

Review

Research Trends on Wheelchair Basketball: A Bibliometric Review

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Abstract: Wheelchair basketball is played in more than 80 countries and is considered one of the Paralympic sports with the greatest audience and media impact. This study aimed a detailed analysis of the global scientific production around wheelchair basketball. A total of 314 journal publications between 1973 and 2024 were retrieved from the Scopus database using a specific search strategy. The findings point to a steady increase in the number of publications, particularly between 2020 and 2024, which constitutes more than 40% of the total output. Spain stands out as the country with the highest productivity, both in terms of publications and institutional output, with Turkey, Brazil, Japan and the United States following. In addition, the topics of the different articles with the highest impact focused on physical performance, injury prevention and classification. The scientific mapping showed a thematic progression from general demographic and methodological aspects in previous decades to more specific issues such as adapted sport, performance and disability in recent years. Joint word and keyword studies identified two main thematic clusters: one linked to research design and descriptors pertaining to the general population, and the other focused on concepts particular to sport and linked to disability. This bibliometric review highlights the academic progress of wheelchair basketball research and provides valuable insights to guide future studies, promote wider cooperation and inform evidence-based practices.

Keywords: physical fitness; persons with disabilities; performance; injuries; team sports.

1. Introduction

Globally, approximately 16% of the population lives with some form of disability, a figure that is continuing to rise, mainly due to population ageing, higher

rates of survival from severe injuries, and the increasing prevalence of non-communicable diseases (World Health Organization, 2022). People with disabilities often experience significant health inequities, including increased risk of morbidity and mortality,



and reduced quality of life (Umucu et al., 2025). Although physical activity has documented benefits in reducing these risks, individuals with physical disabilities often have significantly lower levels of physical activity than individuals without disabilities, often due to environmental, medical, and social barriers (Böttger, Dennhardt, Knappe & Marotzki, 2022). In response, leading public health organizations, such as the WHO and national health agencies, now recommend similar levels of physical activity for people with disabilities as for the general population (Hasset, Shields, Cole, Owen & Sherrington, 2021). An essential strategy for addressing the lack of physical activity among individuals with disabilities has been the promotion of adaptive sports: modified physical activities designed to be inclusive and easily accessible (Derakhshan et al., 2025). Among these alternatives, wheelchair basketball has emerged as a particularly impactful option, promoting not only physical fitness but also social integration and mental well-being (Sarol, 2024).

Beyond its physiological and psychological benefits, adapted sport is increasingly recognized as a powerful means of promoting social participation and inclusion for people with disabilities. Participation in community sports programs contributes to improved self-esteem and social identity, while helping to challenge stereotypes and reduce social barriers (Yazicioglu, Yavuz, Goktepe & Tan 2012; Ramsden, Hayman, Potrac & Hettinga, 2023). Adapted sport is not only an activity that promotes health, but also a vehicle for social change and community participation. In this sense, wheelchair basketball offers unique opportunities for interaction between

athletes with and without disabilities, fostering reverse integration and promoting a sense of belonging and equality within the sporting community and in general (Ocete, Roldan, Reina, Ortega & Pérez-Tejero, 2025).

Wheelchair basketball has established itself as one of the most popular adapted sports worldwide, played in more than 80 countries and considered one of the Paralympic sports with the largest audience and media impact (Arroyo, Alsasua, Arana, Lapresa & Teresa Angeura, 2022). This adapted sport has seen a rise in academic attention in tandem with its expanding popularity, with studies addressing diverse aspects such as performance analysis (Lee & Kim, 2025), injury prevention (Sá, Costa e Silva, Gorla, Silva & Magno e Silva 2022), classification systems (Hernández-Beltrán, Ibáñez, Espada & Gamonales, 2024), biomechanics (Farì et al., 2023) and other psychological factors (Karabay, Yildiz, Caliskan & Ozer Kaya, 2024; Ramsden et al., 2023).

To the best of our knowledge, only one bibliometric review on wheelchair basketball has been published to date (Hernández-Beltrán, Espada, Castelli Correia de Campos, Gamonales & Becerra-Patiño, 2024). This study was limited to the Web of Science database and focused exclusively on performance-related aspects. However, bibliometric methodology has established itself as a valuable resource for mapping scientific production, assessing the influence of authors or institutions and detecting emerging trends in various sports and disciplines (Donthu, Kumar, Mukherjee, Pandey & Lim, 2021; Verma & Gustafsson, 2020). Besides, some authors suggest that a minimum threshold of 200 publications is

recommended to conduct a rigorous bibliometric review, as this volume ensures the robustness of statistical and network analyses (Rogers, Szomszor & Adams, 2020). In the case of wheelchair basketball, this quantitative criterion is clearly met by the studies published to date, which justifies the methodological relevance of conducting a bibliometric review. Furthermore, this type of review has been widely applied in the field of traditional team sports such as rugby (Hunzinger & Schussler, 2023), basketball (Sofyan, Abdullah & Gazali, 2022), and soccer (Plakias, 2025).

Therefore, the aim of this bibliometric review is to systematically analyze the scientific production on wheelchair basketball, identifying the main research lines, most influential authors, high-impact journals, leading countries, and collaboration networks, as well as emerging thematic trends, in order to provide a comprehensive overview of the current state of knowledge and to guide future research in this field.

2. Materials and Methods

Data collection and search strategies — A systematic search was conducted in the Scopus database, encompassing all available records from its inception through June 2025. Scopus was selected due to its broader journal coverage compared to Web of Science, particularly within the domains of social sciences, arts, and humanities (Singh, Singh, Karmakar, Leta & Mayr, 2021). Given that the data collection occurred while the year 2025 was still ongoing, publications from that year were excluded to ensure the reliability and completeness of the dataset, thus minimizing the risk of bias stemming

from partial indexing or incomplete bibliographic records.

The search strategy was developed based on a comprehensive review of the relevant literature. The search equation employed was: TITLE ("wheelchair basketball"). Restricting the search to article titles was intended to enhance the specificity of the results and reduce the retrieval of irrelevant records, a practice aligned with previous bibliometric investigations (Feng, Hadizadeh, Zheng & Li, 2020; Memon, Vandelanotte, Olds, Duncan & Vincent, 2020).

To ensure the inclusion of scholarly sources of the highest rigor, several filters were applied within Scopus. Only documents classified as journal articles were retained, while other formats such as books, book chapters, conference proceedings, editorials, letters, notes, and errata were excluded. No language restrictions were imposed during the selection process.

Consequently, the final corpus comprised peer-reviewed journal articles, regardless of methodological design, meeting the inclusion criteria. These were deemed most appropriate for bibliometric analysis due to their standardized publication processes and academic reliability (see Figure 1).

Bibliometric analysis — The bibliometric analysis was structured around two complementary methodological approaches: (1) performance analysis and (2) scientific mapping.

Performance analysis entails a quantitative assessment of the scientific output within the field, incorporating indicators such as the annual evolution of publication volume, the most highly cited

documents, leading journals and authors, patterns of co-authorship, and the institutional and geographical distribution of scholarly contributions.

In contrast, scientific mapping aims to elucidate the intellectual structure and temporal evolution of the field through techniques such as co-word analysis and keyword co-occurrence networks. This approach enables the segmentation of the study period into distinct phases, typically an initial stage characterized by the emergence and consolidation of foundational research fronts, and a subsequent phase reflecting the rise or decline of specific thematic trends. Such chronological stratification facilitates the identification of knowledge development patterns and supports projections regarding the future trajectory of the field (Donthu et al., 2021).

Data analysis— Data extraction and analysis were conducted using the Bibliometrix R-package (v. 4.3.0) within the R environment (v. 4.4.2) (Aria & Cuccurullo, 2017). Bibliographic records were retrieved from Scopus and included metadata related to authorship, affiliations, countries, journals, citation counts, keywords, and other relevant bibliometric indicators. The data were exported in BibTeX format and subsequently analyzed using Biblioshiny, the web-based interface of Bibliometrix. This workflow enabled the application of Bradford's Law to identify core journals and facilitated the exploration of prevailing thematic clusters and emerging research trends within the domain.

3. Results

The initial search identified a total of 362 records related to the topic under study.

However, following an initial screening, 11 records were excluded because they were published in 2025, as the present analysis includes only works published up to December 31, 2024. In addition, 37 records were removed for not meeting the inclusion criteria established for this study. As a result of this selection process, a total of 314 articles were included in the final analysis (see Figure 1). These studies are distributed across 155 different scientific journals.

3.1. Performance Analysis

Annual Evolution— The annual scientific output in this field spans from 1973 to 2024, reflecting sustained growth over a 51-year period, with a compound annual growth rate of 6.34%. A total of 314 documents have been published across 155 distinct sources, indicating a moderate yet consistent level of scholarly production. Prior to the year 2000, only 17 articles had been published. The highest levels of publication activity were observed in 2022 ($n = 32$), 2020 ($n = 27$), 2021 ($n = 25$), and 2023 ($n = 25$). Notably, literature published between 2020 and 2024 accounts for 42.04% ($n = 132$) of all articles in this area. The average age of the documents (9.06 years) suggests a mature yet evolving field.

Most Prolific Authors, Institutions, and Countries—The analysis conducted in this study revealed that, among the 944 identified authors, only ten researchers published eight studies related to the topic during the period under review. Therefore, 78% of the authors ($n = 736$) contributed with a single publication and 12.5% with two studies ($n=118$).

Regarding the most active institutions, Ibaraki Prefectural University of Health Sciences (Japan) ranked first with 29

publications, followed by the University of the Basque Country (Spain) with 18 publications. Third place was held by the Universidad Politécnica de Madrid (Spain) with 12 publications, while the Technical University of Madrid (Spain) and Loughborough University (United Kingdom) followed with 11 and 9 publications, respectively.

Regarding country-level productivity, Spain led the scientific output on this topic with 52 publications. It was followed by Turkey with 26, Brazil with 23, Japan and the United States, each with 19 publications. In terms of international collaboration, Spain showed a relatively high proportion of multi-country publications (26.9%), while most

countries, such as Japan and the United States, presented limited international cooperation, with only 0 and 1 multi-country publications, respectively.

Most Relevant Journals— Table 1 shows that Adapted Physical Activity Quarterly was the most active source on the topic, with a total of 25 published articles. It was followed by the Journal of Sports Sciences, which contributed 10 publications. The International Journal of Sports Physiology and Performance ranked third with 8 articles. In fourth place, with 7 publications each, were Applied Sciences (Switzerland), Perceptual and Motor Skills, and the International Journal of Environmental Research and Public Health.

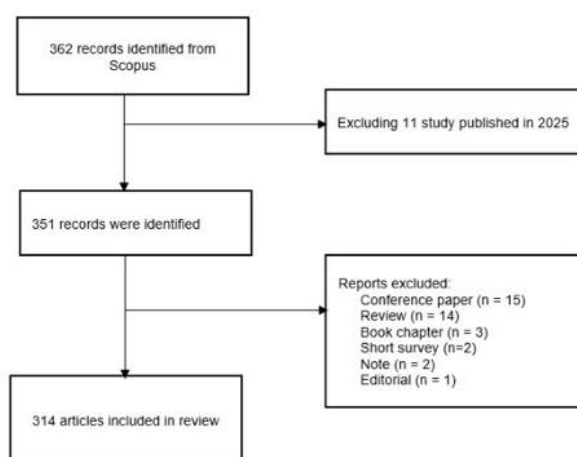


Figure 1. Diagram of the article selection process for bibliometric analysis

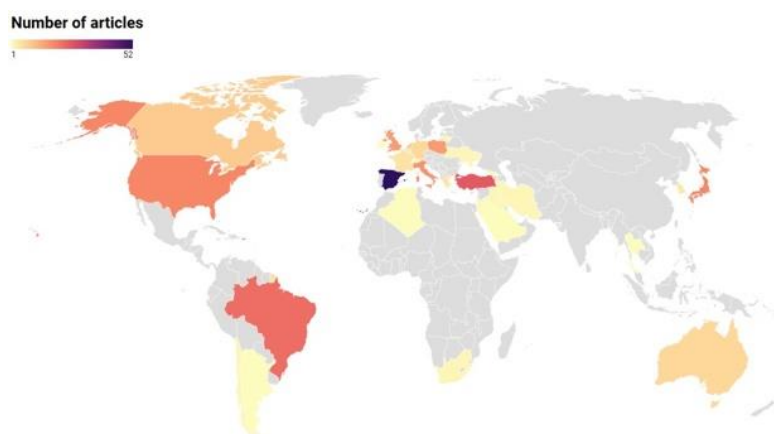


Figure 2. Most productive countries from 1973 to 2024.**Table 1.** Most relevant sources between 1973 and 2024.

Sources	Nº of articles	Impact Factor	Quartile	Category	Publisher
Adapted Physical Activity Quarterly	25	1.7	Q2	Rehabilitation	Human Kinetics Publishers Inc.
Journal of Sports Sciences	10	2.3	Q2	Sport Sciences	Taylor & Francis Ltd.
International Journal of Sports Physiology and Performance	8	3.5	Q1	Sport Sciences	Human Kinetics Publishers Inc.
Applied Sciences (Switzerland)	7	2.5	Q1	Engineering, Multidisciplinary	MDPI
International Journal of Environmental Research and Public Health	7	SJR 0.92+	Q2	Public Health, Environmental and Occupational Health	MDPI
Perceptual and Motor Skills	7	1.4	Q4	Psychology, Experimental	SAGE Publications Inc.
Frontiers in Psychology	6	2.6	Q2	Psychology, Multidisciplinary	Frontiers Media SA.
PLoS One	6	2.9	Q1	Multidisciplinary Sciences	Public Library of Science
Research Quarterly for Exercise and Sport	6	1.4	Q3	Sport Sciences	Taylor & Francis Ltd.
Retos	6	1.2	Q3	Hospitality, Leisure, Sport & Tourism	FEADEF

The impact factor, quartile, and category are based on the 2023 edition of the Journal Citation Reports (JCR); + Data were obtained from SJR 2024 because the journal was not indexed in the 2023 JCR edition.

Nine of the ten journals with the highest number of publications were included in the 2023 edition of the Journal Citation Reports (JCR), with three of them positioned in Quartile 1. Only International Journal of Environmental Research and Public Health was not indexed in JCR but were included in the 2024 Scimago Journal Rank (SJR).

The ten most productive journals were published by a wide range of editorial, including major international publishers such as Human Kinetics, Taylor & Francis Ltd., SAGE Publications Inc., MDPI, Frontiers Media SA, and Public Library of Science.

Most cited articles— The three most impactful studies in terms of citations correspond to the studies by Vanlandewijck,

Daly & Theisen (1999), Curtis & Black (1999) and Vanlandewijck et al. (2004), which have accumulated a total of 119, 116, and 100 citations, respectively, as of June 15, 2025 (Table 2).

3.2. Scientific Mapping

Thematic Evolution of Author's Keywords— The evolution of the keywords selected by the authors, is organized into two clearly differentiated phases: the period from 1973 to 2018, and the more recent period from 2018 to 2024 (Figure 3).

Keywords Plus Network— Two main clusters of Keywords Plus were identified through co-word network analysis (Figure 4). In the visualization, the size of each circle represents the frequency of the keyword,

while the thickness of the connecting lines indicates the strength of their associations. The first cluster, highlighted in red, comprised 27 keywords and was primarily associated with general demographic and methodological terms, including human, male, adult, article, and female, suggesting a broad foundational focus in the literature. The second cluster, shown in blue, contained 23 keywords and was more thematically specific, centered around sport and disability-related concepts such as basketball, wheelchair, wheelchairs, humans, and athlete. This structure reflects a dual emphasis in the field: one on general population descriptors and research design, and the other on applied contexts related to adapted sport.

Trending Topics— Figure 5 shows the trending topics analyzed through Keywords Plus, using the following parameters: (1) Minimum word frequency = 25, and (2) Number of words per year = 3. The size of each bubble reflects the relative prominence of the term, while the horizontal span indicates the temporal range of its use.

Between 2020 and 2022, terms like wheelchair basketball and disability gained notable prominence, indicating a shift toward adapted sport research. Meanwhile, long-standing keywords such as sport and human reflect the field's foundational interests. Thematic trends reveal a move from general concepts to more specific and inclusive topics.

Table 2. Most cited articles in the period 1973–2024.

Author(s)	Title	Citations Received
Vanlandewijck et al. (1999)	Field Test Evaluation of Aerobic, Anaerobic, and Wheelchair Basketball Skill Performances	119
Curtis & Black (1999)	Shoulder Pain in Female Wheelchair Basketball Players	116
Vanlandewijck et al. (2004)	The relationship between functional potential and field performance in elite female wheelchair basketball players	100
Yanci et al. (2015)	Sprint, agility, strength and endurance capacity in wheelchair basketball players	92
Croft et al. (2010)	A Comparison of the Physiological Demands of Wheelchair Basketball and Wheelchair Tennis	82
Sporner et al. (2009)	Quantification of Activity During Wheelchair Basketball and Rugby at the National Veterans Wheelchair Games A Pilot Study	78
Cavedon et al. (2015)	Physique and Performance of Young Wheelchair Basketball Players in Relation with Classification	73
De Groot et al. (2012)	Validity and reliability of tests determining performance-related components of wheelchair basketball	73
Coutts (1992)	Dynamics of wheelchair basketball	73
Wang et al. (2005)	Contributions of Selected Fundamental Factors to Wheelchair Basketball Performance	69

[illegible]

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4. Discussion

This bibliometric review provides a comprehensive overview of the evolution, productivity, and thematic trends of research on wheelchair basketball over the past five decades (1973–2024). The analysis reveals a continuous and sustained increase in scientific output, with a remarkable acceleration between 2020 and 2024, which accounts for more than 40% of all publications. This upward trend reflects the growing visibility of adapted sports in academic and social contexts, as well as the increasing integration of Paralympic research into the broader field of sport sciences.

From a geographical perspective, Spain emerged as the most productive country, followed by Turkey, Brazil, Japan, and the United States. The leadership of Spain aligns with previous findings from bibliometric studies in adapted and Paralympic sports (Hernández-Beltrán et al., 2024; Pisà Canyelles et al., 2023). This prominence may be related to the consolidation of specialized research groups, strong collaboration between universities and sport federations, and sustained national investment in inclusive sport initiatives. Furthermore, countries with a strong presence in international Paralympic competitions tend to produce higher research output, as performance success often stimulates institutional support and academic interest (Dehghansai, Lemezz, Wattie & Baker, 2017; Fadian, Umar, Hidayatullah & Riyadi, 2024). However, despite this progress, international collaboration remains limited. For instance, Spain exhibits a moderate rate of multi-country publications (26.9%), while Japan and the United States show minimal cooperation with foreign institutions.

Strengthening global partnerships could enhance knowledge transfer and increase the impact of research in this field.

The most frequently cited texts highlight traditional research that has addressed physical performance and injuries in wheelchair basketball, such as those by Vanlandewijck et al. (1999, 2004) and Curtis & Black (1999), with 119, 100, and 116 references, respectively. These studies have laid the foundation for new lines of research focused on classification, injury prevention, and performance assessment through specific physical test (Ascondo et al., 2024; Hernández-Beltrán et al., 2024a; Snyder et al., 2024a). The impact of these studies underscores the importance of considering functional capacity as a key factor in athletic performance — understood as the interaction between a player's classification, physiological parameters and sport-technical and tactical skills— as seen in other wheelchair-adapted sports such as rugby (Morgulec-Adamowicz, Kosmol, Molik, Yilla & Laskin, 2011) or tennis (Sánchez-Pay & Sanz-Rivas, 2019), especially in contexts where physical limitations distinguish between athletes.

Regarding the keyword study, clear thematic progression is noted over the decades. Until 2018, studies focused more on general and demographic aspects (Jaarsma, Dijkstra, Geertzen & Dekker, 2014; Maharaj, 2011; Yazicioglu et al., 2012), but since then, a transition toward more specific topics related to adapted sports has been noted, such as "wheelchair basketball" (Seron et al., 2025), "disability" (Ocete et al., 2025) and "performance" (Silva et al., 2025). The study of co-occurrence networks identified two large groups: one associated with general

methodological concepts, and another focused-on ideas related to sport and disability, indicating a consolidation of the most widely used lines of research in recent years.

Likewise, emerging topics show a growing interest in understanding the factors that influence physical performance, injury prevention, and the effect of classification on the physiological and tactical demands of the game. The rise of concepts such as "shoulder pain," "functional classification," and "agility" indicates a shift toward a comprehensive analysis of the athlete, which could result in more precise interventions in the field of training and rehabilitation. This trend is consistent with current research promoting broader personalization of training based on a player's position and classification (de Oliveira Silva, de Sá, Gorla, Costa e Silva & Bertoncello, 2025; Snyder et al., 2024b).

Using only the Scopus database may have influenced the results by not including possible sources that are not indexed in that database. Furthermore, using the article title alone as a search criterion, while increasing the accuracy of the results, could have ignored relevant research addressing wheelchair basketball in other sections of the text (abstract or keywords). In contrast, bibliometric analysis does not allow for a comprehensive assessment of the methodological quality or practical impact of the analyzed research.

5. Practical Applications.

This study offers researchers, coaches, and health experts an updated map of the most relevant and emerging lines of research in the field of wheelchair basketball, facilitating the identification of knowledge

gaps and opportunities for future research. Furthermore, they facilitate decision-making related to training, injury prevention, and the creation of more appropriate intervention programs for both athletes and the general population, based on the actual needs of each population, based on their classification, physical profile, or position within a team.

6. Conclusions

The result of this research reveals a sustained and growing interest in wheelchair basketball research, with a significant acceleration in scientific output from 2020 to 2024, which constitutes more than 40% of the total number of publications. The recognition of 314 articles highlights both the variety of topics and the academic maturity of this field. Thematic trends have progressed from general biomedical and demographic descriptions to more focused topics on performance, injury prevention and psychological dimensions, highlighting the multifaceted diversity of wheelchair basketball. Although the discipline continues to strengthen its research structure, the emergence of highly influential authors, relevant journals and established thematic clusters indicates that increasing specialization is occurring.

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