

## Bibliometric analysis of studies on football

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**Abstract:** The purpose of the study is to analyze 7243 studies, 2493 authors, and 1144 sources (journals, books, etc.) with the statement of “football” on the article title published within the scope of SCI-Expanded in between the years 2010-2023 regarding football matches with bibliometric analysis and to address the trends of recent years.

In this context, a scanning was made under the title of “football” in the Web of Science Core Collection database and bibliometric data were obtained. Current issues regarding the concept of “football” were revealed with this study in order to contribute to the studies on football sport. The studies were examined in terms of the number of publications, publication types, reference analyses, annual total citation per year, most frequent words, most local cited authors, most relevant affiliations, and most relevant sources.

According to the results of the analysis, the journals publishing the highest number of articles regarding “football” are respectively Journal of Sports Sciences, International Journal of Environmental Research and Public Health, and Journal of Strength and Conditioning Research. The most frequent words are humans, male, soccer, football and adolescent, respectively. These words were used 4998, 3058, 2251, 2033 and 1580 times in publications, respectively.

As a results, the increase in bibliometrics studies can provide an important contribution by serving as a lead to the studies conducted in the field of sport.

**Keywords:** Bibliometry, football, sport, publish.

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### I. Introduction

Football is a worldwide sport with different playing styles and standards of play throughout the world, resulting in disparities in heading qualities between nations (McCunn et al., 2021). In a recent systematic review (2021) (McCunn et al., 2021) on the prevalence of heading in football, 25 studies were undertaken in the United States and Canada, 15 in the United Kingdom and Europe, one in Brazil, and one in professional football in Israel. Furthermore, the majority of studies were carried out in high-ranking FIFA countries (many of the research done in the United States and Canada comprised mostly female players, as their women's team is rated higher than their men's) (McCunn et al., 2021, Harris et al., 2019).

A comparison of heading kinds and frequencies at lower levels of football, as determined by FIFA World Rankings, will help to achieve a more holistic understanding of heading types and frequencies. According to the February 2019 FIFA World Rankings, Australia and India are placed 42nd and 103rd in the world, respectively. Investigating the characteristics of heading incidence in Australian and Indian football, particularly when compared to the 'gold standard' of Men's football, FWC matches, can broaden existing knowledge on heading globally to include countries outside of Europe and the top 40 FIFA World Rankings (FIFA, 2019).

The Olympics, World Cup, Formula One, NBA, and other internationally recognized and world-renowned athletic events are examples. Despite the numerous benefits it provides to event organizers, participants, fans, and visitors, large football tournaments are also targeted by hackers. The security situation in cyberspace is growing increasingly serious as information security challenges become more complicated and diverse, particularly in recent World Cup-style football tournaments. Only by analyzing the system's risk profile can tailored security controls be established (Lu, 2022).

With an estimated 260 million active participants, soccer (football) is without a doubt the most popular and actively played sport in the world (Walden et al., 2011). An anterior cruciate ligament (ACL) injury can be a severe setback that leads in a premature end to a soccer player's season due to the dynamic range of movement displayed by a soccer player on the field, such as cutting, twisting, leaping, and landing (Brumitt et al., 2019). In a prospective study of professional soccer players who undergone ACL reconstruction (ACLR), only 85.8% were actively playing soccer three years following surgery, and only 65% were playing at their pre-injury level (Walden et al., 2011).

Overall, interest in football and other sports has been rather consistent over the period. Football earned several victories in terms of raising interest in key strategic regions inside specific markets. Interest in China

grew from 27% in 2013 to 32% in 2017, India from 30% to 45%, and the United States from 28% to 32% (World Football Report, 2018).

Football is one of the most influential sports on the planet. This sport has evolved tremendously over the previous several decades, as has the accompanying betting business's earnings. Because of the enormous number of elements that might impact games, forecasting results is a difficult undertaking. Due to the nature of the game, it is feasible for a team to lose against a plainly weaker opponent, making any form of bet much more difficult. The game's volatility makes it tough to gamble without conducting any type of analysis on game facts (Rodrigues and Pinyo, 2022).

The goal of this research is to determine the most common study topics of football sport, the most common time periods, and the most important publications of the chosen time period. This study is anticipated to contribute to the literature by throwing light on football-related studies.

## II. Material and Method

The bibliometric analysis approach was utilized to evaluate the studies considered in this study. The data for the study came from the Web of Science core collection database and papers covered by the SCI-EXPANDED, SSCI, AHCI, and ESCI indexes. The word "football" was searched for in the study between 2010 and 2023. In this study, only articles on the issue under discussion were discussed. From the database, 7243 items were collected. The Bibliometrix package in the R programming language was used for the bibliometric analysis (Aria and Cuccurullo, 2017).

A sort of systematic literature review known as bibliometric research analyzes bibliographic data using quantitative and statistical techniques. Bibliometric studies provide a more objective and thorough approach than other types of evaluations because they use quantitative metrics, databases, and software powered by big data analytics and machine learning (Mukherjee et al., 2022). Performance analysis and science mapping are the two main kinds of analytical approaches that are frequently used in bibliometric research. Performance analysis is used to assess output and influence, offering perceptions on the effectiveness of writers, organizations, or journals. In contrast, scientific mapping is a relational method that uncovers knowledge clusters and links within a field, enabling researchers to pinpoint important subjects, trends, and partnerships (Donthu et al., 2021).

## III. Results

According to the data from the WOS database, a total of 7243 papers on football were published, 6692 of which were articles. 22493 authors contributed to the research (Table 1).

**Table 1.** Main information about data

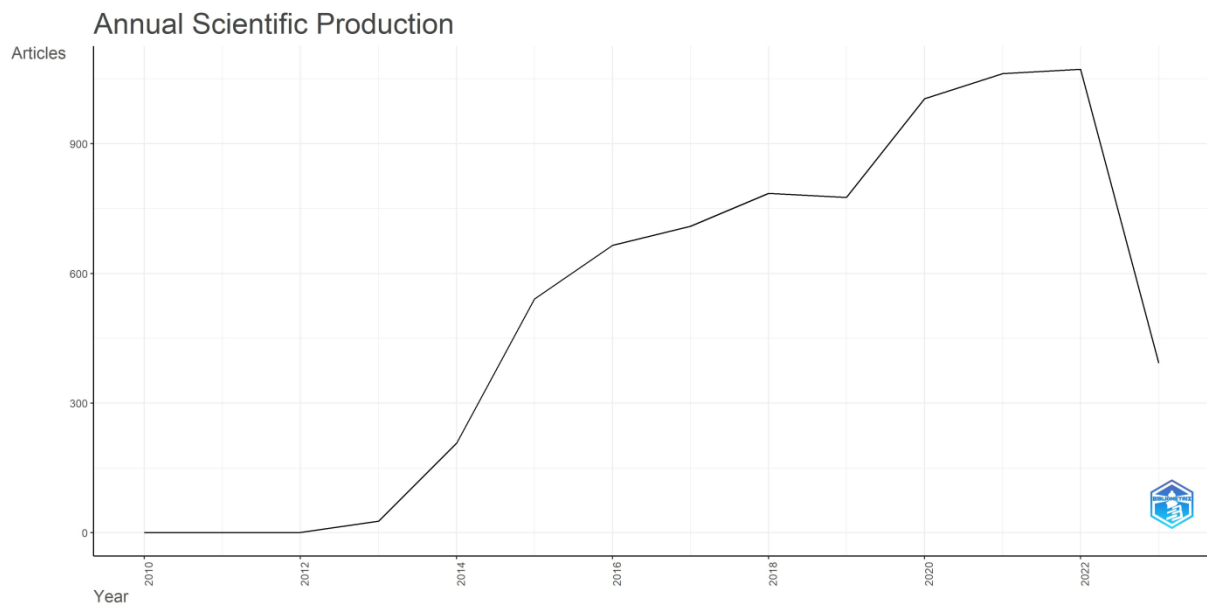
Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2010:2023
Sources (Journals, Books, etc.)	1144
Documents	7243
Annual Growth Rate %	58.33
Document Average Age	3.95
Average citations per doc	0
References	1
DOCUMENT CONTENTS	
Keywords Plus (ID)	3349
Author's Keywords (DE)	9992
AUTHORS	
Authors	22493
Authors of single-authored docs	232
AUTHORS COLLABORATION	
Single-authored docs	260
Co-Authors per Doc	5.9
International co-authorships %	0

DOCUMENT TYPES	
Address	3
Biography	4
Case reports	214
Clinical study	6
Clinical trial	36
Clinical trial protocol	5
Comparative study	152
Consensus development conference	3
Controlled clinical trial	9
Editorial	4
Evaluation study	20
Guideline	2
Historical article	12
Journal article	6692
Letter	1
Meta-analysis	10
Multicenter study	1
Observational study	14
Randomized controlled trial	21
Review	18
Systematic review	16

There are 7243 entries identified in the Web of Science database on September 7, 2023 while searching with the term "football". This record spans the years 2010 through 2023 (Table 2 and Figure 1). There were ups and downs in the number of publications every year over that time period. More articles were published between 2015-2022. The year with the most research is 2022, with 1072 studies completed.

**Table 2.** Distribution of publications by years

Year	Articles
2010	1
2011	0
2012	1
2013	27
2014	207
2015	541
2016	665
2017	709
2018	785
2019	776
2020	1004
2021	1062
2022	1072
2023	393



**Figure 1.** Annual scientific production

Journal of Sports Sciences, with 275 articles, is the journal with the most publications published in the topic of football. This is followed by International Journal of Environmental Research and Public Health, which has 227 articles, and Journal of Strength and Conditioning Research, which has 219 articles (Table 3, Figure 2).

**Table 3.** Number of most relevant sources

Sources	Articles
JOURNAL OF SPORTS SCIENCES	275
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	227
JOURNAL OF STRENGTH AND CONDITIONING RESEARCH	219
BRITISH JOURNAL OF SPORTS MEDICINE	187
ORTHOPAEDIC JOURNAL OF SPORTS MEDICINE	186
FRONTIERS IN PSYCHOLOGY	184
JOURNAL OF SCIENCE AND MEDICINE IN SPORT	180
INTERNATIONAL JOURNAL OF SPORTS PHYSIOLOGY AND PERFORMANCE	177
PLOS ONE	158
SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS	146

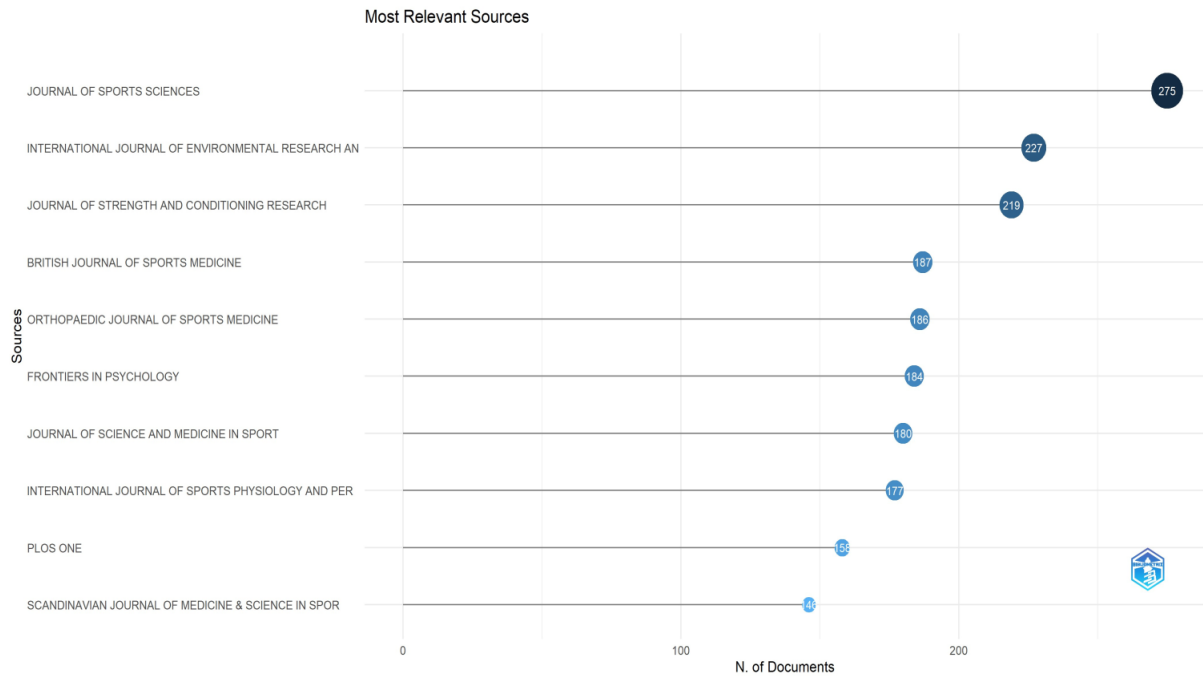


Figure 2. Number of documents most relevant sources

The number of publications made by the authors over time is given in Table 4. Clemente FM broadcasts the most about football with 109 broadcasts. This was followed by Krstrup P with 98 studies and Kerr ZY with 89 studies. The same information was shown in Figure 3. These publications covered the period 2013-2023 (Table 4 and Figure 4).

Table 4. Author production over time

Author	Years	Frequency
ALOSCO ML	2016-2023	50
BAHR R	2015-2023	49
CLEMENTE FM	2016-2023	109
GUSKIEWICZ KM	2014-2023	55
HÅGGLUND M	2014-2023	49
KERR ZY	2015-2023	89
KRUSTRUP P	2013-2023	98
MEYER T	2014-2023	62
ROBERTSON S	2014-2023	52
STERN RA	2014-2023	52

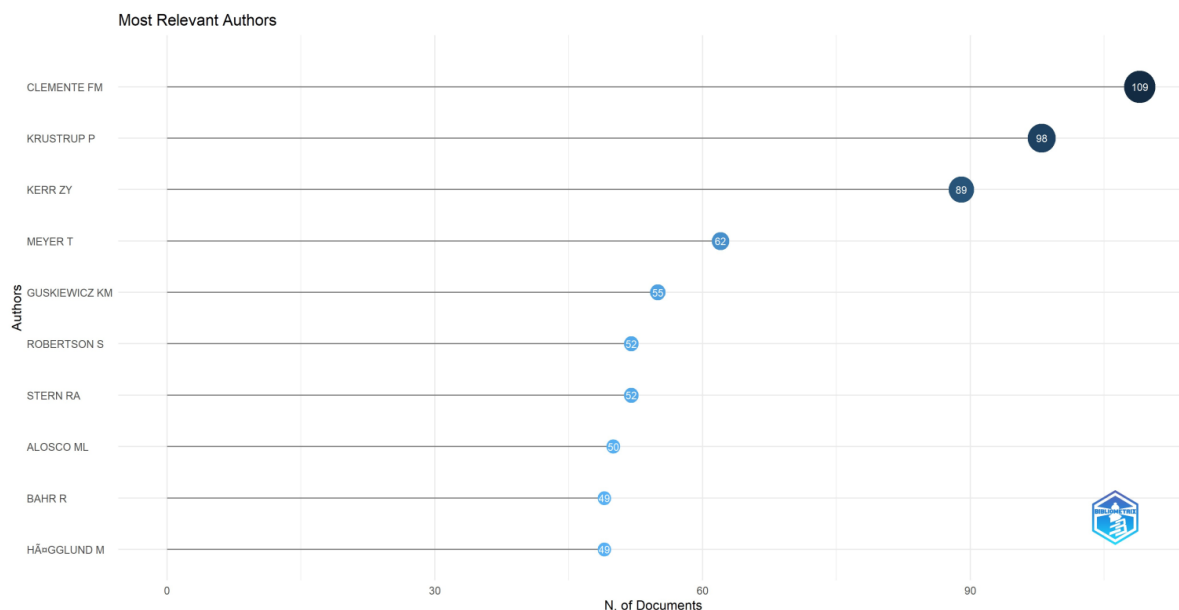


Figure 3. Most relevant authors

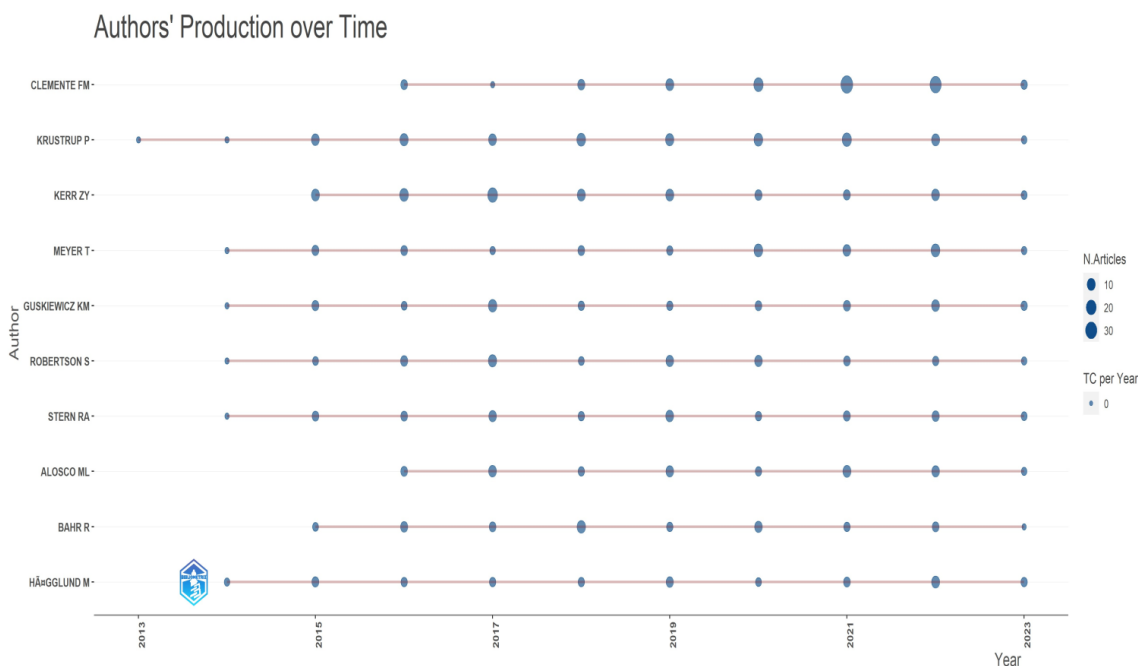
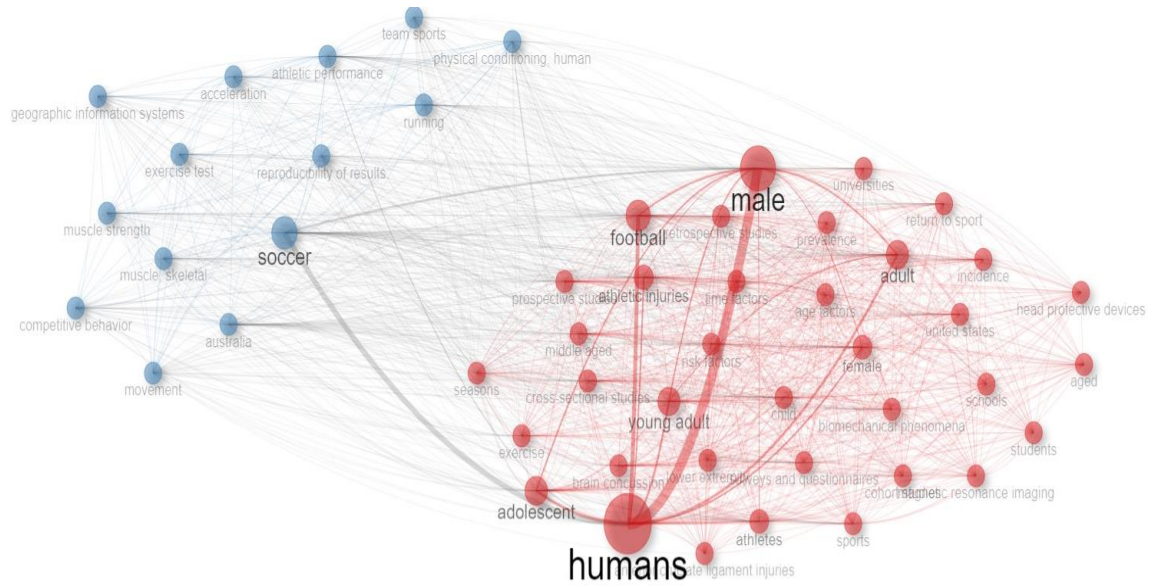


Figure 4. Authors' production over time

The collaboration map between the words used in published studies is presented in Figure 5. Collaboration networks present the common relationships between keywords through a social network. When collaboration networks are examined according to keywords, the word x word adjacency matrix is used in the collaboration network, which is basically determined according to the frequency of words used together. When the network structure was examined, two different clusters were formed. While words represented nodes in clusters, the thickness of the ties between words represented the frequency of collaboration. The growth of nodes revealed the effect of words on the network. When the clusters in the figure are examined, humans come to the fore in the red cluster. Words that cooperate with the word human are the words male, football, adolescent, adult and young adult. The word soccer in the blue cluster collaborates with words such as movement, muscle skeletal, geographic information systems, Australia, competitive behavior and reproducibility of results.



**Figure 5.** Collaboration occurrence network (keywords)

As a result of Web of Science-based scanning, the most frequently used keywords in the journals included in the SCI-Exp. index are presented in Table 5 and Figure 6.

**Table 5.** Most Frequent Words

Words	Occurrences
Humans	4988
Male	3058
Soccer	2251
Football	2033
Adolescent	1580
Adult	1510
Young adult	1451
Athletic injuries	1268
Athletes	1231
Female	1181

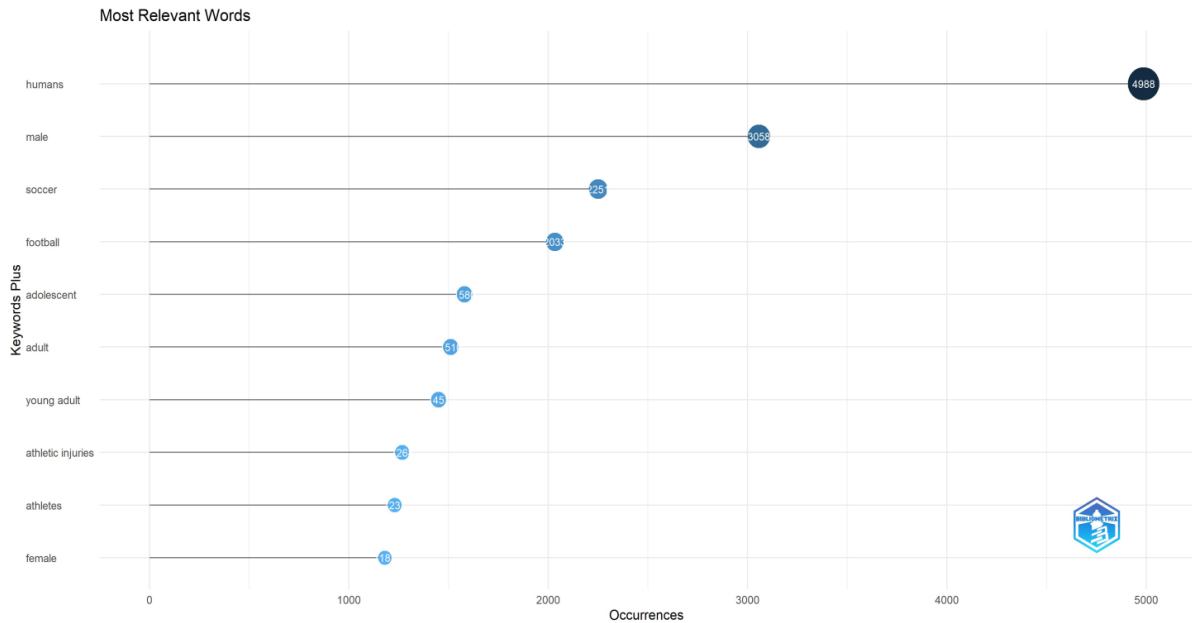


Figure 6. Most relevant words

As seen in Table 5 and Figure 6, the most used expressions in publications on the subject are the words human, male and soccer, respectively. These expressions were used 4988, 3058 and 2251 times in the studies, respectively. These expressions were followed by the words football, which was used 2033 times, adolescent, which was used 1580 times, and adult, which was used 1510 times, respectively. Word cloud analysis was carried out for the most used keywords and the analysis results are shown in Figure 7.



Figure 7. Word Cloud

When Figure 7 was examined, it was seen that most of the words were domain specific. The most used keyword was “humans”. “Male” was the second most used keyword. These words were followed by the words "soccer", "football" and "adolescent".

The representation of topic densities is presented in Figure 8. The most intensively studied topics are listed as "humans", "soccer", "biomechanical phenomena" and "covid-19". Information about the relevant thematic map clusters is given in Table 6.



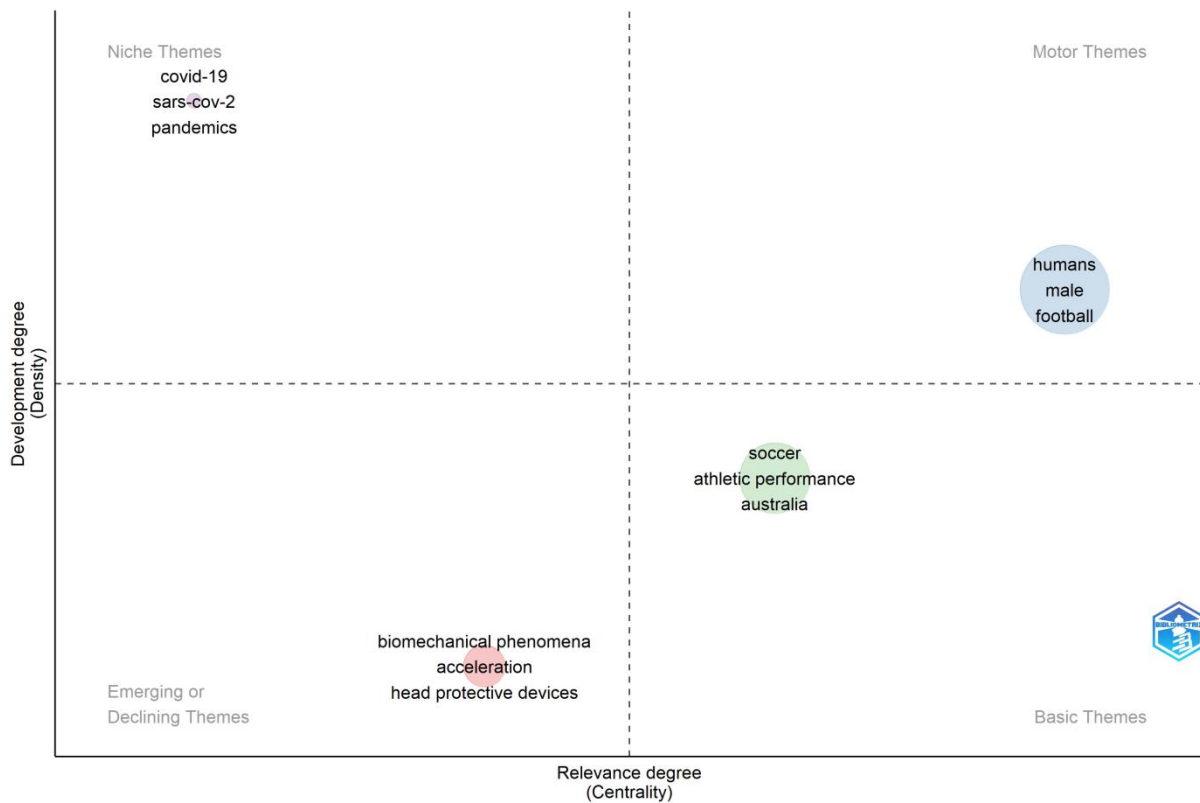


Figure 8. Thematic Map

Table 6. Thematic map clusters

Cluster	Callon Centrality	Callon Density	Rank Centrality	Rank Density	Cluster Frequency
Biomechanical phenomena	0.129709646	2.39522475	2	1	1604
Humans	0.670233501	2.656186228	4	3	29134
Soccer	0.448759417	2.560966528	3	2	9332
covid-19	0.022720286	2.715385362	1	4	309

Trend themes analysis allows us to see how keywords, titles, and abstracts have changed over time, which has become a driving element in the expansion of research in any sector (Figure 9). To monitor changes, trend topics analysis assigns logarithmic frequency values to terms on a coordinate plane.

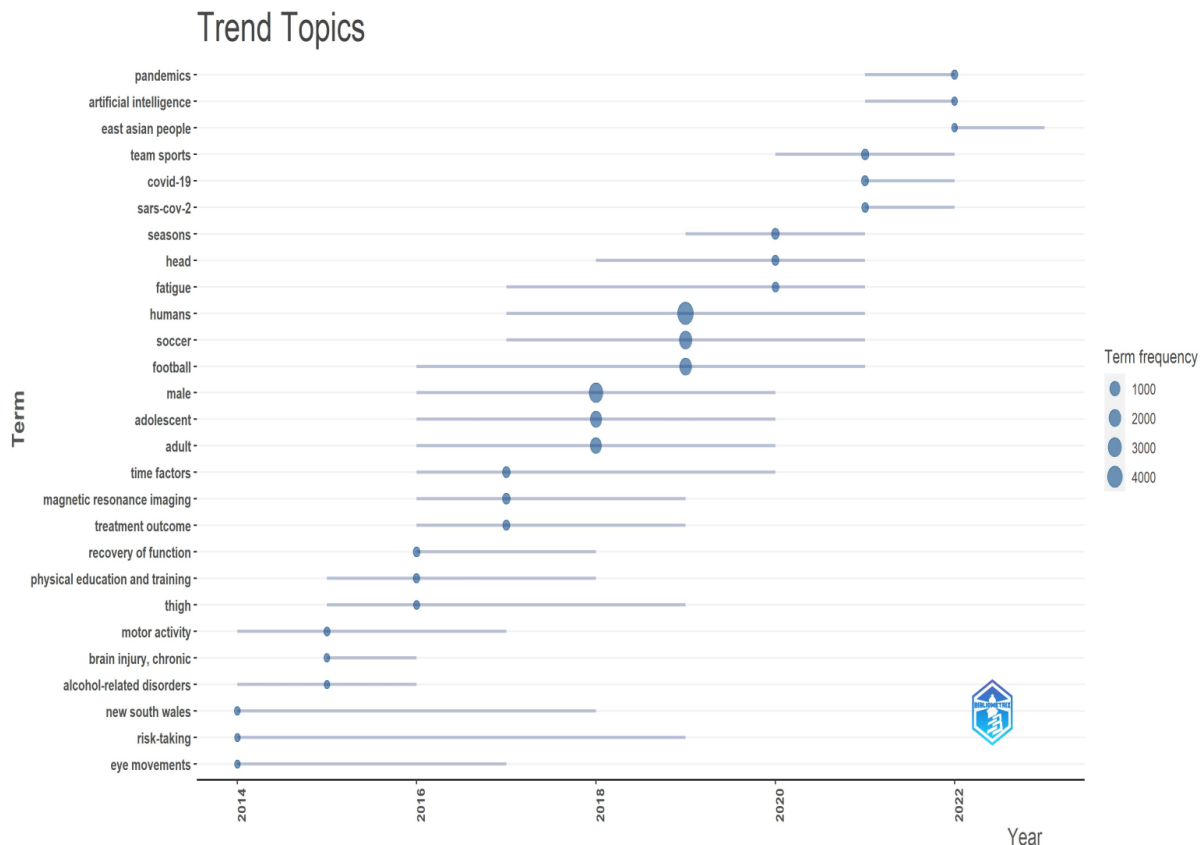


Figure 9. Trend topics of the field

The trends of football topic studies were explored using Figure 9, which was constructed to demonstrate the such as abstract, keyword, and title of three keywords cited at least three times each year between 2014 and 2022. While research in recent years has regularly incorporated keywords from humans, soccer, football, and, the phrases "male", "adolescent", and "adult" have retained their appeal.

From 2007 through the middle of 2023, Hernandez-Hernandez et al. (2023) illustrated the co-occurrence analysis of the key ideas connected to stakeholder governance and sustainability in football. The investigation uncovered five unique.

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