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Exploring Trends in Student Motivation in Sport Education in the Digital Age: A Bibliometric Analysis of Ten Years of Research

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Abstract

The objective of this literature review is to examine ongoing research trends regarding student motivation for physical education in the digital era. Over the past decade, research has demonstrated a significant paradigm shift toward the integration of digital technologies, such as online learning applications, educational games, and social media platforms, in enhancing student motivation. Additionally, studies have shown an increasing interest in incorporating digital technologies such as big data analytics and adaptive learning into physical education. A bibliometric analysis was conducted on research concerning student motivation in physical education from 2013 to 2023. This study identified citation growth patterns, key authors, journals, institutions, and leading countries. VOSviewer was utilized for visualization and analysis. These findings provide valuable insights for researchers, educators, and readers to understand the growth of student motivation topics in physical education and to identify potential current research areas. Spain emerged as the most productive country, contributing 38 publications related to student motivation in physical education, while also being the most influential country with 503 citations. Future research is expected to continue exploring the potential of emerging technologies and addressing existing challenges to enhance the understanding of student motivation in physical education. By focusing on the development of innovative and efficient solutions, both academia and industry can effectively leverage this knowledge to improve student motivation and participation in physical education, thereby advancing the field as a whole. The integration of these technologies enhances student engagement and participation while expanding possibilities for personalized learning approaches and performance enhancement strategies.

Keywords: bibliometric analysis, research trends, sports education, student motivation

Introduction

Explanation

Over the past decade, physical education has undergone a significant transformation driven by advancements in digital technology. The integration of digital technologies, such as online learning applications, educational games, and social media platforms, has reshaped how students interact and stay motivated in the context of physical education (Swim et al., 2024). Studies have shown that the use of these technologies not only enhances student participation but also facilitates more personalized learning approaches (Ambele et al., 2022).

Student motivation is crucial to the success of physical education. Motivation theories, such as intrinsic and extrinsic motivation theory, highlight the importance of internal and external factors in encouraging students to participate in physical education (Tendinha et al., 2021). Recent studies suggest that digital technology can influence both types of motivation in complex and diverse ways (Efremova & Huseynova, 2021).

The digital era has brought significant changes to data collection and analysis methods in physical education. Big data analytics and AI have enabled researchers to identify trends and patterns in student motivation with greater precision (Jastrow et al., 2022). This study employs bibliometric analysis to explore research trends in student motivation in physical education over the past decade (2013–2023).

Objective

Bibliometric analysis is an effective method for understanding the research landscape in a specific field. By using tools such as VOSviewer, researchers can visualize networks of authors, institutions, and dominant keywords in the literature (Van Eck & Waltman, 2010; Cobo et al., 2011). The objective of this literature review is to examine ongoing research trends on student motivation for physical education in the digital era. In the context of this study, bibliometric analysis helps identify publication and citation patterns, providing insights into the development and direction of research in the field of student motivation in physical education.

Method

This study begins by applying bibliometric analysis to collect a large body of literature on student motivation in physical education. This bibliometric approach serves as a crucial instrument for mapping the breadth of scientific literature, similar to a systematic literature review, to ensure the accuracy and reliability of the information used and the results obtained (C. J. Chen et al., 2022).

One of the most commonly used tools in bibliometric analysis is VOSviewer. We utilized VOSviewer software to construct and visualize relationships between bibliometric sources, leading authors, and journals, providing deeper insights into specific publications, scholars, or journals (Anandh et al., 2021; Kirby, 2023). Additionally, we conducted a parallel investigation to analyze publication trends and evolution within a specific domain, offering further insights into research dynamics. Through bibliometric analysis, we also identified key factors influencing scientific production, contributing to a deeper understanding of research content and its development. The parameters and analytical methods used were adapted from previous bibliometric studies (C. J. Chen et al., 2022). The generated outputs include relevant keywords across scholarly works, author connections, document counts, and researchers' countries of origin.

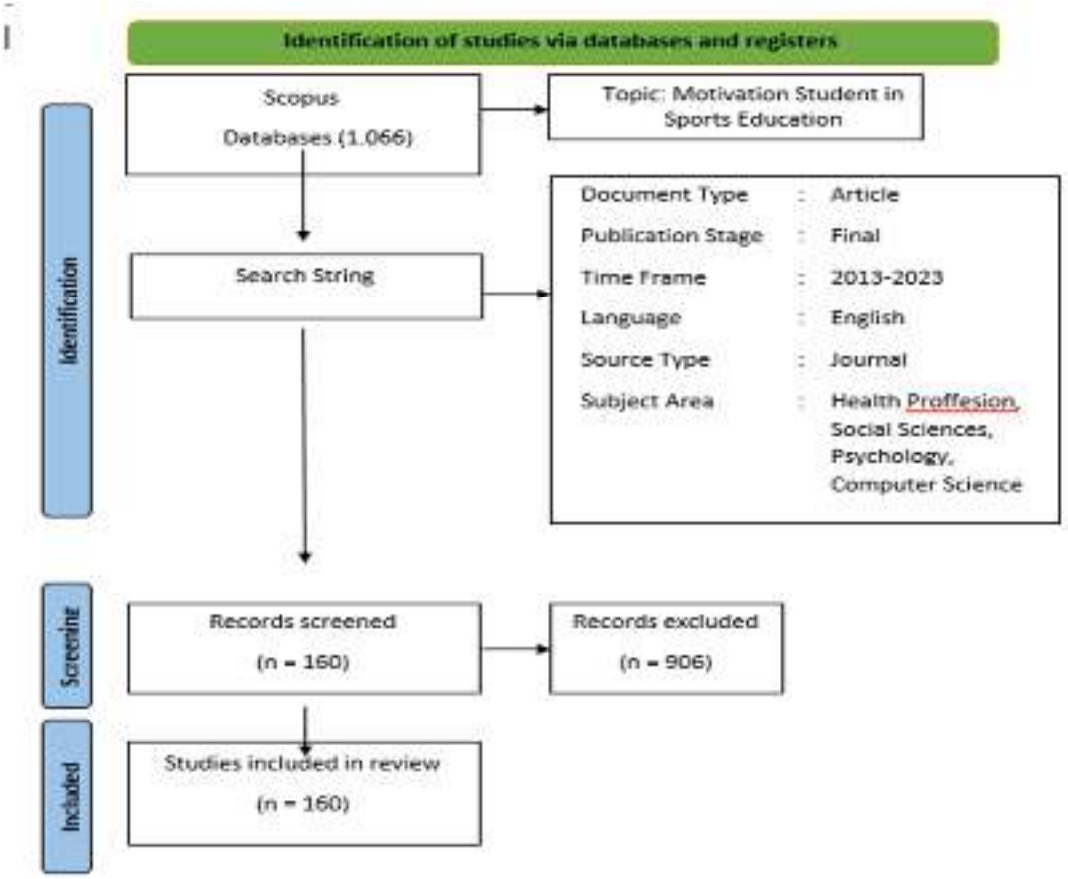
To achieve the research objectives and extend beyond the specified parameters, we conducted a structured literature review to ensure logical consistency in formulating our understanding of student motivation in physical education. Our analysis follows an approach supported by bibliometric processes in terms of clustering perspectives through bibliographic connections, focusing on the most recently cited documents on this topic. Additionally, we explored methods for transferring bibliometric details from documents into an Excel spreadsheet format. The final outcome of this analysis is a literature review that provides recommendations for future research based on bibliometric analysis trends.

Search Engines

For our systematic literature analysis focusing on student motivation in sports education, we selected the Scopus database through Elsevier as the primary source for bibliographic research. On June 4, 2024, we explored the Scopus database with the aim of collecting journals and articles. Within the bibliographic repository, which encompasses over 1,000 multidisciplinary subjects, we conducted a bibliometric study centered on similarity visualization methods. To enhance the relevance of our data, we refined our search to specifically focus on the topic of student motivation in sports education, extracting relevant information such as citations, bibliographic details, abstracts, keywords, findings, and other related data.

Figure 1

PRISMA Search and Filtering Strategy Flowchart



Search Strategy

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topic of student motivation in physical education, extracting relevant information such as citations, bibliographic details, abstracts, keywords, findings, and other related data.

TITLE-ABS-KEY (motivation AND student AND in AND sport AND education) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "PSYC") OR LIMIT-TO (SUBJAREA , "HEAL") OR LIMIT-TO (SUBJAREA , "COMP")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (EXACTKEYWORD , "Motivation") OR LIMIT-TO (EXACTKEYWORD , "Physical Education") OR LIMIT-TO (EXACTKEYWORD , "Students") OR LIMIT-TO (EXACTKEYWORD , "Sport") OR LIMIT-TO (EXACTKEYWORD , "Physical Activity")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all")).

Time period

This study involved a comprehensive examination of the literature background, including approximately 1,066 articles over a ten-year period from 2013 to 2023. By limiting the search to the last ten years, the research avoids outdated conclusions or findings that may be less relevant to current physical education practices. This approach ensures that the analysis remains up-to-date, accurate, and serves as a valid foundation for further research recommendations. Another reason for selecting this time frame is that research on student motivation in physical education gained significant traction during this period, with a notable increase in related studies in 2023.

Eligibility criteria

The eligibility criteria used in this study include several aspects, such as document type, publication stage, language, and data sources. The selected articles must be journal articles, in their final publication stage, within the ten-year

period from 2013 to 2023, written in English, and originating from relevant disciplines such as Health Professions, Social Sciences, Psychology, and Computer Science. Articles that do not meet these criteria were excluded from the analysis.

Data refinement (data selection procedure)

The data screening process in this study was carried out systematically to ensure that only relevant literature meeting the established criteria was included in the analysis. The selection process involved several stages, beginning with the initial identification of articles aligned with the research topic. Next, a screening process was conducted by evaluating the relevance of articles based on abstracts and relevant keywords. Articles that did not meet the inclusion criteria were excluded from further analysis. Following this stage, a final selection was performed by reviewing the full content of the articles to ensure their alignment with the research focus. This process aimed to obtain high-quality data that could support a comprehensive analysis.

Data synthesis

Citation Network Analysis to uncover current trends in research on student motivation in physical education. Citation Network Analysis, a review method aimed at mapping the scholarly organization of a field through the analysis of citation patterns, has been the central focus of our study (C. D. McLaren & Bruner, 2022).

We collected metadata from the Scopus journal database using relevant keywords such as "motivation," "physical education," "sports," "students," and "physical activity." This metadata included information on article titles, authors, journals, publication years, and the number of citations received by each article. The data was organized and stored using Microsoft Excel 16.63.1 for further analysis. We processed this data using VOSviewer 1.6.18, a software tool that enables the visualization and analysis of citation networks and relationships between topics in scientific literature (Rodriguez-Marin et al., 2022).

Trough bibliometric analysis, we were able to track events and trends in scientific publications related to student motivation in physical education, as well as identify recurring citation patterns among related works (Jeong et al., 2020). Citation network analysis allowed us to understand the structure and dynamics of collaboration among authors, institutions, and countries in this field of research.

One of the main advantages of using VOSviewer is its ability to evaluate bibliometric data from major databases such as Scopus and Web of Science. With its advanced technology, VOSviewer enables us to gain deeper insights into the underlying patterns of scientific literature on student motivation in physical education (Perdima et al., 2023). This visualization aids in presenting data intuitively and enhances our understanding of the complexity of this research field.

Research Findings

Descriptive findings (statistics)

The research process began with the identification of data sources, where relevant articles were collected from the Scopus database. In this stage, a total of 1,066

initial articles related to the topic "Motivation Student in Sports Education" were found. To ensure that only relevant articles were included in this study, an initial screening process was conducted by applying predefined search strings. These search strings were constructed based on key terms related to the research topic, allowing

Figure 2
Annual Total Publication Distribution

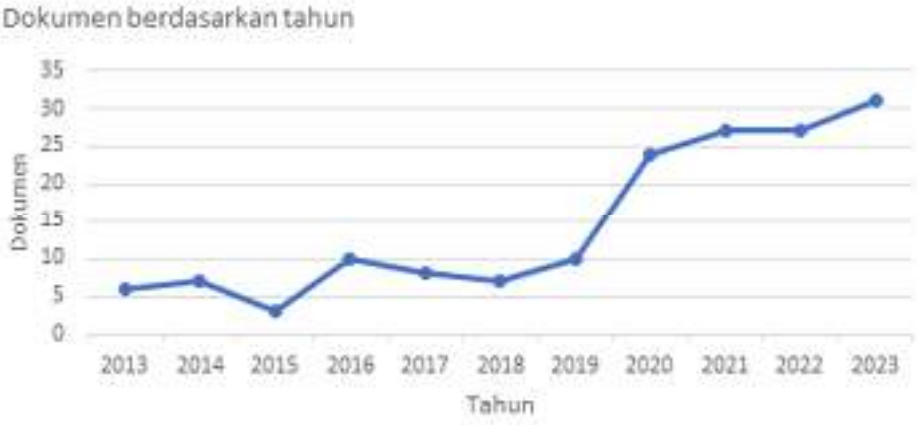
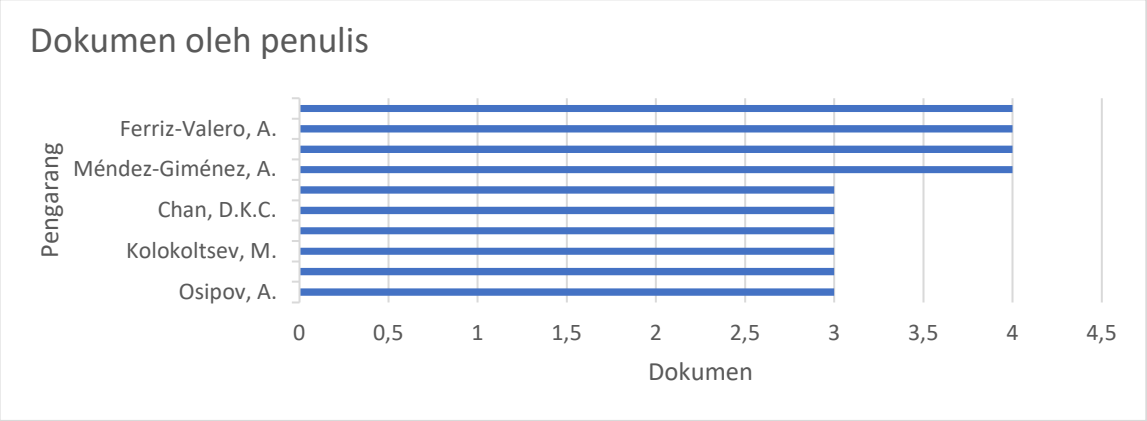


Figure 3
Author Production Over Time



for the elimination of articles that did not align with the study's focus from the outset.

Next, the screening stage was conducted on all collected articles. This process aimed to select articles based on predetermined inclusion and exclusion criteria. The inclusion criteria included document type (only final-published journal articles), publication timeframe (2013–2023), publication language (English), and relevant academic fields, including Health Profession and Social Sciences, psychology, and Computer Science. Articles that did not meet these criteria were excluded from the analysis. Out of the 1,066 articles examined, a total of 906 articles were eliminated for failing to meet the selection criteria.

Table 1
The Ten Most Cited Articles According to Scopus

No	Judul Dokumen	Penulis	Tahun	Total Kutipan
1	The Concept of Mental Toughness: Tests of Dimensionality, Nomological Network, and Traitness	Gucciardi, D.F., Hanton, S., Gordon, S., Mallett, C.J., Temby, P.	2015	232
2	Different combinations of perceived autonomy support and control: identifying the most optimal motivating style	Haerens L., Vansteenkiste M., De Meester A., Delrue J., Tallir I.., Vande Broek G., Goris W., Aelterman N.	2018	113
3	Impact of exergames on physical activity and motivation in elementary school students: A follow-up study	Sun, H.	2013	97
4	Sport education model versus traditional model: Effects on motivation and sportsmanship | Modelo de educación deportiva versus modelo tradicional: Efectos en la motivación y deportividad	Méndez-Giménez, A., Fernández-Río, J., Méndez-Alonso, D.	2015	78
5	Perceived physical competence towards physical activity, and motivation and enjoyment in physical education as longitudinal predictors of adolescents' self-reported physical activity	Timo, J., Sami, Y.-P., Anthony, W., Jarmo, L.	2016	76
6	Need-supportive professional development in elementary school physical education: Effects of a cluster-randomized control trial on teachers' motivating style and student physical activity	Escriva-Boulley, G., Tessier, D., Ntoumanis, N., Sarrazin, P.	2018	70
7	The impact of nonlinear pedagogy on physical education teacher education students' intrinsic motivation	Moy, B., Renshaw, I., Davids, K.	2016)	65
8	Sport education model and self-determination theory: An intervention in secondary school children pemain bola basket	Cuevas, R., García-López, L.M., Serra-Olivares, J.	2016	54
9	An analysis of weight perception and physical activity and dietary behaviours among youth in the COMPASS study	Patte, K.A., Laxer, R.E., Qian, W., Leatherdale, S.T.	2016	37
10	Experiences matter: Positive emotions facilitate intrinsic motivation	Løvoll, H.S., Røysamb, E., Vittersø, J.	2017	34

These exclusions included articles from non-academic sources, those irrelevant to the specified fields of study, non-English publications, or articles published outside the designated timeframe.

After a rigorous selection process, a total of 160 articles were retained for further analysis in this study. These selected articles were deemed highly relevant to the research objectives, allowing for a deeper understanding of the factors influencing student motivation in sports education. The final outcome of this stage ensured that only high-quality studies aligned with the research scope were included in the subsequent analysis.

Schematic map and trend

From 2013 to 2023, researchers from various countries have published articles related to student motivation in sports education. The overall publication trend on this topic from 2013 to 2023 is illustrated in Figure 2. Analysis based on the Scopus database indicates that in 2013, a total of six articles were published.

In 2014, the number of published articles increased to seven. However, in 2015, the number declined to three articles. In 2016, a significant increase occurred, with the number of publications reaching ten articles. In 2017, the number of published articles slightly decreased to eight, followed by a slight decline to seven articles in 2018. Nevertheless, in 2019, the number of publications rose again, with ten articles published.

significant increase in publications, reaching 24 articles. This upward trend continued in 2021 and 2022, where the number of publications peaked at 27 articles each year. In 2023, the number of publications continued to rise, reaching 31 articles. This trend indicates a growing interest in research on student motivation in sports education.

Overall, this study highlights the rising attention to student motivation in sports education, especially in recent years. The increase in the number of publications reflects the importance of this topic in modern education and emphasizes the need for more effective strategies to enhance student motivation in sports education.

Tabulation and summarizing the findings

Top Authors and Most-Cited Publications

Figure 3 illustrates that among the ten most productive researchers in the field of student motivation in sports education, several scholars have made significant contributions through their publications. Baena-Morales, S., Ferriz-Valero, A., Moreno-Murcia, J.A.,

and Méndez-Giménez, A. have each contributed four articles, offering valuable insights into student motivation in sports education.

They are followed by Aunola, K., Chan, D.K.C., Fernández-Río, J., Kolokoltsev, M., Kudryavtsev, M., and Osipov, A., who have each made important contributions with three articles that highlight key aspects of this research area. These researchers demonstrate persistence and dedication to the study of student motivation in sports education. Their contributions enrich the literature and provide new perspectives on how motivation can be enhanced in the context of sports education. Their work not only helps in understanding current trends but also lays the foundation for future research in this field.

Table 1 presents the top 10 authors with the most influential articles on student motivation in sports education in the digital era. The first position is held by an article published by Gucciardi et al., which has received a total of 232 citations. The second position is occupied by an article published by Haerens et al., with a total of 113 citations. The third position is taken by an article published by Sun, with a total of 97 citations.

In the fourth position, an article by Méndez-Giménez et al. has accumulated 78 citations. Meanwhile, sequentially, the articles published by

Table 2. Source: Scopus Database, Country Distribution Based on Citations, Documents, and Total Link Strength

Peringkat	Negara	Kutipan	Dokumen	Kekuatan tautan total
1	Spain	503	38	10
2	Australia	499	12	18
3	United Kingdom	393	16	19
4	United States	323	13	14
5	Finland	277	9	14
6	Chile	81	3	3
7	France	74	3	2
8	Norway	55	5	2
9	Ukraine	54	8	2
10	China	48	15	8

Timo et al. have received 76 citations; Escriva-Boulley et al., 70 citations; Moy et al., 65 citations; Cuevas et al., 54 citations; Patte et al., 37 citations; and Løvoll et al., 34 citations. This demonstrates how several authors have made significant contributions to the research on student motivation in sports education. Their work has shaped academic discussions and provided valuable insights for further studies in this field.

Table 1 presents the top 10 authors whose articles have had the greatest impact on research related to student motivation in sports education in the digital era. The first position is held by an article published by

Gucciardi et al., which has received a total of 232 citations. The second position is occupied by an article published by Haerens et al., with a total of 113 citations. The third position is taken by an article published by Sun, with a total of 97 citations.

In the fourth position, an article by Méndez-Giménez et al. has accumulated 78 citations. Meanwhile, sequentially, the articles published by Timo et al. have received 76 citations; Escriva-Boulley et al., 70 citations; Moy et al., 65 citations; Cuevas et al., 54 citations; Patte et al., 37 citations; and Løvoll et al., 34 citations.

This data highlights how certain authors have made significant contributions to the field, shaping the discourse and advancing the understanding of student motivation in sports education. That have significantly contributed through their research, providing important insights into understanding student motivation in sports education. These articles serve as a crucial foundation for further research and the development of more effective strategies to enhance student motivation in the context of sports education.

Citation and Distribution Network by Country

Based on the number of citations received by published articles, Table 2 lists the top 10 countries. The country with the highest number of citations is Spain, with a total of 503 citations. Australia ranks second with 499 citations, followed by the United Kingdom in third place with 393 citations. The United States and Finland occupy the fourth and fifth positions with 323 and 277 citations, respectively. Meanwhile, Chile, France, Norway, Ukraine, and China have a total of fewer than 100 citations each.

Governments in industrialized countries can support researchers working in sports education by providing funding and additional data to analyze student motivation in sports education. The top five countries in this study are developed nations.

Illustrated in Figure 4. Darker colors indicate a higher number of citations from published articles. The majority of articles were published in Spain and Australia. According to these statistics, most publications were from Spain, with a total of 503 citations. Lighter colors indicate fewer citations from published articles. This suggests that research trends and breakthroughs in student motivation in sports education are significantly influenced by publications from Spain.

There are three main categories of collaboration networks: from researcher to student, from institution to institution, and from country to country. For this publication, we utilized the author collaboration feature in VOSviewer to generate a collaboration network with a minimum of one document and one citation, as shown in Figure 5. The number of articles submitted from each; country is represented by the size of the node in the graph; collaboration between countries is represented by lines

different groups are distinguished by colors, and the similarity of research topics is indicated by the distance between nodes. Our observations indicate that the international collaboration network in the field of student motivation in sports education is divided into nine clusters, with major countries as follows: Cluster #1 – United Kingdom, Hungary, Romania, Saudi Arabia, Luxembourg,

Figure 4

Country-Based Scientific Production in the Context of Student Motivation in Sports Education

Table 3. Visualization of Network Articles and Sports Biomechanics Source: Processed by the authors using VOSviewer.

Cluster	Item	Color	Percentage	Total
Cluster 1	Academic Performance, amotivation, confirmatory factor analysis, extrinsic motivation, feeling, internal consistency, passion, physical literacy, pressure, reliability, secondary school, self esteem, structural equation modeling, student athlete, validity	Red	25%	15
Cluster 2	Autonomous motivation, autonomy support, physcial comptence, positive emotion, psychological need, secondary school student, sport injury prevention, sport injury prevention behavior, sports injury, sportsmanship	Green	16%	10
Cluster 3	Achievment motivation, boxing, life satisfaction, natural science, personality, psychological gender, sport science, sports dance, young adult	Blue	15%	9
Cluster 4	Accuracy, college, skill, speed, sports science, sports skill	Yellow	10%	6
Cluster 5	Badminton, healthy habit, learning task, situational interest, video game	Purple	8%	5
Cluster 6	Body, indicator, motor test, pedagogical experiment, young student	Light blue	8%	5
Cluster 7	College student, commitment, participation motivation, sports behavior motivation	Orange	7%	4
Cluster 8	Athlete, long jump, physyical fitness, positive impact	Brown	7%	4
Cluster 9	Effectivenes, sports volunteering, student teacher	Pink	4%	3
Total			100%	61

Slovakia; Cluster #2 – China, Kazakhstan, Russia, South Korea, Czech Republic; Cluster #3 – Spain, Norway, Mexico, Chile, Algeria; Cluster #4 – Finland, United States, Hong Kong, Greece; Cluster #5 – Brazil, Poland, Portugal, Ukraine; Cluster #6 – Australia, Sri Lanka, Vietnam; Cluster #7 – Indonesia and Malaysia; Cluster #8 – Austria and Germany; and Cluster #9 – France and India.

Characteristics of Internal Publications

"Keywords serve as important indicators of an article's content, and when two or more keywords appear together in the same article, they are referred to as co-keywords" (Li et al., 2016; Su & Lee, 2010). In the field of scientific knowledge, analyzing co-keywords can play a crucial role in identifying research hotspots and tracking shifts in research boundaries (C. Chen et al., 2014; Lee & Su, 2010). In this study, we utilized the co-keyword function in VOSviewer to generate a co-keyword graph, using the fractional counting method with a minimum occurrence of two for keywords, and author keywords as the unit of analysis. Each cluster has been categorized and visualized in Table 3 and Figure 6 based on its clustering.

Self-Esteem, Psychological Need, Achievement Motivation, Skill, Situational Interest, Indicator, College Student, Athlete, and Effectiveness are all displayed in the hierarchical map in Figure 7, illustrating the interdisciplinary nature of research on student motivation in sports education. With the term "Self- Esteem" appearing in 25% of the publications, it is evident that this aspect has garnered significant academic interest. Additionally, 16% and 15% of these publications include the terms "Psychological Need" and "Achievement Motivation," indicating a growing focus on this area. The importance of psychological factors in enhancing student motivation becomes more apparent with the presence of terms such as "Skill" and "Situational Interest" in 10% and 8% of the publications, respectively, highlighting that a deep

understanding of students' psychological needs and skill development is a key objective of this research. Furthermore, the terms "College Student" and "Athlete" appear in 7% of the publications, while "Effectiveness" is found in 4%, suggesting that this research also emphasizes specific populations and the effectiveness of interventions in sports education.

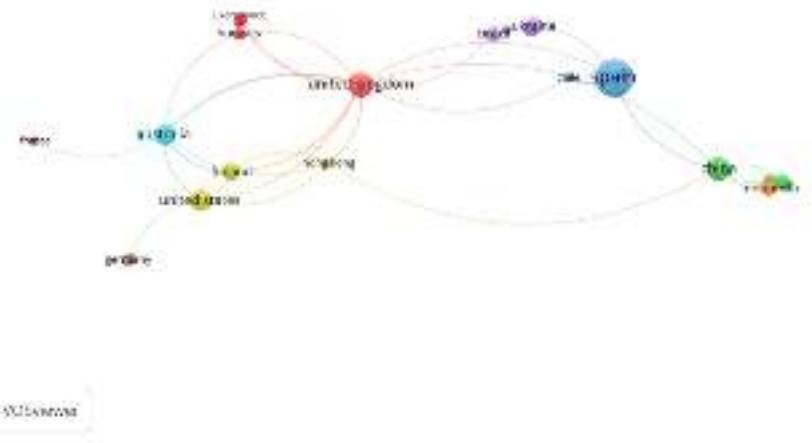
Discussion

Summary of Evidence

This study highlights the impact of the ten most cited articles in research on student motivation in sports education over the past decade. Using VOSviewer software, this study identifies key trends in the field, including frequently cited journals, authors, and topics. The analysis results indicate that these articles have significantly influenced the development of theories and practices aimed at enhancing student motivation. Several key topics frequently discussed in these articles include the use of digital technology in learning, student-centered instructional methods, and the implementation of educational games to enhance student engagement. Additionally, this study reveals that the coverage of the Scopus database has limitations in including articles published before 2013, which may affect the analysis results.

Interpretation

Figure 5. Citation Network Visualization by Country
Source: Scopus Database



A high number of citations for certain articles indicates that research on student motivation in sports education holds significant academic appeal and continues to evolve. The findings of this study suggest that innovations in instructional methods, such as the use of artificial intelligence and project-based approaches, play a crucial role in enhancing student engagement and motivation. However, these results also reflect a bias inherent in the Scopus database, which only includes selected articles and does not fully represent the global research landscape. Therefore, the interpretation of these findings should consider the limitations of the data coverage used. Further analysis incorporating a more diverse range of sources is necessary to gain a broader perspective on research trends and impacts in this field.

Strengths and Limitations

This study has several strengths, particularly in its bibliometric analysis approach, which enables the identification of patterns and trends in research on student motivation in sports education. The use of VOSviewer software facilitates the identification of relationships between articles, authors, and frequently cited topics, providing deeper insights into the dynamics of research in this field. However, this study also has certain limitations, such as its reliance on the Scopus database, which may exclude important articles from other sources. Additionally, the study only considers articles published after 2013, potentially omitting older yet still relevant research from the analysis. For future research, it is recommended to incorporate multiple databases to ensure broader and more representative coverage, as well as to include expert reviews to validate the quality of the findings.

Conclusion

The field of student motivation in sports education has experienced significant growth between 2013 and 2023, reflecting an increasing interest in understanding the factors that influence student engagement and motivation in physical activity and sports. The analysis of publication and citation trends during this period indicates a consistent rise in scientific exploration

Figure 6
Co-occurrence Network of Student Motivation in Sports Education (Author Keywords)
Source: Processed by the Authors Using VOSviewer

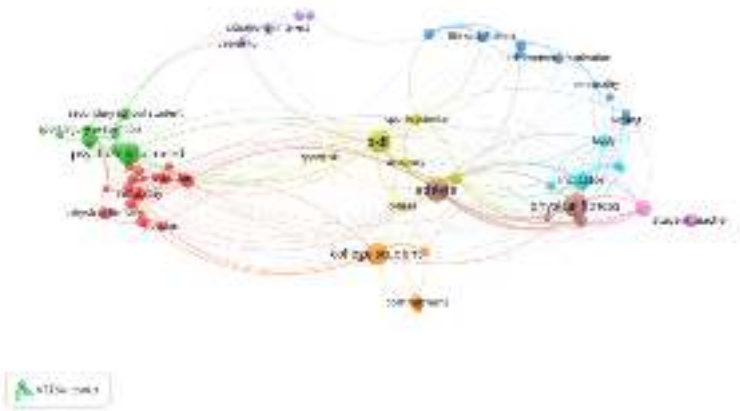
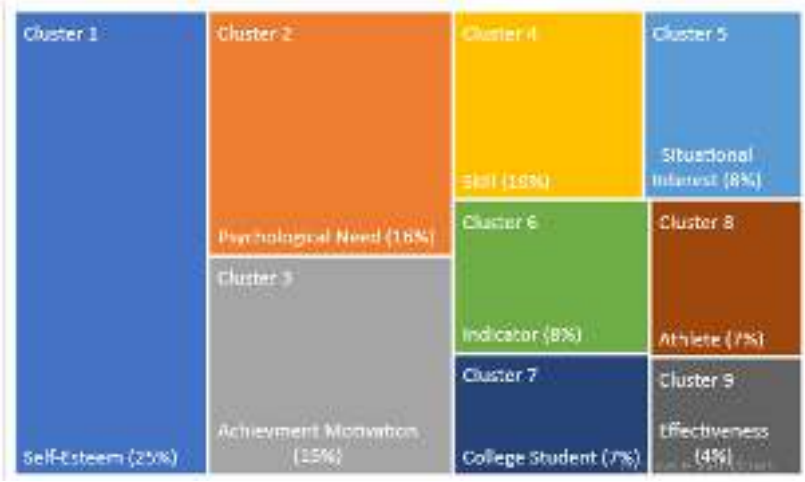


Figure 7. Dominant Themes in Sports Biomechanics Studies. The data were processed by the author using Microsoft Excel



within this domain. Citations in the Scopus database suggest that the top 10 most cited articles likely had a significant impact on subsequent peer-reviewed literature. Several classic and highly cited articles published in this field's leading journals have made substantial contributions to advancing knowledge on student motivation and sports education. Spain has emerged as one of the major contributors, with 38 relevant publications, demonstrating its sustained commitment to advancing knowledge in this area. Furthermore, Spain is the most influential country, with 503 citations, highlighting the global recognition of research originating from the country. This information provides valuable insights for researchers and practitioners in navigating collaborative frameworks, shaping future research directions, and identifying key experts in the field. The author keyword network analysis has emphasized recent developments and ongoing trends in student motivation in sports education, strengthening our understanding of active research areas and offering insights into the future of the field. With increasing interdisciplinary collaboration, student motivation in sports education remains an exciting topic for academics and practitioners, offering boundless opportunities for growth and innovation.

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