

N G

8 August JSA 2026 OKE Ketut Chandra Adinata Kusuma 239_252 (1)

 JSA

Document Details

Submission ID

trn:oid:::3618:149328392

Submission Date

Aug 25, 2026, 8:40 AM GMT+7

Download Date

Aug 25, 2026, 8:47 AM GMT+7

File Name

8 August JSA 2026 OKE Ketut Chandra Adinata Kusuma 239_252 (1).docx

File Size

1.1 MB

15 Pages

6,406 Words

41,703 Characters

16% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Filtered from the Report

- Bibliography
- Small Matches (less than 9 words)

Match Groups

-  **49 Not Cited or Quoted 14%**
Matches with neither in-text citation nor quotation marks
-  **7 Missing Quotations 2%**
Matches that are still very similar to source material
-  **0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
-  **0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 14%  Internet sources
- 10%  Publications
- 11%  Submitted works (Student Papers)

Integrity Flags

0 Integrity Flags for Review

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.

Match Groups

- 49 Not Cited or Quoted 14%**
Matches with neither in-text citation nor quotation marks
- 7 Missing Quotations 2%**
Matches that are still very similar to source material
- 0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
- 0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 14% Internet sources
- 10% Publications
- 11% Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	Internet	www.mdpi.com	8%
2	Internet	journal.uir.ac.id	2%
3	Publication	Perumbalath Shamshadali, C.P. Abdul Gafoor, Phungkha Daimari. "Mapping the f...	<1%
4	Internet	taiwanebook.ncl.edu.tw	<1%
5	Internet	sportifbakis.com	<1%
6	Student papers	Universita degli Studi di Milano on 2019-03-18	<1%
7	Student papers	Universitas Padjadjaran on 2026-08-12	<1%
8	Internet	mfuir.mfu.ac.th	<1%
9	Student papers	WHU - Otto Beisheim School of Management on 2026-05-26	<1%
10	Student papers	Indian Institute of Management Visakhapatnam on 2026-07-17	<1%

11	Internet	www.sportedu.org.ua	<1%
12	Student papers	Abo Akademi University on 2026-04-21	<1%
13	Student papers	Universitas Negeri Surabaya The State University of Surabaya on 2025-09-22	<1%
14	Publication	Elena Mainer-Pardos, Oliver Gonzalo-Skok, Hadi Nobari, Alberto Roso-Moliner. "Sc...	<1%
15	Publication	Tofan Stofiana, Dadang Sunendar, Yeti Mulyati, Andoyo Sastromiharjo. "A Decade...	<1%
16	Student papers	Universitas Islam Riau on 2026-08-08	<1%
17	Internet	www.qatarday.com	<1%
18	Student papers	California Southern University on 2026-08-21	<1%
19	Publication	Raju Vaishya, Alok Singh, Brij Mohan Gupta, Abhishek Vaish, Mandeep S. Dhillon. ...	<1%
20	Student papers	UCL on 2026-07-29	<1%
21	Internet	d-nb.info	<1%
22	Internet	estudogeral.uc.pt	<1%
23	Internet	jebs.ssrc.ac.ir	<1%
24	Internet	mmanovost.com	<1%

25	Internet	press.um.si	<1%
26	Internet	public-pages-files-2025.frontiersin.org	<1%
27	Internet	riuma.uma.es	<1%
28	Internet	u3isjournal.isvouga.pt	<1%
29	Internet	www.jaspe.ac.me	<1%
30	Internet	www.open-access.bcu.ac.uk	<1%

Global research trends in youth soccer: A 20-year bibliometric analysis (2005-2025)

Ketut Chandra Adinata Kusuma^{1abcde,*} , Ali Md Nadzalan^{2abc} , Ruben Lagunero Tagare Jr.^{3abc} , I Dewa Made Aryananda Wijaya Kusuma^{4abc} ,
& I Ketut Ade Meisha Putra^{5bc} 

Universitas Pendidikan Ganesha, Indonesia¹
Universiti Pendidikan Sultan Idris, Malaysia²
University of Shouthern Mindanao, Philippines³
Universitas Negeri Surabaya, Indonesia⁴
Universitas Pendidikan Ganesha, Indonesia⁵

Received 20 May 2026; Accepted 02 August 2026; Published 25 August 2026
Ed 2026; 11(2): 240-254

ABSTRACT

Background: Although previous bibliometric studies have examined specific aspects of youth soccer, such as injury prevention, performance analysis, or talent identification, no study has comprehensively mapped the intellectual evolution of the field over the past two decades. **Objectives:** This study aimed to provide a comprehensive bibliometric mapping of youth soccer research published between 2005 and 2025 and to identify emerging themes and future research priorities. **Methods:** Bibliographic data were retrieved from the Scopus database using a predefined Boolean search strategy. Eligible studies were limited to English-language journal articles reporting primary research with a primary focus on youth soccer. Following data cleaning and duplicate removal, bibliometric performance analysis was conducted using Biblioshiny (version 4.5.3), while science mapping and network visualisation were performed using VOSviewer (version 1.6.20). **Results:** A total of 1,737 articles met the inclusion criteria, showing substantial publication growth after 2018. Clemente FM was identified as the most productive author, while the Journal of Sports Sciences emerged as the leading publication source. Keyword co-occurrence analysis identified eight thematic clusters, including talent identification, injury prevention, coaching, physiology, talent development, biomechanics, recovery and mental health, and technology-based monitoring. Character-building research was underrepresented, whereas technology-assisted coaching appeared as an emerging but relatively underdeveloped theme. **Conclusion:** This bibliometric analysis provides a comprehensive overview of the evolution of youth soccer research over two decades by identifying publication trends, collaboration networks, influential contributors, and key research themes. The findings reveal emerging research opportunities, offering valuable directions for future research and evidence-based practice in youth soccer.

Keywords: Youth; soccer; research trends; science mapping

 [https://doi.org/10.25299/sportarea.2026.vol11\(2\).28318](https://doi.org/10.25299/sportarea.2026.vol11(2).28318)

OPEN ACCESS 

Copyright © 2026 Ketut Chandra Adinata Kusuma, Ali Md Nadzalan, Ruben Lagunero Tagare Jr., I Dewa Made Aryananda Wijaya Kusuma, I Ketut Ade Meisha Putra

 Ketut Chandra Adinata Kusuma, Department of Sport Coaching Education, Faculty of Sport and Health, Universitas Pendidikan Ganesha, Singaraja, Indonesia
 chandra.adinata@undiksha.ac.id

How to Cite: Kusuma, K. C. A., Nadzalan, A. M., Tagare Jr., R. L., Kusuma, I. D. M. A. W., & Putra, I. K. A. M. (2026). Global research trends in youth soccer: A 20-year bibliometric analysis (2005-2025). *Journal Sport Area*, 11(2), 240-254. [https://doi.org/10.25299/sportarea.2026.vol11\(2\).2318](https://doi.org/10.25299/sportarea.2026.vol11(2).2318)

2

Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

17

The growing professionalisation of youth soccer has stimulated substantial scientific interest in player development, talent identification, and injury prevention. The future of soccer in every country is determined by the development of young players (Kelly, 2024). In recent decades, attention to youth soccer development has increased significantly as it has been assumed to be the main foundation in creating future elite players (Bidaurrezaga-Letona et al., 2017; Saward et al., 2020). The development pathway is mapped out through grassroots organisations and continues into high-performance environments such as soccer academies (North et al., 2022). The environment aims to develop the potential of players in various aspects such as physical, technical, tactical, psychological, with the ultimate target of producing important players in the team (Stables et al., 2024). Based on a survey at the 2006-2018 FIFA World Cup, a total of 20,401 young players were involved (Pedersen et al., 2022), and the involvement of 829 young players from 32 countries participating in the FIFA World Cup Qatar 2022 (Platvoet et al., 2023). This data shows that many potential young players are sought after by senior teams within their respective national teams. The World Health Organization (WHO) defines youth as 15-24 years old. In the context of youth in soccer, there are still many versions from researchers who suggest a young age range, such as 9-23 years (McCalman et al., 2022), starting at the age of 7 years (Reeves & Roberts, 2020), and in the Indonesian football curriculum it is stated that it starts at the age of 6 years (Danurwinda et al., 2017). Ultimately, in the context of soccer, youth players are those whose chronological age is still under 23 years (U-23). As in several FIFA-affiliated championships, from regional to confederation levels, the final strata is the 22-year-old age group, also known as U-23.

21

22

Although research on youth soccer has grown substantially, previous studies have generally examined only specific dimensions of the field rather than providing an integrated overview of its development. For example, existing studies have focused on particular topics such as injury prevention, physical performance, biomechanics, relative age effects, or technology-assisted performance monitoring, thereby producing valuable but fragmented evidence (Bangert et al., 2024; Aku & Yang, 2024; Hegedüs et al., 2025; Plakias et al., 2024). In fact, a recent literature review study stated that the research focus is also starting to shift towards long-term player development with a data-driven approach during the training process (Castillo et al., 2025). Likewise, recent bibliometric analyses have primarily described publication trends within selected themes or relatively short periods, without integrating the diverse research domains that characterise youth soccer research or examining their evolution over an extended timeframe (Yu et al., 2025). Consequently, the current literature provides only a partial understanding of how the global youth soccer research landscape has evolved, how influential authors, institutions, and countries have interacted, and how research themes have shifted over time.

5

Therefore, significant research gaps remain. Recent bibliometric studies have contributed to understanding the development of youth soccer research from various perspectives. For example, Liu et al. (2023) mapped the scholarly landscape of youth soccer using Bibliometrix with the Web of Science (WoS) database, Mainer-Pardos et al. (2025) examined research trends in women's youth soccer, and Yu et al. (2025) analysed the international development of youth soccer research using the WoS database and the China Knowledge Infrastructure Project (CNKI) using CiteSpace. While these studies have provided valuable insights, they differ significantly in their research scope, analytical approach, temporal scope, and thematic focus. Therefore, the current evidence provides only a partial understanding of how youth soccer research has developed globally, particularly regarding the integration of publication growth, collaborative networks, influential contributors, intellectual structure, and thematic evolution within a single analytical framework. To our knowledge, no previous study has comprehensively integrated these dimensions over the period 2005-2025 using complementary bibliometric performance analysis and science mapping techniques. Addressing this gap is expected to provide a more comprehensive understanding of the intellectual evolution of youth soccer research while identifying emerging themes and future research priorities.

Bibliometric analysis aims to capture the growth and development of a research domain, identify influential authors, institutions, or journals, and emerging research trends, as well as assess the impact of their publications (Donthu et al., 2021; Kusuma et al., 2025). This approach is an effective method for systematically analysing and mapping the development of scientific knowledge (Guzsvinecz & Szűcs, 2025). Unlike previous bibliometric studies that focused on specific subfields or limited research themes, this study provides the first comprehensive mapping of the global youth soccer literature spanning the period 2005-2025. By integrating various bibliometric techniques—such as using Biblioshiny for graphic clarity and VOSviewer for enhanced network views in performance analysis and science mapping—this study seeks to identify influential contributors, knowledge structures, and the evolution of research topics over the past twenty years. To address the identified research gaps and clarify the analytical scope of the study, this research is guided by the following research questions: **RQ1.** How has the scientific production on youth soccer evolved between 2005 and 2025? **RQ2.** Who are the most influential contributors (authors, and journals) in youth soccer research? **RQ3.** What are the patterns of scientific collaboration among authors, institutions, and countries? **RQ4.** What are the major intellectual structures and thematic clusters that characterize youth soccer research? **RQ5.** What emerging research topics and future directions can be identified from the bibliometric analysis? Thus, this study provides a broader understanding of the intellectual development of youth soccer research and provides a strong evidence base to guide future research agendas in this area.

METHODS

Data Source

A search for relevant documents was conducted on March 13, 2026, using the Scopus database by searching titles, abstracts, and keywords. Scopus was selected because it is one of the largest curated citation databases, offering broad multidisciplinary coverage and high-quality bibliographic metadata that are particularly suitable for bibliometric studies (Baas et al., 2020). Furthermore, its rigorous content selection process ensures the reliability and consistency of publication and citation data. The use of a single database also helps maintain methodological consistency and minimises data duplication in bibliometric analyses. No temporal filters were applied during the search phase, to ensure the inclusion of all relevant documents regardless of publication year. The Boolean expression consists of three parts, connected using the AND operator. In the first part, general terms used in sports physical activity were entered with the OR operator connecting them. The second part was used to specify the sport (soccer). The third part was used to narrow the articles down to only youth soccer. The final Boolean expression applied was: (TITLE-ABS-KEY (“Youth soccer” OR “Youth football” OR “Academy soccer” OR “Football academy” OR “Adolescent soccer” OR “Junior soccer” OR “Elite youth soccer” OR “Youth player*”)) AND PUBYEAR > 2004 AND PUBYEAR < 2026 AND (LIMIT-TO (SRCTYPE , “j”)) AND (LIMIT-TO (LANGUAGE , “English”)) AND (LIMIT-TO (DOCTYPE , “ar”)).

Search Strategy

The search strategy was developed by adapting keywords from previous bibliometric studies on youth soccer and refining them to align with the objectives of the present study. Boolean operators (AND, OR) were employed to construct the search query in the Scopus database. To ensure adequate coverage of the literature, the final search string was validated by confirming the retrieval of several seminal publications in the field. Articles retrieved from the initial search were subsequently screened according to predefined eligibility criteria. Only original research articles published in peer-reviewed journals, written in English, reporting primary data, and primarily focusing on youth soccer (including recreational, amateur, elite, and professional levels) were included. Review articles, conference papers, book chapters, editorials, and studies not primarily related to youth soccer were excluded.

Inclusion and Exclusion Criteria

The raw data that was successfully collected was then filtered according to the inclusion criteria which included studies from primary data, written in English, published in journals, and with a primary focus on youth soccer. **Table 1** presents the detailed inclusion and exclusion criteria.

Table1. Inclusion and Exclusion Criteria for Documents Selection

Inclusion Criteria	Exclusion Criteria
Documents from empirical studies (quantitative or qualitative) that present original data.	Documents that are explicitly categorised as review articles or theoretical articles that synthesise existing literature.
Written in English.	Documents written in languages other than English.
Published in a peer-reviewed academic journal.	Documents published in non-journal sources (magazines, proceedings, conference abstracts, reports, books).
Main focus on youth soccer.	Documents that do not focus on soccer or that discuss soccer but do not focus on youth soccer.
Documents contain titles, authors, abstracts, keywords clearly (complete metadata).	Documents metadata is incomplete.

Study Selection and Data Cleaning

Bibliographic records were retrieved from Scopus in RIS format, with duplicates removed using Mendeley. The cleaned data were exported to BibTeX and analysed using Biblioshiny (v4.5.3) for bibliometric performance analysis and VOSviewer (v1.6.20) for science mapping and network visualisation. As shown in **Figure 1**, the initial search identified 2,272 records. After removing 17 records before screening, 2,255 records were screened, of which 437 were excluded based on the eligibility criteria. Of the remaining 1,818 records, 85 were excluded because of incomplete or unavailable metadata, resulting in 1,737 studies for the final analysis. This dataset exceeds the minimum number of documents suggested in previous bibliometric methodological studies, providing sufficient coverage for performance analysis and knowledge mapping (Donthu et al., 2021; Rogers et al., 2020).

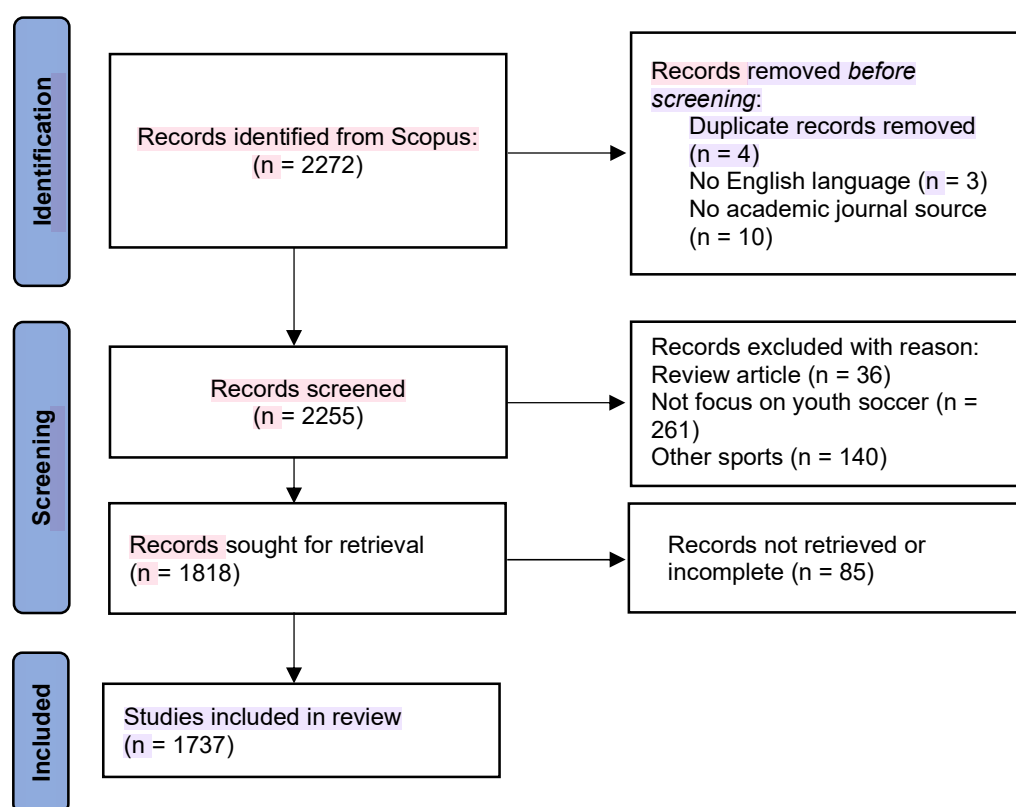


Figure 1. PRISMA 2020 flow diagram of study selection

Bibliometric Analysis

To conduct this bibliometric analysis, several techniques such as bibliometric youth soccer, science mapping, clustering have been used (Ellegaard, 2018). The following steps are used in youth soccer bibliometrics: calculating the number of articles included per year and calculating the sources and authors with

the most documents. For science mapping, the following methods are used: (a) co-authorship analysis using the author as the unit of analysis, and (b) co-occurrence analysis with the author's keywords as the unit of analysis, investigating how often certain keywords appear together in the same document. A threshold of five occurrences was selected to balance network interpretability and keyword coverage. **Table 2** presents an overview of the analysis techniques used as parameters applied in VOSviewers.

Table 2. Overview of Bibliometric Analysis Techniques and Parameters Applied in Vosviewer

Technique	Unit of Analysis	Limitation (Minimum Thresholds)	Weight	Type of Visualisation
Co-authorship	Author	a) Minimum number of documents of an author = 5 b) Only authors linked to at least one other author	Documents	Overlay
Co-occurrence	Author Keywords	Minimum number of occurrences of a keyword = 5	Occurrences	Network

RESULTS AND DISCUSSION

Result

Bibliometric Performance Analysis

The number of publications related to youth soccer has shown a significant increase since 2017 as seen in Figure 2. Before 2017, the number of publications was only in double digits, but since 2018 the number of publications has reached three digits, namely 103 publications and the trend has increased until 2025 reaching 244 documents. Figure 2 demonstrates a substantial increase in publications related to youth soccer research over the past two decades. Although publication output remained relatively modest until 2017, with annual publications consistently below 100 documents, the trend changed markedly thereafter. The year 2017 appears to represent an inflection point, while exponential growth became evident from 2018, when annual publications first exceeded one hundred (103 documents). Since then, the number of publications has continued to increase steadily, reaching 244 documents in 2025. This pattern suggests that youth soccer has evolved into an increasingly important research area attracting sustained international scientific attention. Several factors may explain this accelerated growth. First, the increasing professionalisation of youth soccer has heightened the demand for scientific evidence to optimise player development, performance monitoring, injury prevention, and long-term athlete development. Second, technological advances have fundamentally transformed research practices in youth soccer. Around the late 2010s, the wider adoption of Global Positioning System (GPS) technology, wearable sensors, Inertial Measurement Units (IMUs), heart-rate monitoring devices, and integrated performance tracking systems enabled researchers to collect objective, high-resolution data on players' external and internal workloads during both training and competition.

Annual Scientific Production

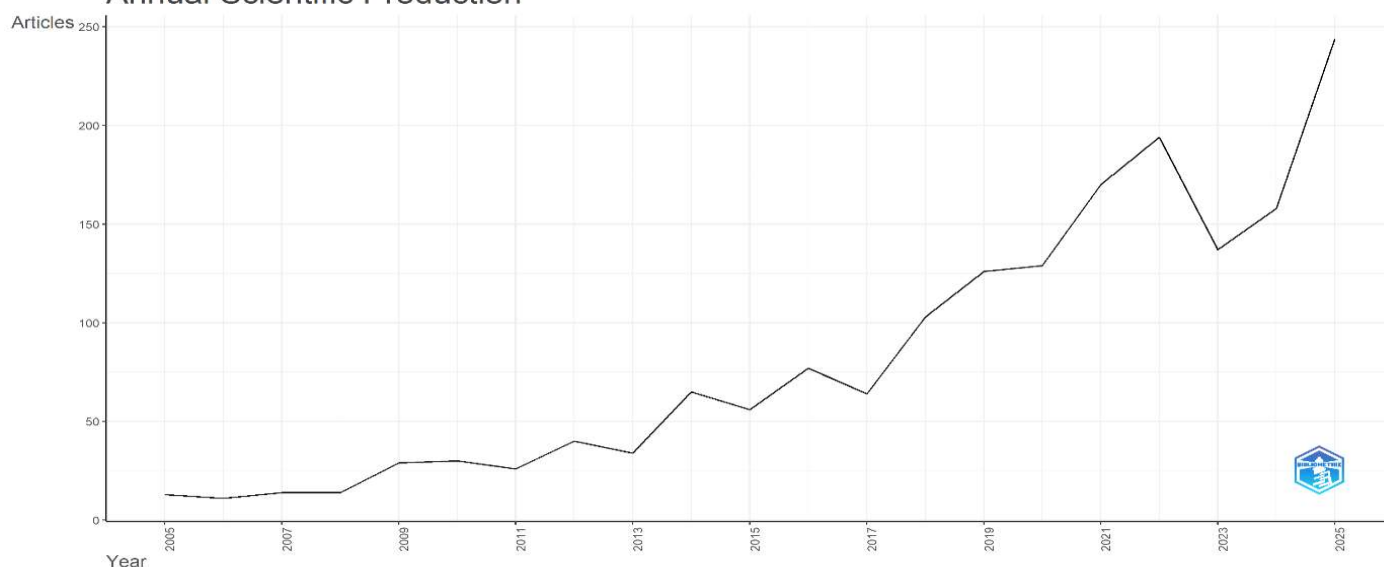


Figure 2. Annual Distribution of Publication

Figure 3 presents the most reviewed academic journals on youth soccer. The journals are ranked by the top ten by number of published articles. The journal with the most publications is the Journal of Sports Sciences with 102 articles. In second place is the Journal of Strength and Conditioning Research (99 articles). Next are the International Journal of Sports Science and Coaching (54 articles), Sports (54 articles), the International Journal of Environmental Research and Public Health (44 articles), the Journal of Human Kinetics (43 articles), the International Journal of Sports Physiology and Performance (41 articles), the Journal of Physical Education and Sport (41 articles), Science and Medicine in Football (37 articles), and the International Journal of Sports Medicine (36 articles).

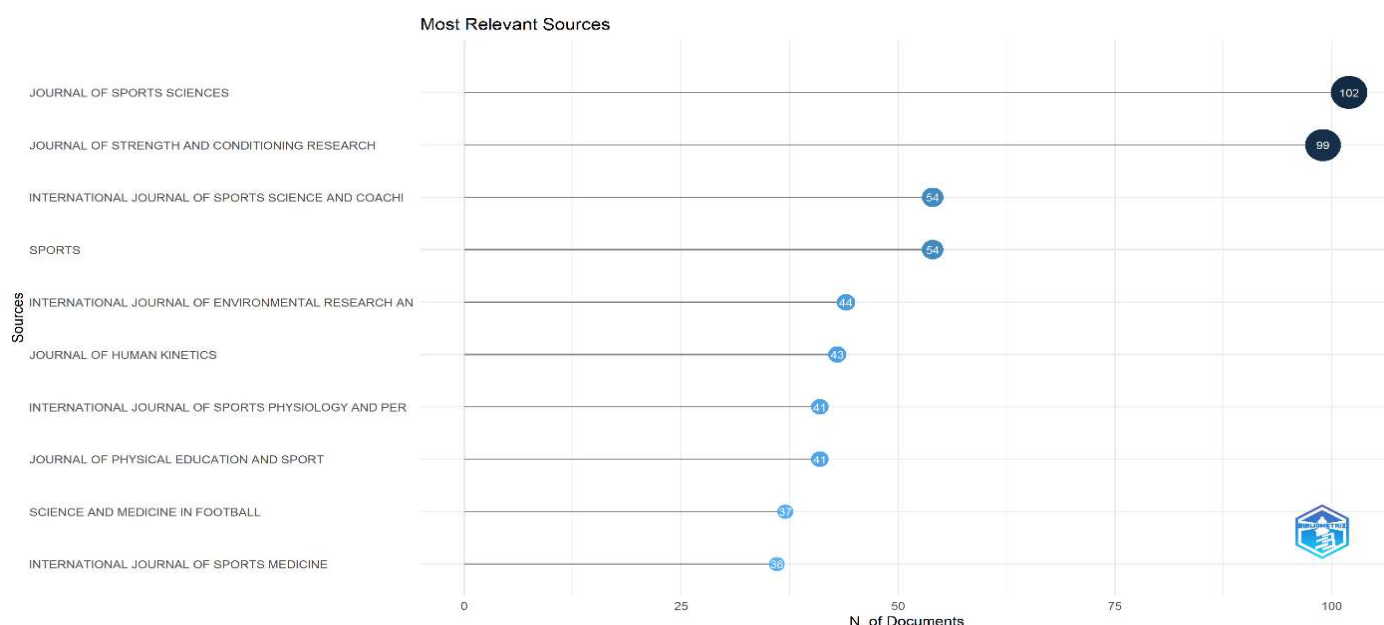


Figure 3. Top Ten Most Relevant Sources

The Journal of Sports Sciences emerged as the most productive publication outlet, contributing 102 articles on youth soccer (**Figure 3**). This dominance is attributable to the journal's broad interdisciplinary scope, which encompasses key areas frequently investigated in youth soccer research, including biomechanics, performance analysis, physiology, psychology, sports medicine, coaching, and talent identification. Such thematic coverage closely aligns with the multidimensional nature of youth soccer research, making the journal a preferred platform for disseminating studies in this field.

Beyond its publication productivity, the journal also demonstrates substantial scientific influence. It is indexed in both MEDLINE and Clarivate Analytics and exhibits strong citation-based performance, with a 2024 Impact Factor of 2.5 (Q2), a Scopus CiteScore of 5.3 (Q1), an SNIP of 1,205, and an SJR of 1,020. These metrics indicate that the journal not only publishes a high volume of youth soccer research but also maintains broad visibility and citation impact within the sports science community. Therefore, the prominence of the Journal of Sports Sciences reflects both its thematic relevance and its role as a leading scholarly outlet for advancing evidence-based research in youth soccer.

Figure 4 presents the ten most prolific authors in youth soccer research. Clemente FM ranked first with 44 publications, followed by Malina RM with 38 publications, while Coelho-E-Silva MJ, Figueiredo AJ, Michailidis Y, Nobari H, Stitzel JD, and Vaeyens R each contributed 23 publications, and Lenoir M and Oliver JL each published 22 articles. The prominence of these authors reflects their sustained contribution to advancing research on youth soccer.

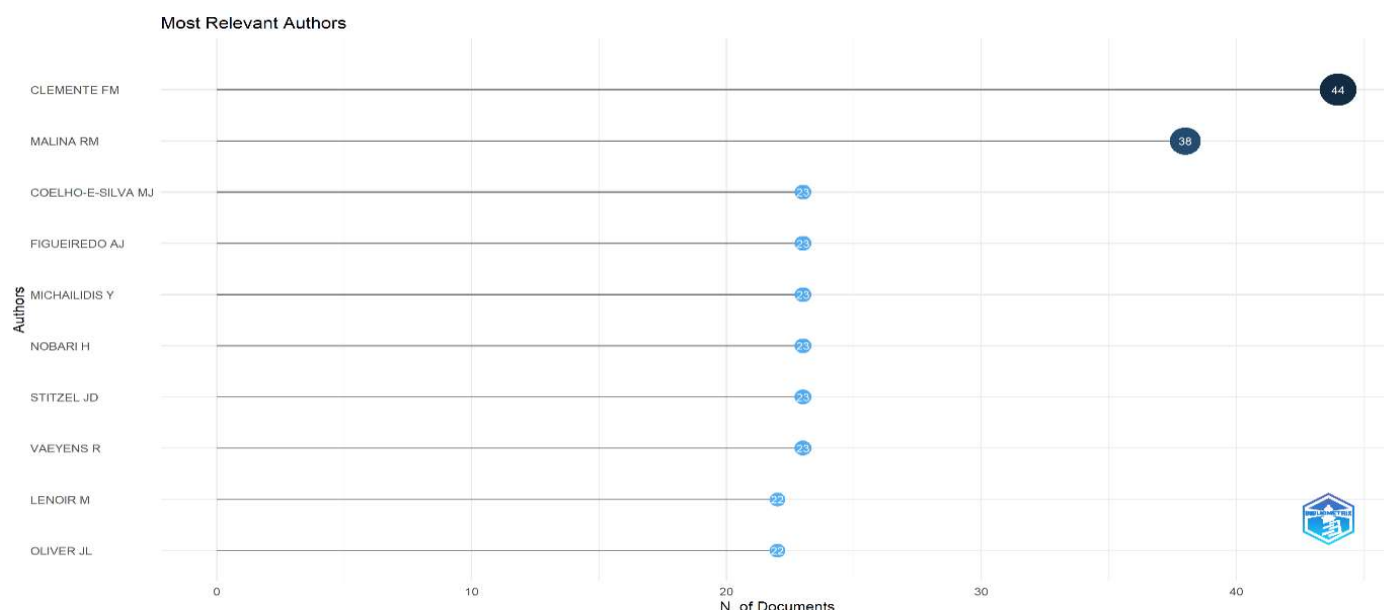


Figure 4. Top Ten Most Relevant Authors

However, publication output alone does not fully represent an author's scientific influence. Citation-based indicators reveal that Robert M. Malina has the greatest scholarly impact, with approximately 85,483 citations and an h-index of 131, despite publishing fewer articles than Clemente FM. This suggests that Malina's work has been widely recognised and extensively cited, particularly in areas related to youth growth, maturation, and athletic development, which have become foundational references in youth soccer research. Meanwhile, Clemente FM, the most productive author, has accumulated approximately 25,781 citations and an h-index of 80, demonstrating that his extensive publication record is also accompanied by substantial scientific influence. Similarly, Manuel Coelho-E-Silva has achieved approximately 11,049 citations and an h-index of 49, indicating a strong and consistent contribution to the literature. Collectively, these findings demonstrate that the leading authors in youth soccer research are distinguished not only by their publication productivity but also by the considerable scientific impact of their work, as reflected in citation-based metrics.

1 Science Mapping

The co-authorship analysis is presented in Figure 5. The overlay visualisation illustrates collaborative relationships between authors. Each node represents an author, and links between nodes indicate co-authorship connections. Node size reflects the number of published documents, and node color corresponds to the year of publication, with yellow indicating the most recent publication year. The largest and most interconnected cluster centers around Malina RM and Clemente FM. This cluster demonstrates their extensive, strong, and active collaboration with other authors and significant contributions to the knowledge in the field. An interesting observation is the lower-left cluster, which includes Heilmann F and Trecroci A. This cluster appears isolated from the broader network. However, this is due to the fact that they are new authors in the field, as indicated by the yellow color.

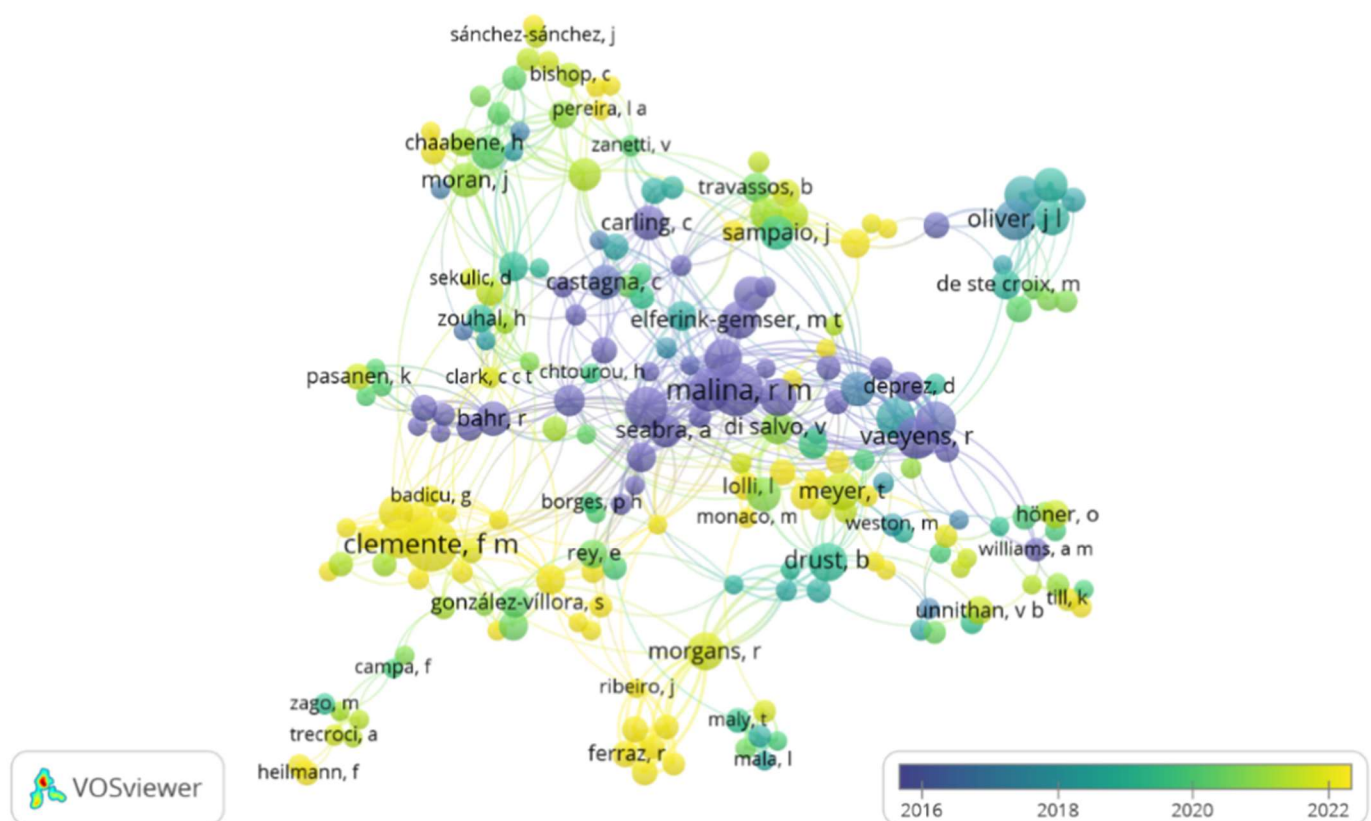


Figure 5. Co-Authorship Overlay Visualisation

Co-occurrence analysis, with the author's keyword as the unit of analysis, is presented in Figure 6. The analysis results indicate that the keywords are divided into eight clusters. The red cluster focuses on talent identification methods and physical parameters with keywords such as soccer, football, youth soccer, relative age effect, talent identification, academy, gender, growth, strength, sprint, jump, ground reaction force. The green cluster relates to injury, accident prevention, risk factors, prospective study, observational study. The navy cluster emphasises coaching strategies, skill development, metabolic processes, with keywords such as human experiment, physical activity, body mass, body fat, body composition, fitness, bone age, jumping, velocity, oxygen uptake, aerobic capacity. The yellow cluster emphasises physiological aspects with keywords such as physiology, athletic performance, creatine kinase, pathophysiology, skeletal muscle, running, endurance, hydrocortisone. The purple cluster relates to talent development, with keywords such as adolescent, child, age, competitive behaviour, decision making, human relations, motivation, motor performance, nutrition education, psychology. The blue cluster appears to focus on biomechanics, with keywords like biomechanics, kinematics, analysis, rotation, video recording, and accelerometer. The orange cluster highlights the recovery and mental aspects of players, with keywords like sleep, sleep time, dehydration, mood, physiological stress, psychometry, well-being, and self-report. The brown cluster focuses on technology-based measurement or monitoring, with keywords like geographic information system, principal component analysis, young adult, and soccer.

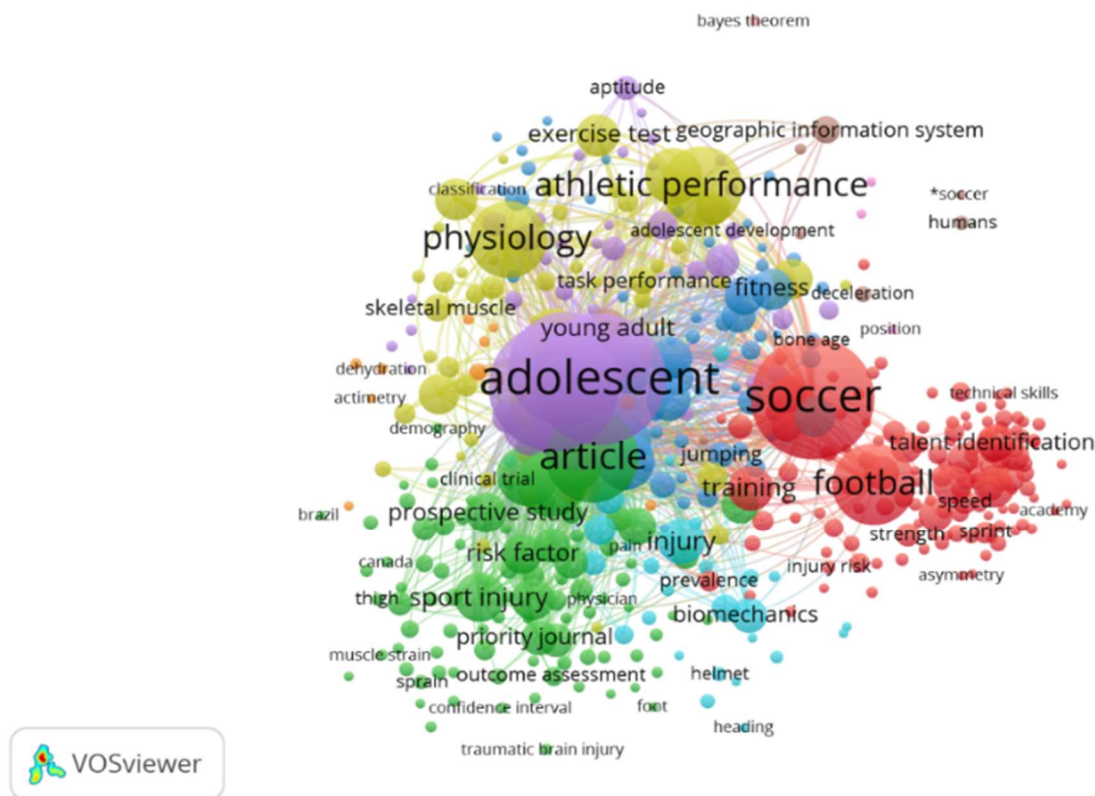


Figure 6. Co-Occurrence Network Visualisation

Discussion

Research Trends

The exponential increase in youth soccer publications after 2017 indicates that the field has undergone substantial scientific development rather than merely experiencing an increase in publication volume. The transition from double-digit annual outputs before 2017 to sustained three-digit publications thereafter suggests that youth soccer has evolved into an established and multidisciplinary research domain within sport science. This growth reflects increasing scientific attention toward understanding athlete development during childhood and adolescence as a critical component of long-term sporting performance (Ford et al., 2020; O'Sullivan et al., 2023).

The publication trend identified in this bibliometric analysis also demonstrates a shift in research priorities within football science. Contemporary perspectives increasingly recognise that elite performance is shaped through long-term developmental processes involving technical, physical, tactical, and psychosocial factors. Consequently, youth soccer has attracted growing scholarly interest because it provides an important context for investigating talent development, training adaptation, and player progression across developmental stages (Sarmiento, Anguera et al., 2018; Vermeire et al., 2024). The sustained increase in publications after 2017 therefore reflects the scientific community's increasing commitment to developing evidence-based approaches to youth player development.

Furthermore, the continuous growth of publications suggests that youth soccer research has become increasingly interdisciplinary. Previous studies were largely concentrated on isolated performance-related variables, whereas contemporary investigations encompass broader themes involving talent identification, athlete development, injury prevention, performance analysis, and training methodologies. The diversification of research topics observed throughout the bibliometric mapping supports the view that youth soccer is no longer a secondary topic within football science but has emerged as a mature field characterised by extensive collaboration across multiple scientific disciplines.

Taken together, the publication pattern identified in this study highlights not only the rapid expansion of scientific output but also the growing maturity and strategic importance of youth soccer research. The sustained increase in publications since 2017 reflects an international research agenda that increasingly emphasises systematic and holistic approaches to understanding youth athlete development, thereby positioning youth soccer as one of the most dynamic areas of contemporary sport science research.

Leading Authors and Journals

The dominance of authors such as Clemente FM, Malina RM, and Coelho-E-Silva demonstrates that youth soccer research has been substantially shaped by a relatively concentrated group of internationally recognised scholars. This bibliometric pattern suggests that the development of the field has been driven not only by publication productivity but also by sustained scientific contributions over time. The prominence of these authors reflects the establishment of influential research agendas focusing on athlete development, biological maturation, performance analysis, and training methodologies that continue to underpin contemporary youth soccer studies (Ford et al., 2020; Sarmiento, Clemente et al., 2018).

Furthermore, the concentration of highly productive authors indicates the importance of collaborative research networks in advancing youth soccer science. Bibliometric studies have shown that productive authors frequently occupy central positions within international collaborations, facilitating knowledge exchange and promoting methodological developments across disciplines (Aria & Cuccurullo, 2017; Donthu et al., 2021). Consequently, the bibliometric pattern identified in this study suggests that the rapid expansion of youth soccer research has been supported by internationally connected scientific communities rather than isolated individual contributions.

The journal distribution identified in this study further reflects the multidisciplinary nature of youth soccer research. The dominance of journals such as the Journal of Sports Sciences and the Journal of Strength and Conditioning Research indicates that contemporary youth soccer studies are primarily positioned within mainstream sport science literature encompassing athlete development, performance analysis, and training science. The presence of journals specialising in coaching science, sports physiology, sports medicine, and public health also demonstrates that youth soccer has evolved into a multidisciplinary field that extends beyond performance-related outcomes alone (Padulo, 2025; Popel et al., 2023; Secomb, 2024). Taken together, the bibliometric patterns observed among leading authors and journals suggest that the evolution of youth soccer research has been shaped by sustained international collaborations and the increasing integration of multiple sport science disciplines. These findings reinforce the growing scientific maturity of the field and explain why youth soccer has experienced substantial publication growth over the past two decades.

Dominant Topic and Research Gap

The co-occurrence network demonstrates that youth soccer research has evolved into a highly multidisciplinary field encompassing talent identification, physiology, biomechanics, psychology, injury prevention, recovery, and technology-assisted performance monitoring. The relationships among these clusters reflect the increasing complexity of athlete development, where performance is influenced not only by physical attributes but also by biological maturation, technical skills, psychological readiness, and environmental factors. This finding is consistent with the LTAD framework, which emphasises the integration of multiple scientific disciplines across different stages of athlete development (Balyi et al., 2014).

The prominence of the talent identification cluster indicates that early player selection remains a central concern in youth soccer research. Contemporary studies increasingly recognise that talent identification requires multidimensional assessments involving maturation status, physical performance, and technical and psychological characteristics rather than relying solely on chronological age (Bergkamp et al., 2019; Malina et al., 2015). Similarly, the emergence of injury prevention, physiology, and recovery-related themes highlights a growing emphasis on holistic athlete management, acknowledging that sustainable player development depends on balancing performance enhancement with health preservation and adequate recovery (Juch et al., 2025; Kellmann et al., 2018).

Another notable finding is the increasing prominence of technology-oriented keywords, including accelerometer, geographic information system, principal component analysis, and video recording. Their emergence reflects a broader transition from conventional physiological assessments toward data-driven athlete monitoring supported by wearable technologies and advanced analytical approaches (Cummins et al., 2013; Rico-González et al., 2023). This development has substantially expanded opportunities for objective and individualised performance evaluation in youth soccer.

The overlay visualisation and thematic evolution further demonstrate a temporal shift in research priorities. Earlier studies primarily focused on physiological and performance-related variables, whereas recent investigations increasingly emphasise recovery, well-being, monitoring technologies, and multidimensional performance assessment (Ravé et al., 2020; Teixeira et al., 2025; Waldron et al., 2021). Likewise, talent identification research has evolved from emphasising anthropometric and maturation-related characteristics toward incorporating broader psychological, biomechanical, and contextual performance variables (Malina et al., 2015).

Despite this thematic diversification, the bibliometric findings indicate that several research domains remain only weakly connected. Technology-oriented topics have yet to be fully integrated with talent identification research, while recovery-related themes remain relatively isolated from performance development and biomechanical investigations. These patterns suggest that future studies should move beyond examining individual domains independently by integrating physiological, technological, recovery, and talent development perspectives within comprehensive multidisciplinary frameworks. Strengthening these interdisciplinary linkages represents an important opportunity for advancing both the scientific understanding and practical applications of youth soccer research (Grivas & Safari, 2025; Schelling et al., 2025; Warmenhoven et al., 2026).

Future Research Opportunities

Finally, the thematic evolution suggests that several emerging topics remain insufficiently connected within the current knowledge structure. Although psychological well-being, nutrition education, recovery, biomechanics, and monitoring technologies have each gained increasing attention, relatively few studies have investigated how these factors interact throughout the athlete development pathway. Therefore, future bibliometric and empirical studies should prioritise interdisciplinary research integrating physiology, psychology, biomechanics, sports analytics, and coaching science within longitudinal athlete development frameworks. Such integration would not only address the fragmented structure observed in the co-occurrence network but also contribute to more comprehensive evidence-based youth soccer development models.

CONCLUSION

This 20-year bibliometric analysis systematically maps the structural evolution of youth soccer research, depicting its progression from local investigations of physical growth and relative age effects (2005-2017) to a broad international collaborative network focused on leveraging digital technologies in workload optimisation (2018-2025). The study's primary scientific value lies in its synthesis of historically fragmented research domains, specifically integrating physiology, biomechanics, and injury prevention into a unified global framework. This intellectual landscape remains grounded in key scientific publications such as the Journal of Sports Sciences and is fundamentally shaped by the ongoing scientific leadership of prolific contributors including Clemente FM and Malina RM. Practically, the empirical data demonstrates that youth soccer academies must shift from subjective talent scouting to a goal-directed selection paradigm tailored to maturity, while simultaneously managing sports injuries as a systemic health issue closely linked to sleep architecture and psychological well-being. Furthermore, the clear keyword deficit and limited technology integration identified in the science mapping suggest that future empirical investigations must go beyond basic descriptive tracking metrics. Thus, current research priorities focus on developing technology-assisted training frameworks, multidimensional talent selection pathways, and comprehensive monitoring systems that encompass both physical and technical development parameters. Future studies should expand bibliometric

analyses by integrating Scopus and Web of Science datasets and employing longitudinal thematic evolution analyses to capture emerging interdisciplinary trends.

ACKNOWLEDGEMENTS

The author would like to thank the leadership of Universitas Pendidikan Ganesha, Universitas Pendidikan Sultan Idris, University of Southern Mindanao, and Universitas Negeri Surabaya for giving us the opportunity to collaborate in writing this article.

CONFLICT OF INTEREST

The authors believe and ensure that from the writing stage until this paper is completed, there are no conflicts of interest.

AI DISCLOSURE STATEMENT

The author acknowledges and declares that the use of AI is limited to the QuillBot application. QuillBot, an AI-powered writing tool, was used solely for paraphrasing, language refinement, grammar checking, and final proofreading. It was not used to generate, analyse, or interpret the research data or results. The authors take full responsibility for the content, accuracy, and integrity of the manuscript.

REFERENCES

- Aku, Y., & Yang, C. (2024). The Relative Age Effect and Its Influence on Athletic Performance in Chinese Junior Female' Tennis Players. *PLoS ONE*, 19(3 March), 1–15. <https://doi.org/10.1371/journal.pone.0298975>
- Aria, M., & Cuccurullo, C. (2017). Bibliometrix: An R-Tool for Comprehensive Science Mapping Analysis. *Journal of Informetrics*, 11(4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus as a Curated, High-Quality Bibliometric Data Source for Academic Research in Quantitative Science Studies. *Quantitative Science Studies*, 1(1), 377–386. https://doi.org/10.1162/qss_a_00019
- Balyi, I., Way, R., & Higgs, C. (2014). *Long-Term Athlete Development*. Human Kinetics.
- Bangert, Y., Jaber, A., Trefzer, R., Zietzschmann, S., Koch, K. A., Kern, R., Spielmann, J., Renkawitz, T., & Weishorn, J. (2024). The Impact of Injury on Career Progression in Elite Youth Football—Findings at 10 Years. *Journal of Clinical Medicine*, 13(7). <https://doi.org/10.3390/jcm13071915>
- Bergkamp, T. L. G., Niessen, A. S. M., den Hartigh, R. J. R., Frencken, W. G. P., & Meijer, R. R. (2019). Methodological Issues in Soccer Talent Identification Research. *Sports Medicine*, 49(9), 1317–1335. <https://doi.org/10.1007/s40279-019-01113-w>
- Bidaurrezaga-Letona, I., Lekue, J. A., Amado, M., & Gil, S. M. (2017). Progression in Youth Soccer: Selection and Identification in Youth Soccer Players Aged 13-15 Years. *Journal of Strength and Conditioning Research*, 33(9), 2548–2558. <https://doi.org/10.1519/JSC.0000000000001924>
- Castillo, D., Marqués-Jiménez, D., Bertollo, M., López-Flores, M., Bovolon, L., De Fano, A., & Pompa, D. (2025). A Systematic Review and Meta-Analysis of Various Injury Prevention Programs in Youth Soccer Players. *BMC Sports Science, Medicine and Rehabilitation*, 17(1), 1–19. <https://doi.org/10.1186/s13102-025-01246-8>
- Cummins, C., Orr, R., O'Connor, H., & West, C. (2013). Global Positioning Systems (GPS) and Microtechnology Sensors in Team Sports: A Systematic Review. *Sports Medicine*, 43(10), 1025–1042. <https://doi.org/10.1007/s40279-013-0069-2>

- Danurwindo, Ganesha, P., Sidik, B., & Prahara, J. L. (2017). *Kurikulum Pembinaan Sepakbola Indonesia*. Persatuan Sepakbola Seluruh Indonesia.
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to Conduct a Bibliometric Analysis: An Overview and Guidelines. *Journal of Business Research*, 133(May), 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Ellegaard, O. (2018). The Application of Bibliometric Analysis: Disciplinary and User Aspects. *Scientometrics*, 116(May), 181–202. <https://doi.org/10.1007/s11192-018-2765-z>
- Ford, P. R., Bordonau, J. L. D., Bonanno, D., Tavares, J., Groenendijk, C., Fink, C., Gualtieri, D., Gregson, W., Varley, M. C., Weston, M., Lolli, L., Platt, D., & Di Salvo, V. (2020). A Survey of Talent Identification and Development Processes in the Youth Academies of Professional Soccer Clubs from Around the World. *Journal of Sports Sciences*, 38(11–12), 1269–1278. <https://doi.org/10.1080/02640414.2020.1752440>
- Grivas, G. V., & Safari, K. (2025). Artificial Intelligence in Endurance Sports: Metabolic, Recovery, and Nutritional Perspectives. *Nutrients*, 17(20), 1–26. <https://doi.org/10.3390/nu17203209>
- Guzsvinecz, T., & Szűcs, J. (2025). A Bibliometric Analysis of the Trends in UAV Research Using the Bibliometrix R-Tool. *Applied Sciences (Switzerland)*, 15(21), 1–22. <https://doi.org/10.3390/app152111305>
- Hegedűs, P., Csala, D., Tóth, J., & Tóth, J. (2025). Age-Related Effects of Physical Performance on Technical and Tactical Outcomes in Youth Soccer. *Sports*, 13(6), 1–12. <https://doi.org/10.3390/sports13060162>
- Juch, E., van de Koppel, V. C., Blokland, D., Wouters, R. A., Backx, F. J. G., Goedhart, E. A., & van der Horst, N. (2025). Growth-Related Sports Injuries among Young Male Professional Football Players in the Netherlands: A Prospective Cohort Study Concerning Injury Incidence, Severity and Burden. *Sci Med Footb*, 9(1), 26–37. <https://doi.org/10.1080/24733938.2023.2261399>
- Kellmann, M., Bertollo, M., Bosquet, L., Brink, M., Coutts, A. J., Duffield, R., Erlacher, D., Halson, S. L., Hecksteden, A., Heidari, J., Wolfgang Kallus, K., Meeusen, R., Mujika, I., Robazza, C., Skorski, S., Venter, R., & Beckmann, J. (2018). Recovery and Performance in Sport: Consensus Statement. *International Journal of Sports Physiology and Performance*, 13(2), 240–245. <https://doi.org/10.1123/ijsp.2017-0759>
- Kelly, A. L. (2024). *Talent Identification and Development in Youth Soccer*. Routledge. <https://doi.org/10.4324/9781032232799>
- Kusuma, K. C. A., Artanayasa, I. W., Dharmadi, M. A., & Semarayasa, I. K. (2025). Research Trends on Small-Sided Games in Soccer: A Bibliometric Analysis. *JPJO: Jurnal Pendidikan Jasmani dan Olahraga*, 10(1), 63–76. <https://doi.org/10.17509/jpjo.v10i1.76269>
- Liu, B., Zhou, C., Ma, H., & Gong, B. (2023). Mapping the Youth Soccer: A Bibliometrix Analysis Using R-Tool. *Digital Health*, 9(10), 1–16. <https://doi.org/10.1177/20552076231183550>
- Mainer-Pardos, E., Gonzalo-Skok, O., Nobari, H., & Roso-Moliner, A. (2025). Scientific Trends and Emerging Topics in Youth Female Soccer: A Bibliometric Perspective. *Apunts Sports Medicine*, 61(September 2025). <https://doi.org/10.1016/j.apunsm.2025.100503>
- Malina, R. M., Rogol, A. D., Cumming, S. P., Coelho E Silva, M. J., & Figueiredo, A. J. (2015). Biological Maturation of Youth Athletes: Assessment and Implications. *British Journal of Sports Medicine*, 49(13), 852–859. <https://doi.org/10.1136/bjsports-2015-094623>
- McCalman, W., Crowley-McHattan, Z. J., Fransen, J., & Bennett, K. (2022). Skill Assessments in Youth Soccer: A Scoping Review. *Journal of Sports Sciences*, 40(6), 667–695. <https://doi.org/10.1080/02640414.2021.2013617>

- North, M., Kelly, A. L., Ranchordas, M. K., & Cole, M. (2022). Nutritional Considerations in High Performance Youth Soccer: A Systematic Review. *Journal of Science in Sport and Exercise*, 4(3), 195–212. <https://doi.org/10.1007/s42978-022-00171-3>
- O’Sullivan, M., Vaughan, J., Rumbold, J. L., & Davids, K. (2023). Utilising the Learning in Development Research Framework in a Professional Youth Football Club. *Frontiers in Sports and Active Living*, 5(June), 1–17. <https://doi.org/10.3389/fspor.2023.1169531>
- Padulo, J. (2025). Sport and Health Science: Interdisciplinary Approaches to Modern Challenges. *British Medical Bulletin*, 155(1), 1–3. <https://doi.org/10.1093/bmb/ldaf007>
- Pedersen, A. V., Aune, T. K., Dalen, T., & Lorås, H. (2022). Variations in the Relative Age Effect with Age and Sex, and Over Time—Elite-Level Data from International Soccer World Cups. *PLoS ONE*, 17(4 April), 1–15. <https://doi.org/10.1371/journal.pone.0264813>
- Plakias, S., Tsatalas, T., Mina, M. A., Kokkotis, C., Kellis, E., & Giakas, G. (2024). A Bibliometric Analysis of Soccer Biomechanics. *Applied Sciences (Switzerland)*, 14(15), 1–15. <https://doi.org/10.3390/app14156430>
- Platvoet, S. W. J., Heuveln, G. van, Dijk, J. van, Stevens, T., & Niet, M. de. (2023). An Early Start at a Professional Soccer Academy is no Prerequisite for World Cup Soccer Participation. *Frontiers in Sports and Active Living*, 5(November), 1–9. <https://doi.org/10.3389/fspor.2023.1283003>
- Popel, S., Mazin, V., Maksymchuk, B., Saienko, V., Chernyshenko, T., & Maksymchuk, I. (2023). Network Planning at the Faculties of Physical Education and Sport in the Postmodern Era. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, 14(1), 554–570. <https://doi.org/10.18662/brain/14.1/435>
- Ravé, G., Granacher, U., Boullosa, D., Hackney, A. C., & Zouhal, H. (2020). How to Use Global Positioning Systems (GPS) Data to Monitor Training Load in the “Real World” of Elite Soccer. *Frontiers in Physiology*, 11(August). <https://doi.org/10.3389/fphys.2020.00944>
- Reeves, M. J., & Roberts, S. J. (2020). A Bioecological Perspective on Talent Identification in Junior-Elite Soccer: A Pan-European Perspective. *Journal of Sports Sciences*, 38(11–12), 1259–1268. <https://doi.org/10.1080/02640414.2019.1702282>
- Rico-González, M., Pino-Ortega, J., Méndez, A., Clemente, F. M., & Baca, A. (2023). Machine Learning Application in Soccer: A Systematic Review. *Biology of Sport*, 40(1), 249–263. <https://doi.org/10.5114/biolspor.2023.112970>
- Rogers, G., Szomszor, M., & Adams, J. (2020). Sample Size in Bibliometric Analysis. *Scientometrics*, 125(1), 777–794. <https://doi.org/10.1007/s11192-020-03647-7>
- Sarmiento, H., Anguera, M. T., Pereira, A., & Araújo, D. (2018). Talent Identification and Development in Male Football: A Systematic Review. *Sports Med*, 48(4), 907–931. <https://doi.org/10.1007/s40279-017-0851-7>
- Sarmiento, H., Clemente, F. M., Araújo, D., Davids, K., McRobert, A., & Figueiredo, A. (2018). What Performance Analysts Need to Know About Research Trends in Association Football (2012–2016): A Systematic Review. *Sports Medicine*, 48(4), 799–836. <https://doi.org/10.1007/s40279-017-0836-6>
- Saward, C., Hulse, M., Morris, J. G., Goto, H., Sunderland, C., & Nevill, M. E. (2020). Longitudinal Physical Development of Future Professional Male Soccer Players: Implications for Talent Identification and Development? *Frontiers in Sports and Active Living*, 2(October), 1–15. <https://doi.org/10.3389/fspor.2020.578203>

- Schelling, X., Spencer, B., Azalbert, V., Alonso-Perez-Chao, E., Sosa, C., & Robertson, S. (2025). Decision Support Systems for Time Series in Sport: Literature Review and Applied Example of Changepoint-Based Most Demanding Scenario Analysis in Basketball. *Applied Sciences (Switzerland)*, 15(19), 1–18. <https://doi.org/10.3390/app151910575>
- Secomb, J. L. (2024). Share Favorites Permissions Invitation Interdisciplinary Sport Science in Individual Sports - A Framework for Implementation. *Strength and Conditioning Journal*, 46(1), 82–89. <https://doi.org/10.1519/SSC.0000000000000789>
- Stables, R. G., Hannon, M. P., Costello, N. B., McHaffie, S. J., Sodhi, J. S., Close, G. L., & Morton, J. P. (2024). Acute Fuelling and Recovery Practices of Academy Soccer Players: Implications for Growth, Maturation, and Physical Performance. *Science and Medicine in Football*, 8(1), 37–51. <https://doi.org/10.1080/24733938.2022.2146178>
- Teixeira, J. E., Maio, E., Afonso, P., Encarnação, S., Machado, G. F., Morgans, R., Barbosa, T. M., Monteiro, A. M., Forte, P., Ferraz, R., & Branquinho, L. (2025). Mapping Football Tactical Behavior and Collective Dynamics with Artificial Intelligence: A Systematic Review. *Frontiers in Sports and Active Living*, 7(May). <https://doi.org/10.3389/fspor.2025.1569155>
- Vermeire, T., Balliauw, M., & Verlinden, T. (2024). Measures for a Better Youth Development Environment in European Professional Football. *Journal of Global Sport Management*, 9(1), 202–229. <https://doi.org/10.1080/24704067.2022.2097115>
- Waldron, M., Harding, J., Barrett, S., & Gray, A. (2021). A New Foot-Mounted Inertial Measurement System in Soccer: Reliability and Comparison to Global Positioning Systems for Velocity Measurements during Team Sport Actions. *Journal of Human Kinetics*, 77(1), 37–50. <https://doi.org/10.2478/hukin-2021-0010>
- Warmenhoven, J., Shrier, I., Bullock, G. S., Holcombe, A. O., Nimphius, S., Menaspà, P., Coutts, A. J., & Impellizzeri, F. M. (2026). Unifying to Advance Understanding: Collaborative, Community-Driven and ‘Open’ Approaches for Better Science in Sport. *Sports Medicine*, 56(4), 845–859. <https://doi.org/10.1007/s40279-026-02394-8>
- Yu, W., Liao, W., Zhong, Y., & Guan, Y. (2025). International Youth Football Research Developments: A Citespace-Based Bibliometric Analysis. *Heliyon*, 11(1), e41663. <https://doi.org/10.1016/j.heliyon.2025.e41663>