



Thematic Structure, Evolution, and Authorship Patterns of Physical Education Theory and Methodology (2019–2025)

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Abstract

Background. Bibliometric analyses provide an evidence-based approach for examining the thematic orientation, development trajectories, and collaboration patterns of scientific journals.

Purpose. The purpose of this study was to analyze the thematic structure, thematic evolution, and authorship patterns of publications in Physical Education Theory and Methodology (PETM) during 2019–2025.

Methods. Scopus-indexed metadata were analyzed using bibliometric methods. A weighted keyword co-occurrence network was constructed and examined using the Louvain community detection algorithm. Thematic evolution was assessed across three periods (2019–2020, 2021–2022, 2023–2025), and recurrent co-authorship patterns were identified based on indexed author records.

Results. Five major thematic clusters representing the core research domains of PETM were identified. Thematic evolution analysis revealed a cumulative development pattern characterized by stable methodological foundations and pronounced growth in health-related, assessment-oriented, and integrative applied research. Authorship analysis demonstrated the presence of recurring author teams and stable collaborative structures.

Conclusions. The findings provide quantitative evidence of PETM's controlled thematic diversification and support its positioning as a methodologically grounded journal with expanding international relevance. The results may inform editorial positioning, scope refinement, and future policy development.

Keywords: bibliometric analysis, thematic evolution, co-authorship patterns, physical education research, journal analysis.

Introduction

Over the past decade, bibliometric methods have become an important tool for analyzing the development of scientific journals, allowing researchers and editors to assess thematic orientation, structural changes, and collaboration patterns at the journal level. Such analyses are particularly relevant for long-standing journals, where questions of continuity, diversification, and international visibility are central to editorial strategy. Bibliometric approaches are widely used to examine thematic orientation, structural change, and

collaboration patterns in scientific journals (Zupic & Čater, 2015; Donthu et al., 2021).

Founded more than two decades ago, Physical Education Theory and Methodology (PETM) represents a specialized journal in the field of physical education, motor development, and movement science. As the journal enters a new stage of development, a systematic examination of its recent thematic profile and authorship structure is necessary to support evidence-based editorial decisions.

The purpose of this study is to provide a bibliometric overview of PETM publications from 2019 to 2025, with specific objectives to: (1) identify the journal's core thematic clusters; (2) examine thematic evolution over time; and (3) analyze authorship and collaboration patterns. The

study focuses on journal-level characteristics rather than individual author performance.

Methodology

Data Source and Dataset

The analysis was based on publications from *Physical Education Theory and Methodology* indexed in the Scopus database. Metadata were exported in BibTeX format and processed using the bibliometrix package in R. The initial dataset comprised 568 documents, of which publications dated between 2019 and 2025 were selected for detailed analysis. The Scopus metadata were exported on 23 December 2025, including documents indexed as “articles” and “reviews.” Other document types (editorials, notes, letters) were excluded from the analysis. Only records containing author keywords were retained for the keyword co-occurrence analysis. Bibliometric mapping and science mapping procedures were implemented using established methodological frameworks (Aria & Cuccurullo, 2017; Cobo et al., 2011).

Keyword Processing and Network Construction

Author keywords were extracted from the metadata fields DE and KW_Merged. Keywords were standardized by conversion to uppercase and trimming of whitespace. A binary document–keyword matrix was constructed to indicate the presence of keywords in each publication. Based on this matrix, a weighted keyword co-occurrence network was generated, where edge weights reflected the frequency of joint occurrence of keywords within the same document. Keywords with very low frequencies were excluded to reduce noise in the network structure. Minor lexical variants were merged during preprocessing to ensure conceptual consistency at the cluster level. Keyword co-occurrence analysis is a standard approach for identifying conceptual structures within scientific domains (Zupic & Cater, 2015).

Community Detection and Thematic Evolution

The keyword co-occurrence network was modeled as an undirected weighted graph, and isolated nodes were removed. The Louvain community detection algorithm was applied to identify thematic clusters through modularity optimization. Community detection was performed using the Louvain algorithm, which is widely applied in large-scale network analysis (Blondel et al., 2008; Newman, 2006). The resulting cluster structure demonstrated high internal coherence, allowing stable interpretation of thematic domains across all three time periods. To analyze temporal dynamics, publications were grouped into three periods: 2019–2020, 2021–2022, and 2023–2025. Keyword frequencies were aggregated at the cluster level for each period to examine thematic evolution.

Authorship and Collaboration Analysis

Authorship patterns were analyzed using Scopus metadata fields related to authors and affiliations. Recurrent co-authorship patterns were identified to describe stable

collaborative structures within the journal. The analysis emphasizes recurring author teams rather than individual author rankings. It should be noted that Scopus author identification and name disambiguation procedures may influence the aggregation of co-authorship records. Therefore, the results are interpreted at the level of indexed author teams rather than individual researcher performance.

Results

Thematic clusters

Community detection identified five major thematic clusters corresponding to the core research domains of PETM:

1. Pedagogical models and instructional design in physical education.
2. Motor development and fundamental movement skills.
3. Assessment, testing, and measurement.
4. Physical fitness, training effects, and experimental designs.
5. Health-related physical activity, inclusion, and functional outcomes.

Although network visualization revealed transitional zones between clusters, modularity optimization integrated these areas into broader, stable thematic communities.

Table 1. Thematic clusters and their conceptual focus in PETM (2019–2025)

Cluster	Conceptual focus	Representative keywords
Cluster 1	Pedagogical models and instructional design in physical education	physical education; teaching; students; program; control; pedagogical modeling
Cluster 2	Motor development and fundamental movement skills	motor skills; motor fitness; physical fitness; children; boys; girls
Cluster 3	Assessment, testing, and measurement	testing; discriminant analysis; assessment; agility; balance; VO ₂ max
Cluster 4	Physical fitness, training effects, and experimental designs	training; strength; exercise; performance; experimental design
Cluster 5	Health-related physical activity, inclusion, and functional outcomes	physical activity; body composition; healthy lifestyle; inclusion; physical performance

Network visualization and bibliometric mapping were used to support the interpretation of thematic and collaborative structures (van Eck & Waltman, 2010).

Thematic evolution

Thematic evolution analysis demonstrated differentiated growth trajectories across clusters. During 2019–2020, research activity was concentrated in methodologically oriented domains, with emphasis on experimental design, testing, and multivariate statistical methods. In 2021–2022,

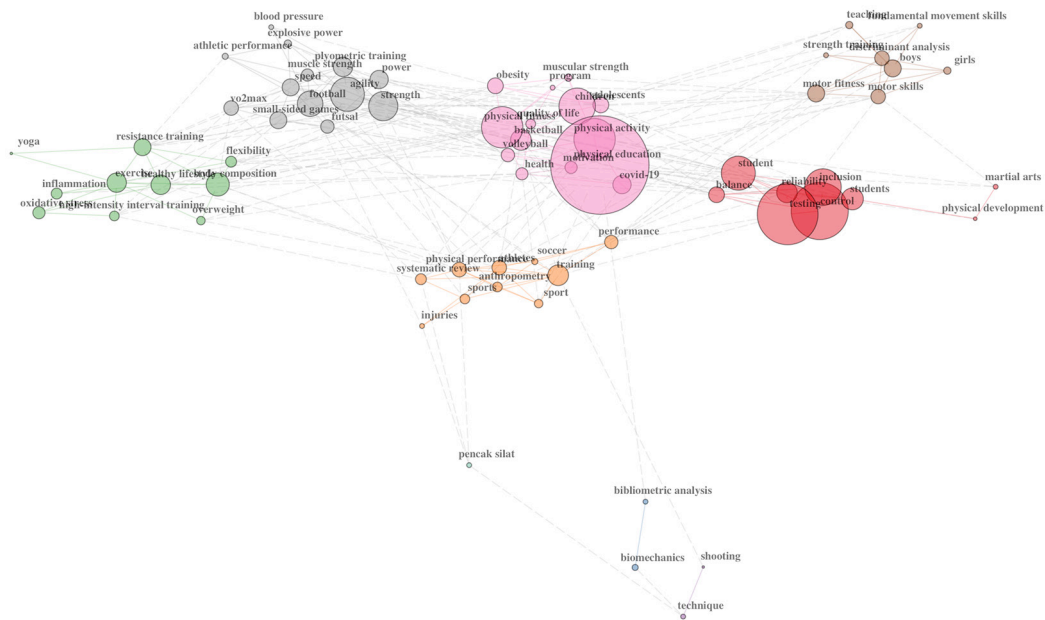


Fig. 1. Keyword co-occurrence network with five clusters

Table 2. Thematic evolution across periods (cluster-level keyword frequencies) in PETM (2019–2025)

Cluster	2019–2020	2021–2022	2023–2025	Evolutionary pattern
Cluster 1 Pedagogical models and instructional design	32	54	61	Stable growth
Cluster 2 Motor development and fundamental movement skills	4	34	105	Late acceleration
Cluster 3 Assessment, testing, and measurement	7	31	99	Progressive expansion
Cluster 4 Physical fitness, training effects, and experimental designs	28	33	81	Continuous growth
Cluster 5 Health-related physical activity, inclusion, and functional outcomes	5	27	108	Rapid expansion

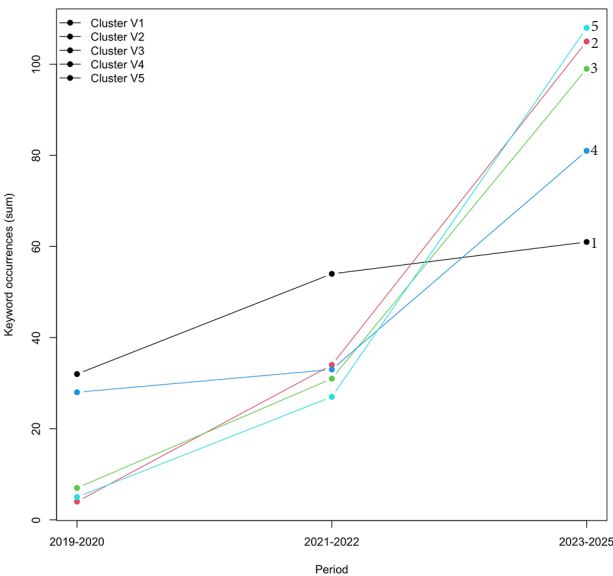


Fig. 2. Thematic evolution trends across three periods

all clusters showed increased activity, reflecting expansion toward training interventions, physical activity, and functional performance indicators. The period 2023–2025 was characterized by a sharp increase across all thematic

domains, particularly in health-related and assessment-oriented research.

Authorship and Collaboration Patterns

Analysis of Scopus metadata revealed a limited number of recurring author teams contributing multiple publications to PETM. The most frequent teams authored two or three articles each, indicating the presence of stable collaborative groups rather than isolated individual contributions. Examples include the author teams Ben Rakaa O.; Bassiri M.; Lotfi S., Kumar S.; Das R., and Milenković D., each contributing three articles during the analyzed period.

Table 3. Most frequent author teams in PETM (2019–2025)

Author team (as indexed in Scopus)	Number of articles
Ben Rakaa O.; Bassiri M.; Lotfi S.	3
Kumar S.; Das R.	3
Milenković D.	3
Abiyra A.J.; Tiwari S.; Haq M.A.U.	2
Choudhary P.K.; Dubey S.	2
Elezi A.; Elezi G.; Gontarev S.; Georgiev G.	2
Kapkan O.O.; Khudolii O.M.; Bartik P.	2
Nuttoch W.; Hemarachatanon P.; Huntula S.	2
Pahan M.K.; Singh M.K.	2

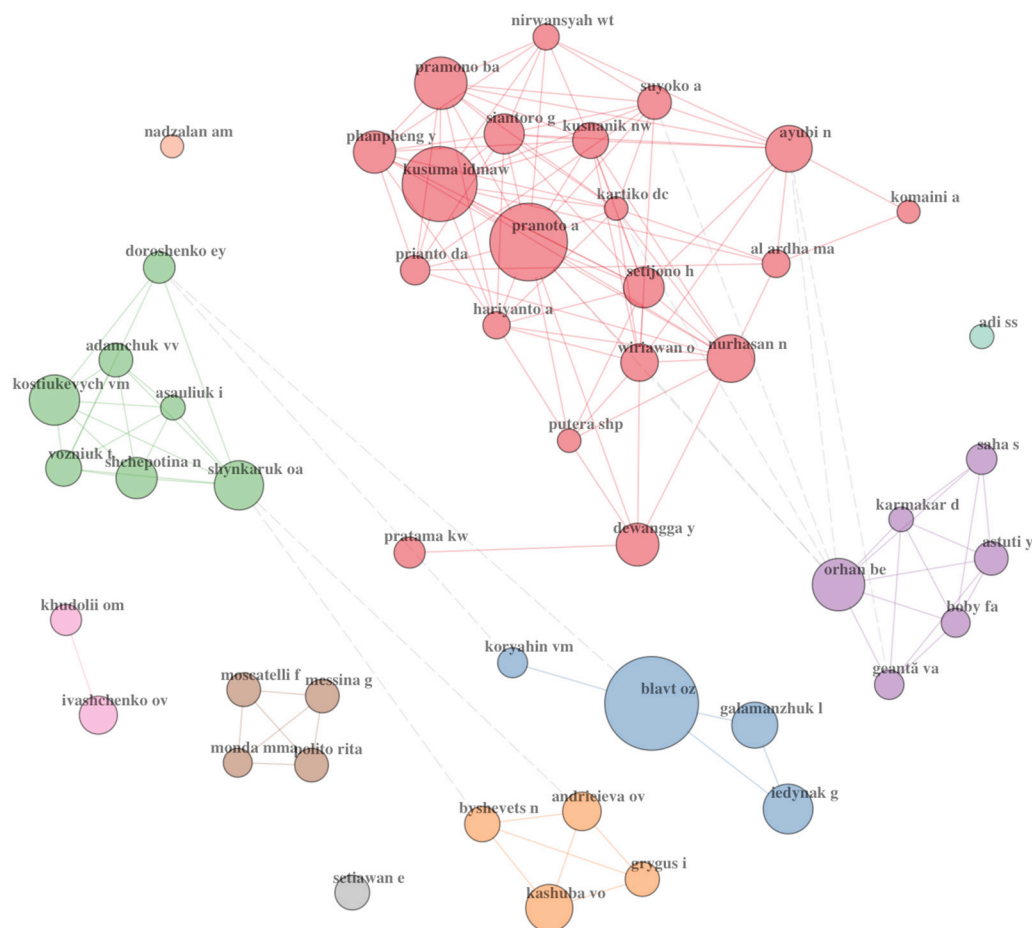


Fig. 3. Co-authorship network of PETM publications

Discussion

The results indicate that PETM has undergone a process of controlled thematic diversification during 2019–2025. Rather than replacing its methodological core, the journal has expanded cumulatively into health-related, assessment-based, and integrative applied research domains. This pattern suggests a balance between thematic stability and innovation. Importantly, the observed thematic expansion reflects cumulative development rather than a shift away from the journal's established methodological core. Journal-level bibliometric analyses provide a descriptive basis for understanding cumulative thematic development rather than evaluative assessments of individual performance (Moed, 2005).

The presence of recurring author teams and stable collaboration structures further supports the interpretation of PETM as a journal embedded in sustained scientific cooperation. Together, the thematic and authorship findings provide an empirical basis for editorial positioning and future strategic development.

Conclusions and Editorial Implications

This bibliometric analysis demonstrates that the development of *Physical Education Theory and Methodology* during 2019–2025 is characterized by cumulative thematic growth, stable collaborative authorship, and controlled diversification

toward applied and health-related research domains. The identified thematic clusters and evolution patterns provide an empirical foundation for refining the journal's scope, editorial priorities, and desk-review criteria. Overall, the results confirm PETM's position as a methodologically grounded journal with expanding international relevance. These findings may inform future editorial policies, including thematic prioritization, desk-review criteria, and the strategic balance between methodological rigor and applied research.

Ethics Approval

Ethical approval was not required for this article, as it is an editorial and conceptual work that does not involve human participants, animals, or the collection or analysis of personal or identifiable data.

Informed Consent

Not applicable, as no human participants were involved.

Data Availability Statement

Data sharing is not applicable to this article, as it does not report or analyze empirical datasets and is based on conceptual analysis and publicly available sources.

AI Transparency Statement

AI-assisted tools were used solely to support language editing, stylistic refinement, and structural organization of the manuscript, based exclusively on content provided by the authors. No AI tools were used for data collection, data analysis, interpretation of results, or generation of original scientific content. Full responsibility for the content, interpretation, and conclusions rests with the authors.

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Conflict of Interest

The authors declare no financial or personal conflicts of interest. This article was prepared within the framework of the journal's editorial and methodological development activities, which does not influence the objectivity or integrity of the presented content.

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Тематична структура, еволюція та авторські моделі журналу Physical Education Theory and Methodology (2019–2025)

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 6 с., 3 табл., 3 рис., 8 джерел.

Обґрунтування. Бібліометричні аналізи забезпечують доказовий підхід до вивчення тематичної спрямованості, траєкторій розвитку та моделей наукової співпраці в межах наукових журналів.

Мета. Метою цього дослідження було проаналізувати тематичну структуру, тематичну еволюцію та авторські моделі публікацій у журналі Physical Education Theory and Methodology (PETM) за період 2019–2025 років.

Методи. Аналіз виконано на основі метаданих публікацій, проіндексованих у базі Scopus, із використанням бібліометричних методів. Побудовано зважену мережу спільної появи ключових слів, яку проаналізовано за допомогою алгоритму виявлення спільнот Louvain. Тематичну еволюцію оцінювали у трьох часових періодах (2019–2020, 2021–2022, 2023–2025), а повторювані моделі співавторства ідентифіковано на основі індексованих авторських записів.

Результати. Визначено п'ять основних тематичних кластерів, що репрезентують ключові напрями досліджень журналу PETM. Аналіз тематичної еволюції виявив кумулятивний характер розвитку, який поєднує стабільне методологічне підґрунтя з виразним зростанням досліджень, орієнтованих на здоров'я, оцінювання та інтегративні прикладні підходи. Аналіз авторських моделей засвідчив наявність повторюваних авторських команд і стабільних структур наукової співпраці.

Висновки. Отримані результати надають кількісні докази контрольованої тематичної диверсифікації PETM та підтверджують його позицію як методологічно орієнтованого журналу з розширюваною міжнародною присутністю. Висновки можуть бути використані для редакційного позиціонування, уточнення тематичного профілю та формування майбутньої редакційної політики.

Ключові слова: бібліометричний аналіз, тематична еволюція, моделі співавторства, дослідження з фізичного виховання, аналіз наукового журналу.

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