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Physical fitness interventions for primary school students with special educational needs: a bibliometric analysis of global trends in inclusive education (1964–2025)

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ABSTRACT

Physical fitness is a critical determinant of health, development, and well-being for children with special educational needs (SEN), yet their participation in physical activity remains limited due to physical, social, and institutional barriers. Although adapted physical activity (APA) interventions have been widely investigated, the global evolution of research on physical fitness among children with disabilities has not been systematically mapped. This study conducts a bibliometric analysis of Scopus-indexed publications from 1964 to 2025 focusing on school-aged children (approximately 5-12 years) with physical, intellectual, sensory, and developmental disabilities. Studies unrelated to physical fitness or exercise outcomes were excluded. A total of 536 documents were analyzed using Scopus Analyzer, Microsoft Excel, and VOSviewer to examine publication trends, document types, country productivity, authorship patterns, collaboration networks, keyword co-occurrence, and bibliographic coupling. The inclusion of 2025 records reflect early-access indexing at the time of retrieval. Results indicate substantial growth in research output, particularly after 2016. Research is predominantly concentrated in high-income Western countries. Established themes center on rehabilitation and motor performance, while emerging topics include inclusion, adaptive sports, and psychosocial outcomes. Findings should be interpreted cautiously due to reliance on a single database and English-language dominance.

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1. INTRODUCTION

School-based physical education refers to curriculum-embedded instructional programmers carried out within formal school timetables. Non-curricular physical activity programmers encompass structured or semi-structured interventions implemented outside the formal physical education curriculum, such as extracurricular, recreational, or supplementary school-based activities, as conceptualized within holistic school-based intervention frameworks [1]. This distinction is important for understanding how different school-based approaches influence children's physical fitness and overall development.

Health-related physical fitness, as proposed by Caspersen *et al.* [2] is defined as a multidimensional construct comprising five core components: cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition. This definition has been widely accepted and adopted in

health-and fitness-related research, including guidelines and scholarly works that emphasize its significance to physical training and health outcomes [3], [4]. These five components are classified under health-related fitness because they are directly influenced by physical activity and exercise and display a significant association with overall health status [5].

Physical fitness is widely accepted as a fundamental determinant of children's overall development, contributing to physical health, cognitive functioning, emotional stability, and social well-being. Extensive research confirms that routine participation in physical activity improves cardiovascular efficiency, muscular strength, executive performance, and psychological resilience among children and adolescents [6], [7]. These benefits are particularly crucial for children with special educational needs (SEN), who often experience higher health risks, developmental delays, and greater levels of physical inactivity compared to their typically developing peers [8], [9]. Despite well-established evidence highlighting the importance of physical fitness, children with disabilities remain significantly undersold in school-based physical activity and physical education contexts, largely due to persistent physical, social, and systemic barriers [10]–[12]. These barriers not only restrict opportunities for structured physical engagement but also limit social annexation, emotional development, and academic participation.

In response to these obstacles, increasing scholarly attention has been directed towards the development of altered and inclusive physical fitness interventions. Previous studies indicate that school-based adapted physical activity (APA), structured exercise programmers, and targeted fitness-focused interventions can lead to meaningful progresses in functional capacity, motor performance, and psychosocial outcomes among children with disabilities [13], [14]. Such interventions are commonly implemented within or alongside physical education settings; however, they differ in scope, intensity, and objectives, ranging from curriculum-based fitness activities to auxiliary physical activity programmers. Technological innovations including activity-monitoring systems, modified sports, and interactive or game-based training methods have further enhanced engagement and accessibility, offering promising pathways to increase participation among SEN students [15]–[17]. Nevertheless, the implementation of these interventions remains inconsistent and constrained by systemic opposes such as limited teacher preparedness, inadequate institutional support, insufficient facilities, and funding limitations [18]–[23].

More recently, global concerns regarding falling physical activity and physical fitness levels among children, including those with disabilities, have intensified following the COVID-19 pandemic. Movement restrictions and prolonged school closures contributed to increased inactive behavior and reduced access to structured physical engagement opportunities [24], [25]. These trends contradict international policy priorities, particularly the sustainable development goals (SDG 3: good health and well-being; SDG 4: quality education), which emphasize equitable access to health-promoting activities and inclusive educational participation [26]. Although a substantial number of studies have examined disability-specific physical fitness interventions, the existing literature remains patchy across disability categories, educational contexts, and methodological approaches, with limited integration of findings at the global scale.

Bibliometric analysis offers a systematic and objective approach to addressing this fragmentation by examining large-scale publication data to identify research trends, influential contributors, leading countries, collaboration networks, and thematic structures within a field [27]–[29]. By mapping patterns of knowledge production over time, bibliometric methods enable a macro-level identification of how a research domain has evolved and where critical gaps persist. In accordance, this study conducts a macro-scale bibliometric analysis of Scopus-indexed publications related to physical fitness interventions for primary school students with SEN, containing research published between 1964 and 2025. The purpose of this study is to provide a comprehensive impression of the scientific development of this field, thereby informing future research directions, policy formulation, and inclusive educational practices.

Despite the expanding coverage of research on physical fitness and APA for children with SEN, current evidence remains unequally distributed across regions, disability categories, and intervention types. Existing studies often focus on specific disabilities, such as autism or intellectual disability, particular programmer models, or isolated school contexts, which limits the generalizability and comparability of findings across situations. Furthermore, much of the literature is intervention-oriented and descriptive in nature, offering limited insight into long-term research tracks, collaboration structures, or dominant thematic emphases at the global scale. This fragmentation makes it difficult to identify well-established research areas, appearing topics, and under-appreciated domains requiring further investigation.

To date, limited research has undertaken a global bibliometric synthesis spanning six decades to examine productivity patterns, influential contributors, collaborative structures, and thematic developments in physical fitness intervention research for primary school students with SEN. Without such a macro-level synthesis, policymakers, educators, and researchers miss out on a clear understanding of the geographical distribution of knowledge production, existing research imbalances, and the intellectual foundations molding this field. Addressing this bibliometric gap is therefore fundamental to support more unbiassed, evidence-

based, and strategically updated approaches to physical fitness interventions for children with disabilities. Accordingly, this bibliometric study is guided by the following research questions:

- What are the publication trends in research on physical fitness interventions for primary school students with SEN from 1964 to 2025?
- What types of documents and publication sources dominate the literature on physical fitness interventions for students with SEN?
- Which countries contribute most substantially to the global research output on physical fitness interventions for primary school students with SEN?
- Who are the most influential authors in this research field, and how is authorship productivity distributed?
- What are the patterns of collaboration among countries in research on physical fitness interventions for students with SEN?
- What are the dominant thematic clusters and research focuses identified through keyword co-occurrence and bibliographic coupling analyses?

2. METHOD

This study employs bibliometric methods to systematically analyze the scientific development of research on physical fitness among children with disabilities. Bibliometric analysis provides an objective and reproducible approach to examining large bodies of scholarly output, enabling identification of publication trends, research gaps, and thematic structures [30]. Unlike systematic reviews or meta-analyses that rely on smaller datasets, bibliometric approaches allow analysis across extended time periods [31], [32]. Following established bibliometric procedures [33], the Scopus database was selected due to its extensive coverage of international peer-reviewed journals and compatibility with bibliometric tools [34]–[37]. PRISMA principles were applied to guide identification, screening, and selection stages for transparency, although this study is not a systematic review.

The retrieval process involved iterative refinement of search terms and the application of explicit inclusion and exclusion criteria to ensure conceptual alignment. Quantitative bibliometric indicators and network analyses were used to examine publication output, citation patterns, keyword co-occurrence, co-authorship networks, and bibliographic coupling. VOSviewer generated network visualizations, while Scopus Analyzer provided descriptive profiling. Limitations include reliance on a single database and exclusion of non-journal materials. Ethical considerations were addressed by publicly accessible bibliometric metadata.

2.1. Keyword identification and screening

An iterative screening process was employed to refine search terms for retrieving relevant publications. Primary trial searches were conducted in the Scopus database using combinations of keywords within the title, abstract, and author keyword fields. Following several refinements, the final query selected for data retrieval is presented in Table 1.

This search string was selected to maintain conceptual specificity toward physical fitness outcomes. Although terms such as “adapted physical activity” or “motor skills” are widely used, preliminary searches showed that these terms frequently retrieved studies focused on pedagogy or participation without explicit fitness assessment. To reduce conceptual dilution, these terms were excluded. To mitigate potential omission of relevant studies, reference lists of key review articles and highly cited publications identified during screening were manually examined, confirming adequate coverage of core fitness-related literature.

The search returned n=536 documents indexed in Scopus. Records were screened based on titles, abstracts, and keywords. Studies were included if they addressed physical fitness, health-related fitness, motor fitness, or exercise-related outcomes involving children with disabilities, and excluded if they focused solely on psychological outcomes, obesity without a fitness component, migration, coaching, or unrelated health topics. A total of 30 non-English publications were excluded due to limitations in metadata standardization for bibliometric analysis; this exclusion may introduce language bias and is acknowledged as a limitation. Metadata extracted included publication year, authorship, keywords, sources, references, and countries of affiliation. The outcome of the screening process is illustrated in Figure 1 (PRISMA diagram).

Table 1. Search string

String	Keywords
Search string	(Children with disabilities) AND (physical fitness) Date retrieved: 15 November 2025

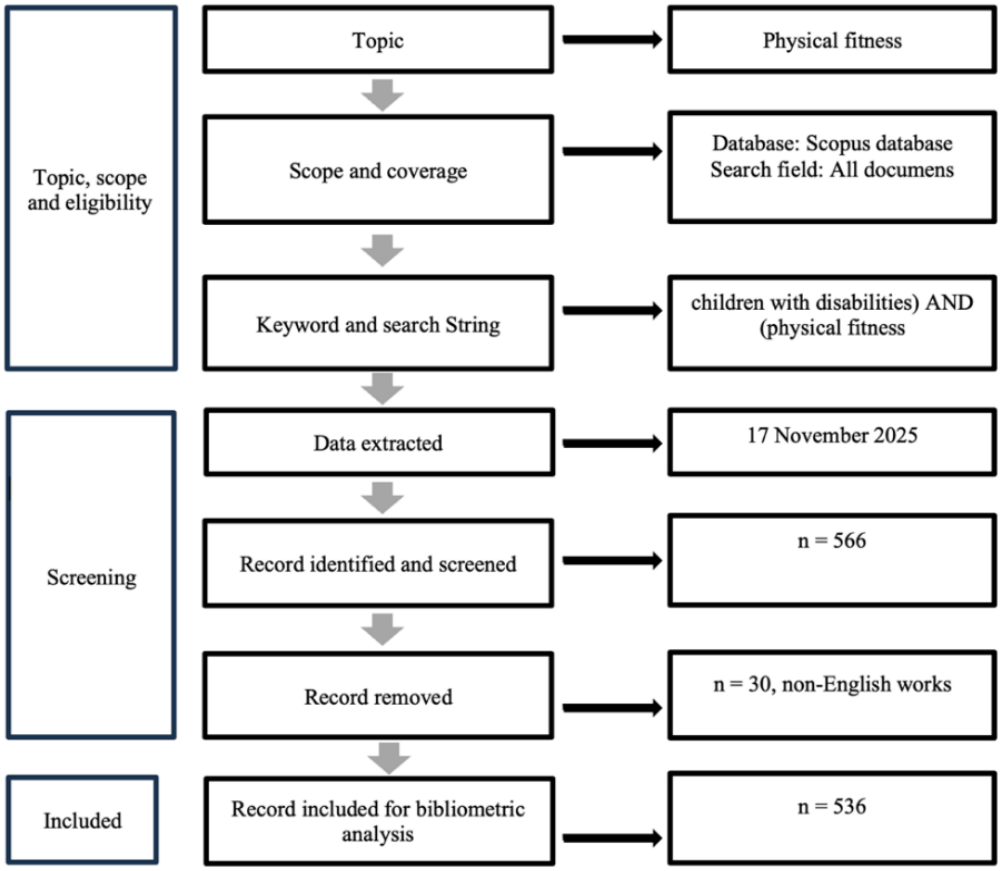

Figure 1. PRISMA diagram

2.2. Analyzing and controlling the data

The dataset was obtained from Scopus in CSV format and processed using Microsoft Excel for cleaning and organization. The cleaning procedure included standardizing author names, verifying publication titles, removing duplicate logs, correcting inconsistencies in country labels, and harmonizing keyword terminology. To enhance the accuracy of keyword co-occurrence analysis, a thesaurus file was developed to merge synonymous terms ("health-related fitness" and "physical fitness"; "disabled children" and "children with disabilities"). This thesaurus file was later uploaded into VOSviewer to minimize fragmentation in visualization maps. Additionally, Scopus Analyzer was used to generate an initial descriptive overview of the dataset, including yearly publication output, paper types, source types, leading countries, prominent authors and institutions, and subject area distributions. This initial overview ensured dataset reliability prior to bibliometric mapping.

2.3. Analyzing the data

The final dataset was analyzed using VOSviewer, Scopus Analyzer, and Microsoft Excel. VOSviewer was employed to generate network visualizations for co-authorship, keyword co-occurrence, and bibliographic coupling analyses. To ensure analytical consistency and reproducibility, standard VOSviewer settings were applied across all analyses, including minimum occurrence thresholds and clustering resolution parameters commonly used in bibliometric research. These settings were selected based on preliminary testing to balance network clarity and interpretability while retaining meaningful thematic structures.

A thesaurus file was applied during keyword co-occurrence analysis to standardize terminology and merge synonymous terms, thereby reducing fragmentation in visualization maps. Examples of merged terms ("disabled children" consolidated as "children with disabilities") are provided in Table 2 for transparency. Trend analyses were conducted to examine changes in publication output and thematic focus over time. All visualizations were generated using VOSviewer and cross-checked against Scopus Analyzer outputs to ensure accuracy and consistency.

Table 2. Examples of term standardisation using thesaurus file for keyword co-occurrence analysis

No.	Original term(s) identified in dataset	Standardised term used in analysis
1	Disabled children; child with disability; children with disability	Children with disabilities
2	Special needs children; children with special needs; SEN children	Children with special educational needs
3	Health-related fitness; health related fitness	Physical fitness
4	Adapted PE; adapted physical education; APA	Adapted physical education
5	Motor ability; motor performance; motor function	Motor performance
6	Exercise participation; physical activity participation	Exercise participation

Note: The thesaurus file was applied in VOSviewer to merge synonymous terms prior to keyword co-occurrence analysis in order to reduce semantic redundancy and improve the interpretability and reproducibility of bibliometric network visualisations.

3. RESULTS

This study analyzed 536 scholarly publications focusing on physical fitness among children with disabilities. The analysis focused on annual publication trends, document types, keyword patterns, country productivity, authorship contributions, and bibliographic relationships. Results are presented using frequencies, percentages, descriptive statistics, and network visualization maps to illustrate structural relationships and thematic developments within the field.

3.1. Annual publication trends

Figure 2 shows the distribution of publications from 1964 to 2025. Research output during the early decades (1964–1999) was sparse and occasional, reflecting limited global attention to physical fitness in disability contexts. A steady increase emerged in the early 2000s, followed by a pronounced rise after 2016, with annual output consistently surpassing 20 publications. The year 2024 recorded the highest productivity with 38 documents. The long-term trajectory indicates heightened recognition of physical fitness as a relevant dimension of disability research and growing institutional support for inclusive health and education agendas.

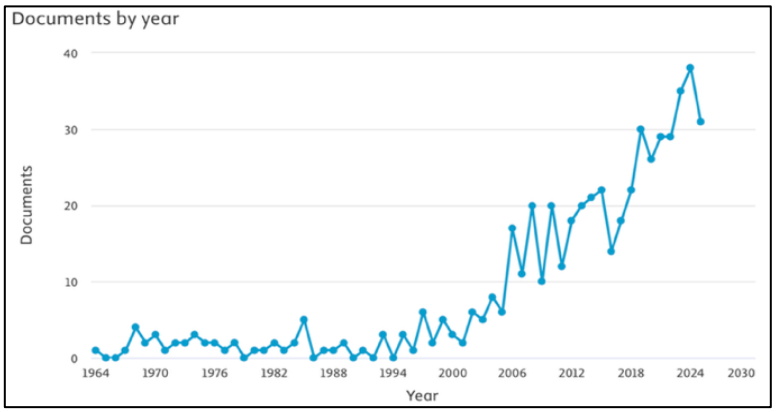

Figure 2. Percentage of publications on classification topics from 1964 to 2025

3.2. Document types and source distribution

As presented in Figure 3, journal articles embodied the dominant document type (75.4%), demonstrating that empirical and peer-reviewed work forms the core of academic dissemination in this field. Review articles contributed 17.0%, indicating a strong emphasis on synthesizing intervention effects and summarizing evidence bases. Other document types such as book chapters, conference papers, notes, editorials, and letters each constituted less than 3%, suggesting limited circulation beyond journal environments. This pattern aligns with a mature, academically driven research landscape that prioritizes journal-based outlets for knowledge transmission.

3.3. Country productivity

Figure 4 highlights that the United States emerged as the most productive country in terms of publication output, followed by Canada, the Netherlands, and the United Kingdom. These countries represent high-income contexts with strong research infrastructures in pediatric rehabilitation, APA, and exercise science. Moderate contributions were observed from Australia and Spain, while smaller yet consistent outputs originated from Finland, Poland, and Ireland. The distribution highlights substantial geographic imbalance, with low-and middle-income countries contributing modestly.

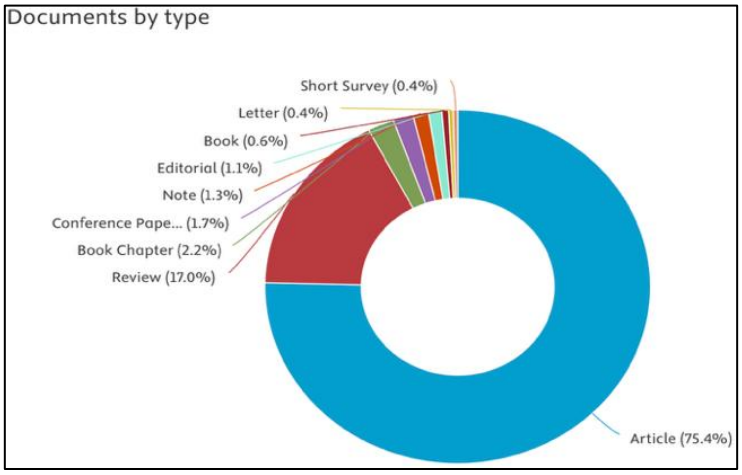

Figure 3. The type of source where the documents are published

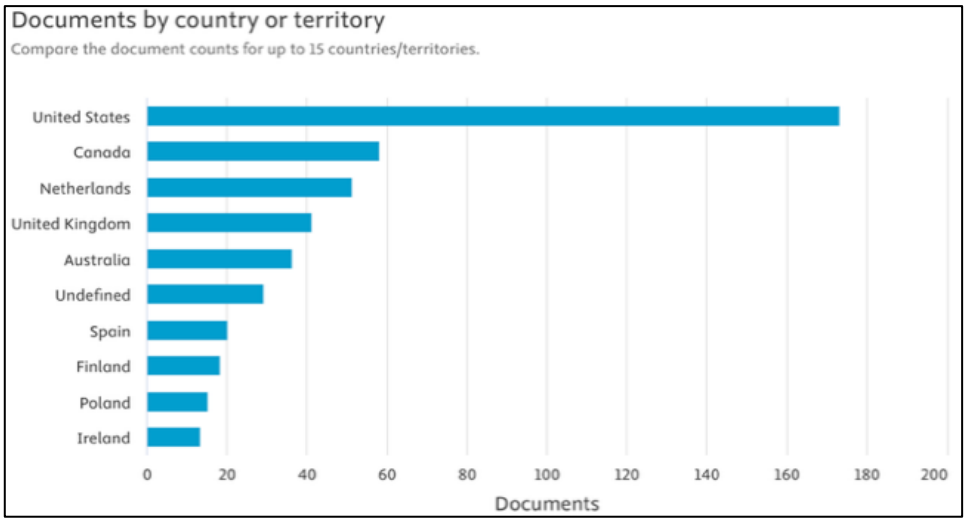

Figure 4. The documents by country

3.4. Author productivity

As presented in Figure 5, the author productivity analysis revealed a concentrated group of researchers who have backed extensively to the field of physical fitness among children with disabilities. Takken, T. emerged as the most prolific author, with a total of 17 publications, followed by Verschuren, O. with 12 publications. Both authors are widely recognized for their sustained scholarly contributions in paediatric rehabilitation and physical activity. Additional prominent contributors include Gorter, J.W., Zwinkels, M., and Becher, J.G., who collectively produced between six and eight publications each, indicating a stable pattern of engagement over time. These authors navigate research direction, collaboration patterns as well as thematic progress withing the field.

Beyond this core group, several other authors demonstrated consistent but more moderate levels of output, including Dallmeijer, A.J., Hutzler, Y., Ng, K., Backx, F.J.G., and Evenhuis, H.M., each generating between four and six publications. While their individual output is comparatively lower, their presence reflects a distributed research community supporting the field's knowledge base. Overall, the distribution pattern suggests that research output within this domain is driven by a reasonably petite yet influential cluster of scholars whose work ground much of the published literature. The presence of this concentrated author group is characteristic of a maturing research area with established research links and recognized expertise.

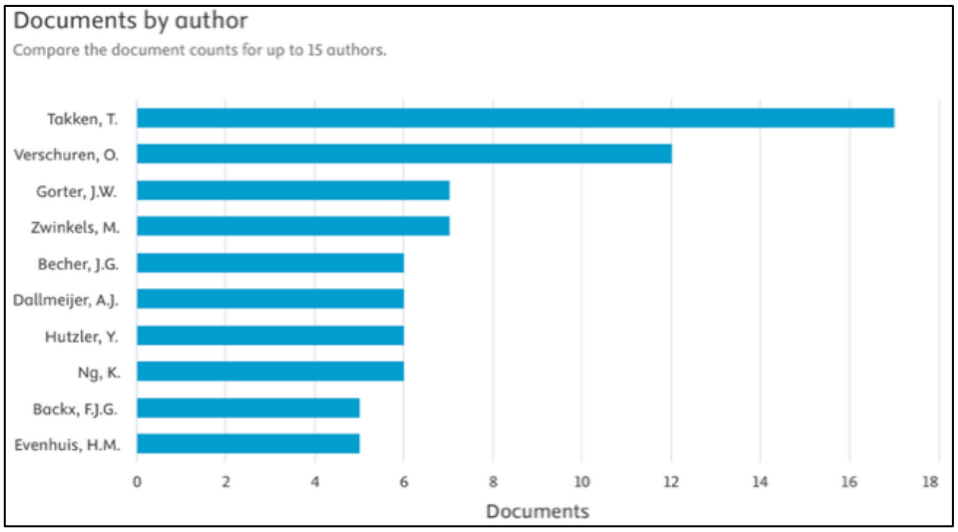

Figure 5. The documents by author

3.5. Co-authorship networks

Figure 6 demonstrates that; the co-authorship network map further demonstrates collaborative structures. The United States occupies the central position in the global collaboration network, forming extensive partnerships with European and Asian regions. European clusters, including the Netherlands, the United Kingdom, Spain, Belgium, and Finland are closely interconnected and demonstrate strong multinational research collaboration. Asian participation appears in emerging clusters linked primarily to Western hubs, involving countries such as China, Japan, Malaysia, and South Korea. A smaller regional cluster links Italy, Serbia, and Greece. Overall, collaboration patterns uncover Western dominance with selective but mounting engagement from developing research systems.

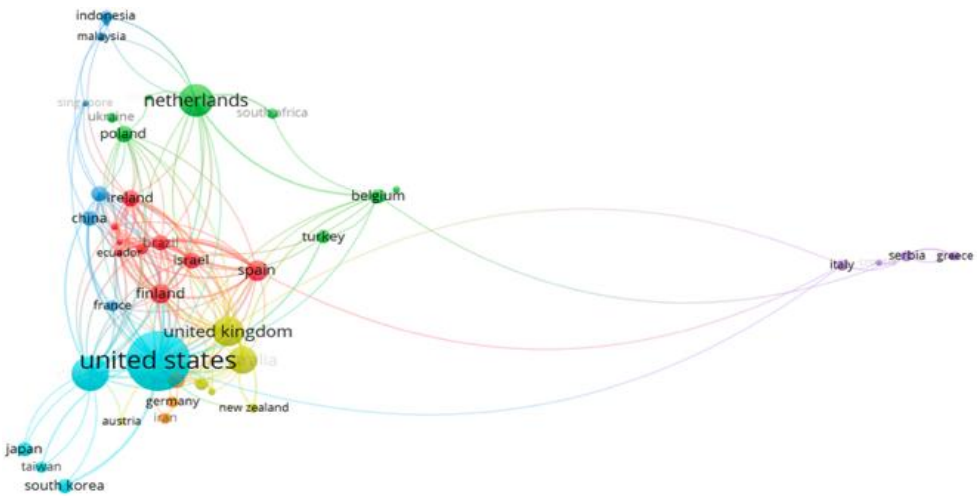

Figure 6. Network visualization map of the co-authorship-countries

3.6. Keyword co-occurrence analysis

As shown in Figure 7, the keyword co-occurrence network shows that “human” is the most frequently used and dominant term, indicating that most studies emphasize human subjects within disability and physical fitness contexts. Surrounding this core, several foremost thematic clusters emerge, including physiology, motor performance, disability evaluation, physical education, and health promotion, reflecting diverse research cores within the field. The presence of clusters related to pathophysiology, risk factors, and exercise tolerance suggests strong interdisciplinary links with medicine, rehabilitation, and exercise science. Keywords such as

motor skills, adaptive sports, kinesiotherapy, and work capacity evaluation indicate that many studies investigate operational and performance-based outcomes for children with disabilities. The inclusion of terms related to psychology, inclusion, and barriers highlights the social and behavioral dimensions of involvement in physical activity. Overall, the map illustrates a rich, multidimensional research landscape that cover themes such as health, motor performance, disability assessment, and inclusive physical education.

3.7. Bibliographic coupling analysis

Figure 8 highlights that, the bibliographic coupling visualization reveals a dense and interconnected network of influential publications that collectively define the intellectual foundation of research on physical fitness and disability. At the center of the map, several seminal works [38]–[41] form the strongest nodes, indicating their pivotal role as high-impact references repeatedly cited across multiple studies. These central documents anchor the main research cluster. They suggest enduring scholarly focus on motor function, physical activity participation, and APA interventions for children with disabilities. Several works [42]–[44] appear closely linked to the core, illustrating continued emphasis on functional performance and behavioral outcomes, while peripheral but emerging nodes [45]–[48] represent newer research directions and methodological innovations. The different colors and overlapping bundles suggest strong interdisciplinary integration among pediatric rehabilitation, exercise physiology, special education, and developmental disability research. Furthermore, the spread of intersections goes across different years from foundational studies in the 1990s to recent work in the 2020s. It reveals both the longevity and dynamic evolution of the field. Overall, the network emphasizes a mature yet blooming research landscape, where a small group of high-impact publications continues to shape existing studies while newer contributions broaden the thematic and methodological margins of the discipline.

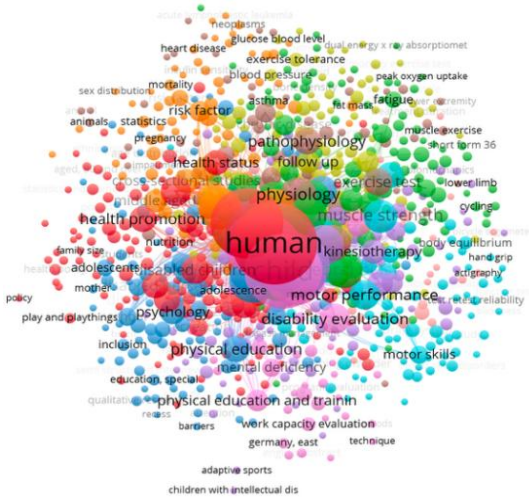

Figure 7. Network visualization map of the keyword co-occurrence

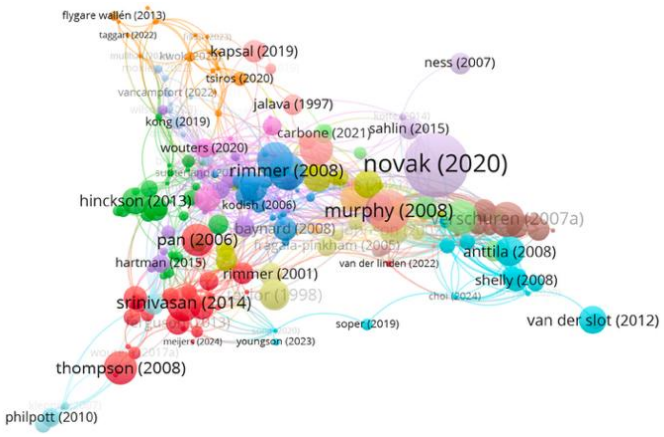

Figure 8. Network visualization map of the bibliographic coupling by documents

4. DISCUSSION

The bibliometric findings indicate that research on physical fitness among children with disabilities has extended substantially over the past six decades, moving from a limited area of inquiry to a recognized interdisciplinary field. The coverage expanded to rehabilitation, pediatrics, special education, and exercise science. The increase in publications after 2016 supports increased global commitments toward inclusive health and education. The frameworks such as the SDG, which emphasize equitable access to health-promoting opportunities for all children further consolidate the need for the expansion [49]. The peak in publication output observed in 2024 indicates growing academic and policy interest in evidence-based physical fitness interventions for disability populations, reflecting wider concerns about the persistent health disparities experienced by children with disabilities [26], [50]. This growth suggests a reinforced commitment amongst researchers and institutions in understanding how fitted, developmentally appropriate physical activity programmers can enhance functional capacity, participation, and overall well-being.

The dominance of journal articles and the notable ratio of review papers emphasize the methodological maturity and evidence-driven nature of the field. Peer-reviewed journals now serve as the primary platform for disseminating empirical insights, mirroring broader trends in APA research where methodological rigor is essential for guiding practice and policy [51]. However, there are limited portrayal of book chapters, conference papers, and grey literature. This restricted dissemination channel, largely academic, may inadvertently limit the translation of research findings applicable in school and community settings. Practitioners such as teachers, therapists, and coaches largely depend on more accessible and readily usable formats. Widening distribution routes may thus be necessary to strengthen the research-to-practice pipeline.

The geographical distribution of research output reveals significant global inequalities. The United States and Western European countries dominate scholarly contributions. This shows to their well-established research foundations, strong funding mechanisms, and long-standing investment in APA programming. These patterns are consistent with broader trends in disability research, where high-income countries generate most of the scientific output [52], [53]. Contrarywise, contributions from Asia, Africa, and Latin America linger limited. Their presence often becomes apparent via collaborations with Western institutions. This disparity highlights unequal access to research opportunities as well as the underrepresentation of disability populations in low-resource contexts. Disability experiences and physical activity opportunities differ widely across cultural, socioeconomic, and educational settings. Expanding research participation in underrepresented regions is essential for spawning more globally relevant and culturally receptive evidence.

In terms of intellectual development, the thematic structure of the field, as revealed through keyword co-occurrence and bibliographic coupling, indicates that the intellectual base of the discipline remains anchored in biomedical and functional paradigms. Terms related to motor performance, physiology, disability evaluation, and exercise tolerance govern the landscape, reflecting long-standing priorities in pediatric rehabilitation. While these perspectives are foundational, they also expose the narrow emphasis on physical functioning at the expense of broader ecological, psychosocial, and participatory aspects of physical fitness [54]. Emerging themes including inclusion, barriers, adaptive sports, and psychological determinants signal a steady growth toward more holistic and socially grounded approaches. However, these areas remain comparatively underdeveloped. The intensity of output among a small group of influential researchers further suggests centralized intellectual leadership. It limits diversification of methodologies and theoretical frameworks. Significantly, this analysis reflects research on physical fitness interventions rather than broader health or disability research, thereby providing a focused view of how exercise- and fitness-oriented programmers are conceptualized and studied for SEN populations.

Taken together, the findings lay emphasis on both progress and persistent gaps within the field. While scientific output, thematic diversity, and methodological sophistication have increased considerably, geographical imbalances, limited research dissemination formats, and dominant biomedical orientations persist as challenges. Strengthening interdisciplinary collaboration, expanding global research participation, and integrating educational, sociocultural, and psychological perspectives will be vital for advancing a more comprehensive and evenhanded research agenda. These findings underscore the mounting need for capacity-building in schools, particularly in supporting inclusive physical fitness interventions for students with disabilities. Teachers, therapists, and school leadership play central roles in such implementation. Future research would benefit from incorporating sociocultural perspectives, community participation models, and teacher-mediated approaches to better support inclusive education goals and sustain meaningful application across diverse school contexts.

The findings of this study have direct implications for educational systems and policy planning. First, schools embody a critical implementation setting for physical fitness programmers for children with disabilities. Teacher training, curriculum design, and school resource allocation should overtly incorporate principles of APA and inclusive health promotion. Second, policymakers may strengthen planning by

integrating physical fitness objectives into national inclusive education frameworks by expanding funding for school-based APA initiatives. Third, future research should prioritize low- and middle-income contexts, where disability-related health disparities are most apparent. This can be done by adopting teacher-mediated and community-based intervention models to better reflect real-world implementation. Finally, the study acknowledges the limitations inherent to Scopus indexing, including over-representation of English-language and Western publications, which may undercount scholarship from non-indexed regions. Addressing these gaps will support more equitable participation and update the development of contextually responsive and evidence-based physical fitness programmers for students with SEN.

5. CONCLUSION

This bibliometric analysis provides a comprehensive six-decade overview of the global research landscape on physical fitness among children with disabilities. It reveals significant growth in scientific output, diversification of research themes, and increasing interdisciplinary engagement. The sharp increase in publications since 2016 highlights a global shift toward prioritizing inclusive health, evidence-based interventions, and equitable opportunities for children with SEN. Core contributing countries, influential authors, and dominant thematic clusters indicate a mature field anchored in rehabilitation sciences, pediatric exercise physiology, and adapted physical education. Meanwhile, emerging areas such as inclusion, adaptive sports, and psychosocial determinants signal a gradual transition toward more holistic and socially responsive approaches. Collectively, these findings offer essential insights into the evolution and current direction of the field while providing a foundation for strengthening research, practice, and policy.

Even so, the analysis reveals persistent global and conceptual imbalances. Research leadership is concentrated in high-income Western nations, with comparatively limited participation from low-and middle-income countries where disparities in disability services and inclusive physical education are greatest. The field remains predominantly informed by biomedical and functional paradigms. This underscores the need for broader theoretical integration incorporating ecological, sociocultural, and educational perspectives. Addressing these imbalances will require stronger international collaboration, the adoption of culturally responsive research methodologies, and a more explicit commitment to inclusive educational practices.

From an educational perspective, the findings underscore the central role of schools as implementation agents for physical fitness interventions among children with disabilities. Teacher preparation, curriculum design, and school resource allocation should explicitly embed APA principles and inclusive health promotion strategies. Policymakers may support these endeavors by integrating physical fitness objectives within national inclusive education agendas. This will provide teachers with training systems and expanding funds to carry out APA infrastructure in schools. These educational implications align closely with the broader goals of inclusive education and highlight the potential for school-based interventions to enhance participation, functional capacity, and well-being for learners with disabilities. Finally, while this bibliometric analysis reflects research on physical fitness interventions rather than broader disability or health promotion arena, it provides a focused account of how exercise-and fitness-oriented programmers are conceptualized and investigated for SEN populations. Advancing these directions will not only enrich the scientific understanding of physical fitness interventions but also contribute to the development of sustainable, evidence-informed and impactful programmers that promote health, participation, and quality of life for all learners with disabilities in the near future.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study were retrieved from the Scopus database using a defined search string. Due to licensing restrictions, the dataset is not publicly available but can be obtained from the corresponding author, [KFK], upon reasonable request.

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