



Evolution of documents related to the aquatic therapy in older adults

Evolución de los documentos relacionados con la terapia acuática en adultos mayores

Authors

Carolina A. Cabo ^{1, 2, 3, 4}
 Víctor Hernández-Beltrán ⁵
 José M. Gamonales ^{5, 6}
 José A. Parraca ^{1, 2}
 Mário C. Espada ^{2, 3, 4, 7}

^{1, 2} University of Évora, Évora, Portugal

³ Escola Superior de Educação, Setúbal, Portugal

⁴ Centro de Investigação e Inovação em Desporto Atividade Física e Saúde, Santarém, Portugal

⁵ University of Extremadura, Cáceres, Spain

⁶ University of Extremadura, Badajoz (Spain)

⁷ University of Lisboa, Lisboa, Portugal

⁸ Life Quality Research Centre (CIEQV-Leiria), Rio Maior, Portugal

Corresponding author: carolinaacabo@gmail.com
 Francisco Ruiz Juan
 retosfeadef@gmail.com

Received: 09-12-25
 Accepted: 22-01-26

How to cite in APA

Cabo, C., Hernández-Beltrán, V., Gamonales, J., Parraca, J., & Espada, M. (2026). Evolution of documents related to the aquatic therapy in older adults. *Retos*, 77, 335-345. <https://doi.org/10.47197/retos.v77.118328>

Abstract

Introduction. Aquatic therapy combines different strategies to increase, maintain and re-store maximum movement and functional capacity. This can be useful in any stage of life and can help with different types of injuries, illnesses, disorders, environmental conditions or factors that threaten movement and function.

Objective. This study aimed to carry out a bibliometric analysis related to aquatic therapy in older adults.

Design and Method. A bibliometric analysis through the years 1980-2024, identifying a total of 33 documents was carried out using the Web of Science Core Collection.

Results. Since 1997 there has been no continuity until 2015, resulting in at least one document published per year until today, in which 2019 was the period with the largest number of studies carried out. It is observed that the number of documents increased by 39% from 1997 to today. A total of 170 authors were identified, with an average of 5.15 authors per document. Masiero, S. is the author with the largest number of documents and Agnew, W., and Barnes, A.C. have the largest number of citations. A total of 68 institutions were identified, with the "University of Padua" having the largest number of documents. A total of 15 countries were identified, 3 of which have a minimum of 5 published documents.

Conclusions. We found a scarcity of studies in this area of research. The network between authors and institutions was observed, although with few associated countries. Bibliometric analysis provides pertinent information, which can support future research.

Keywords

Authors; aquatic therapy; citations; elderly; performance.

Resumen

Introducción. La terapia acuática combina diferentes estrategias para aumentar, mantener y restaurar al máximo el movimiento y la capacidad funcional. Puede ser útil en cualquier etapa de la vida y ayudar en distintos tipos de lesiones, enfermedades, trastornos, condiciones ambientales o factores que amenazan el movimiento y la función.

Objetivo. Este estudio tuvo como objetivo realizar un análisis bibliométrico relacionado con la terapia acuática en adultos mayores.

Diseño y método. Se llevó a cabo un análisis bibliométrico de los años 1980 a 2024, identificando un total de 33 documentos mediante el uso de la Colección Principal de Web of Science. **Resultados.** Desde 1997 no hubo continuidad hasta 2015, obteniéndose al menos un documento publicado por año hasta la actualidad, siendo 2019 el período con el mayor número de estudios realizados. Se observa que el número de documentos aumentó un 39% desde 1997 hasta la fecha. Se identificaron un total de 170 autores, con un promedio de 5,15 autores por documento. Masiero, S. es el autor con el mayor número de documentos, y Agnew, W. y Barnes, A.C. son los autores con el mayor número de citas. Se identificaron un total de 68 instituciones, siendo la Universidad de Padua la que presenta el mayor número de documentos. Se identificaron un total de 15 países, de los cuales 3 cuentan con un mínimo de 5 documentos publicados.

Conclusiones. Se encontró una escasez de estudios en esta área de investigación. Se observó la red entre autores e instituciones, aunque con pocos países asociados. El análisis bibliométrico proporciona información relevante que puede respaldar futuras investigaciones.

Palabras clave

Autores; terapia acuática; citas; adultos mayores; rendimiento.

Introduction

The growing proportion of individuals aged 60 years and older relative to the total population is primarily driven by demographic shifts associated with declining mortality and fertility rates. Global projections indicate that this age group will increase by approximately 64% between 2015 and 2030, making it the fastest-growing segment of the population. This demographic transformation poses substantial implications for public health and constitutes one of the major challenges to be addressed in the present century (García-García et al., 2025). Population aging is therefore recognized as one of the most significant global public health challenges (García-Rico et al., 2026).

In this context, promoting healthy aging through preventive strategies becomes essential. Middle age represents a critical window for intervention, as this is when the first signs of age-related functional decline begin to emerge. The aging process is accompanied by a series of physiological and functional changes that reduce individuals' ability to maintain independence and quality of life. Among the most prominent consequences is the progressive loss of muscle mass, strength, and functional capacity, which directly compromises mobility and autonomy in older age. This decline not only affects well-being but also significantly increases the risk of dependency, institutionalization, hospitalization, and mortality (Sinza Leyton et al., 2025).

To counteract these age-related changes, physical exercise has emerged as one of the most effective non-pharmacological strategies. Regular physical activity plays a crucial role in mitigating the physiological effects of aging, particularly on the musculoskeletal system, while contributing to the maintenance of independence, body weight regulation, and overall quality of life in older adults (McPhee et al., 2016). However, traditional land-based exercises may exacerbate joint pain and increase the risk of falls, particularly in older individuals with mobility impairments or chronic conditions (Distefano & Goodpaster, 2018).

Aquatic exercise emerges as a highly beneficial and safer alternative. The fluid properties of water—such as buoyancy, hydrostatic pressure, viscosity, resistance, and thermal conductivity—interact to positively influence human physiology (Buitrago-Restrepo et al., 2024). These unique characteristics provide a supportive environment that reduces joint loading, facilitates movement, and enhances neuromuscular coordination.

Aquatic therapy, also known as hydrotherapy, pool therapy, or balneotherapy, involves performing structured exercises in warm water, typically maintained between 32°C and 36°C. The warm water component is believed to help reduce pain, decrease stiffness in the musculoskeletal system, and promote muscle relaxation (Bartels et al., 2016). Over the years, this form of therapy has been increasingly recognized for its effectiveness in managing a variety of conditions, including musculoskeletal disorders, neurological impairments, and age-related functional decline.

Specifically in older populations, aquatic therapy has been shown to increase pain thresholds and improve functional capacity, making it an effective strategy for promoting health and mobility (Alcalde et al., 2017). Aquatic exercise not only alleviates muscle pain and stiffness but also supports rehabilitation by restoring maximal movement and functional abilities. These outcomes are particularly important given that age-related decline in muscle strength, balance, and coordination contributes significantly to the risk of falls and loss of independence.

Moreover, aquatic interventions offer a versatile therapeutic approach that can be applied across various life stages and clinical contexts. They are suitable for managing injuries, chronic diseases, environmental conditions, or any factor that may threaten motor function and mobility (Carayannopoulos et al., 2020; Marinho-Buzelli et al., 2015). By integrating the physical benefits of water with structured physical activity, aquatic therapy stands out as an accessible and effective tool to support healthy aging (Pérez-de la Cruz, 2020).

Over the years, the terminology surrounding aquatic exercise has evolved, encompassing terms like pool therapy, hydrotherapy, and balneotherapy. Regardless of the nomenclature, the core principle remains consistent: leveraging the therapeutic properties of water to facilitate exercise and rehabilitation (Kamioaka et al., 2010; Mooventhan & Nivethitha, 2014).



Recent research has further highlighted the positive effects of aquatic therapy on cardiovascular function, joint health, pain management, and psychological well-being. These findings support the incorporation of aquatic exercises into broader health promotion strategies, especially as part of multidisciplinary approaches aimed at addressing the complex health needs of the ageing population (Campos et al., 2021).

Therefore, this study aimed to conduct a bibliometric analysis of the scientific literature related to aquatic therapy in older adults, identifying publication trends, key contributors, and gaps in the current research landscape.

Method

Study design

A bibliometric analysis of the scientific production related to aquatic therapy in older adults published between 1980 and June 2024 was conducted. The analysis was performed using the Web of Science (WoS) Core Collection as the primary data source, following bibliometric research methods previously described in the literature (Becerra-Patiño et al., 2024; Martínez Benítez et al., 2024). This approach allowed for the identification, quantification, and evaluation of publication trends, authorship, institutional collaboration, and citation patterns in the field of aquatic therapy applied to the older population.

Search strategy

The following terms were used to search documents: “aquatic”, “elderly”, and “therapy”, using the following search equations (“aquatic AND elderly AND therapy”) using the WoS database. All the documents identified were included in the analysis to analyse the co-authorship of the studies regarding different variables. Finally, a total of 33 documents were included.

Data extraction

For the statistical analysis, the most relevant laws of bibliometric reviews were considered (Contreras-Barraza et al., 2021). To evaluate the exponential growth of the selected documents, Price’s law (Price, 1976) was used, through the calculation of the coefficient R2. In this way, the trend in the increase in the number of documents published about the topic was deduced. To identify those authors with the largest output of published research documents on the topic, the Lotka analysis (Coile, 1977) was carried out, extracting the H-Index for each author identified in the search (Hirsch, 2005). All the authors of each study were extracted and analyzed, independently of the position they had in the list of authors consigned in the research document. The H-index was defined as the maximum value of h, such that the given author has published at least h papers that have each been cited at least h times (Crespo & Simoes, 2019). The H-Index was employed to identify those authors with the potential greatest contribution to the field under scrutiny (Campos-Soto et al., 2019). Additionally, the affiliations of each author were also collected and meta-analyzed to detect organizations with the highest research output on the topic.

In addition, to analyze the keywords most used by the authors in each of the papers, Zipf’s law was used (Valderrama-Zurián et al., 2021; Vega-Muñoz et al., 2022). Finally, for data analysis and visualization, Microsoft Excel (2006 version: Microsoft Corporation, Redmond, WA, USA) and VOS viewer (v.1.6.19 for macOS, Center for Science and Technology Studies, Leiden, The Netherlands) were used. For the creation and visualization of the results, a fragmentation analysis was used (attraction: 3 and repulsion: -3), depending on the theme and the temporality of the results (Uribe-Toril et al., 2019).

Results

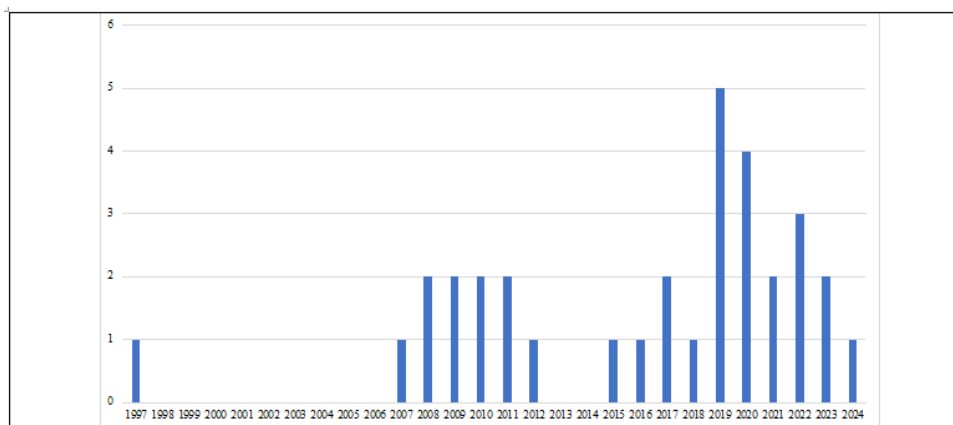
Evolution of the number of documents

Taking as a reference the number of publications made since the beginning in 1997 (Monteil & Harf-Monteil, 1997), there is no continuity until 2015, obtaining at least one document published per year until to date, in which 2019 was the period with the highest number of studies made (n=5). Figure 1 shows the evolution of the number of documents since the first publication. Through the use of the R2



coefficient, it is observed that the number of documents has increased a 39% from 1997 till to date. Although 2019 represents the peak year in publications (n=5), subsequent years show a stabilization, with at least one document published annually, indicating continuity of research activity in the field.

Figure 1. Evolution of the document between 1997 and 2024.



Most cited documents

Next, the Top 10 most cited articles are shown in Table 1. In the same line, the average citation per year since its publication is shown.

Table 1. Top 10 most cited documents.

Authors	Article Title	Source Title	Times Cited	Publication Year	Mean of citations
Jones and Liptan	Exercise Interventions in Fibromyalgia: Clinical Applications from the Evidence	Rheumatic Disease Clinics Of North America	112	2009	7,5
da Silva et al.	Effects of aquatic exercise on mental health, functional autonomy and oxidative stress in depressed elderly individuals: A randomized clinical trial	Clinics	85	2019	17,0
Resende et al.	Effects of hydrotherapy in balance and prevention of falls among elderly women	Brazilian Journal Of Physical Therapy	76	2008	4,8
Irandoust and Taheri	The effects of aquatic exercise on body composition and nonspecific low back pain in elderly males	Journal Of Physical Therapy Science	73	2015	8,1
Avelar et al.	Effectiveness of aquatic and non-aquatic lower limb muscle endurance training in the static and dynamic balance of elderly people	Brazilian Journal Of Physical Therapy	63	2010	4,5
Papalia et al.	The Role of Physical Activity and Rehabilitation Following Hip and Knee Arthroplasty in the Elderly	Journal Of Clinical Medicine	59	2020	14,8
Matsumoto	Evaluation of the Role of Balneotherapy in Rehabilitation Medicine	Journal Of Nippon Medical School	53	2018	8,8
Marta et al.	Wearable Biofeedback Suit to Promote and Monitor Aquatic Exercises: A Feasibility Study	Ieee Transactions On Instrumentation And Measurement	40	2020	10,0
Alcalde et al.	Effect of aquatic physical therapy on pain perception, functional capacity and quality of life in older adults with knee osteoarthritis: study protocol for a randomized controlled trial	Trials	35	2017	5,0
Khaltaev et al.	Balneotherapy and hydrotherapy in chronic respiratory disease	Journal Of Thoracic Disease	32	2020	8,0

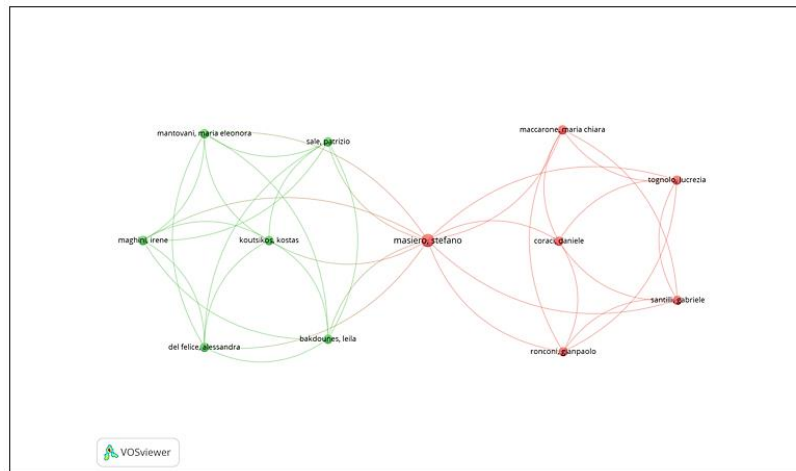
Interactions between the authors

Taking the most prolific authors as a reference, a total of 170 authors were identified, with an average of 5.15 authors per document. Masiero, S. is the author with the highest number of documents (n=2). However, the authors with the biggest number of citations are Agnew, W., and Barnes, A.C. with 309



citations. Figure 2 shows the interaction between the authors, it shows that Masiero, S. is the main axis and connection between two groups of authors (Figure 2).

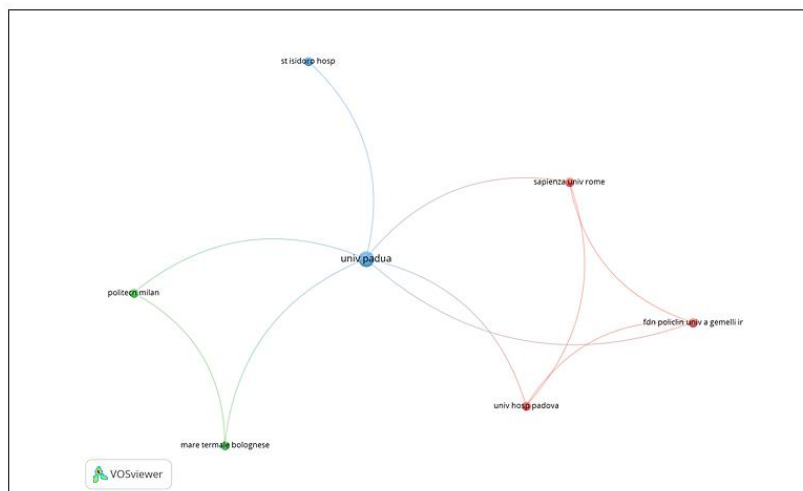
Figure 2. Node map for the relationship between the co-authorships



Interactions between the authors

Considering the institutions which have participated in the studies, a total of 68 were identified in this line, “Universidade De Padua” is the institution with the highest number of documents (n=3) and with a total of 52 citations. On the contrary, The University of Queensland is the one with the highest number of citations (n=309) with only one article published. Figure 3 shows the interactions between the most prolific institutions.

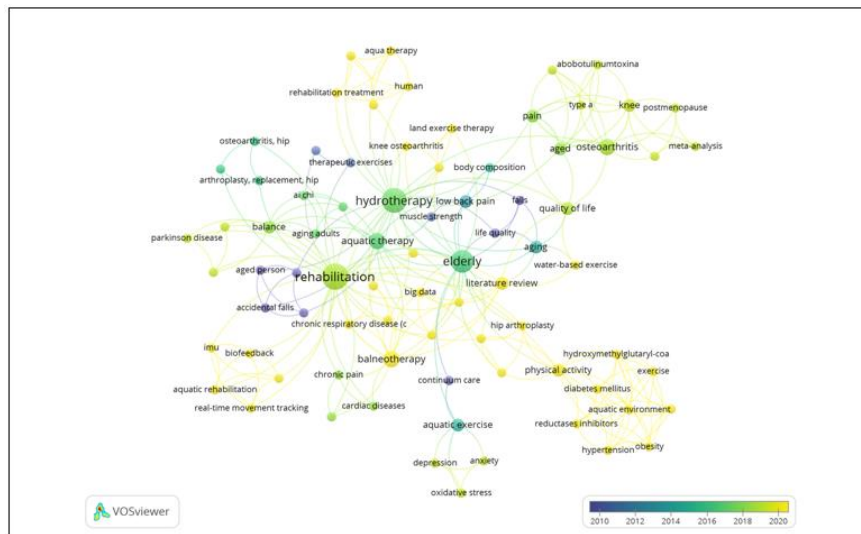
Figure 3. Node map for the relationship between the organization



Interactions between the countries

A total of 15 countries were identified, of which 3 of them have a minimum of 5 documents published. The United States of America and Brazil are the countries with the highest number of documents (n=7). According to previous results, Australia is the region with the highest number of citations (n=309), due to the University of Queensland is located in this country. Figure 4 shows the interaction between the countries. This analysis shows the rare interaction which is produced between the countries. Only USA,

Figure 6. Node map for the relationship between the co-occurrences for keywords considering the timing.



Citation Topic Micro

Table 2 shows the classification of the document considering their Micro Topics following the classification made by the WoS database. This information reveals the main aim of the studies and the main theme that the author developed in the study, being “Falls” the most predominant topic.

Table 2. Classify of the documents according to the Micro Topics

Citation Topics Micro	Number of documents	% de 33
1.82.263 Falls	11	33.33
1.34.255 Osteoarthritis	6	18.18
1.34.158 Total Arthroplasty	3	9.09
1.129.98 Low Back Pain	2	6.06
1.42.853 Vibrio Cholerae	2	6.06

Discussion

This study conducted a bibliometric analysis on the evolution of scientific publications related to aquatic therapy in older adults. Bibliometric analysis offers valuable insights into publication trends over time, including aspects such as the year of publication, contributing journals, frequently cited authors and keywords, as well as the most active institutions and countries. The findings of this review indicate that although the first publication in this area dates back to 1997, there was a noticeable gap in continuity until 2015. From that year onward, at least one study has been published annually, with 2019 marking the peak in publication volume. Overall, the number of publications has grown by approximately 39% between 1997 and the present, reflecting a gradual increase in academic interest in the role of aquatic therapy for the aging population.

The bibliometric analysis conducted in this study offers a broad and insightful over-view of the scientific output concerning aquatic therapy in older adults. A total of 170 authors contributed to the body of literature, with an average of 5.15 authors per publication, reflecting a collaborative approach to research in this field. While Masiero, S. was identified as the most prolific author with two published studies, the most influential contributors in terms of citations were Agnew, W. and Barnes, A.C., whose work received a total of 309 citations. This contrast illustrates the distinction between publication volume and scientific impact, emphasizing that a smaller number of high-quality studies can achieve significant academic recognition. Aquatic therapy has increasingly been adopted as a viable alternative to traditional land-based exercise programs, particularly for older adults experiencing reduced physical activity levels, neuromuscular deterioration, or orthopedic conditions affecting balance, mobility, and pain management (Shariat et al., 2021).

Author collaboration mapping further revealed that Masiero, S. serves as a central node, connecting two clusters of authors. This positioning indicates a structured yet limited network of scientific collaboration in the field of aquatic therapy for older adults. The current structure suggests potential for expansion through more interdisciplinary and international partnerships, which could enhance the diversity and impact of future research endeavors (Chou & Chow, 2024).

Regarding institutional contributions, 68 different institutions were identified, demonstrating a relatively broad interest across academic centers. Notably, the University of Padua led in publication count ($n = 3$) and accrued a moderate citation total ($n = 52$), whereas the University of Queensland, despite contributing only a single article, amassed the highest number of citations ($n = 309$). This again underscores the importance of research quality and its resonance within the academic community over sheer output volume. The prominence of Italy and Australia in the field of aquatic therapy for older adults can be attributed to several interrelated factors, including institutional focus, research infrastructure, and national health priorities. Italy's significant output in this domain is exemplified by the University of Padua, which led in publication count within our analysis. The Department of Neuroscience at the University of Padua has been instrumental in advancing research on water-based rehabilitation for the elderly. For instance, Coraci et al. (2022) conducted a comprehensive scoping review to support water-based rehabilitation in the elderly, highlighting the institution's commitment to this field. This focus aligns with Italy's broader emphasis on geriatric care and rehabilitation, reflecting national health priorities that support aging populations. Australia's impact, particularly through the University of Queensland, is notable for the high citation count of its publications. Although the university contributed a single article, it amassed a significant number of citations, underscoring the quality and influence of its research. This aligns with Australia's proactive approach to integrating aquatic therapy into aged care settings, especially for individuals with dementia. For example, a study by Henwodd et al. (2017) demonstrated the benefits of aquatic exercise programs for older adults with dementia in residential aged care, indicating a practical application of research findings.

In terms of geographical distribution, the study identified 15 countries involved in the production of scientific literature in this field. The United States and Brazil were the most prolific, each contributing 7 documents. The predominance of the United States and Brazil in the scientific production related to aquatic therapy in older adults can be attributed to several scientific and structural factors. In the United States, the high volume of research stems from strong investments in health sciences, a well-established culture of interdisciplinary collaboration, and the growing emphasis on non-pharmacological interventions for aging populations (Melo et al., 2023). In Brazil, the increasing scientific output in this field is closely tied to public health initiatives and the expansion of research programs focused on geriatric care within the framework of the Unified Health System (SUS). Moreover, the demographic shift towards an aging population in Brazil has driven national research agendas to prioritize effective and accessible rehabilitation strategies, thereby encouraging more publications in this area (Butowicz et al., 2020). Interestingly, Australia, represented by the highly cited University of Queensland, stands out as the country with the greatest citation impact. Nonetheless, the international collaboration between countries appears limited. Only a few countries—USA, Greece, Canada, Taiwan, Switzerland, and Italy—show evidence of interconnectivity in their research efforts. This highlights a critical area for improvement, as enhanced international partnerships could facilitate knowledge sharing, improve study generalizability, and foster innovation.

The keyword analysis identified 112 unique terms, averaging 3.73 per document. The most frequently occurring keywords were "rehabilitation" ($n = 8$), "hydrotherapy" ($n = 7$), and "therapy" ($n = 6$). These terms suggest a thematic consistency across studies, reinforcing the therapeutic and rehabilitative orientation of aquatic interventions for older adults. Figure 6 reveals the temporal evolution of these keywords, which is useful for identifying research trends and emerging areas of interest. Such analyses can guide future studies to focus on underexplored yet relevant aspects, such as cognitive outcomes, mental health, or long-term adherence to aquatic therapy programs.

Finally, topic classification based on the WoS Micro Topics indicates that "falls" as the most predominant thematic focus in the literature on aquatic therapy for older adults aligns with global geriatric health priorities, recognizing fall prevention as a critical issue due to its significant impact on morbidity, mortality, and healthcare costs among aging populations. Aquatic therapy has been shown to effectively en-

hance balance, strength, and coordination while minimizing joint stress, making it a suitable intervention for fall prevention. A systematic review and meta-analysis by Kim et al. (2020) demonstrated that aquatic exercise significantly improves dynamic balance in older adults, a key factor in reducing fall risk. Furthermore, a randomized controlled trial by Moreira et al. (2020) found that a 16-week aquatic training program improved functional capacity, balance, and quality of life in older adults with musculoskeletal disorders and a moderate to high risk of falls. These findings underscore the potential of aquatic therapy as a targeted approach in fall prevention programs, warranting further exploration and validation through large-scale, multicentric studies.

Conclusions

This bibliometric analysis reveals a limited but emerging body of literature on aquatic therapy in older adults. Following a period of discontinuity between 1997 and 2015, the number of publications stabilized from 2015 onwards, with 2019 representing the peak year in scientific output. Although the overall volume of research remains low, the continuity observed in recent years indicates sustained interest in this field. Masiero stands out as the most prolific author, and the average number of authors per document was 5.15, suggesting moderate collaboration. However, institutional involvement remains limited, and scientific contributions are concentrated in only 15 countries, with collaborative interactions occurring among six of them. These findings highlight both the scarcity of studies and the fragmented nature of the research network, underscoring the need to strengthen international collaboration and to promote further investigations aimed at improving the health and functional capacity of older adults through aquatic therapy.

Financing

This work was funded by the Instituto Politécnico de Setúbal and National Funds by FCT- Foundation for Science and Technology, and the project with DOI number <https://doi.org/10.54499/UID/06185/2025> attributed to SPRINT-Sport Physical Activity and Health Research & Innovation Center.

References

- Alcalde, G. E., Fonseca, A. C., Bôscua, T. F., Gonçalves, M. R., Bernardo, G. C., Pianna, B., Carnavale, B. F., Gimenes, C., Barrile, S. R., & Arca, E. A. (2017). Effect of aquatic physical therapy on pain perception, functional capacity and quality of life in older people with knee osteoarthritis: study protocol for a randomized controlled trial. *Trials*, 18(1), 317. <https://doi.org/10.1186/s13063-017-2061-x>
- Bartels, E. M., Juhl, C. B., Christensen, R., Hagen, K. B., Danneskiold-Samsøe, B., Dagfinrud, H., & Lund, H. (2016). Aquatic exercise for the treatment of knee and hip osteoarthritis. *Cochrane Database of Systematic Reviews*, 2016(3). <https://doi.org/10.1002/14651858.CD005523.pub3>
- Becerra-Patiño, B. A., Varón-Murcia, J. J., Cárdenas-Contreras, S., Castro-Malaver, M. A., & Ávila-Martínez, J. D. (2024). Scientific production on the relative age effect in sport: bibliometric analysis of the last 9 years (2015-2023). *Retos. Nuevas Tendencias En Educación Física, Deporte y Recreación*, 52, 623–638. <https://doi.org/10.47197/retos.v52.101944>
- Buitrago-Restrepo, C. M., Patiño-Villada, F. A., & Arango-Paternina, C. M. (2024). Effects of Aquatic Exercise on Physical Performance in Older Adults: A Systematic Review and Meta-Analysis. *Journal of Aging and Physical Activity*, 32(5), 651–667. <https://doi.org/10.1123/japa.2023-0192>
- Butowicz, C. M., Pontillo, M., Ebaugh, D., & Silfies, S. P. (2020). Comprehensive movement system screening tool (MSST) for athletes: Development and measurement properties. *Brazilian Journal of Physical Therapy*, 24(6), 512–523. <https://doi.org/10.1016/j.bjpt.2019.10.002>
- Campos, D. M., Ferreira, D. L., Gonçalves, G. H., Farche, A. C. S., de Oliveira, J. C., & Ansai, J. H. (2021). Effects of aquatic physical exercise on neuropsychological factors in older people: A systematic

- review. *Archives of Gerontology and Geriatrics*, 96, 104435. <https://doi.org/10.1016/j.archger.2021.104435>
- Campos-Soto, N., Ramos Navas-Parejo, M., & Moreno-Guerrero, A. J. (2019). Realidad virtual y motivación en el contexto educativo: Estudio bibliométrico de los últimos veinte años de Scopus. *Alteridad*, 15(1), 47–60. <https://doi.org/10.17163/alt.v15n1.2020.04>
- Carayannopoulos, A. G., Han, A., & Burdenko, I. N. (2020). The benefits of combining water and land-based therapy. *Journal of Exercise Rehabilitation*, 16(1), 20–26. <https://doi.org/10.12965/jer.1938742.371>
- Chou, W., & Chow, J. C. (2024). Analyzing collaboration and impact: A bibliometric review of four highly published authors' research profiles on collaborative maps. *Medicine*, 103(28), e38686. <https://doi.org/10.1097/MD.00000000000038686>
- Coile, R. C. (1977). Lotka's frequency distribution of scientific productivity. *Journal of the American Society for Information Science*, 28(6), 366–370. <https://doi.org/10.1002/asi.4630280610>
- Contreras-Barraza, N., Madrid-Casaca, H., Salazar-Sepúlveda, G., Garcia-Gordillo, M. Á., Adsuar, J. C., & Vega-Muñoz, A. (2021). Bibliometric analysis of studies on coffee/caffeine and sport. *Nutrients*, 13(9), 3234. <https://doi.org/10.3390/nu13093234>
- Coraci, D., Tognolo, L., Maccarone, M. C., Santilli, G., Ronconi, G., & Masiero, S. (2022). Water-Based Rehabilitation in the Elderly: Data Science Approach to Support the Conduction of a Scoping Review. *Applied Sciences*, 12(18), 8999. <https://doi.org/10.3390/app12188999>
- Crespo, N., & Simoes, N. (2019). Publication Performance Through the Lens of the h-index: How Can We Solve the Problem of the Ties? *Social Science Quarterly*, 100(6), 2495–2506. <https://doi.org/10.1111/ssqu.12696>
- Distefano, G., & Goodpaster, B. H. (2018). Effects of Exercise and Aging on Skeletal Muscle. *Cold Spring Harbor Perspectives in Medicine*, 8(3), a029785. <https://doi.org/10.1101/cshperspect.a029785>
- García-García, J., Benavides-Rodríguez, L., & Fernandez-Ortega, J. (2025). Efectos del entrenamiento de fuerza sobre la condición física funcional en el adulto mayor. *Retos. Nuevas Tendencias En Educación Física, Deporte y Recreación*, 76, 68–77. <https://doi.org/10.47197/retos.v76.100103>
- García-Rico, L., Delgado Moya, R., Tovar Sánchez, M., & Rua Jiménez, H. (2026). Efectos de un programa de actividad física combinada en la condición física de mayores de 40 años. *Retos. Nuevas Tendencias En Educación Física, Deporte y Recreación*, 76, 189–197. <https://doi.org/10.47197/retos.v76.117978>
- Henwood, T., Neville, C., Baguley, C., & Beattie, E. (2017). Aquatic exercise for residential aged care adults with dementia: benefits and barriers to participation. *International Psychogeriatrics*, 29(9), 1439–1449. <https://doi.org/10.1017/S104161021700028X>
- Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences*, 102(46), 16569–16572. <https://doi.org/10.1073/pnas.0507655102>
- Kamioka, H., Tsutani, K., Okuizumi, H., Mutoh, Y., Ohta, M., Handa, S., Okada, S., Kita-yuguchi, J., Kamada, M., Shiozawa, N., & Honda, T. (2010). Effectiveness of Aquatic Exercise and Balneotherapy: A Summary of Systematic Reviews Based on Randomized Controlled Trials of Water Immersion Therapies. *Journal of Epidemiology*, 20(1), 2–12. <https://doi.org/10.2188/jea.JE20090030>
- Kim, Y., Vakula, M. N., Waller, B., & Bressel, E. (2020). A systematic review and meta-analysis comparing the effect of aquatic and land exercise on dynamic balance in older adults. *BMC Geriatrics*, 20(1), 302. <https://doi.org/10.1186/s12877-020-01702-9>
- Marinho-Buzelli, A. R., Bonnyman, A. M., & Verrier, M. C. (2015). The effects of aquatic therapy on mobility of individuals with neurological diseases: a systematic review. *Clinical Rehabilitation*, 29(8), 741–751. <https://doi.org/10.1177/0269215514556297>
- Martínez Benítez, C. F., Becerra-Patiño, B., & Rada-Perdigon, D. A. (2024). Mapping the research trend in the Web of Science on small-sided games in soccer: a Bibliometric study between 2010-2023. *Retos. Nuevas Tendencias En Educación Física, Deporte y Recreación*, 55, 363–378. <https://doi.org/10.47197/retos.v55.102437>
- McPhee, J. S., French, D. P., Jackson, D., Nazroo, J., Pendleton, N., & Degens, H. (2016). Physical activity in older age: perspectives for healthy ageing and frailty. *Biogerontology*, 17(3), 567–580. <https://doi.org/10.1007/s10522-016-9641-0>



- Melo, R. S., Carreira, C. S. F., Rezende, D. S. A., Guimarães-do-Carmo, V. J., Lemos, A., & de Moura-Filho, A. G. (2023). Effectiveness of the aquatic physical therapy exercises to improve balance, gait, quality of life and reduce fall-related outcomes in healthy community-dwelling older adults: A systematic review and meta-analysis. *PLOS ONE*, 18(9), e0291193. <https://doi.org/10.1371/journal.pone.0291193>
- Monteil, H., & Harf-Monteil, C. (1997). *Aeromonas* infections. *Presse Medicale* (Paris, France : 1983), 26(37), 1790–1798.
- Mooventhan, A., & Nivethitha, L. (2014). Scientific evidence-based effects of hydrotherapy on various systems of the body. *North American Journal of Medical Sciences*, 6(5), 199. <https://doi.org/10.4103/1947-2714.132935>
- Moreira, N. B., da Silva, L. P., & Rodacki, A. L. F. (2020). Aquatic exercise improves functional capacity, perceptual aspects, and quality of life in older adults with mus-culoskeletal disorders and risk of falling: A randomized controlled trial. *Experimental Gerontology*, 142, 111135. <https://doi.org/10.1016/j.exger.2020.111135>
- Pérez-de la Cruz, S. (2020). Influence of an Aquatic Therapy Program on Perceived Pain, Stress, and Quality of Life in Chronic Stroke Patients: A Randomized Trial. *International Journal of Environmental Research and Public Health*, 17(13), 4796. <https://doi.org/10.3390/ijerph17134796>
- Price, D. D. S. (1976). A general theory of bibliometric and other cumulative advantage processes. *Journal of the American Society for Information Science*, 27(5), 292–306. <https://doi.org/https://doi.org/10.1002/asi.4630270505>
- Shariat, A., Ghayour Najafabadi, M., Ghannadi, S., Nakhostin-Ansari, A., Hakakzadeh, A., Shaw, B. S., Ingle, L., & Cleland, J. A. (2021). Effects of aquatic therapy on balance in older adults: a systematic review and meta-analysis. *European Geriatric Medicine*, 13(2), 381–393. <https://doi.org/10.1007/s41999-021-00577-2>
- Sinza Leyton, D. L., Quijano Duarte, S. A., Mantilla Toloza, S. C., & Conde Parada, N. E. (2025). Factores asociados a la velocidad de la marcha en adultos mayores: influencia de la fuerza prensil y variables sociodemográficas. *Retos. Nuevas Tendencias En Educación Física, Deporte y Recreación*, 71, 509–519. <https://doi.org/10.47197/retos.v71.116087>
- Uribe-Toril, J., Ruiz-Real, J., Haba-Osca, J., & de Pablo Valenciano, J. (2019). Forests' First Decade: A Bibliometric Analysis Overview. *Forests*, 10(1), 72. <https://doi.org/10.3390/f10010072>
- Valderrama-Zurián, J. C., García-Zorita, C., Marugán-Lázaro, S., & Sanz-Casado, E. (2021). Comparison of MeSH terms and KeyWords Plus terms for more accurate classification in medical research fields. A case study in cannabis research. *Information Processing & Management*, 58(5), 102658. <https://doi.org/10.1016/j.ipm.2021.102658>
- Vega-Muñoz, A., Salazar-Sepúlveda, G., Contreras-Barraza, N., & Araya-Silva, L. (2022). Scientific Mapping of Coastal Governance: Global Benchmarks and Trends. *Journal of Marine Science and Engineering*, 10(6), 751. <https://doi.org/10.3390/jmse10060751>

Authors' and translators' details:

Carolina Alexandra Cabo	carolinaacabo@gmail.com	Autor/a
Víctor Hernández-Beltrán	vhernandpw@alumnos.unex.es	Autor/a
Jose Gamonales	martingamonales@unex.es	Autor/a
Jose Alberto Parraca	jparraca@uevora.pt	Autor/a
Mário Cunha Espada	mario.espada@ese.ips.pt	Autor/a