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Bibliometric analysis of national martial arts

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E – Funds Collection

Abstract

Background and Study Aim National martial arts (NMA) are sports that have developed primarily within a single country. They reflect national characteristics and influence societal development. Currently, many have spread beyond national borders and gained worldwide popularity. The aim of this study was to analyze publications on national martial arts using bibliometric methods and to identify priority research areas in this field.

Material and Methods As of 31 December 2025, the Web of Science Core Collection (WoS) and Research Commons (RC) databases were selected for analysis. The publication sample was compiled using the search query “national martial art”. The sample included 552 publications in WoS and 367 in RC. The analysis period covered 2015–2025. Bibliometric methods were applied to process the data. VOSviewer (version 1.6.20) was used for keyword and direct citation analyses, including the construction of bibliometric maps and the visualization of cluster density and citation weights. The minimum threshold for keyword inclusion was five occurrences for WoS. For RC, all keywords were included due to their limited number.

Results The WoS database identified the following priority research areas: sociology, sports, education, history, and medicine, in descending order of publication frequency. The RC database does not classify research areas. Authors from China produced the largest number of publications in both databases. Poland was also represented by a considerable number of publications. Publications by Ukrainian authors accounted for a small proportion in RC. However, an analysis of leading journals showed that Ukrainian journals constituted a substantial share of the RC database. The most cited authors were identified in the WoS database. Bibliometric maps enabled the identification of key research areas and current trends. Seven clusters were identified. These clusters reflect issues related to anthropometric, functional, and psychophysiological assessment of athletes. They also include sporting, pedagogical, social, historical, and philosophical aspects of NMA; injury-related issues in combat sports, including prevalence, prevention, and rehabilitation; and the use of training interventions to reduce risk factors, improve quality of life, enhance motivation, and optimize physical activity. The keywords within these clusters were also analyzed. However, formatting limitations in RC publications significantly hindered the analysis.

Conclusions A structural bibliometric analysis of publications in the WoS and RC databases on national martial arts for the period 2015–2025 was conducted. The results reflect the thematic structure of the field, dominant research areas, and the distribution of publication activity across countries, authors, and journals. The most frequently represented thematic areas include sports, recreation, and rehabilitation, as well as historical, social, and philosophical aspects of NMA. The conclusions are descriptive and limited by the applied bibliometric approach and the characteristics of the analyzed databases.

Keywords: national martial art, bibliometric mapping, VOSviewer, research trends, citation analysis

Introduction

Martial arts are among the most widespread and popular sports worldwide. This is due to the variety of disciplines, their spectacularity and influence on basic physical qualities. This popularity has resulted in a substantial number of academic publications in this field. A previous study [1] presents an annotated

bibliography of monographs on Asian martial arts published in Spain up to 2009, with a total of more than 2403 sources.

National martial arts (NMA) are sports that have developed primarily within a single country. They reflect national characteristics and influence societal development. Currently, many have spread beyond national borders and gained global popularity. The most widespread are Eastern martial arts, characterized by long-standing traditions and strong connections to national, cultural, and historical contexts.

Chinese martial arts are considered an integral part of Chinese national culture [2, 3, 4]. Their preservation and development are important for shaping national identity. Their role in strengthening national unity and fostering the Chinese national spirit has been emphasized [5, 6, 7]. Wushu is officially included in the national physical education curriculum and plays an important role in promoting physical activity [8].

Several studies [2, 5, 9] examine approaches to preserving Chinese NMA, particularly through the development of specialized programmes for educational institutions at different levels. These studies conclude that educational institutions should focus on training specialists who are knowledgeable in both traditional and modern martial arts.

National sports are an integral part of ethnic culture and require careful preservation and adaptation to the modern socio-cultural environment, taking into account regional and national factors [10]. The extreme climatic conditions of the Far North, historical events, and the traditions and customs of the Sakha people imposed specific demands on men. This required the development of qualities such as agility, strength, speed, and endurance. The national sport of khapsagai wrestling contributed to the development of these traits, ensuring regular physical activity in everyday life, hunting, and work. Khapsagai is a non-contact sport that does not involve striking techniques or pain-inducing holds. At the same time, it emphasizes agility and requires technical and tactical manoeuvres without causing injury to the opponent [10].

The development of NMA requires governmental measures for promotion and support [11, 12, 13]. A previous study [11] analyses the actions of the Brazilian federal government regarding capoeira. Capoeira is an Afro-Brazilian martial art that combines elements of dance, combat, and games, and is practiced with musical accompaniment. The authors evaluate the effectiveness of the Capoeira Protection Plan, which is based on recommendations of the National Institute of Historical and Artistic Heritage.

Similar findings have been reported by other researchers [12]. Their study analyses the law recognizing arnis as the national martial art and sport of the Philippines. The law is implemented through the promotion of training programmes and the organization of competitions at various levels.

Another study [13] reports on the activities of the Georgian Martial Arts Federation. Its founders and ideologues consider national martial practices not only as a basis for developing a national sport but also as a means of fostering Georgian identity and promoting behavioral norms and moral standards accepted within Georgian society. The integration of martial arts and traditional culture serves as an

important means of expressing the contemporary national spirit [14, 15, 16]. One study [14] analyses traditional culture and its representation in martial arts, concluding that martial arts can promote patriotism, vitality, and national identity. An analysis of modern Taijiquan established a link between trends in martial arts development and the cultural and historical characteristics of society [15]. Furthermore, researchers [16] analyzed the dragon and lion dance, which represents a classical form of traditional Chinese sporting culture. Over time, this practice has evolved into a sport that combines martial arts, dance, and music.

The future of traditional Asian martial arts has been examined in recent studies [17, 18]. Processes of modernization and globalization are contributing to the transformation of Asian martial arts. The international promotion of Chinese martial arts is considered an important tool for enhancing the global standing of national sports, expanding the sports industry in the international market, improving communication in sports culture, and preserving the national identity of overseas Chinese communities [18]. Researchers also identify barriers to development and propose measures and strategies for the international promotion of Chinese martial arts.

In the contemporary context, the development of martial arts is becoming increasingly diverse. This has raised concerns about the potential disappearance of many traditional martial arts. This issue has been analyzed by scholars [19], who propose measures for their preservation and global dissemination.

Many national martial arts have a long historical background. For example, one study [20] examined the martial arts of the Korean Mugwa system during the Goryeo and Joseon dynasties. The findings indicate that the legacy of these traditional practices continues to influence modern martial arts, physical education, and sports development in Korea.

An analysis of Korean NMA as symbols of national culture is presented in other studies [21]. The study emphasizes the distinctiveness of Korean martial arts despite their historical roots in China and Japan. It shows that Taekwondo, Tang Soo Do, and Taekkyon currently serve as symbols of Korean national identity.

Another study by Latiff et al. [22] examines the Malay martial art of pencak silat. The authors highlight its national significance and its value as a resource for actor training. It is concluded that pencak silat serves as a foundation for traditional acting techniques.

A further study by Hariono et al. [23] indicates that pencak silat is actively developing at both national and international levels, necessitating comprehensive scientific research. The authors emphasize the importance of incorporating pencak

silat into primary education to improve pupils' physical development.

An analysis of pueblo street fighting as Venezuela's national martial art is presented by other scholars [24]. The popularization of this NMA is associated with the development of Venezuelan nationalism. At the same time, strategies of disinformation and secrecy were employed to restrict its dissemination.

An analytical review [25] examines the influence of martial arts on young people. It highlights their increasing popularity and the growing number of practitioners. The study emphasizes the importance of understanding the dual nature of martial arts, namely their potential to empower as well as to cause harm, in order to maximize benefits and ensure the safety of young athletes.

A further study [26] emphasizes that NMA occupy an intermediate position between sport and both formal and informal artistic practices. They simultaneously represent elements of dance, culture, and the historical heritage of different societies. The authors provide a comprehensive analysis of Malaysian martial arts organizations at various levels. The importance of their legal status and alignment with the objectives of the National Sports Policy is demonstrated.

Another study [27] provides a comprehensive analysis of the Chinese martial art Sanda. The findings highlight the integration of cultural, traditional, and sporting components. This form of NMA contributes to moral education, patriotism, and physical and psychological development. The study of Sanda development trends enables the identification of practical approaches to its promotion.

Studies by Thang et al. [28] and Quoc Thang et al. [29] analyze motivational factors for practicing the Vietnamese martial art Vovinam. The approach integrates components such as health awareness, the need for physical activity, behavioral aspects, and the perception of national identity and pride. Motivational and cultural factors encouraging participation in Vovinam have been identified, confirming its potential as a means of strengthening national identity among young people.

National martial arts are widely practiced in Ukraine. Analyses have identified their historical, ethnic, and sport-related components [30, 31, 32]. In the context of the Russo-Ukrainian War, Ukrainian NMA have acquired increased significance [30]. They serve as elements of military-patriotic education and youth training [31, 32]. The need for a comprehensive approach is emphasized, involving state authorities, local governments, the public, educational institutions, parents, and young people.

A comparative critical analysis of various types of martial arts, including traditional martial arts, Eastern systems, and Ukrainian national styles, is

presented in another study [31]. Martial arts play an important role in improving health and physical fitness among children, adolescents, and young people. Their integration into secondary school physical education remains a relevant issue in contemporary pedagogy.

Previous bibliometric studies on martial arts and related fields have primarily focused on specific disciplines, regions, or isolated thematic domains, often relying on a single database and offering limited integrative analysis. These studies typically emphasize descriptive mapping without comprehensive comparison of data sources or broader conceptual synthesis.

In contrast, the present study adopts a dual-database approach (WoS and Research Commons) and aims to provide a more integrative structural mapping of research on national martial arts. This approach enables not only the identification of thematic clusters but also the comparison of database characteristics and the detection of structural inconsistencies within the field.

Based on the above, this study aimed to analyze publications on national martial arts using bibliometric methods and to identify priority research areas in this field. The study is exploratory and analytical in nature and provides a structural description of the scientific field without drawing causal conclusions. It also offers a comparative and integrative perspective that extends existing bibliometric analyses of martial arts research.

The study employs a bibliometric design and focuses on a systematic quantitative analysis of the publication corpus. The research question is formulated as follows: What thematic areas, author clusters, and research priorities are reflected in publications indexed in the Web of Science Core Collection and Research Commons databases on national martial arts during the period 2015–2025?

Methodology

Data sources

The Web of Science Core Collection (WoS) and Research Commons (RC) databases were selected for analysis as of 31 December 2025. The search strategy was based on the term “national martial art”, applied to the title, abstract, and keyword fields using the standard search interfaces of each database. The same keyword phrase was used without additional Boolean operators or truncation. No updates were performed after the initial search date. No filters were applied for publication language, study type, design, or country of origin. Duplicate records within each database were automatically removed by the respective systems.

The records were exported using the standard functions of each database in available formats (e.g., plain text or CSV). The exported data included

bibliographic metadata such as authors, titles, abstracts, keywords, source titles, and citation information. No manual correction of missing or incomplete data was performed prior to analysis.

No additional manual selection of publications was conducted. The analysis period was limited to 2015–2025. The final sample included 552 publications from WoS and 367 from RC.

The search was not supplemented by manual screening of reference lists or additional databases, and no repeated searches were conducted. The selected databases allowed for a preliminary analysis of the main categories and key indicators of the sample. The results are presented in Table 1.

The WoS and RC databases were used to identify key trends in NMA research. The initial results are presented in Table 1.

The composition of the included publications was analyzed using database metadata. In the WoS database, articles (77.0%), conference proceedings (15.0%), and reviews (5.1%) predominated. In the RC database, the sample consisted exclusively of articles (100%). A detailed classification by study design (e.g., randomized trials, observational studies, qualitative studies) was not performed, as the analysis focused on bibliographic characteristics rather than methodological assessment of the original studies.

The structure of publication categories (Table 1) confirms a multidisciplinary focus. The WoS database identifies the following priority research areas: sociology, sports, education, history, and

medicine, in descending order of publication frequency. The RC database does not specify research areas. Authors from China produced the highest number of publications in both databases. Poland is also represented by a considerable number of publications. Publications by Ukrainian authors account for a small proportion in the RC database. However, analysis of leading journals indicates that Ukrainian journals constitute a substantial share of the RC database. Articles published in these journals account for approximately 10% of the total, whereas the country-level analysis indicates only 1.1%. Furthermore, the RC database includes a substantial number of records without specified journal titles, which significantly complicates the analysis.

An analysis of institutional affiliations shows a predominance of institutions from Poland in both databases. The University of Rzeszów is the most frequently represented institution. The Ministry of Education and Science of Ukraine appears in the WoS database, likely due to inconsistencies in bibliographic records.

Inclusion and exclusion criteria

Inclusion criteria:

- publications indexed in WoS or RC;
- publications published between 2015 and 2025;
- records containing the search term “national martial art”;
- document types: articles, reviews, conference proceedings, and book chapters (WoS); articles (RC).

Table 1. Results of analysis of Web of Science and Research Commons categories

Analysis indicator	WoS (N; %)	RC (N; %)
Document types	Article (425; 77.0%); Proceedings Paper (83; 15.0%); Review (28; 5.1%); Book Chapter (11; 2.0%); Early Access (7; 1.3%).	Article (367; 100.0%).
Subject areas (top 5)	Social Sciences (216; 39.1%); Sport Sciences (138; 25.9%); Education and Educational Research (44; 8.0%); History (24; 4.3%); General and Internal Medicine (22; 4.0%).	Not specified.
Country (top 5)	People’s Republic of China (106; 19.1%); Poland (86; 15.6%); USA (77; 13.9%); Brazil (54; 9.8%); Spain (34; 6.2%).	People’s Republic of China (16; 4.4%); Indonesia (9; 2.5%); Russia (6; 1.6%); Poland (5; 1.4%); Ukraine (4; 1.1%).
Journals (top 5)	Ido Movement for Culture. Journal of Martial Arts Anthropology (74; 13.4%); Revista de Artes Marciales Asiáticas (25; 4.5%); Archives of Budo (21; 3.8%); International Journal of the History of Sport (14; 2.5%); Advances in Social Science, Education and Humanities Research (13; 2.4%).	Source title not available (40; 10.9%); Scientific Journal of National Pedagogical Dragomanov University. Series 15. Scientific and Pedagogical Problems of Physical Culture and Sports (18; 4.9%); Yedynoborstva (12; 3.3%); Uzhhorod National University Herald. Series: Law (10; 2.7%); M/C Journal (6; 1.6%).
Institutions (top 5)	University of Rzeszow (42; 7.6%); University of São Paulo (22; 4.0%); Ministry of Education and Science of Ukraine (12; 2.2%); University of León (10; 1.8%); University of Novi Sad (8; 1.4%).	Beijing Sport University (2; 0.5%); RCH (2; 0.5%); University of Rzeszow (2; 0.5%); Akademia Wychowania Fizycznego we Wrocławiu (1; 0.2%).

NOTE: Source of information: authors’ own research (31 December 2025).

Exclusion criteria:

- publications outside the specified timeframe;
- records lacking bibliographic data required for analysis;
- duplicate records within a single database (where applicable).

Publication selection process

The initial search identified 552 records in the WoS database and 367 records in the RC database. Dataset assembly was conducted separately for each database. After retrieval, bibliographic metadata were screened for the presence of essential fields, including title, authors, keywords, source title, and citation data. Records lacking required metadata were excluded only if they could not be used in bibliometric mapping procedures.

No manual thematic or relevance-based filtering was applied. No additional subject-based restrictions were introduced, as the study aimed to analyze the complete set of publications matching the search criteria. Publications were selected at the level of bibliographic records. No full-text analysis was performed, as the study was strictly bibliometric in nature.

As the analysis was conducted separately for each database, no cross-database duplicate removal was performed. This approach preserved the structural characteristics of each database and enabled comparative analysis of their bibliometric features.

Method of study

VOSviewer (version 1.6.20) was used as the bibliometric analysis tool [33]. Network construction was based on the association strength normalization method, implemented by default in VOSviewer for keyword co-occurrence and direct citation analysis. Clustering was performed using the VOS clustering technique with a standard resolution parameter of 1.0.

The analysis was conducted using the full counting method. Default layout and clustering parameters implemented in VOSviewer were applied unless otherwise specified. No additional parameter tuning was performed beyond standard software settings.

The minimum threshold for keyword inclusion was five occurrences for the WoS database. For the RC database, all keywords were included due to their limited total number ($n = 81$). Additional manual normalization was performed using a thesaurus to merge semantically similar terms.

The preprocessing procedure included unification of synonymous keywords, correction of spelling variations, and removal of non-informative terms. The thesaurus was developed manually based on frequency analysis and expert judgment. Term inclusion was determined by frequency of occurrence and semantic equivalence. Only terms exceeding the predefined threshold were considered

for merging. Ambiguous terms were retained to avoid distortion of meaning. Terms referring to the same concept (e.g., singular and plural forms, abbreviations) were merged into unified entries.

Both keyword co-occurrence analysis [34] and direct citation analysis [35] were applied. The methodology for calculating key indicators and identifying major research categories follows van Eck and Waltman [36].

Priority research areas were identified based on highly cited references. Classification was performed through analysis of the thematic content of these publications and their associated keyword clusters. Each area was defined according to dominant cluster topics and the frequency of related terms. Results are presented as bibliometric maps and tables of keyword characteristics. The distance between elements on the maps reflects the strength of their relationships, with shorter distances indicating stronger connections.

The combined use of keyword co-occurrence and direct citation analysis provides a more comprehensive representation of the research field. This approach enables identification of both thematic relationships and influential research directions beyond descriptive mapping.

In analyzing the results, a double citation approach was applied to enhance analytical depth and the robustness of interpretation [37]. In this context, double citation refers to identifying publications that are both highly cited within the dataset and frequently co-cited with other influential works.

No assessment of risk of bias in individual studies (e.g., using RoB 2, ROBINS-I, or Newcastle–Ottawa Scale tools) was conducted, as the study focused on bibliometric analysis of metadata rather than evaluation of intervention effectiveness. Accordingly, the conclusions reflect publication distribution and thematic structure rather than levels of evidence.

The study workflow included the following stages: data retrieval, export of bibliographic records, keyword preprocessing and normalization, construction of bibliometric networks using VOSviewer, and interpretation of clustering results. Each stage was performed sequentially without iterative re-analysis.

Results

The results provide a structured overview of the thematic organization and research trends in the field of national martial arts. Particular attention is given to the identification of key clusters, their internal relationships, and their contribution to understanding the multidimensional nature of the field.

The analysis revealed a structured distribution of research topics across several major thematic

domains. The most prominent areas include physical performance and athlete conditioning, injury prevention, health-related applications, and socio-cultural aspects of national martial arts. These domains are reflected in the identified keyword clusters, which vary in size, connectivity, and thematic focus.

Both datasets were analyzed using author-provided keywords. The WoS database yielded a total of 2,181 keywords. Terms appearing at least five times were selected for analysis, resulting in a subset of 96 terms. Initial analysis identified semantically similar keywords distributed across different clusters. Therefore, a thesaurus was applied to reduce redundancy, resulting in a final set of 82 keywords.

In the RC database, the total number of keywords was 81. All keywords were included in the construction of bibliometric maps and subsequent analysis.

A network visualization of the WoS dataset is presented in Figure 1. The figure illustrates the distribution of keywords across clusters and highlights the relative importance of research themes based on their connectivity and frequency.

The keywords are grouped into seven clusters, with 735 links and a total link strength of 1734.

The characteristics of the keywords are presented in Table 2, which provides quantitative support for the identified clusters, including keyword frequency and the strength of their connections within the network.

The “Links” and “Total link strength” metrics reflect the relative intensity of connections between keywords within the constructed network and do not represent an absolute measure of the scientific significance of research areas. Link strength indicates the number and intensity of co-occurrence relationships between keywords, showing how frequently terms appear together within the dataset. Higher values indicate stronger thematic connections. These metrics should be interpreted only within the context of the constructed model and selected analysis parameters.

Clusters represent groups of keywords that are more strongly connected to each other than to those in other clusters, indicating distinct thematic areas within the research field. The first cluster is the largest, comprising 21 keywords. The most frequent terms are “performance” and “fitness”. This cluster includes studies assessing the physical conditioning of combat sports athletes. A substantial proportion of these studies focuses on the use of exercise in physical education and

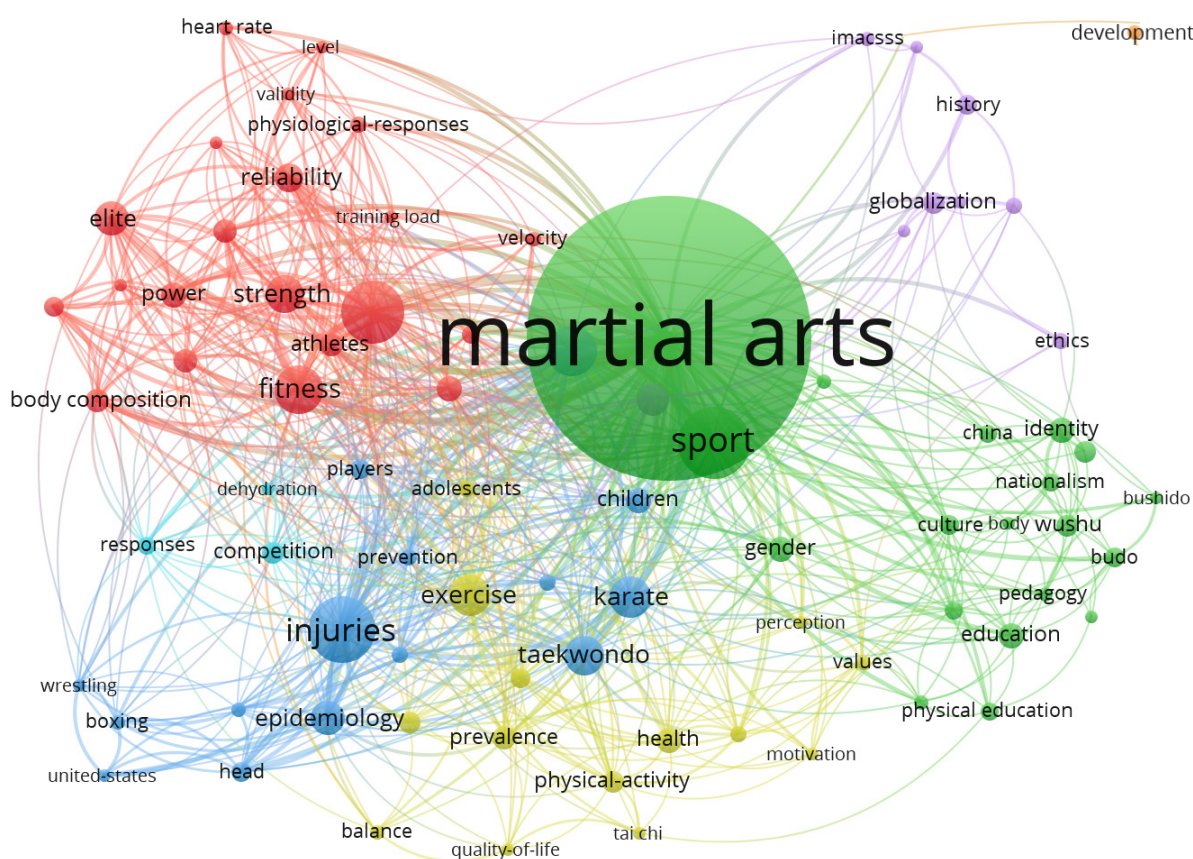


Figure 1. Network visualization of main keywords in publications on national martial arts. Source: authors' own research based on WoS data analyzed using VOSviewer (31 December 2025).

Table 2. Characteristics of keywords in bibliometric network analysis

Keyword	Links	Total link strength	Occurrences	Avg. citations
Cluster 1 (21)				
anthropometry	13	21	5	18.40
athletes	24	46	11	6.91
athletic performance	21	42	11	12.27
body composition	22	55	11	18.18
elite	25	74	18	17.22
fitness	39	127	29	13.03
heart rate	10	19	6	7.67
level	14	23	5	9.80
movement	11	18	5	27.80
performance	47	157	41	13.37
physiological profiles	19	47	9	18.44
physiological responses	18	30	7	12.71
power	23	63	13	24.38
profile	27	48	12	13.92
reliability	28	67	15	22.73
strength	33	83	21	7.10
time-motion analysis	22	39	11	15.55
training	18	28	8	8.12
training load	12	18	5	11.60
validity	13	18	5	11.00
velocity	14	27	6	15.50
Cluster 2 (19)				
body	10	13	5	11.60
budo	11	20	9	4.44
bushido	5	11	5	6.80
China	8	9	8	5.75
Chinese martial arts	5	6	10	4.10
culture	18	27	9	3.89
education	14	24	12	2.58
gender	19	32	12	3.92
identity	13	20	12	8.17
Japan	11	14	6	4.33
martial arts	79	593	290	8.13
national traditional sport	4	4	5	0.40
nationalism	9	15	8	8.75
pedagogy	13	18	6	10.00
physical education	8	12	8	1.88
sport	54	149	48	7.06
students	11	16	6	4.67
violence	14	22	8	6.88
wushu	8	8	10	5.40
Cluster 3 (15)				
boxing	15	30	6	16.50
children	29	52	12	13.83

Table 2. Continued

Keyword	Links	Total link strength	Occurrences	Avg. citations
concussion	15	24	6	24.17
epidemiology	27	64	19	24.37
head	18	46	9	21.00
injuries	42	141	43	11.77
injury prevention	13	24	7	14.14
judo	38	107	30	10.53
karate	32	83	24	13.46
players	17	32	9	11.00
prevention	21	32	7	14.00
rates	17	33	7	17.57
taekwondo	27	68	22	9.59
United States	9	24	5	15.00
wrestling	15	26	5	15.00
Cluster 4 (14)				
adolescents	21	32	7	15.29
balance	10	16	6	18.17
exercise	39	92	24	17.58
health	19	30	12	9.75
impact	16	27	10	12.50
motivation	10	14	5	2.80
participation	18	31	7	6.71
perception	13	21	5	3.80
physical activity	20	34	10	5.90
prevalence	22	34	11	12.18
quality of life	11	13	5	5.00
risk	25	33	9	29.89
tai chi	8	11	5	7.60
values	13	21	6	7.17
Cluster 5 (9)				
capoeira	7	11	7	9.14
ethics	5	10	7	7.57
globalization	10	14	10	7.40
history	4	13	9	4.00
IMACSSS	7	13	6	3.67
mixed martial arts	26	45	17	9.29
national identity	6	10	5	2.20
politics	5	9	5	2.80
tourism	4	7	5	10.00
Cluster 6 (3)				
competition	22	32	10	13.00
dehydration	10	18	5	11.80
responses	18	26	8	21.38
Cluster 7 (1)				
development	1	2	5	0.00

NOTE: Avg. citations – average number of citations per keyword; Source: authors' own calculations based on WoS data (31 December 2025).

health promotion. The keyword analysis confirms the importance of anthropometric, functional, and psychophysiological assessment of athletes.

The second cluster comprises 19 keywords, with “martial arts” and “sport” as the most frequent terms. It includes a considerable number of keywords reflecting characteristics of Eastern martial arts and their links to culture, education, and national identity. Studies in this cluster integrate sporting, pedagogical, social, historical, and philosophical aspects of NMA. This supports the observations identified during the initial dataset analysis.

The third cluster comprises 15 terms, with “injuries” as the most frequent. Research in this cluster focuses on injury prevalence, prevention, and rehabilitation in martial arts. The keywords reflect common injury types and potentially high-risk disciplines.

The fourth cluster comprises 14 terms, with “exercise” as the most frequent. The keywords reflect the recreational and rehabilitative role of martial arts training, including risk reduction, improvement of quality of life, enhancement of motivation, and

optimization of physical activity. Among individual martial arts, only “tai chi” appears in this cluster.

The fifth cluster contains 9 keywords. The most frequent term is “mixed martial arts”, while “tourism”, “capoeira”, “ethics”, and “globalisation” also show relatively high citation levels. The cluster also includes “IMACSSS”, referring to the International Martial Arts and Combat Sports Scientific Society and its associated congress. The prominence of this term is consistent with the results of the preliminary analysis.

The sixth cluster comprises 3 keywords with comparable occurrence levels. The most frequent is “competition”, while the most cited is “responses”. This cluster reflects aspects of competitive activity in combat sports.

The seventh cluster consists of a single keyword, “development”, which shows only one link to “martial arts” in the second cluster. Due to the limited data, no reliable conclusions can be drawn regarding this cluster.

A network visualisation of the RC dataset is presented in Figure 2. The figure indicates weak or



Figure 2. Network visualisation of main keywords in publications on national martial arts. Source: authors' own research based on RC data analyzed using VOSviewer (31 December 2025).



Figure 4. Leading authors in national martial arts research (direct citation analysis with node density and citation weight visualisation). Source: authors' own research based on RC data analyzed using VOSviewer (31 December 2025).

Discussion

The aim of this study was to analyze publications on national martial arts and to identify key research areas using bibliometric methods. The results revealed a multidimensional structure of the field, including clusters related to physical performance, socio-cultural aspects, and injury research. Unlike previous studies, this analysis integrates data from two databases and highlights structural differences between them, particularly in terms of metadata quality and thematic representation. This approach provides a more comprehensive understanding of the research landscape and identifies limitations in emerging databases such as Research Commons.

The interpretation of the identified clusters indicates that the field is organized around several dominant thematic areas, including physical performance, training processes, health-related applications, and socio-cultural dimensions. Some clusters are more developed and interconnected, whereas others remain less structured, reflecting differences in research maturity across domains.

The bibliometric approach enhances analytical rigor by enabling quantitative assessment of the research field. VOSviewer generates bibliometric maps that facilitate the identification of key keywords and leading experts. This software is widely used in sports science. For example, it has been applied to analyze publications on the rehabilitation of patients with Alzheimer's disease through physical exercise [38]. It has also been used to conduct analytical reviews of publications on kickboxing [39], competitive dancing [40], and strength sports [41], allowing the identification of priority research areas in these fields.

The selection of two databases (WoS and RC) expanded the scope of publication analysis. The inclusion of the Research Commons database enables the identification of emerging publication patterns and regional research outputs that may not yet be represented in highly indexed databases such as WoS. This provides additional insight into early-stage development of research areas and highlights structural differences in data quality and indexing practices.

The WoS database includes high-ranking journals, authoritative conferences, and monographs

produced by leading experts. Publication in these sources serves as an indicator of research quality.

The RC database includes journals that meet basic requirements for scientific publications. Bibliometric analysis indicates that publication metadata are often incomplete. Journal titles are missing for a substantial number of records, and keywords are frequently inconsistently reported. This reduces the informational value of the database and limits its analytical reliability. The use of the RC database enabled identification of a group of publications on Ukrainian NMA, confirming the presence of research interest in this area. In contrast to WoS, which reflects established and standardized publication practices, RC provides access to less formalized but regionally relevant research outputs, enabling a broader comparative perspective.

Socio-historical, sports-pedagogical, and philosophical perspectives of NMA research

The identified clusters can be interpreted in relation to existing studies that reflect similar thematic directions but do not provide a unified structural mapping of the field. A bibliometric analysis of Chinese NMA was conducted in [7], based on 924 documents from the CNKI database. These publications address the preservation and development of martial arts and traditional national sports. CiteSpace V was used as the primary tool for visual citation analysis.

The main research areas identified include fundamental theories of martial arts and their preservation and development, theoretical foundations of traditional national sports as an academic discipline, traditional culture, intangible cultural heritage, and the development of competitive martial arts. These findings are consistent with the thematic clusters identified in the present study, particularly those related to socio-cultural and historical dimensions of national martial arts.

Study [42] provides an analysis of the phenomenon of combat. The following categories were identified: physical (perception, pain, movement, and combat techniques), emotional (related to will), intellectual, ethical, symbolic, and spiritual (individual moral choice of lifestyle not directly linked to psychophysical practice). In

addition, several dimensions of combat practice were distinguished: health-promoting (e.g., qigong), ritual (e.g., sumo), utilitarian (self-defence or combat), sporting (competition or recreation), self-actualisation (personal spiritual development), and symbolic (cultural values and respect for traditions).

Chinese martial arts rank among the most widespread and highly developed worldwide [3, 4]. Study [4] characterizes Chinese martial arts as a major tourist attraction. The authors analyze their transformation from a national symbol into a multifunctional transnational phenomenon closely linked to sectors such as tourism. The influence of martial arts on the Chinese tourism industry is driven by the active involvement of multiple stakeholders.

Historical aspects of the development of Chinese martial arts in Taiwan are examined in [43]. Three main periods are identified. The first period was characterized by the expansion of martial arts schools and their inclusion in the national physical education curriculum. The second period, referred to as the era of competitive sport, involved international promotion and the standardization of training and certification systems. During this stage, unified rules for national competitions were established, and instructors and athletes were prepared for participation in international events. The third period combines a sporting focus with an emphasis on physical education and health-oriented training.

Chinese NMA constitute a core component of professional training in martial arts and traditional sports at higher education institutions [44]. The development of information technologies has enhanced training processes. A specialized platform for teaching resources in wushu and traditional sports was developed to support this objective [44]. The platform is based on the integration of educational resources, facilitates access to learning materials, and supports the dissemination of self-directed learning content.

Study [9] analyses the implementation of martial arts training in secondary schools, using the Xiaoshan district of Hangzhou as a case study. The authors identify several shortcomings and propose measures to improve implementation. These findings correspond to the clusters identified in the bibliometric analysis related to educational and pedagogical aspects of martial arts.

In study [31], the rationale for selecting martial arts systems for integration into the physical education curriculum in upper secondary schools in Ukraine is outlined. The selection of physical activities should be based on a balance between physiological safety, methodological consistency, and age-appropriate adaptation. Eastern martial arts offer advantages in terms of structural clarity and educational orientation. Therefore, they are

more suitable for integration into school physical education compared to mixed martial arts (MMA) and Ukrainian NMA. Although these national systems have strong cultural significance and high spectator appeal, their intensive physical demands on adolescents and limited applicability for practical self-defence reduce their suitability for inclusion in standard school programmes.

Another study [45] examines the training of future physical education teachers for work in Ukrainian martial arts organizations. It identifies the need to prepare specialists through four methodological components: organization and implementation of educational and cognitive activities; motivational training; monitoring and independent study; and development of social and behavioral skills. A promising direction for professional coaching education is the prioritization of individual interests and their support throughout the training process.

Study [32] assesses the impact of the Cossack duel training programme on athletes' specific endurance. The results show that over two years of implementation, the intensity of striking actions increased significantly, reflected in a higher number of punches and kicks delivered to a heavy bag. High-intensity exercise within a single round also produced significant cardiovascular responses, leading to more efficient heart rate recovery. The authors conclude that specific endurance is a key factor in athlete training. Monitoring of this parameter can be conducted using a 90 sec test involving punches and kicks on a heavy bag, with strike intensity and heart rate used as evaluation criteria. These findings support the presence of clusters related to physical performance and training processes identified in the present study.

Additionally, study [46] analyses the work of Volodymyr Pilat, the founder of the Ukrainian NMA "Fighting Hopak style". The study highlights the distinctive features of this martial art, particularly its performance to music and the incorporation of traditional weapons such as the long stick, sabre, pike, scythe, sickle, mace, chain, and ice pick.

Study [47] examines the developmental prospects of Ukrainian belt wrestling. A methodology for specialized strength training based on the techniques of this martial art has been developed, and its application is proposed to enhance students' physical fitness.

In study [48], a comparative analysis of anthropometric and postural characteristics of martial arts athletes is presented. The Star Excursion Balance Test (SEBT) was used to assess dynamic balance. Fencers demonstrated higher SEBT scores than karate and hopak athletes, which is attributed to the specific nature of fencing training, emphasizing lower limb development. Karate athletes also showed better results than hopak athletes, reflecting differences in biomechanical

demands across these disciplines.

Another study [12] identifies the promotion of the Filipino martial art Arnis within university education as a key developmental direction. Interviews with instructors enabled an assessment of its dissemination potential. The authors conclude that Arnis should be incorporated into the curriculum as a physical education subject.

Similar findings are reported in study [49], which examines issues related to the development of Muay Thai. Several shortcomings were identified, primarily associated with inadequate infrastructure. To increase its popularity, the author proposes inclusion of Muay Thai in school curricula as a promising direction for development.

The study by Hariono et al. [23] evaluates the feasibility of integrating Pencak Silat into primary education. The methodology included assessments of physical fitness and cognitive abilities, as well as a questionnaire measuring pupils' interest in this martial art. Positive trends were observed across all measured indicators.

Study [50] assesses the validity and reliability of the Illinois Agility Test (IAT) for evaluating agility in Pencak Silat athletes. The results indicate that the IAT effectively reflects key components of Pencak Silat, including rapid changes of direction and multi-directional movements. The authors conclude that the test is a valid and reliable tool for assessing agility, and its application can improve the effectiveness of martial arts training. These findings correspond to clusters identified in the bibliometric analysis, particularly those related to physical performance, training processes, and injury prevention, confirming the internal consistency of the results.

Another study by Shapie et al. [51] provides an overview of the combat sport Silat Tempur. This NMA discipline emerged in 2013 and is designed for children, with the primary aim of improving technical training. The most frequently used techniques include hand and foot strikes, grips, blocks, and takedowns. The study emphasizes the critical role of the coach in both regular training sessions and competition preparation.

Study [52] compares the technical and tactical actions of Silat Tempur athletes. The results indicate that winning athletes performed more actions than their opponents. In particular, winners used kicks more frequently in attack and executed a greater number of successful manoeuvres. The authors conclude that kicks are the primary offensive techniques in Silat matches and contribute to higher success rates.

Similar findings are reported in study [53], which examined the structure of tactical actions in Pencak Silat bouts. Video analysis was used to record key tactical actions, revealing significant differences depending on the round and match outcome. The

authors suggest applying these findings to training to improve sparring tactics.

Study [54] presents training models for practicing evasion techniques in Pencak Silat matches. The Attack Machine simulator was used to enhance the objectivity of the results, together with a newly developed instrumental test, the Attack Machine Test, designed to measure evasion speed. The results showed an increase in the average evasion performance score, which the authors interpret as an improvement in training effectiveness and reaction speed.

Weight-loss methods among Pencak Silat athletes are examined in study [55]. Risky weight management methods (e.g., the use of laxatives, slimming pills, and self-induced vomiting) were found to be less common than in other martial arts. While coaches and peers play a key role in weight management, the study noted insufficient involvement of dietitians in this process. Consequently, the authors concluded that specific dietary strategies should be developed in Silat to optimize both health and sporting performance.

Study Putra et al. [56] investigates the effect of meditation on improving emotional regulation in Pencak Silat athletes. A pre-test–post-test design was used to assess emotional regulation, employing a specialized form of meditation incorporating mindfulness techniques. The findings demonstrated that meditation significantly enhances emotional regulation among members of the Indonesian National Academy of Martial Arts.

The study by Teressa et al. [57] assesses the psychological profile of Pencak Silat athletes as a factor influencing performance. The results indicate that a high level of motivation reflects athletes' engagement in training and thorough preparation for competitions. Conversely, low anxiety control highlights difficulties in maintaining composure during competitions. Self-confidence and concentration were found to be at an average level, confirming the need to target these aspects to enhance overall performance.

In study by Vai [58], the physical fitness of Pencak Silat athletes is examined. The research was conducted during the National Sports Week in West Java. Significant differences were found in physical fitness test results among athletes from different provincial teams. Furthermore, changes in psychological status confirm the development of fatigue, which may negatively affect performance.

Another study by Lubis et al. [59] evaluates the effect of aerobic interval training on the anthropometric and functional parameters of elite Pencak Silat athletes. A five-week training intervention significantly improved VO₂max and reduced resting heart rate, body weight, and body fat percentage.

Study [60] conducts a comparative analysis of

Thai wrestling techniques. This technical analysis enabled the identification of key tactical advantages influencing competitive success. The authors emphasize the importance of a scientifically grounded approach to the study of this sport.

Kinetic and kinematic analyses were employed in study [61] to evaluate three kicking techniques in Sanda: the roundhouse kick, the front kick, and the side kick. Significant differences were identified between the techniques in terms of kinetics (force, power, linear momentum, and inertia), linear kinematics (displacement, velocity, and acceleration), and angular kinematics (segment angles and angular velocity). The front kick was found to generate optimal force and peak power, making it the most effective strike. Conversely, the roundhouse kick demonstrated the fastest execution, indicating high strike velocity. These findings are consistent with the cluster structure reflecting performance-related and biomechanical research areas.

Kendo is a Japanese martial art practiced with a bamboo sword. Study [62] describes a methodology for psychological skills training for athletes in this discipline. The methodology consisted of several stages: training, assessment, instruction in psychological skills, application of these skills in context, and final assessment. The paper discusses specific aspects of Kendo, the use of video technology, and the relationship between the athlete and the consultant.

The study by Cojocariu et al. [63] presents an analysis of the impact of specialized training on anaerobic lactate capacity in Qwan Ki Do. Elite athletes participated during the competitive period. The results showed a low overall level of anaerobic lactate capacity. The authors suggest that this energy system is used to a lesser extent to sustain competitive activity.

Another study by Rajkumar et al. [64] analyses the development of the Indian martial art Thang-Ta, which combines fencing, spear techniques, hand-to-hand combat, and spiritual practices. The findings demonstrate an increase in the number of participants, greater gender inclusivity, and broader regional representation. The codification of rules, improved accessibility, and adaptation to modern sporting frameworks have transformed Thang-Ta from a traditional martial art into a dynamic competitive sport.

Study [65] provides an analysis of techniques used to perform specific elements in Tai Chi. The research indicates that elite Tai Chi athletes typically select six elements of varying difficulty for their competitive routines. Analysis of these exercises identified the movements where errors occur most frequently. Trembling was found to be the main cause of errors in the execution of complex movements.

The health benefits of national martial arts.

Study [8] indicates that martial arts promote longevity, improve physical fitness, prevent illness, and support overall well-being. Long-term practice conditions muscles and ligaments, strengthens bones, enhances flexibility and coordination, and improves blood circulation. Furthermore, the Taoist philosophy associated with Chinese Wushu contributes to physical health and enhances spirituality, mental acuity, and temperament. These findings correspond to the health-related clusters identified in the bibliometric analysis.

The review [25] assesses the growing popularity of NMA and its increasing influence on young people. The authors examine physical and psychosocial benefits, as well as injury risks associated with increased participation. They conclude that martial arts provide a platform for the development of physical health and psychological resilience among youth.

Similar findings are reported in study [15], where an analysis of trends in the development of modern Tai Chi confirmed its global popularity and health benefits. The combination of movement, breathing, and meditation contributes to physical fitness and enhances sensory awareness.

Study [3] proposes incorporating Chinese martial arts exercises into school education. This approach enriches the curriculum, broadens the range of physical activities available to pupils, and improves the physical and mental health of children and adolescents in China. Integrating aerobic conditioning within martial arts enhances students' understanding, increases knowledge, and stimulates interest in the discipline. This aerobic function of martial arts cannot be replicated by other forms of exercise.

Similar results were reported in study [66], which aimed to assess the effect of martial arts classes on physical fitness indicators in primary school-aged children. Participation in these classes improved resting heart rate, increased vital lung capacity, enhanced performance in hypoxic tests (such as the Stange and Gench tests), optimized the Ruffier index, and improved overall physical fitness outcomes.

Study [16] suggests using dragon and lion dances as a form of physical activity. This activity positively affects cardiovascular health and contributes to moral education by supporting the development of moral qualities. Dragon and lion dances are highly accessible and can be performed in various settings.

An online survey of young people practicing the Vietnamese NMA Vovinam was conducted in studies [28, 29]. The findings demonstrate that knowledge about health and the benefits of physical exercise significantly influences motivation to participate in training. Physical activity is a significant predictor of Vovinam participation among young people. A significant correlation was identified between

awareness of health importance, perceived benefits of physical exercise, and the intention to engage in training. Consequently, the authors recommend using this NMA to improve physical health.

Study [67] examines the suitability and effectiveness of Korean Taekwondo for the health of older adults. Participants demonstrated improvements in the average number of push-ups, trunk flexion, and single-leg balance time. Taekwondo proved effective in improving balance performance. The programme showed a low dropout rate, indicating both the ability of older adults to practice a complex martial art and sustained interest in this form of physical activity. These findings suggest that Taekwondo is an effective and potentially attractive form of exercise for older adults.

Overall, the findings indicate that research on national martial arts is fragmented across several domains, with a strong dominance of sport science and physiological studies, while socio-cultural and philosophical aspects remain less systematically integrated. This imbalance reflects disciplinary traditions and database indexing practices and highlights the need for more integrative research approaches.

The rehabilitative focus of NMA

Chinese NMA are traditionally regarded as a means of maintaining physical fitness and health. Study [6] emphasizes the importance of the aesthetic and therapeutic components of traditional Chinese martial arts. These practices constitute an important part of modern leisure activities. The authors conclude that Chinese traditions have significant practical value within the framework of national physical fitness promotion.

The review [68] analyses the use of the traditional Chinese martial art Tai Chi for health improvement and rehabilitation. As an exercise system, Tai Chi employs slow, flowing movements to train the body and develop balance, endurance, and strength. The researchers conducted a systematic search of the PubMed, Web of Science, and EMBASE databases to analyze clinical studies. Most studies demonstrate the positive effects of Tai Chi on balance, cognitive function, mood regulation, sleep quality, pain reduction, cardiorespiratory function, and overall health.

The study by Guo [69] focuses on the '13 Tai Chi Postures in a Wheelchair' programme. This approach makes traditional Chinese martial and therapeutic practice accessible to individuals with disabilities. The programme transforms the wheelchair from an assistive device into a tool for empowerment. Wheelchair Tai Chi has been widely adopted by people with disabilities as a fitness and recreational activity in China. It has been incorporated into national health promotion programmes, and its

effectiveness in treatment and rehabilitation has been demonstrated.

The review [70] presents data on the use of Tai Chi to improve physical and mental health. The meta-analysis showed that Tai Chi has a positive effect on cognitive function in middle-aged and older adults with cognitive impairments, as well as in healthy older adults and university students.

Study [71] examines martial arts within the context of the 'triad of life skills,' which includes healing arts such as acupuncture, self-awareness practices such as yoga, and life skills such as meditation. The authors review medical literature demonstrating the health benefits of martial arts practice. Tai Chi is identified as the most extensively studied discipline. Reported benefits include improved physical fitness, increased self-confidence in older adults, reduced fall incidence, enhanced physical endurance, and positive effects on the immune and autonomic nervous systems. The study highlights the multifaceted nature of martial arts and their importance for both sport and health promotion.

Studies cited in review [25] show that martial arts can improve mindfulness, reduce stress, and enhance self-control, contributing to a reduction in aggressive behavior among school-age children. Martial arts techniques have also proven effective in relieving pain in children with chronic illnesses and in reducing emotional stress in their siblings.

The study by Li [72] analyses the specific characteristics of rehabilitation for knee injuries. Rehabilitation methods aim to restore sensory function, and therapeutic elements incorporating traditional sports are widely used. In recent years, innovative methods such as the use of nanotubes have been introduced. The combination of NMA elements with nanotubes has been shown to accelerate treatment in patients with knee arthritis. Improvements in knee joint range of motion, gait, and swelling reduction were observed compared to the control group.

Another study by Wąsik and Wójcik [73] emphasizes that martial arts integrate athletic, fitness, and rehabilitative components. Therapeutic use of traditional martial arts can facilitate the management of various medical conditions [74]. Participation in these practices contributes to improved mental health, with self-esteem and perceived competence associated with training duration. Contemporary research indicates that traditional martial arts represent an effective complementary approach for the management and rehabilitation of chronic conditions.

The analysis of publications in the WoS and RC databases confirms the continued relevance of NMA development. Priority research areas have been identified, and the bibliometric analysis indicates a predominance of publications related to sport,

recreation, and rehabilitation.

From a conceptual perspective, the findings suggest that national martial arts research constitutes a multidimensional field integrating sport science, health-related studies, and socio-cultural analysis. However, these dimensions are not equally developed, with a clear dominance of performance- and health-oriented research, while cultural and philosophical aspects remain less systematically explored. This indicates the need for a more balanced and integrative research framework connecting these domains.

This is consistent with the results of previous bibliometric analyses of publications on kickboxing [39], competitive dancing [40], and strength sports [41]. The specific nature of NMA determines research directions unique to these disciplines. Consequently, a substantial proportion of publications with a historical, social, and philosophical focus has been identified.

NMA are practiced in various countries, with the highest prevalence in East and Southeast Asia (China, the Philippines, Indonesia, Korea). They also maintain a presence in Latin America, while Ukrainian NMA form a distinct cluster in academic research. Evidence indicates that NMA in these countries are integrated into both the sporting domain and the educational system. Educational programmes focus on training specialists and promoting these disciplines.

Considerable attention is given to the ethnic and sociocultural aspects of NMA. Academic studies highlight their role in fostering national identity and preserving cultural heritage.

Significant differences exist in publication standards between the WoS and RC databases. The WoS database includes publications from highly indexed journals that maintain rigorous quality standards and strict adherence to bibliographic formatting requirements.

Comparative analysis of these databases highlights differences not only in data quality but also in the structure and maturity of the research field. While WoS reflects consolidated scientific directions, RC reveals less structured but potentially emerging research areas.

Ukrainian NMA are represented primarily by publications in the RC database. The structural differences identified between the WoS and RC databases reflect specific indexing features, metadata completeness, and the organization of bibliographic records. The absence of network connections in the RC sample may be explained by the technical characteristics of keyword and citation representation rather than by the quality of scientific research. Therefore, the observed differences should be interpreted as structural features of the respective databases.

Study limitations

This study has several limitations:

- the analysis was limited to two databases (WoS and RC);
- a single search query was used;
- the resulting network structure depends on clustering parameters and keyword inclusion thresholds;
- there are notable differences in metadata completeness between the WoS and RC databases; no assessment of risk of bias in individual studies was conducted;
- publications were not classified by study design;
- no formal statistical comparison of indicator distributions between the databases was performed;
- the results reflect the structure of publication activity rather than the level of evidence of the data presented.

These limitations should be considered when interpreting the findings. The results should be regarded as a structural representation of the scientific field within the scope of the selected sources and analysis parameters.

Future research should expand the bibliometric analysis by including additional databases and more complex search strategies. Further studies may integrate qualitative analysis to better understand the conceptual development of the field. Greater attention should also be given to underrepresented thematic areas, particularly the socio-cultural and philosophical dimensions of national martial arts, as well as to improving the standardization and quality of bibliographic metadata in emerging databases.

Conclusions

This study conducted a structural bibliometric analysis of publications in the Web of Science (WoS) and Research Commons (RC) databases on national martial arts for the period 2015–2025. The findings reflect the thematic structure of the research field, dominant research areas, and the distribution of publication activity across countries, authors, and journals. Based on the analysis of publication metadata, the study identified the thematic areas most frequently represented in the scientific literature on NMA. The most prominent areas include sport, recreation, and rehabilitation, as well as the historical, social, and philosophical aspects of NMA. These conclusions are descriptive and are limited by the scope of the bibliometric method and the characteristics of the analyzed databases. The inclusion of the Research Commons database enabled the identification of structural limitations in emerging bibliographic sources and their comparison with established indexing systems, contributing to a more comprehensive understanding of the research landscape.

Conflict of Interest

Two of the authors hold editorial positions in the journal: Leonid Podrigalo serves as a member of the Editorial Board, and Sergii Iermakov serves as the Editor-in-Chief. To ensure an objective and unbiased review process, the manuscript was handled by an independent editorial board member, and the peer

review was conducted by external reviewers with no affiliations to the authors. The authors holding editorial roles did not participate in the review process, the selection of reviewers, or the editorial decision-making process for this manuscript. The remaining authors declare that they have no conflicts of interest related to this publication.

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