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TRENDS AND DEVELOPMENTS IN PHYSICAL EDUCATION FOR DISABILITIES: A BIBLIOMETRIC ANALYSIS

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Abstract. Research in the field of Physical Education for Disabilities has experienced dynamic development. This study examines trends and advancements in physical education for disabilities through a bibliometric analysis approach. Analyzing a total of 907 articles from the period 2013 to 2023, the study aims to understand the evolution, focus, and contributions of research in this domain. Through bibliometric analysis of data obtained from the Scopus database, we investigated scientific publications related to physical education for disabilities. The use of VOSviewer software facilitated the visualization of collaboration networks among researchers, institutions, and research topics, providing deeper insights into the structure and dynamics of this research domain. This bibliometric method offers insights into research trends over time, identifies key topics of interest, and highlights contributions from various leading institutions and researchers in the field. The study underscores the importance of ongoing research and collaboration in developing physical education for disabilities. Additionally, the study includes a systematic literature review to map potential future research areas based on current trends, offering comprehensive guidance for upcoming research in this field.

Keywords: Disabilities, Bibliometric Analysis, Inclusive Education, Physical Education, Research Trends,

I. INTRODUCTION

Sports education for individuals with disabilities is a crucial field in education, given its significant role in the physical, mental, and social development of individuals with disabilities (Rojo-Ramos et al., 2023). Throughout various stages of life, individuals with disabilities face unique challenges that can be mitigated with appropriate sports education (Ockta et al., 2024; Umar et al., 2023; Yuliana et al., 2023). Physical activity through sports helps them develop gross and fine motor skills, improve cardiovascular health, and establish sustainable healthy lifestyle patterns (Al Zaki et al., 2023; Amin et al., 2023; Hambali et al., 2024). Research indicates that regular participation in physical activities not only enhances physical health but also has a positive impact on the mental and social well-being of individuals with disabilities (Haris et al., 2024; Likardo et al., 2023; Umar et al., 2023). Sports education provides opportunities for regular physical activity, helps reduce social isolation, and boosts self-confidence and the ability to interact with their surroundings (Arini et al., 2019; Fitri et al., 2022; Qi & Wang, 2018). Therefore, integrating sports

into the basic education curriculum for individuals with disabilities becomes highly relevant and crucial (Chinta et al., 2024; Illahi et al., 2023; Insani et al., 2024; Pitnawati et al., 2023).

Research in the field of physical education for individuals with disabilities has undergone significant and dynamic developments (Al Zaki et al., 2023; Illahi et al., 2023; Insani et al., 2024; Khani et al., 2024; Nusri et al., 2024; Safitri et al., 2024). One example is that physical education also plays a role in the development of social and emotional skills for individuals with disabilities (Bluechard & Shephard, 1995; Cañabate et al., 2018). Through sports, they learn about teamwork, discipline, leadership, and how to handle both defeat and victory. This character education is crucial in shaping resilient individuals who can adapt to various situations (Cureton, 2022; Fatmawati & Nurhastuti, 2018; Frey et al., n.d.; Mubarak & Syamsi, 2019). Other research confirms that sports and physical activities contribute to moral and emotional development of individuals with disabilities, all of which are essential components of holistic education (Alhumaid, 2023; Fitri et al., 2023; Rojo-Ramos et al., 2022). Regular participation in physical activities can enhance the physical and mental

health of individuals with disabilities, as well as positively contribute to their academic achievements (Dimiyati et al., 2022; McMillan & Jarvis, 2013; Moon & Kong, 2022). Besides the physical benefits, physical education significantly contributes to the cognitive development of individuals with disabilities (Fitri et al., 2021; Kashi et al., 2023; Zhu et al., 2023). Structured and regular physical activity has been shown to improve cognitive functions such as attention, memory, and problem-solving skills (Özkan & Kale, 2023; Vázquez, 2018; Widajati & Mahmudah, 2022). Studies have found a positive relationship between physical activity and academic performance, indicating that physically active individuals with disabilities tend to have better learning abilities (Marcaida et al., 2022; McKenzie, 2007; Rimmer et al., 2017). However, not all consequences of physical education are beneficial. The excessive growth of physical education and the lack of planning over the last few decades of the twentieth century have led to some educational institutions experiencing negative impacts from their sports programs, challenging their capacity for sustainability (Barker et al., 2023; Brown, 2014). In-depth research is needed to identify frequently researched and underexplored topics in the context of physical education to gain a comprehensive understanding of dominant research focuses and less-explored aspects in this field (Adrizal et al., 2024; Arfi et al., 2024; Iqbal et al., 2024; Oktadinata et al., 2024).

Bibliometric analysis has emerged as a leading method for comprehensively investigating trends, patterns, and advancements in the scientific literature (Jangid et al., 2023; Pellegrini & Caputo, 2020). In the realm of physical education, bibliometric analysis provides valuable insights into research trajectories, key themes, and collaborations among scholars. The primary focus of this study is to conduct a bibliometric analysis of research related to physical education and associated topics between 2013 and 2023. This study aims to examine the network of occurrences containing keywords selected by the authors, analyze the patterns of publication and citation growth, identify leading papers, top authors, influential journals, and active countries in this field. Through these findings, researchers and readers can monitor the development and expansion of subjects related to physical education, as well as understand current and emerging areas of study.

II. METHODS

We commenced our investigation by utilizing bibliometric analysis to gather a substantial amount of literature related to physical education in schools for disabilities. Bibliometric analysis serves as a valuable tool for mapping extensive scholarly literature, akin to systematic literature reviews, ensuring the quality and accuracy of the information utilized and the outcomes produced (González-Torres et al., 2020). By adopting this approach, researchers can gain a comprehensive understanding of the knowledge landscape within this specific domain, as well as identify trends, patterns, and relationships among existing research (Tang et al., 2018).

Bibliometric analysis enables researchers to explore collaboration networks among authors, countries, and research topics, which in turn can reveal underlying relationships between these entities (H. Chen et al., 2023). For our bibliometric analysis focused on physical education in schools for disabilities, we selected Elsevier's Scopus database as the primary source for bibliographic research on this topic. This involved a comprehensive background analysis covering approximately 904 articles over more than 10 years, from 2013 to 2023. Our exploration of the Scopus database on June 15, 2024 aimed to gather journals and articles. In a bibliographic repository encompassing over 2000 multidisciplinary subjects, we conducted a bibliometric study centered on visualization methods of similarity. Using a science mapping approach, we delved into existing literature, analyzing bibliographic data extracted from various documents in this field. (Garrigos-Simon et al., 2018)

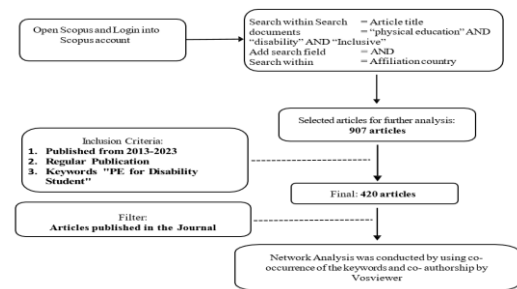


Fig. 1. Document Article Filtering Process in Scopus

To enhance the relevance of our data, we narrowed our search to specifically focus on the topic of sports education and disabilities, extracting relevant information such as citations, bibliographic details, abstracts, keywords, findings, and other related data. We utilized keywords such as "Physical Education" and "Disability Student", applying filters aligned with practices of sports education in schools for disabilities. Our search concentrated solely on article titles to ensure the inclusion of reports directly relevant, as broad searches may miss explicitly related studies. The specific keywords used in our search are outlined below.

TITLE-ABS-KEY (physical AND education AND inclusive AND disability AND disabilities) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))

III. RESULTS

1) Document Published

From 2013 to 2023, researchers from 101 countries have published articles related to sports technology for disabilities. The overall publication trend in physical education for disabilities from 2013 to 2023 is depicted in Figure 2. Analysis based on the Scopus database shows that in 2013, there were 21 published articles. In 2014, the number of published articles increased to 25. In 2015 and 2016, there

was a slight decrease in the number of published articles to 24 and 18, respectively. However, in 2017 and 2018, there was an increase in the number of publications, with articles reaching 28, 40, and 47 in 2019. In 2020, the number of articles decreased again to 40. The upward trend continued in 2021 and 2023 with 54, 60, and 73 articles. Thus, there was a significant increase in publications in 2021 and 2023, indicating a growing interest in research on Physical Education for Disabilities.

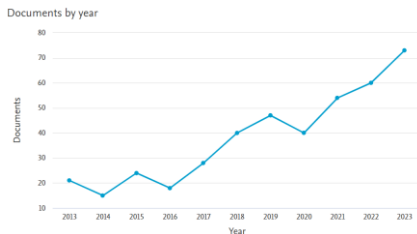


Fig. 2. Document Published on Scopus Databased

In Table 1, the top 10 authors with the most influential articles in research on Physical Education for Disabilities are listed. The first position is held by the article published by Moriña et al., with a total of 220 citations. The second position is occupied by the article published by Shields et al., with 208 citations. The third position is held by the article published by Haegele et al., with 125 citations. Collins et al.'s article ranks fourth, with a total of 105 citations. Meanwhile, articles by Vaz, Elbeltagi, Halstead, Schwab, Haegele, Hutzler and Flewitt have total citations less than 100, in descending order. This table summarizes the most influential articles and their respective citation counts in the field of Physical Education for Disabilities, providing insights into the impactful research contributions by various authors.

Table 1. Top 10 articles with the most citations on Scopus

No	Document title	Authors and Year	Citations Total
1	Inclusive education in higher education: challenges and opportunities	(Moriña, 2017)	220
2	Perceived barriers and facilitators to participation in physical activity for children with disability: A qualitative study	(Shields & Synnot, 2016)	208
3	Perspectives of Students with Disabilities Toward Physical Education: A Qualitative Inquiry Review	(Haegele & Sutherland, 2015)	125
4	'Bringing everyone on the same journey': revisiting inclusion in higher education	(Collins et al., 2019)	105
5	Factors associated with primary school teachers' attitudes towards the inclusion of students with disabilities	(Vaz et al., 2015)	104
6	'Happy and a bit nervous': The experiences of children with autism in physical education	(Elbeltagi et al., 2023)	97
7	Parents' attitudes towards inclusive education and their perceptions of inclusive teaching practices and resources	(Schwab, 2019)	89
8	Inclusion Illusion: Questioning the Inclusiveness of Integrated Physical Education	(Haegele, 2019)	87
9	Attitudes and self-efficacy of physical education teachers toward inclusion of children with disabilities: a narrative review of international literature	(Hutzler et al., 2019)	86
10	Touching the virtual, touching the real: iPads and enabling literacy for students experiencing disability	(Flewitt et al., 2014)	66

2) Author Analysis

Figure 3 illustrates that among the 10 most productive researchers in the field of Physical Education for Disabilities, several researchers have

made significant contributions through their publications. Table 2 showed, Haegele, J.A., Alhumaid, M.M., Wang, L., Maher, A.J., and Li, C., have all made valuable contributions with twelve to five articles providing insights into sports education. They are followed by Opoku, M.P., Reina, R., Adsuar, J.C., Bastos, T., and Blavt, O., who have made important contributions with four to five articles highlighting critical aspects in research on Physical Education for Disabilities. However, in terms of citation counts, the order of authors shifts with Haegele, J.A., having the highest citations, showcasing impressive productivity levels with his twelve articles. The researchers reflect their commitment to innovation and advancing knowledge in the field of Physical Education, particularly for school disabilities.

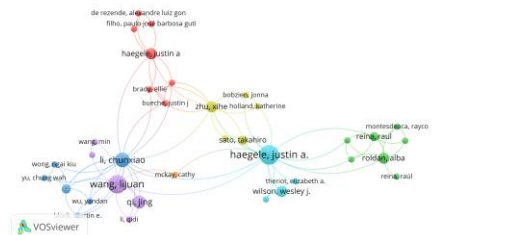


Figure 3. Productive Authors based on Documents and Citation

Table 2. Authors, documents and citations.

Rank	Author	Doc.	Cite	Rank	Author	Doc.	Cite
1	Haegele, J.A.	12	303	6	Opoku, M.P.	5	14
2	Alhumaid, M.M.	8	125	7	Reina, R.	5	36
3	Wang, L.	8	38	8	Adsuar, J.C.	4	36
4	Maher, A.J.	6	45	9	Bastos, T.	4	48
5	Li, C.	5	55	10	Blavt, O.	4	11

3) Country Analysis

Table 3 lists the top 10 countries based on document production in the field, with the United States leading at 214 documents, followed by Spain with 118, and the United Kingdom, Australia, and Germany each contributing 116, 94, and 75 documents, respectively. Table 3 reveals the top 10 countries by citations, where Canada ranks first with 576 citations, followed by the United States with 392, and Australia with 303 citations. Figure 4 illustrates the collaboration network distribution, highlighting the United States as the most central country, followed by China, Canada, Spain, and Australia. These nations exhibit strong academic collaboration and significant presence in the field, reflecting their leadership and impact in research on Physical Education for Disabilities.

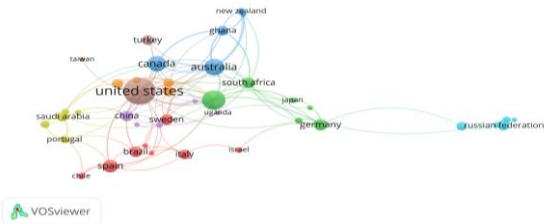


Fig 4. Most productive countries based on documents and citations

Table 3. Country, documents and citations.

Rank	Author	Doc.	Cite	Rank	Author	Doc.	Cite
1	United States	92	1064	6	Germany	17	266
2	United Kingdom	48	540	7	Brazil	16	160
3	Australia	37	816	8	China	14	217
4	Canada	30	276	9	South Africa	14	197
5	Spain	21	400	10	Sweden	14	236

IV. DISCUSSION

Based on the results of the study, several key findings emerge regarding research trends and contributions in the field of Physical Education for Disabilities from 2013 to 2023. The publication trend analysis reveals a fluctuating pattern over the decade, with notable peaks in 2019, 2021, and 2023, suggesting increasing interest and investment in this area of study. This growth underscores a growing recognition of the importance of sports technology and physical education for enhancing the lives of individuals with disabilities. The article of significant impact based on the highest citations is authored by Morina (2017), titled "Inclusive education in higher education: challenges and opportunities" which has accumulated 220 citations. This article discusses inclusive education in higher education, focusing on its challenges and opportunities.

Figure 3 highlights the significant contributions of the top 10 most productive researchers, such as Haegele, J.A., Alhumaid, M.M., Wang, L., Maher, A.J., and Li, C., who have collectively published numerous insightful articles in this domain. These contributions not only enrich the academic discourse but also reflect a commitment to advancing knowledge and innovation in adapting sports education for individuals with disabilities. Moreover, citation analysis underscores Haegele, J.A.'s notable impact, emphasizing the influence of his extensive body of work on the field. Table 3 and Table 4 provide insights into the global landscape of research productivity and impact. The United States emerges as a leader in both document production and citations, followed closely by Canada and Australia. This leadership is further illustrated in Figure 4, which visualizes collaboration networks among countries. The centrality of the United States, along with strong collaborations involving Canada, China, Spain, and Australia, highlights the global nature of research efforts in Physical Education for Disabilities. This may be due to the fact that journals or proceedings typically indexed by Scopus are predominantly in English (Net et al., 2023).

Furthermore, the study employed co-keyword analysis to uncover thematic clusters and interrelationships among research topics. This methodological approach facilitated the identification of key themes and emerging trends within the literature, offering a structured understanding of the interconnectedness of ideas and facilitating future research directions. By mapping these co-keyword clusters, the study contributes to refining and expanding the scholarly discourse on sports technology and physical education for individuals with disabilities. From the emergence of keywords, the topic of physical education for disabilities is intriguing to explore. Physical activities have a significant impact on students' character and fundamental influence on knowledge articulation assessed in schools. This can be observed from clusters and the percentage occurrence, such as in Cluster 1: "Children, health, impact, implementation, parent, person, physical disability, youth", which are frequently mentioned keywords in the analysis documents. However, many issues remain under-researched or warrant further investigation, such as how different approaches to

4) Co-occurrence Analysis of Keywords

Keywords can provide core information about the content of an article, and when two or more keywords appear together in the same article, they are referred to as co-keywords. Co-keywords analysis is used to explore the relationships between concepts or themes within a body of literature, revealing patterns of association and helping to identify clusters of related research topics. This method is valuable for understanding the interconnectedness of ideas and themes across academic disciplines or specific fields of study, facilitating insights into prevalent themes and emerging trends within scholarly literature (Su & Lee, 2010). In the realm of scientific knowledge, co-keyword analysis can be utilized to identify popular research topics and track research boundaries (C. Chen et al., 2014; H. Chen et al., 2023; Su & Lee, 2010). In this study, we generated a co-keyword graph using the co-keyword function in VOSviewer, employing fractional counting method, setting a minimum occurrence of 2 for keywords, and using author keywords as the unit of analysis. Each cluster has been grouped and presented in Table 4 and Figure 5 of the clustering analysis.

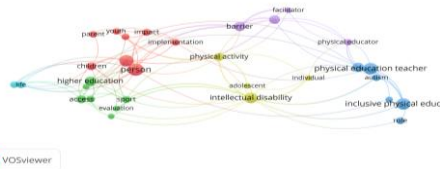


Fig 5. Keyword Analysis

Table 4. Clusters and Keywords based on VOSViewer

Cluster	Item	Colour	Percent	Total
Cluster 1	Children, health, impact, implementation, parent, person, physical disability, youth	Red	25%	8
Cluster 2	Access, challenge, evaluation, higher education, sport, voice, young person	Green	19%	6
Cluster 3	Application, autism, inclusive physical education, physical education teacher, role, self efficacy	Blue	19%	7
Cluster 4	Adolescent, individual, intellectual disability, physical activity	Yellow	14%	4
Cluster 5	Barrier, facilitator, participation, physical educator	Purple	14%	4
Cluster 6	Life, quality	Light Blue	9%	2
Total			100%	75

physical education can influence the socio-emotional development of disabilities, and how integrating technology into physical education can enhance student participation and learning outcomes. Overall, this comprehensive analysis provides valuable insights into the evolution, trends, and collaborative dynamics of research in Physical Education for Disabilities. These findings not only inform current scholarship but also serve as a roadmap for future investigations aimed at enhancing the educational and developmental outcomes for individuals with disabilities through sports and physical education interventions.

The study has several limitations that warrant consideration. Firstly, the reliance on English-language publications indexed in Scopus introduces a potential language bias, omitting valuable research published in other languages. Secondly, the use of Scopus may result in publication bias, as it does not encompass all relevant literature, particularly from non-indexed sources or niche areas. Thirdly, the analysis is constrained by data availability up to 2023, potentially missing newer developments beyond this timeframe. Fourthly, despite efforts in keyword selection, some relevant articles may have been overlooked, affecting the comprehensiveness of the study. Lastly, while the bibliometric approach offers quantitative insights, it may not capture qualitative nuances or contextual details provided by individual studies, suggesting a need for cautious interpretation of the findings. These limitations underscore the need for future research to address these gaps and provide a more comprehensive understanding of physical education for disabilities.

V. CONCLUSIONS

In summary, this study offers comprehensive insights into the evolution, trends, and collaborative dynamics of research in Physical Education for Disabilities from 2013 to 2023. The analysis reveals fluctuating publication patterns with notable peaks in 2019, 2021, and 2023, indicating increasing scholarly interest and investment in this field. Significant contributions highlighted include Morina's (2017) impactful work on inclusive education in higher education, which garnered 220 citations, underscoring critical challenges and opportunities in the domain. Top researchers such as Haegele, J.A., Alhumaid, M.M., Wang, L., Maher, A.J., and Li, C., have played pivotal roles in advancing knowledge through prolific publications. The dominance of the United States in document production and citations, coupled with robust international collaborations visualized in Figure 4, underscores its leadership and influence in shaping global research agendas. However, limitations in language bias, publication selectivity, and the bibliometric approach suggest avenues for future research to explore broader literature sources and qualitative dimensions to enhance our understanding

and application of physical education for individuals with disabilities comprehensively

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