah Mada	6
Deakin University	5
Islamic Azad University	5
University of Ballarat	5
University of Belgrade	5
Victoria University	5

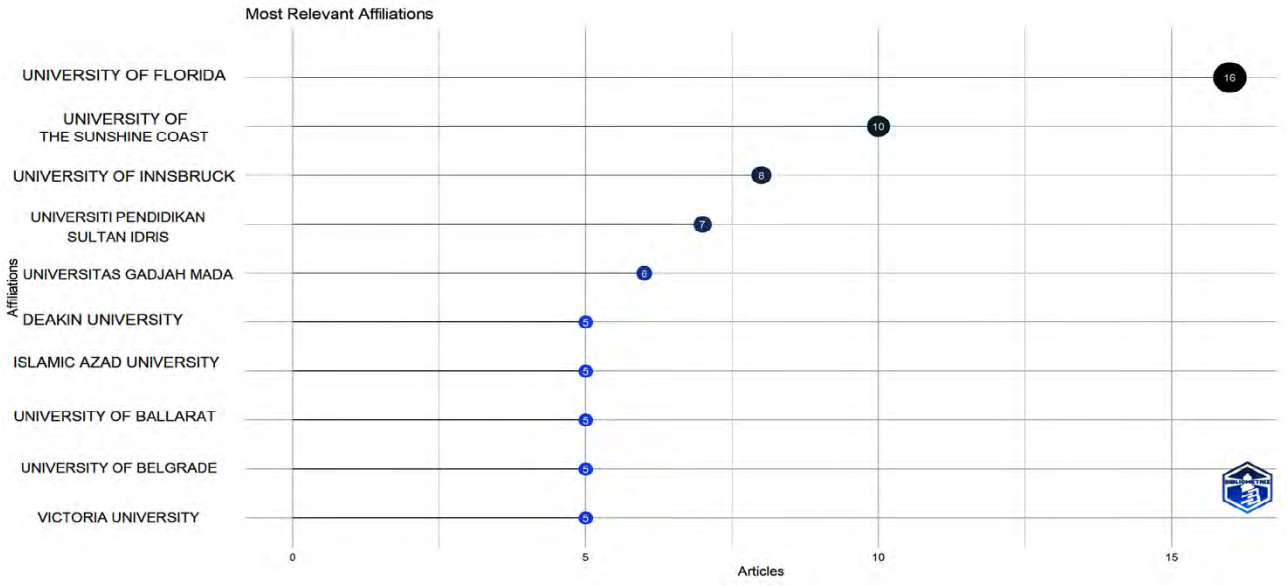

Chart 4. Top 10 Affiliations With The Most Scientific Production in The Field of Safety Management in Sports

The University of Florida, a Q1-ranked university, has been acknowledged as the top university in this subject by producing 16 credible scientific works, according to the data in Table 6 or Chart 4, which was collected from the website https://www.scimagoir.com/. A senior member of the State University System of Florida since 1853, the University of Florida is a state-funded research university in Gainesville, Florida. Since September 1906, it has been running continuously on its Gainesville campus. The university is ranked 137th in the globe and 29th among the best US universities.

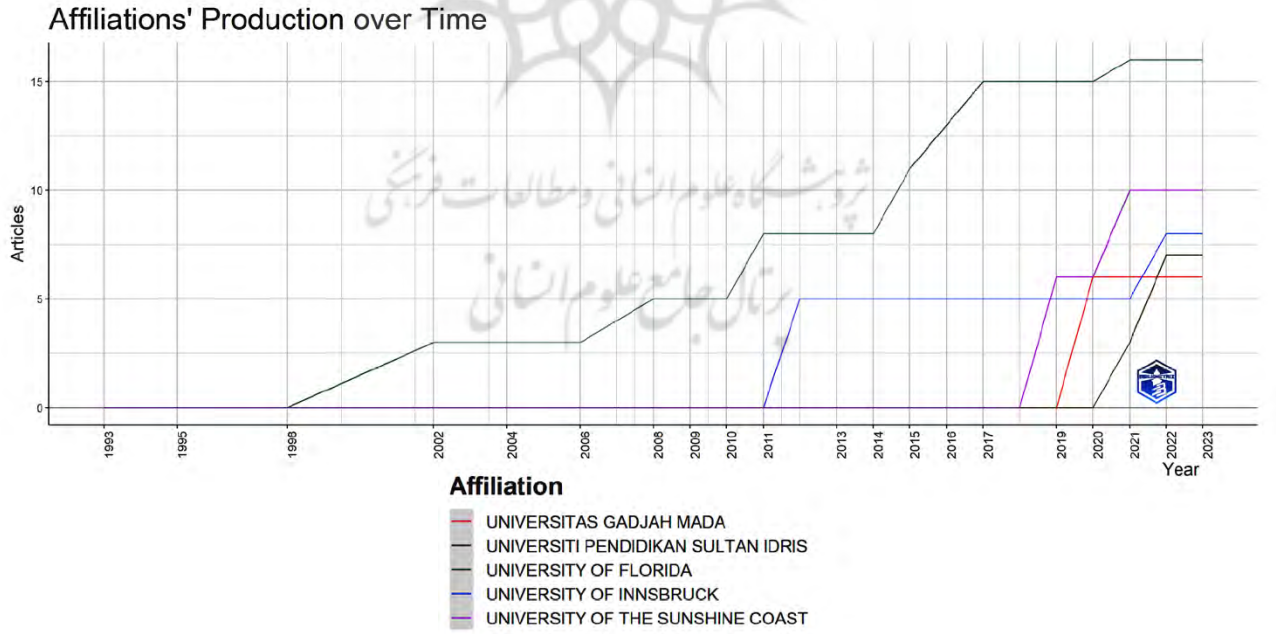

Chart 5. The Linear Growth Trend of Scientific Production in The Field of Safety Management in Sports in Affiliations and Universities

Additionally, the University of Florida in the United States and Sun Shine Coast in Australia have the highest growth rates in the area of safety management in sports, as demonstrated in linear chart 5, which depicts the growth of scientific knowledge output in scientific institutions.

Functional analysis of countries

The United States, Australia, the United Kingdom, China, and Malaysia are the top five nations for scientific productivity, according to data in Chart 6. With 154 documents altogether, over 105 of which can be assigned to the United States based on the number of authors, the United States produces more scientific work than any of the other top generating nations. The scientific output of the United States in the area of safety management in sports is significantly higher than that of the other four top producing nations when domestic and international author collaborations are taken into account (which account for over 72% of the documents).

Table 7. Top 10 Countries With The Most Scientific Production in The Desired Field

Country	Total Citations	Average Article Citations
USA	331	11.80
AUSTRALIA	286	22.00
UNITED KINGDOM	193	14.80
FRANCE	191	27.30
CANADA	140	20.00
AUSTRIA	72	36.00
SWEDEN	53	13.20
CHINA	51	7.30
BRAZIL	48	16.00
SPAIN	23	7.70

The United States has received 331 articles and is relatively far ahead of Australia and the United Kingdom, which have received 286 and 193 citations, respectively, in terms of the highest and most effective countries in the field of scientific production quality, according to table 7. This demonstrates how established and advanced nations consistently set the bar for innovation in the fields of production and citations, as well as in the development of innovative techniques for evaluating the validity of research measurement indicators.

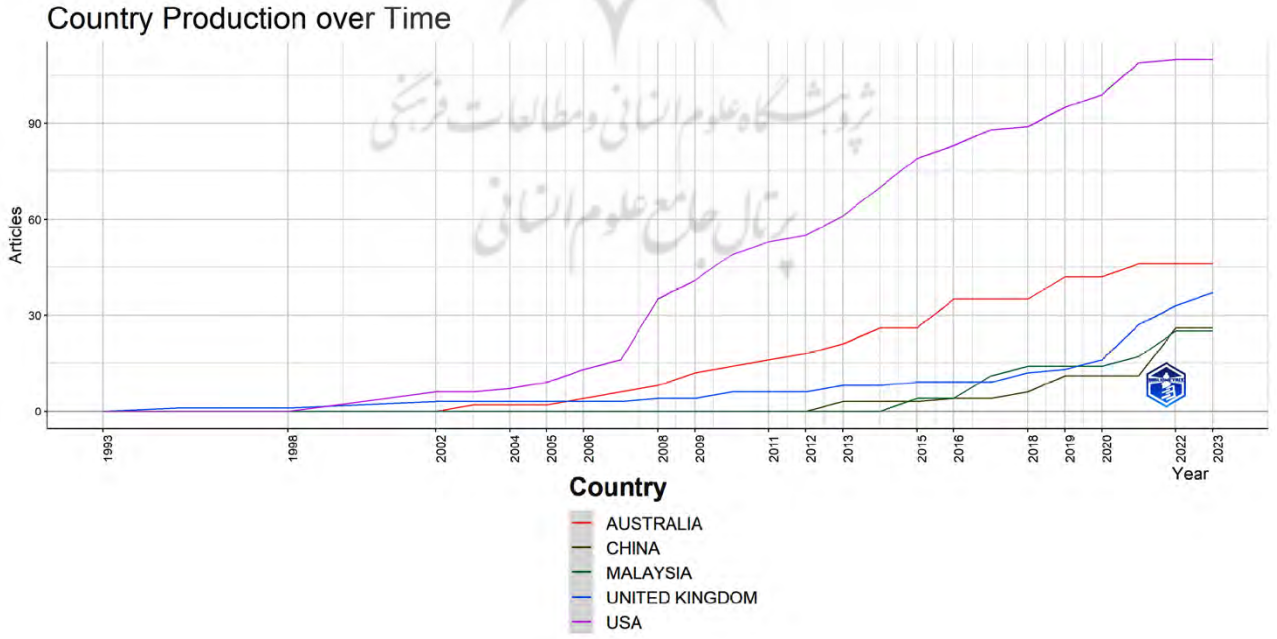

Chart 6. The Linear Growth Trend of Scientific Production in The Field of Safety Management in Sports in Countries

International cooperation in sport safety management can open up opportunities for study worldwide, with the top 10 countries also having both single-country and multi-country studies, as shown in Chart 7 ñAkkın & Cizel)))))))

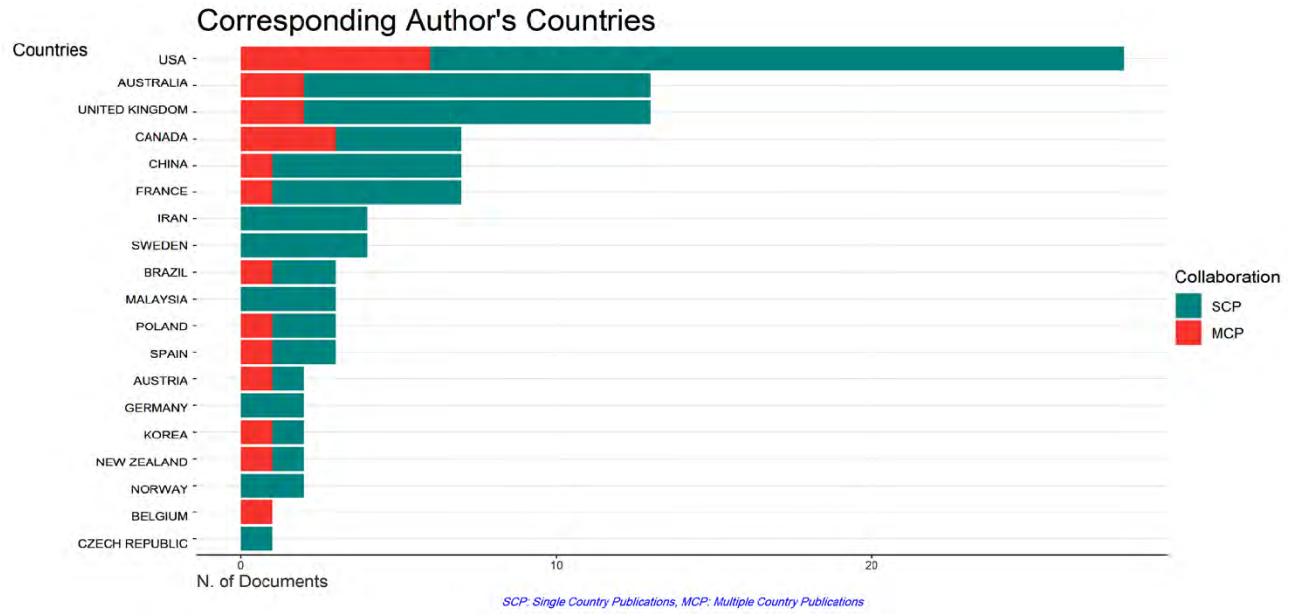

Chart 7. Cooperation of Authors From Different Countries

With six collaborations, the United States leads the world in international cooperation in the area of safety and risk management, according to chart 7. Canada is in second place with three international collaborations in this area, ahead of Britain and Australia, each of which has only two. Chart 7's observations show that developed countries account for the majority of international cooperation in safety and risk management. However, poor nations have also worked together recently to make sure that their studies are published in credible and acknowledged publications. The availability of English-speaking colleagues and chances for future research, which also increases the visibility of the authors from these nations, are the likely causes of these collaborations.

Vocabulary Analysis

The most crucial words in a piece of writing are keywords, which can be used to narrow down study topics in a crowded or uninteresting sector. They are crucial for deciphering and comprehending the content of the article (Pesta, Fuerst, & Kirkegaard, 2018). A statistical study of keywords can highlight original research areas and trends as well as show how a field's scientific boundaries are being pushed. This method is crucial for developing research in an area and expanding the boundaries of knowledge (Akkın & Cizel)))))))

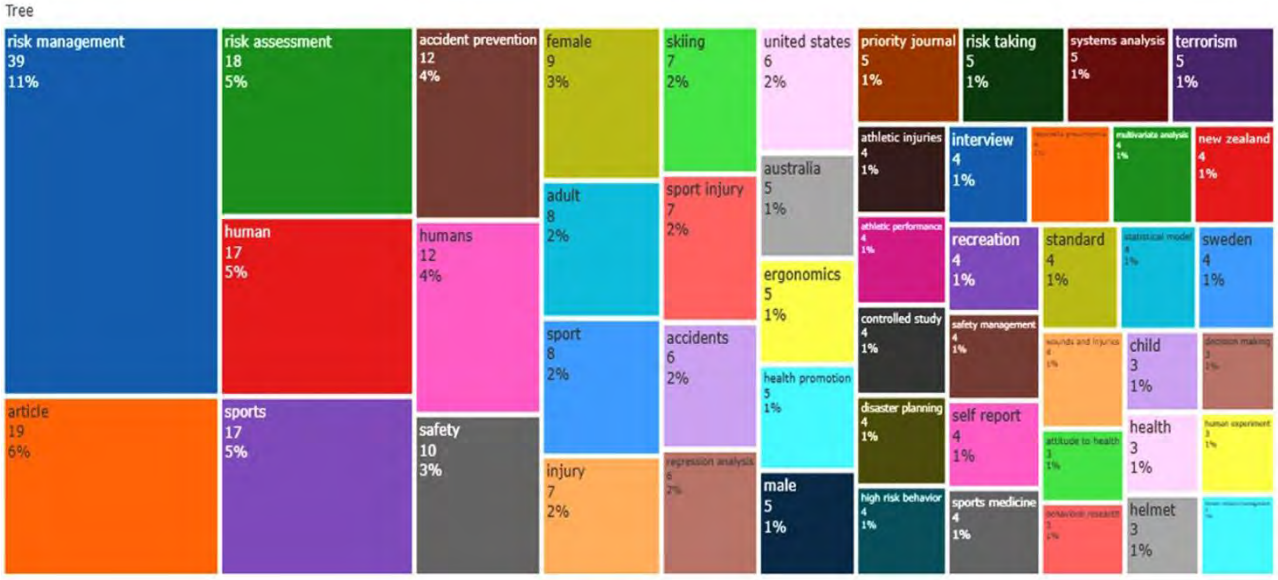

Figure 5. Tree Diagram of Key Words of Researchers (Key Words With The Highest Frequency)

Figure 5 shows how concepts like risk management, articles, risk assessments, human, and sports directly affect how important phrases in the chosen subject are related to one another. It advises researchers to consider software updates and suitable tests when conducting their work.

Each unique keyword has a varied volume and weight in the field of risk and safety management, as shown in Fig 5 and Chart 8. Naturally, the study area, risk management, has the highest proportion at 11%. To find relevant terms that are closely related to one another, academics should concentrate on these themes in addition to using the most recent software and appropriate testing. All academic researchers from all fields are advised to read this.

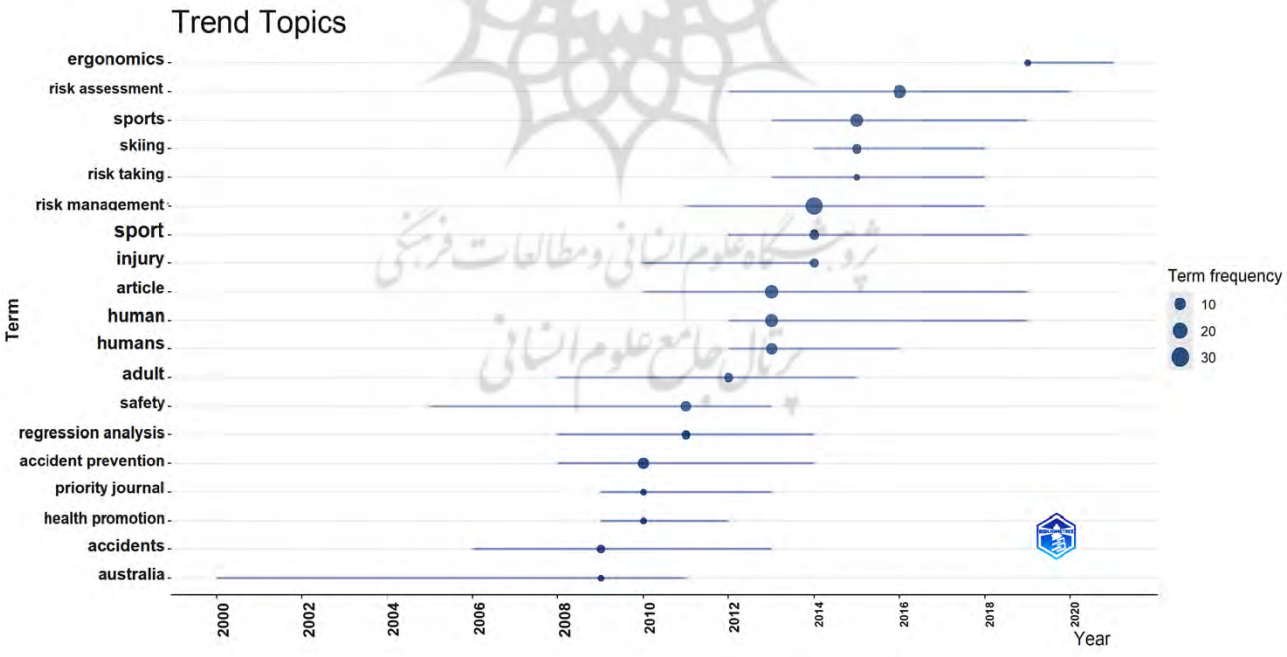

Chart 8. The Movement of Keywords Over Time by Calculating The Weight of Topics

Network analysis and bibliographic scientific mapping

Scientific mapping is an interdisciplinary field that analyzes and models scientific and technical procedures using computational techniques from computer science and library information science. The combination of information scientometrics, citation analysis, visual analysis, data mining, and knowledge discovery has caused it to grow swiftly (Chen, Dubin, & Schultz, 2014).

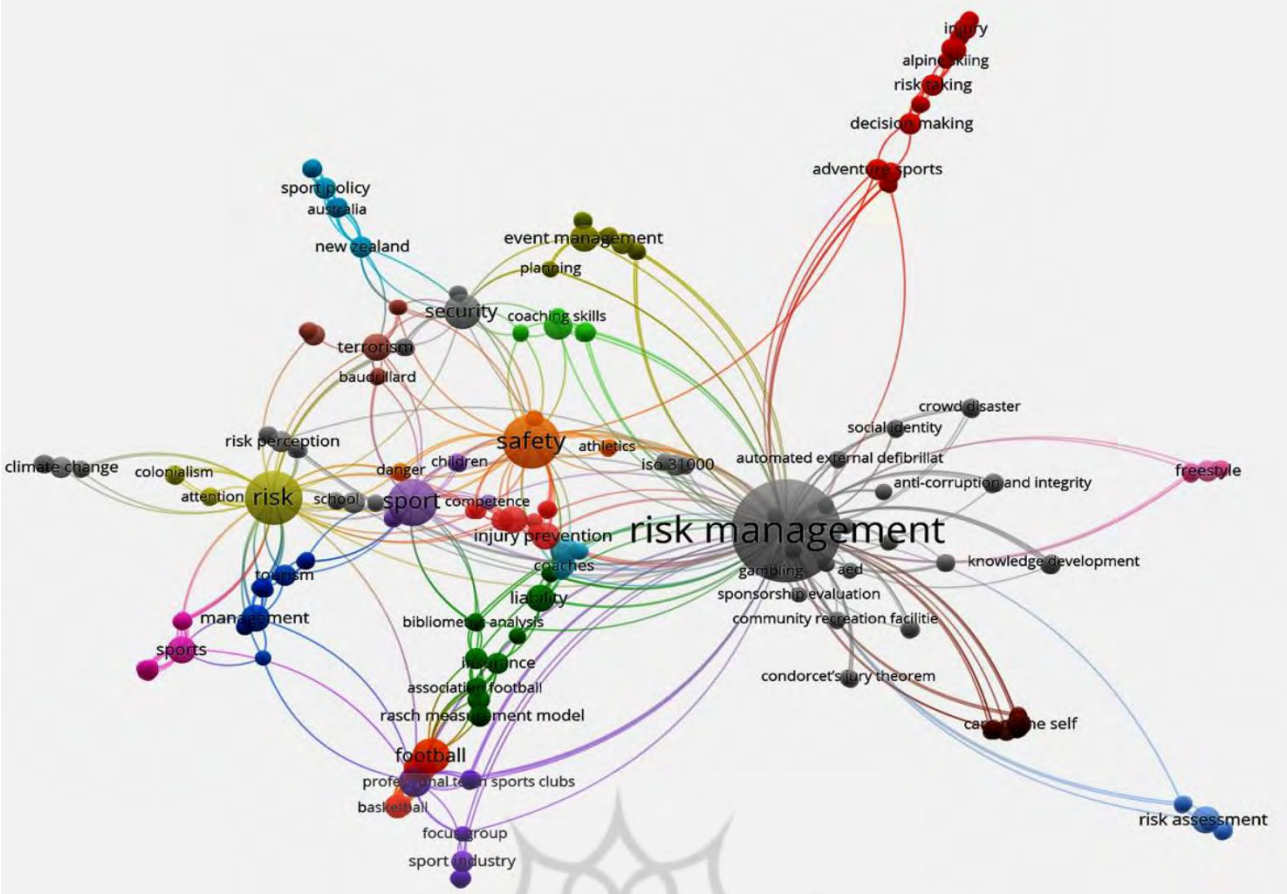

Figure 6. Coincidence of Keywords With The Highest Frequency

A document researcher chooses a document with at least five overlapping and co-occurring keywords, according to studies on keyword co-occurrence networks. These keywords are made up of the top 25 most common words, with each node's size indicating how frequently that word occurs. The keyword "risk management" serves as the cluster's focal point in Fig 6 and the silver cluster, which is connected to the other 65 keywords. There are a number of interconnected and closely related thick links, such as sports, safety, risk, and security, inside this cluster.

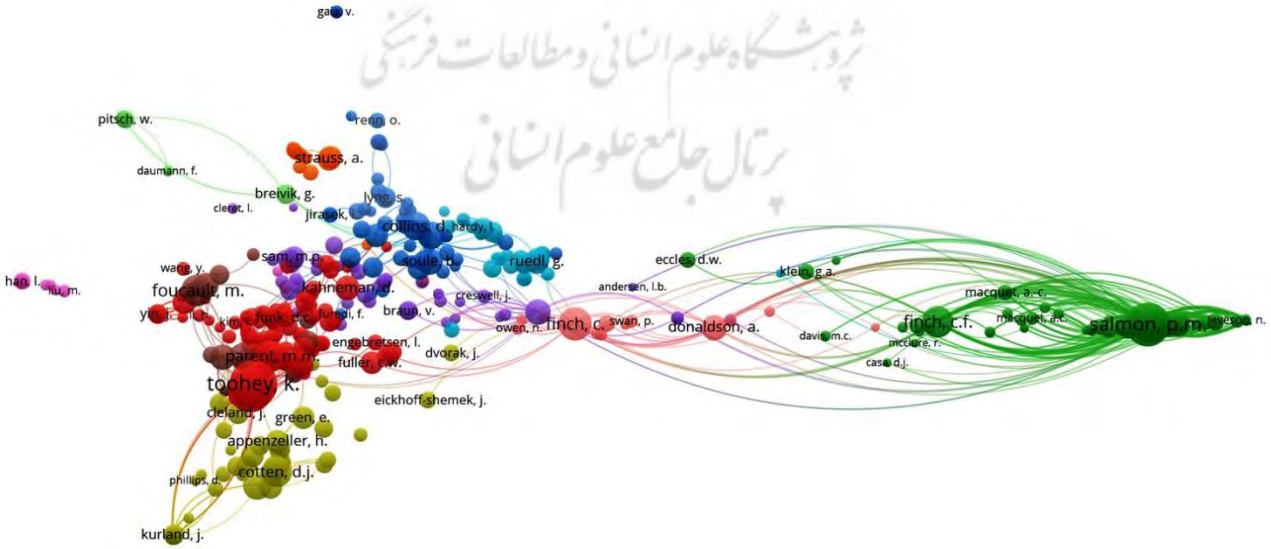

Figure 7. Co-authoring Network of Authors of Documents in The Field of Safety Management in Sports

Maps of collaboration between countries that publish articles on risk management and safety in sports are shown in Figures 8 and 9. On the map, only countries that have created at least five articles in this field are displayed. The bold lines on the map indicate the vast and strong collaboration that exists between the United States, Australia, Britain, Canada, and South Korea. In this regard, South Korea also works well with Singapore and Brazil. Brazil and Britain's cooperation is remarkable, and there are obviously other collaborations with the United States, albeit they are less obvious than other relationships.

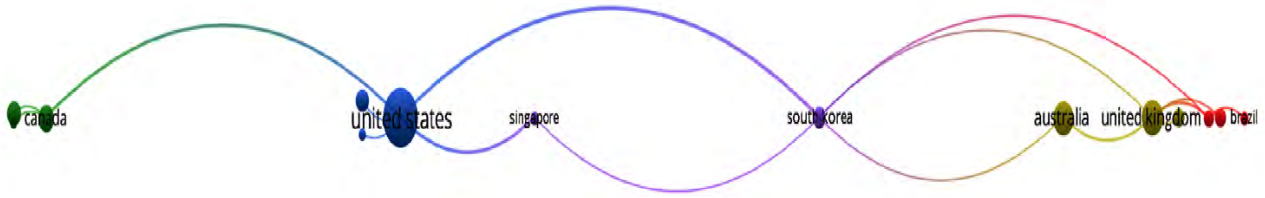

Figure 8. Cooperation of Countries Producing Articles in The Field of Safety and Risk Management in Sports

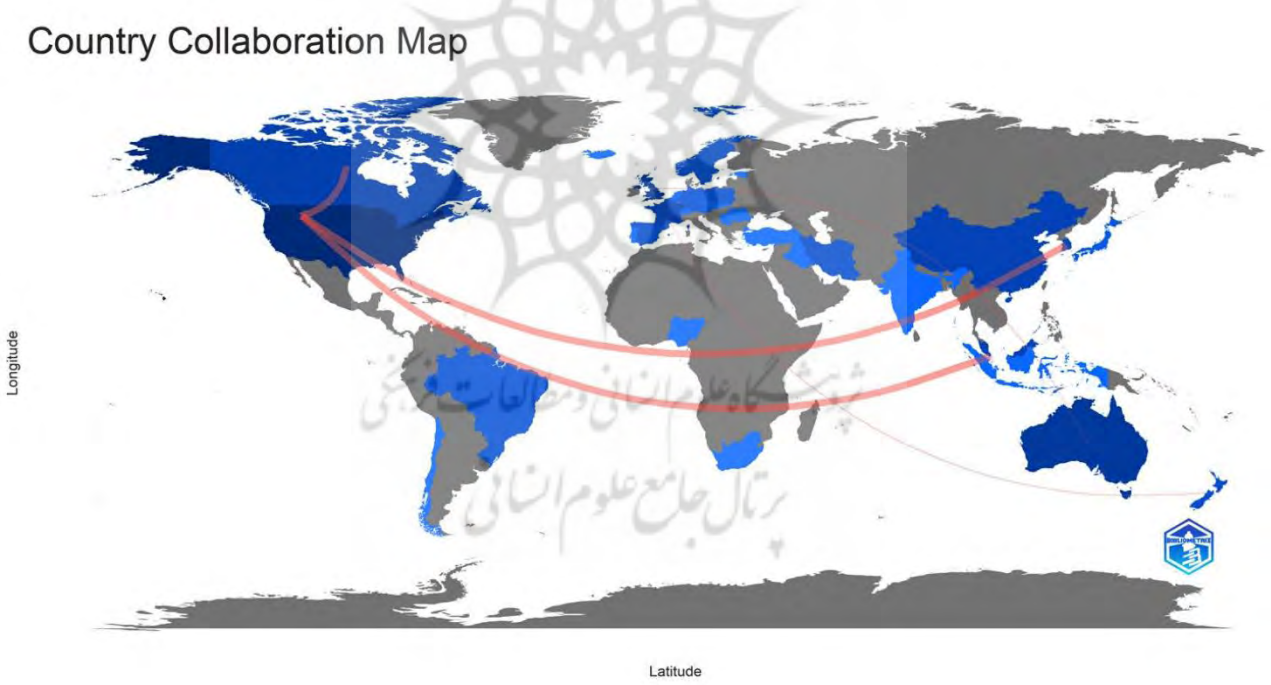

Figure 9. Country Collaboration Map

Content Analysis

Qualitative methods have also been used to produce more dynamic findings in bibliometrics, in response to concerns of the usage of quantitative methods. In order to make the findings of our study more publicly known, we applied the qualitative technique of hidden content analysis. In bibliometrics, this allows us to combine quantitative and qualitative methodologies to produce the reasonable results.

Hidden Content Analysis

In this study, the content of the top 20 publications in this topic was examined using the maxqda2020 software. The Shannon matrix, maxmap chart, and word cloud were extracted and shown in the following figures after any necessary coding, adjustments, and key terms.

Figure 10 is a Shannon matrix that displays the amount of codes given to the top 20 safety and risk management articles together with their significance coefficient depending on how frequently those codes occur.

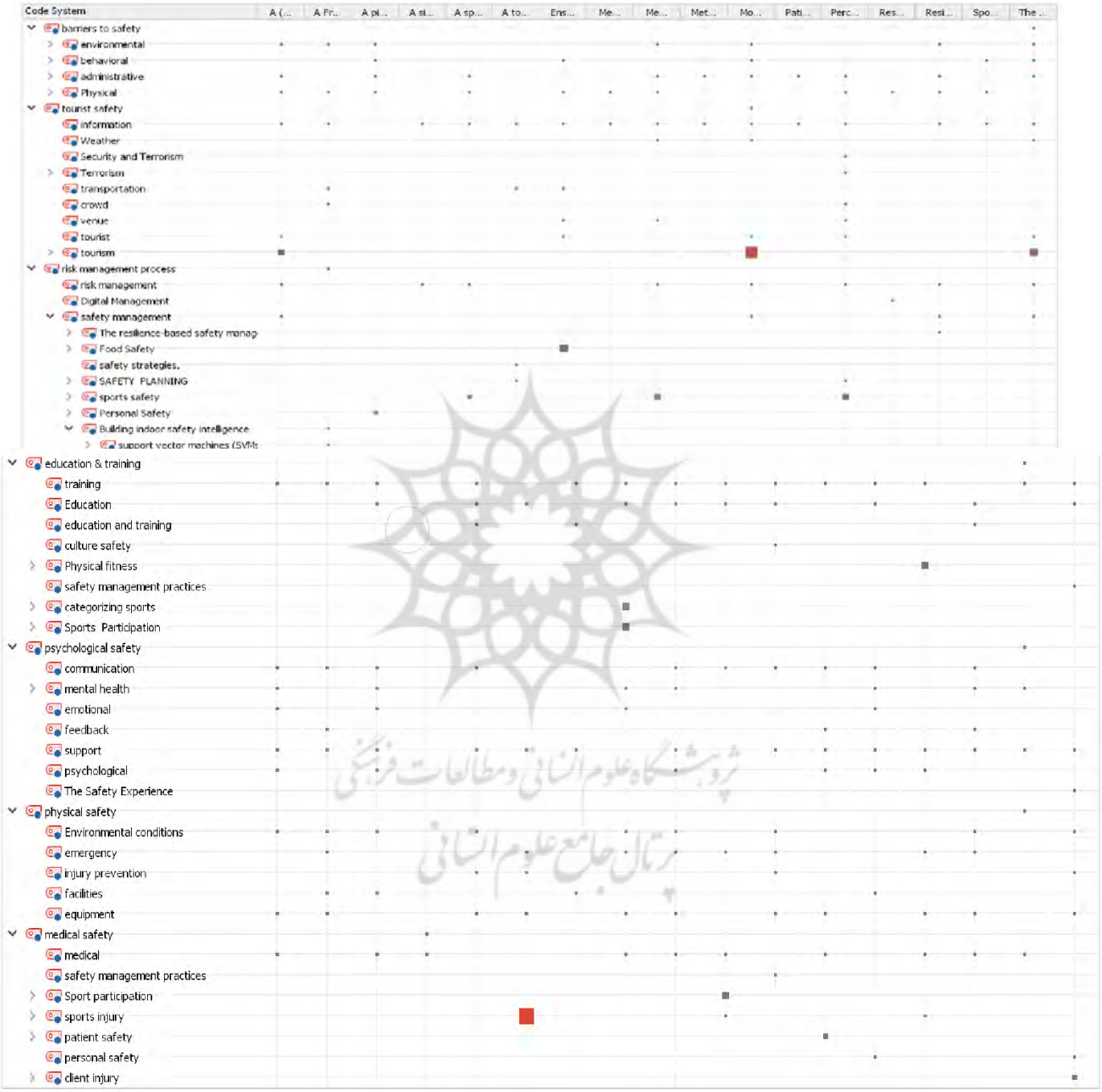

Figure 10. Shannon Matrix

Many scholars advise utilizing a code cloud diagram to represent the significance of codes in terms of frequency rather than the Shannon matrix. Higher frequency codes are represented in this graphic by larger sizes, while lower frequency codes are represented by smaller sizes. This kind of

depiction of code importance gives the researcher a goal to work toward and is much simpler for readers to comprehend.

Figure 11. Word Cloud

Limitations

The following criteria and methods for data analysis may have been used in the current study, which may have restrictions for how the results should be interpreted:

- The conducted search does not permit reading and in-depth examination of all articles due to the huge number of documents chosen for bibliometric analysis.
- The protocol utilized in this study, which places particular emphasis on certain criteria, can both avoid and result in the removal of numerous categories of research from the analysis basket.
- Only one database was used to collect data for this study, which may have resulted in the loss of some data. Since just one database was utilized to gather data, it follows that some data may not be present in that database and are therefore not mentioned in the research.
- There may be some information lost if the title, abstract, and keywords are all written in English. For instance, original corrections and updates in this sector won't be identified, which would result in information loss, if unusual and exceptional non-English terms are used in the title, abstract, and keywords of certain essential articles.

Discussion and Conclusion

To safeguard athletes' health and improve their performance, safety management is crucial. It entails educating athletes about the drawbacks of participating in sports and other associated activities, using the proper safety equipment, creating the ideal environment, and taking other pertinent measures. This management strives to improve athletic performance while safeguarding their health. Safety management in sports can significantly reduce athlete accidents and injuries, protect long-term physical health, and enhance athletes' performance. It is beneficial for both short- and long-term health. According to a study done in this area, Abbott et al. found that putting safety management into football teams enhances safety operations, allowing clubs to improve their safety management systems and achieve desired performance (Abbott, Klarenaar, Donaldson, & Sherker, 2008). In this regard, Donaldson et al. claim that sports organizations in Australia can implement safety policies and guidelines. These policies can be used by all these sports organizations to prevent sports injuries and improve according to their needs (Donaldson, Borys, & Finch, 2013). According to another study in this area carried out in Sweden, sports safety practices in urban

populations can be significantly impacted by safety and health rules and programs, which can be used as a model for fostering safety and health in other communities (Backe, Janson, & Timpka, 2012).

According to diagram number 1 in the section 1, which displays the number of articles published in various years, the subject of safety and risk management has received the most attention during the years 2001 through 2008, 2011 through 2014, and 2019 through 2023. Given these intervals, it is obvious that concerns about safety management have been crucial whenever large sporting events have taken place in a given year. The cause of this can be traced to ongoing worries stemming from unanticipated and tragic events like terrorism, which have emerged as event planners' top worries. The September 11 incident, which garnered many attention at the time and was among the most significant of these occasions, increased the importance placed on safety management in the sports industry. The spread of the coronavirus, which has increased awareness of food safety, physical safety, and other safety-related issues more than ever before, is another significant factor contributing to the high attention safety management talks have received in 2019.

The findings of this study show that the United States is regarded as the country with the greatest influence in this area and gives the safety management field the most attention, reserving a sizable percentage of published articles in this area for themselves. The University of Florida was also recognized as the most influential institution in the field of safety and risk management. The source of their supremacy may be seen in the volume and caliber of credible research and publications they have produced, which are rated higher than those of other organizations engaged in this subject. However, the findings of this study reveal that "Recreational Sports Journal" is the most influential journal in the field of safety and risk management. Each of them has six papers, placing Konnauaghton, DP, and Spengler, JO, among the most significant authors in the field of safety and risk management. The study by Decker and Villinger, which studies head injuries, one of the most prevalent and catastrophic sports injuries, is acknowledged as the finest published paper in Scopus linked to safety and risk management. Their study highlights the necessity of paying more attention to safety management in sports, which results in the creation of practical solutions to reduce such hazards.

As a result of a systematic review analysis of 214 articles related to safety and risk management published in the Scopus citation database from 1993 to 2023, the term "risk management" has emerged as the most frequent term and phrase among other existing expressions in the key terms in safety and risk management articles obtained through pertinent software. Hidden Content Analysis (HCA), which used content analysis to extract 1497 codes from the top twenty articles in this subject, was also used in this study in addition to the above analysis. The keyword "safety" was identified as the primary and most often used term in the word cloud produced by this research. In almost 90% of the top articles, the word "safety" has been used 585 times, which is the highest frequency of any other word. Also, the word "risk," which is used 418 times, is the fourth most frequently used word after "sport" and "injury." Managers and event planners should always pay extra attention to safety and risk, two of the most crucial concepts in the field of study. It should be stressed, nevertheless, that safety and risk should exist everywhere in society, not just during sporting events and other special occasions, in order to keep potential harm and hazards at a manageable level.

In papers connected to the topic of safety and risk management, the dimensions of safety and risk management according to extant models can be summed up in a few key terms. The most of these terms are related to safety cognition, safety behaviors, safety culture, safety performance, safety atmosphere, safety participation in order and safety motivation. However, in this research, eight dimensions can be introduced as safety and risk management dimensions based on the analysis of the top 20 articles and the latent content analysis indicated in the previous material. The elements of safety management are therefore defined as medical safety, psychological safety, legal safety, tourist safety, physical safety, education and training, risk management processes, and barriers to safety management based on the research's conclusions. It should be noted that the

majority of the management terms discussed in earlier articles are included in these new dimensions and are recognized as safety management dimensions and subcategories. Finally, by merging these dimensions, we create an eight-dimensional, comprehensive model of safety management that, as of 2023, may be regarded as the most recent model in the discipline. Chart 9 displays the safety management dimensions. It should be emphasized that in this model, a thicker line denotes a stronger correlation between two variables.

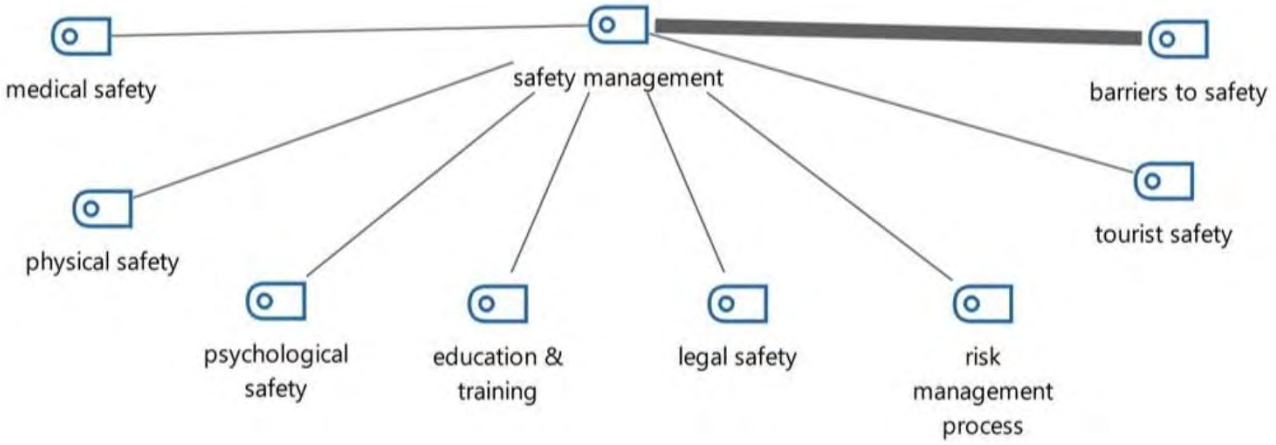

Chart 9. Dimensional Model of Safety Management

Finally, it can be said that safety and risk management in sports can be successful in reducing the risks associated with sports and raising safety standards. A detailed evaluation of the effects of safety and risk management in sports has led to the general conclusion that the existence of safety management in sports can significantly increase the safety of athletes and reduce the risks associated with sports. This is especially important given the potentially increased risks associated with high-intensity sports such as football, basketball, and hockey. It is recommended that sports managers and coaches use these insights to improve player safety and apply this management strategy in all sports to prevent sports-related hazards. Finally, current researchers in this field are advised to confidently use this article as a primary reference and continue their research.

Acknowledgments

The contribution of all researchers to this research is appreciated.

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