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A Bibliometric Analysis on the Badminton Research Trends from the Scopus Database (2016-2025)

Mary Jida^{1*}, Shailesh Kumar Singh¹, Lahu Linggi²

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ABSTRACT

Badminton has attracted substantial attention in sports science, particularly in the domains of performance analysis, physiology, biomechanics, and training methodologies, but the body of research remains unsystematically evaluated over the last decade. This study addresses this concern and aims to provide a comprehensive overview of badminton related research indexed in Scopus database from the year 2016 to 2025. A bibliometric approach was used to analyse badminton publications in Scopus over the last ten years, focusing on annual production, citation patterns, categories of documents, authorship, leading authors and nations, prominent journals, and recurring keywords to depict research trends. The research found 588 badminton-related documents with 4,457 citations, averaging 7.58 per document. Publications increased from 12 in 2016 to 126 in 2025, indicating growth in badminton research publications. Most were journal articles, with over 90% co-author. China was the top-producing country. Key topics included performance, physiology, biomechanics, training, and lower-limb demands. Findings show that the research around badminton grew increasingly from 2016 to 2025 in both volume and citations. The focus on performance and athletes indicates a positive shift towards sports science, emphasising upon the physical and biomechanical aspects.

INTRODUCTION

Badminton is a fast-paced, intermittent racket sport that requires a highly complex combination of technical proficiency, tactical expertise, and physical endurance. This game has gained considerable interest in the academic field particularly those within sports and exercise science research (Abian *et al.*, 2015). Recent investigations by the researchers have transcended the basic descriptions to delve into a critical analysis of various aspects of the game, including match play organization, energy expenditure, biomechanics, injury trends, and training effects. These studies highlight the intricacies of playing badminton and reflect the gradual transformation of the game into a legitimate area of high-level scientific inquiry (Abian-Vicen *et al.*, 2013).

Taking into consideration the highly dynamic and interactive nature of badminton, the players must be capable of making quick and accurate movements at all times, adjusting to the tactics of their opponents (Boesen *et al.*, 2006). The aforementioned complexity has increased interest in studying the diverse set of physical skills required to perform at the competitive level. According to various studies, badminton is a game that requires high-intensity and intermittent physical effort, including sudden bursts of speed and agility supported by an efficient aerobic system (Chang *et al.*, 2022). The importance of biomechanical analysis in understanding stroke execution cannot be overemphasized, especially when considering that efficient biomechanics not only help in improving the technique but also prevents and minimizes risks related to injuries caused by the

continuous use of strokes and changing directions.

The increasing number of scientific studies related to badminton is gradually focusing on how to prevent injuries and create training strategies that cater to the unique characteristics of this sport. Recent findings regarding the physiological effects on athletes during competitions are helping to develop specialized training programs that focus on improving the endurance, muscular strength, and recovery (Chin *et al.*, 1995). Also, the discovery of specific factors contributing to injuries in badminton, including muscular strain, joints overloading, and repetitive stress, enables developing efficient methods of treatment and training load management. Overall, these findings illustrate the growing specialization of this sport as a result of its development from a mere recreational activity to the highly specialized one. Therefore, there is a need for an integrated and holistic approach that uses physiological, biomechanical, and medical knowledge about badminton which can prove to be helpful in the longevity and competitive success of the athletes (Al-Khoury *et al.*, 2022).

The use of bibliometric analysis allows to study the development of a scientific field systematically and quantitatively and therefore, discover the major areas of interest, citation practices, and emerging trends. Bibliometric analysis uses such sources as publication results, citations, co-authors, and thematic patterns (EVERHART *et al.*, 1999). In terms of a bibliometric analysis database, Scopus is one of the most trusted sources used for studying different sciences due to its wide coverage and high level of indexing (Mohd Jamali

¹ Assistant Professor. LNIPE, NERC, Guwahati, India

² Ph.D Scholar, CMJ University, Modrina Mansion Laitumkhrah, Shillong Meghalaya, India

* Corresponding author's e-mail: maryjida2017@gmail.com

et al., 2022). There have been very few bibliometric studies on badminton despite the great interest in the subject. Although few studies conducted in the past have explored badminton research using bibliometric methods, they usually examined longer historical periods or broader topics, without focusing closely upon the last 10 years (Hong *et al.*, 2014).

Taking into consideration the increase in badminton studies within sports science and the wide range of topics covered by such scholarly works, it becomes important to undertake a systematic evaluation of recent progress made in this field. In response to this challenge, the current study conducts a bibliometric review of the published literature on badminton included in the database Scopus from the years 2016 to 2025. The objective of this article is to evaluate patterns related to growth in publications, citations, documents, leading

authors, nations, and journals, as well as to analyze key terms used in such scholarly papers to provide a contemporary scenario of badminton related research.

MATERIAL AND METHODS

Research design

This type of research is a Bibliometric Analysis and the articles were searched and analysed using a comprehensive strategy across the SCOPUS research journal database. The keyword used was “Badminton”. Furthermore, the inclusion criteria were journals published in the last 10 years, up to 2025. 2,230 articles from Scopus were mined on April 9th, 2026. Therefore, 588 articles were selected for further analysis using VOSviewer software. (Al Ardha *et al.*, 2024). This study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

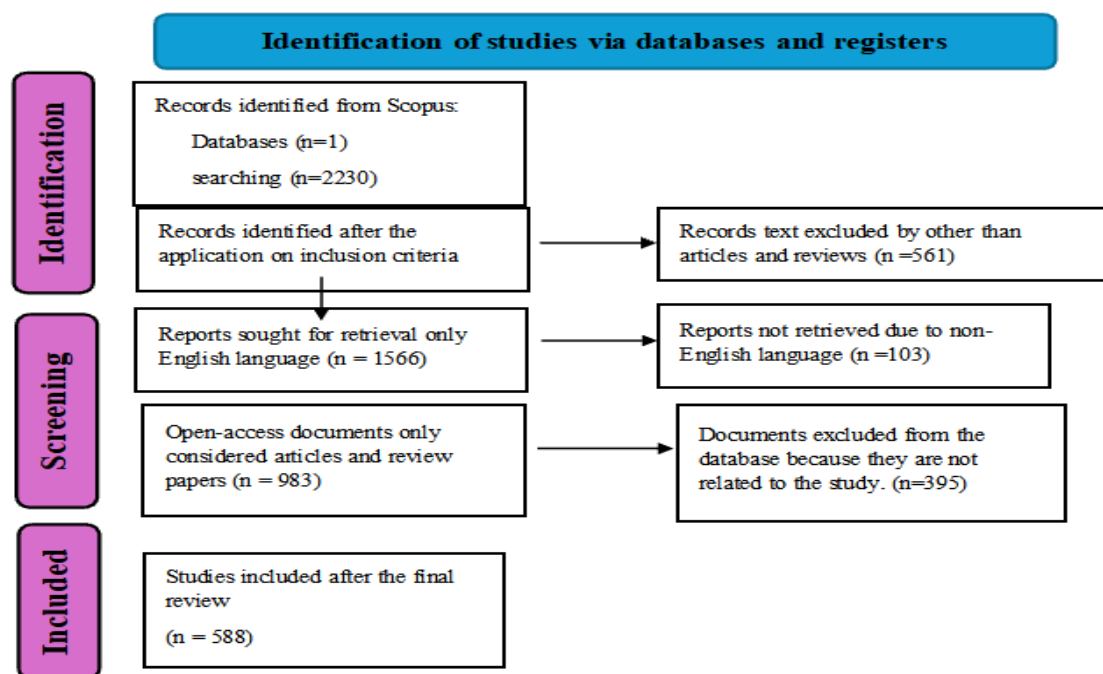


Figure 1: Prisma Flowchart

Data Source

The dataset used in this research was collected from the Scopus database by exporting it into CSV files. This database is frequently used in bibliometric studies owing to its rich content consisting of peer-reviewed journals. The current review concentrates on high-quality, fully processed journal articles and review papers that have been released between 2016 and 2025. The articles under consideration include the ones related to human research. To enhance the credibility and relevancy of the chosen dataset, specific inclusion and exclusion criteria should be met. The publications issued before 2016, written in any other language but English, book chapters, brief surveys, notes, editorials, in press papers, and the papers based on animal research were eliminated from the dataset. It can be stated that the criteria chosen for this article very well corresponds to the guidelines of bibliometric studies and

Scopus database (Krauskopf, 2017).

Data Selection

The identification of the correct database for the purposes of extracting information is very essential for attaining accuracy, consistency, and validity during bibliometric analysis. The choice of Scopus as a tool for this study has been made based on its reputable status as one of the major citation databases globally. Being an indexing tool by Elsevier, Scopus covers quality peer-reviewed journals from all fields and, therefore, it would be ideal for conducting scientific mapping. Scopus provides a good platform for analysing bibliometrics because of its strong evaluation methodology that utilizes several bibliometric parameters including; the h-index, CiteScore, SCImago Journal Rank (SJR), and Source Normalized Impact per Paper (SNIP) in order to measure scholarly impact and

visibility of journals (Baas *et al.*, 2020). It can therefore be argued that using Scopus is likely to guarantee validity and scholarly integrity of the current study.

Data Analysis

This assessment carefully maps out the scope and importance of the research environment by utilising important bibliometric parameters. This includes publication trends on an annual basis, citation impact, which is reflected in total citations and average citations per document, as well as the breakdown of different types of documents, thus giving a full picture of scholarly output in the field (Henneken & Kurtz, 2019). The profiling of top authors, contributing countries, and top journals, on the other hand, helps highlight the important players and publication outlets that shape the subject area. Besides, the analysis of the common keyword's sheds light on the major topics and new frontiers of research in the field. Standardisation in

terms of keyword selection in lowercase was adopted to eliminate any repetitions and improve the accuracy of the frequency distribution analysis (Adams *et al.*, 2021). The authorship analysis was also conducted to understand collaboration trends, especially the growing importance of co-authorship in publications. The systematic arrangement of information in tabular form makes the data more accessible and underscores the importance of these metrics for correctly understanding research dynamics and the evolving landscape of this field.

RESULTS AND DISCUSSION

Publication growth and citation performance

The study "Badminton Research Trends: A Bibliometric Analysis from the Scopus Database (2016–2025)" offers a comprehensive and compelling overview of the field, highlighting key research trends, including yearly publication volume, citations, and average citations

Table 1: Year-wise Distribution of Publications, Citations, and Average Citations

Year	Publications	Citations	Average citations per document
2016	12	125	10.42
2017	21	289	13.76
2018	24	396	16.50
2019	30	491	16.37
2020	45	704	15.64
2021	55	670	12.18
2022	73	660	9.04
2023	96	539	5.61
2024	106	421	3.97
2025	126	162	1.29

per document, that can help in shaping the future of research related to badminton.

The bibliometric dataset comprising of 588 documents published from 2016 to 2025, has garnered a significant 4,457 citations, averaging 7.58 citations per document. Notably, publication output has surged dramatically over this period, increasing from just 12 documents in 2016

to an impressive count of 126 in 2025. This remarkable growth puts forth the increasing importance and rapid development of badminton-related research in the Scopus-indexed literature. The year 2020 recorded the maximum number of citations, totalling 704 across 45 publications. Although, the year 2025 exhibited the highest publication output, its average citation count was

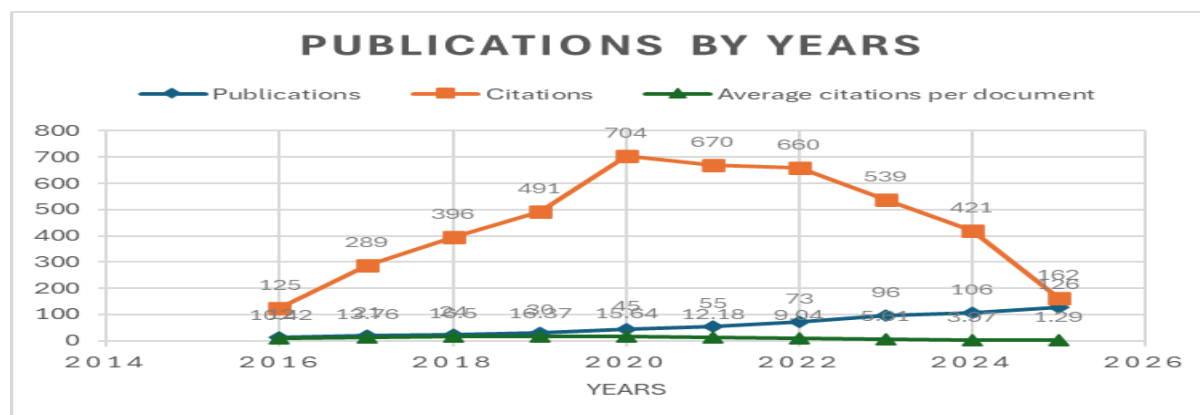


Figure 2: Publication by years with citations

Table 2: Citation analysis of different authors

Rank	Authors	Source/Journal	Total Citations
1	Iserbyt (2017)	Physical education and sports pedagogy	89
2	Pardiwala (2020)	Indian Journal of Orthopaedics	60
3	Steels (2020)	Sensors (Switzerland)	60
4	Nugroho (2021)	Journal of physical education and sports	59
5	Salleh (2021)	Nutrients	54
6	Miyake (2016)	Asian journal of sports medicine	53
7	Wong (2019)	Medicine (United States)	52
8	Zhang (2016)	Journal of Human Kinetics	52
9	Iam (2020)	peerj	50
10	van de water (2017)	Journal of Human Kinetics	48

comparatively lower because of the shorter period available for recent studies to accumulate citations.

Productive authors, source titles and citations analysis

The present study titled “Badminton Research Trends: A Bibliometric Analysis from the Scopus Database (2016–2025)” offers a comprehensive overview of the field, emphasising upon the key research trajectories, including annual publication counts, prominent authors, important journals, and major contributing countries that influence the future of badminton research.

Table 2 provides a summary of the top 10 most-cited publications in the field of Badminton. This overview highlights leading articles from various journals and identifies research gaps in racket sports and Badminton. The most-cited study is by Iserbyt *et al.* (2017), with 89 citations in the Journal of Physical Education and Sports Pedagogy. Pardiwala *et al.* (2020) conducted a systematic review on badminton injuries in elite athletes, focusing on epidemiology and biomechanics; this paper has 60 citations and was published in the Indian Journal of Orthopaedics. Steels *et al.* (2015) authored “Badminton Activity Recognition Using Accelerometer Data,” which has also received 60 citations in Sensors (Switzerland). Nugroho’s

(2021) study, published in the Journal of Physical Education and Sports, has 59 citations. Additionally, Salleh *et al.* (2021) examined the effects of probiotics on anxiety, stress, mood, and fitness in badminton players. They gathered 54 citations, while Miyake *et al.* (2016), published in the Asian Journal of Sports Medicine, received 53 citations.

Wong *et al.* (2019) conducted a cross-sectional study of balance control, agility, hand-eye coordination, and sports performance among amateur badminton players. Their research has been cited 52 times and is published in Medicine (United States). Similarly, Zhang *et al.* (2016) have received 52 citations and published in the Journal of Human Kinetics. Additionally, Iam *et al.* (2020) published in PeerJ and received 50 citations. Moreover, van de Water *et al.* (2017) authored a paper titled “Assessing cognitive performance in badminton players: a reproducibility and validity study” in the Journal of Human Kinetics, which has been cited 48 times. This citation analysis underscores the most influential research and authors in the field of badminton studies.

Keyword Analysis

Figure 3 shows how keywords are grouped based on how often they appear together. Researchers used a suitable

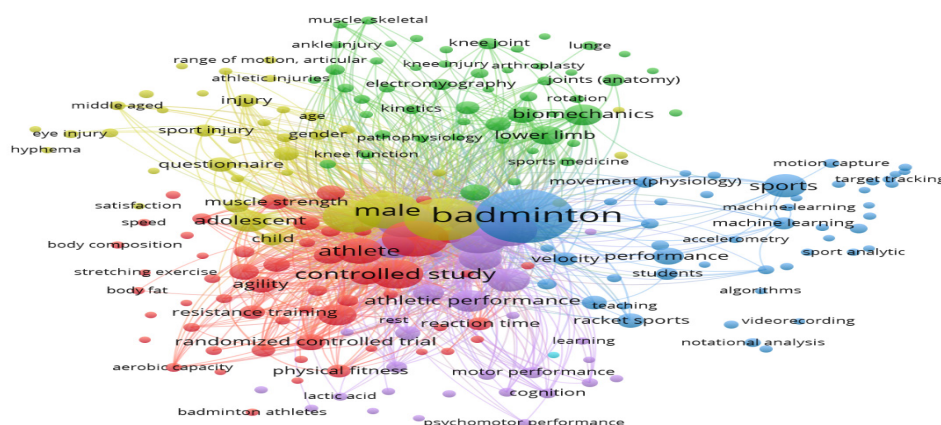


Figure 3: Co-occurrence of keywords

Table 3: Country-wise Distribution of Documents and Total Citations

RANK	COUNTRY	DOCUMENTS	TOTAL CITATIONS
1	China	187	1206
2	Spain	48	601
3	United Kingdom	38	473
4	Indonesia	77	459
5	Malaysia	47	440
6	Australia	24	368
7	Japan	33	349
8	United States	20	287
9	Taiwan	34	276
10	South Korea	20	197

method to analyze keywords related to badminton. From 588 research papers, 3,671 keywords were identified, with 227 appearing at least five times. These keywords were sorted into six groups, with the first group containing 55 items. Generally, larger circles in the diagram represent keywords that are used more often in scholarly work. It's obvious that the circles for words like "badminton," "racket sports," "athletic performance," "human," "exercise intensity," "male," and "biomechanics" are bigger than others. Less common keywords include "aerobic capacity," "lactic acid," "sports injury," and "performance analysis." Future studies might focus on these less frequent keywords to deepen understanding of the sport and observe current trends in badminton research.

Overall, these findings show that recent badminton research mainly concentrates on improving player performance, examining sport-specific physiology, analysing movement, and boosting physical conditioning. The frequent mentions of lower-limb and strength-related topics also indicate a rising interest in injury prevention and managing biomechanical stress.

Country Analysis

Table 3 presents the dispersal of documents and total citations by country among the top 10 contributors. China positions with 187 documents and 1,206 citations, showcasing its leading role in research productivity and impact. After that Spain follows with 48 documents and 601 citations, while the United Kingdom has 38

documents and 473 citations. Indonesia contributed 77 documents and received 459 citations, while Malaysia produced 47 documents and garnered 440 citations. Other countries, such as Australia, Japan, the United States, Taiwan, and South Korea, have fewer publications and citations compared to these top nations.

Figure 4 demonstrates the network of relationship between countries, with China acting as the main hub connecting many nations. The links between China and other countries reflect active international research partnerships, highlighting the collaborative efforts of the United Kingdom, Japan, Taiwan, and Indonesia in this global network.

RESULTS AND DISCUSSION

The findings here demonstrate the presence of a significant and persistent increase in the volume of scholarly articles focused on badminton over the last ten years. Increased number of articles indicates rising interest in studying badminton as a scientifically valuable field (Hadi Karyono *et al.*, 2024). In addition, increased intensity of scholarly activity after the year 2020 might be associated with trends occurring in sports science such as progress in athlete monitoring technologies, increasing availability of motion analysis devices, and the focus on interdisciplinarity. The analysis of citation behaviour further allows stating that articles that were written in earlier periods, especially during 2018-2021, tend to receive higher citation rates when compared with papers written later on. This observation is based on the well-



Figure 4: Top-most contributed countries

known bibliometric facts that indicate a higher likelihood of citing an article published many years ago than recently. Hence, the relatively low citation rate for publications made in 2024 and 2025 requires special attention and cannot be seen as a sign of their lower quality.

The dominance of original articles in comparison with the quantity of review papers implies that the scientific study of badminton remains primarily concerned with producing new empirical knowledge. It is clear that researchers are interested in investigating core areas of the discipline, including performance assessment, physiological aspects, biomechanics, and training techniques. On the other hand, the rather small number of systematic reviews and meta-analyses points towards a lack of comprehensive efforts aimed at synthesizing existing knowledge about badminton. In this regard, conducting additional systematic reviews could contribute significantly to the scientific investigation of badminton. Moreover, examining the geographical affiliation of authors allows identifying specific countries in which research on badminton takes place most actively. Such countries include China, Indonesia, Taiwan, Malaysia, India, and Japan. These countries may be seen as the main centers of badminton research, which explains both the popularity of the sport and the existence of developed infrastructures dedicated to training and investigating badminton players. Nevertheless, contributions from scholars affiliated with Spain, the UK, France, and Brazil also exist. Thus, the globalization of badminton as a research area can be assumed.

Furthermore, analyzing the keywords used in the studied scientific publications, it becomes evident that some themes have been athletic performance, physiology, biomechanics, lower limb, and muscle strength which highlights the increasing recognition of badminton as a high-intensity intermittent sport that requires an integrated approach combining physical, technical, and tactical skills. This evolving focus reflects a sophisticated, evidence-based methodology for training and injury prevention, underscoring its vital role for athletes aiming to excel.

CONCLUSION

This brief bibliometric analysis reveals that the scientific studies related to badminton have expanded exponentially during the period 2016-2025 in the Scopus databases. Badminton research is marked by consistent growth in publication trends, robust patterns of co-authorship, a high level of concentration in terms of geographical locations of authors, and consistent focus on various fields, such as performance science, physiology, biomechanics, and training. This study provides valuable insights into the nature and scope of badminton research, indicating a growing trend towards specialization and evidence-based studies. However, there are various topics that require further investigation in the future. For instance, researchers should explore the epidemiology of injuries in badminton players, long-term monitoring of athletes'

physiological parameters, advanced techniques of match analysis, psychological resilience among badminton players, and gender disparities in scientific research on badminton. Systematic reviews and meta-analysis could be used as effective instruments for synthesizing available information. As badminton continues to broaden its horizon with the sports science landscape, there is considerable scope for interdisciplinary and collaborative research initiatives that can deepen understanding and enhance the development of athletes and performance outcomes simultaneously.

REFERENCES

- 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>
- 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, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Adams, J., Potter, R., Pendlebury, D., & Szomszor, M. (2021). *Multi-authorship and Research Analytics* (pp. 325–346). Ural University. <https://doi.org/10.15826/b978-5-7996-3154-3.012>
- Akhmetovich, B. (2022). Development Of Physical Qualities Through The Sport Of Badminton.. *Zenodo (CERN European Organisation for Nuclear Research)*. <https://doi.org/10.5281/zenodo.7556725>
- Al Ardha, M. A., Nurhasan, N., Wiriawan, O., Purnomo, M., Wijaya, A., Arief, N. A., Wicanhyani, S., Putra, N. S. R. P., Bikalawan, S. S., Yang, C. B., & Putra, K. P. (2024). Analysis of badminton research trend in the last three decades: bibliographic analysis of Scopus journal database. *Retos*, 60, 129–139. <https://doi.org/10.47197/retos.v60.102822>
- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus is 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
- Blanca-Torres, J. C., Ortega, E., Nikolaidis, P. T., & Torres-Luque, G. (2020). Bibliometric analysis of scientific production in badminton. *Journal of Human Sport and Exercise*, 15(2). <https://doi.org/10.14198/jhse.2020.152.03>
- Hadi Karyono, T., Arzhan Hidayat, R., Ihsan, F., Susanto, N., Wijanarko, T., Vicente García-Jiménez, J., Eken, Ö., Latino, F., & Tafuri, F. (2024). Performance Enhancement Strategies For Badminton Athletes: A Systematic Review. *Retos*, 57, 379–389. <https://doi.org/10.47197/retos.v57.107124>
- Hanief, Y. N. (2021). Bibliometric analysis of sports studies in the “Journal Sport Area.” *Journal Sport Area*, 6(2), 263–274. [https://doi.org/10.25299/sportarea.2021.vol6\(2\).6845](https://doi.org/10.25299/sportarea.2021.vol6(2).6845)
- Henneken, E. A., & Kurtz, M. J. (2019). *Usage Bibliometrics*

- as a Tool to Measure Research Activity (pp. 819–834). Springer. https://doi.org/10.1007/978-3-030-02511-3_32
- Hou, J. (2017). Exploration into the evolution and historical roots of citation analysis by referenced publication year spectroscopy. *Scientometrics*, 110(3), 1437–1452. <https://doi.org/10.1007/s11192-016-2206-9>
- Krauskopf, E., Garcia, F., & Funk, R. (2017). Bibliometric analysis of multi-language veterinary journals. *Transinformação*, 29(3), 343–353. <https://doi.org/10.1590/2318-08892017000300011>
- Marvi, R., & Foroudi, M. M. (2023). *Bibliometric analysis* (pp. 43–54). Routledge. <https://doi.org/10.4324/9781003107774-4>
- Al Ardha, M. A., Nurhasan, N., Wiriawan, O., Purnomo, M., Wijaya, A., Arief, N. A., Wicanhyani, S., Putra, N. S. R. P., Bikalawan, S. S., Yang, C. B., & Putra, K. P. (2024). Analysis of badminton research trend in the last three decades: bibliographic analysis of Scopus journal database. *Retos*, 60, 129–139. <https://doi.org/10.47197/retos.v60.102822>
- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus is 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
- Blanca-Torres, J. C., Ortega, E., Nikolaidis, P. T., & Torres-Luque, G. (2020). Bibliometric analysis of scientific production in badminton. *Journal of Human Sport and Exercise*, 15(2). <https://doi.org/10.14198/jhse.2020.152.03>
- İri, R., & Ünal, E. (2024). Bibliometric Analysis Bibliometric Analysis of Research (1980-2023). *Abi Eyyan Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 10(2), 386–403. <https://doi.org/10.31592/aeusbed.1446738>
- Moisescu, P., & Codreanu, C. (2022). The role of coordinating capabilities in the formation of specific skills for the game of badminton. *InterConf*, 26(129), 413–425. <https://doi.org/10.51582/interconf.19-20.10.2022.044>
- Navarro, E., Navandar, A., Veiga, S., & Juan, A. (2021). Applied Biomechanics: Sport Performance and Injury Prevention. *Multidisciplinary Digital Institute*. <https://doi.org/10.3390/books978-3-0365-2609-6>
- Phomsoupha, M. (2019). *Physiological, neuromuscular, and perceived-exertion responses in badminton games*. *International Journal of Racket Sports Science*, 1(1). <https://doi.org/10.30827/digibug.57323>
- Shaharudin, M. I., Muhamed, A. M. C., & Yusof, H. A. (2024). Characteristics of Injuries Among Elite Badminton Players: A Systematic Review. In *Research Square*. *Research Square*. <https://doi.org/10.21203/rs.3.rs-4341034/v1>
- Stepper, B., Hecksteden, A., Stagge, H., Faude, O., & Donath, L. (2025). Systematic review on badminton injuries: incidence, characteristics and risk factors. *BMJ Open Sport & Exercise Medicine*, 11(1), e002127. <https://doi.org/10.1136/bmjsem-2024-002127>
- Wu, Q. (2017, January 1). *The Function Analysis and Skill Teaching of Badminton In College Physical Education*. <https://doi.org/10.2991/saeme-17.2017.50>
- Abian, P., Del Coso, J., Salinero, J. J., Gallo-Salazar, C., Areces, F., Ruiz-Vicente, D., Lara, B., Soriano, L., Muñoz, V., & Abian-Vicen, J. (2015). The ingestion of a caffeinated energy drink improves jump performance and activity patterns in elite badminton players. *Journal of Sports Sciences*, 33(10), 1042–1050. <https://doi.org/10.1080/02640414.2014.981849>
- Abian-Vicen, J., Castanedo, A., Abian, P., & Sampedro, J. (2013). Temporal and notational comparison of badminton matches between men's singles and women's singles. *International Journal of Performance Analysis in Sport*, 13(2), 310–320. <https://doi.org/10.1080/24748668.2013.11868650>
- Al-Khoury, A., Hussein, S. A., Abdulwhab, M., Aljuboori, Z. M., Haddad, H., Ali, M. A., Abed, I. A., & Flayyih, H. H. (2022). Intellectual Capital History and Trends: A Bibliometric Analysis Using Scopus Database. *Sustainability*, 14(18), 11615. <https://doi.org/10.3390/su141811615>
- Boesen, M. I., Boesen, A., Koenig, M. J., Bliddal, H., & Torp-Pedersen, S. (2006). Ultrasonographic Investigation of the Achilles Tendon in Elite Badminton Players Using Color Doppler. *The American Journal of Sports Medicine*, 34(12), 2013–2021. <https://doi.org/10.1177/0363546506290188>
- Chang, C., Chen, K., Cao, J., Wu, Q., & Chen, H. (2022). Analyzing the Effect of Badminton on Physical Health and Emotion Recognition on the account of Smart Sensors. *Applied Bionics and Biomechanics*, 2022, 1–13. <https://doi.org/10.1155/2022/8349448>
- Chin, M. K., Wong, A. S., So, R. C., Siu, O. T., Steininger, K., & Lo, D. T. (1995). Sport specific fitness testing of elite badminton players. *British Journal of Sports Medicine*, 29(3), 153–157. <https://doi.org/10.1136/bjsem.29.3.153>
- Everhart, B., Kernodle, M., Turner, E., Harshaw, C., & Arnold, D. (1999). Gameplay Decisions of University Badminton Students. *The Journal of Creative Behavior*, 33(2), 138–149. <https://doi.org/10.1002/j.2162-6057.1999.tb01043.x>
- Hong, Y., Wang, S. J., Lam, W. K., & Cheung, J. T.-M. (2014). Kinetics of Badminton Lunges in Four Directions. *Journal of Applied Biomechanics*, 30(1), 113–118. <https://doi.org/10.1123/jab.2012-0151>
- Mohd Jamali, M. N. Z., Selvanayagam, V. S., A Hamid, M. S., & Yusof, A. (2022). Prevalence, patterns and factors associated with injury: comparison between elite Malaysian able-bodied and para-badminton players. *The Physician and Sportsmedicine*, 50(4), 316–322. <https://doi.org/10.1080/00913847.2021.1930241>