







## Scientific output in rehabilitation nursing and physical exercise in Portugal: bibliometric review

### Produção científica em enfermagem de reabilitação e exercício físico em Portugal: revisão bibliométrica

#### How to cite this article:

Novo AFMP, Parola VSO, Mendes MER, Preto LSR, Martins MMFPS, Schoeller SD. Scientific output in rehabilitation nursing and physical exercise in Portugal: bibliometric review. Rev Rene. 2025;26:e95548. DOI: <https://doi.org/10.36517/2175-6783.20252695548>

 André Filipe Morais Pinto Novo<sup>1,4</sup>  
 Vítor Sérgio de Oliveira Parola<sup>2</sup>  
 Maria Eugénia Rodrigues Mendes<sup>1</sup>  
 Leonel São Romão Preto<sup>1</sup>  
 Maria Manuela Ferreira Pereira da Silva Martins<sup>3</sup>  
 Soraia Dornelles Schoeller<sup>4</sup>

<sup>1</sup>Instituto Politécnico de Bragança, Centro de Investigação em Vida Ativa e Bem-Estar. Bragança, Portugal.

<sup>2</sup>Universidade de Coimbra, Escola Superior de Enfermagem, Unidade de Investigação em Ciências da Saúde: Enfermagem. Coimbra, Portugal.

<sup>3</sup>Universidade do Porto, Instituto de Ciências Biomédicas Abel Salazar. Porto, Portugal.

<sup>4</sup>Universidade Federal de Santa Catarina. Florianópolis, SC, Brazil.

#### Corresponding author:

André Filipe Morais Pinto Novo  
Escola Superior de Saúde de Bragança  
Avenida Afonso V, 5300-121.  
Bragança, Portugal. E-mail: [andre@ipb.pt](mailto:andre@ipb.pt)

**Conflict of interest:** the authors have declared that there is no conflict of interest.

EDITOR IN CHIEF: Ana Fatima Carvalho Fernandes   
ASSOCIATE EDITOR: Abilio Torres dos Santos Neto 

#### ABSTRACT

**Objective:** to map rehabilitation nursing and physical exercise. **Methods:** bibliometric study conducted in the SCOPUS, MEDLINE (via PubMed), Web of Science, and Portuguese Open Access Scientific Repository databases, using VOSviewer software. Techniques such as keyword co-occurrence analysis, title analysis, co-authorship analysis, modularity-based clustering, and the application of laws for validation were employed. **Results:** 96 publications were analyzed, with 153 authors and 44 co-authored collaborations. Authors such as André Novo, Bruno Delgado, and Eugénia Mendes were the most productive in this theme. Scientific production increased significantly after 2020. The Portuguese Journal of Rehabilitation Nursing, the Coimbra School of Nursing, and the Bragança Polytechnic Institute are primarily responsible for most of the scientific production. Keywords have evolved from clinical approaches to integrated approaches that promote functionality and autonomy. Four thematic clusters were identified. **Conclusion:** physical exercise is a central tool in rehabilitation nursing care. An increasing number of publications in rehabilitation nursing place the predominant care strategy. **Contribution to practice:** valorization of exercise prescription based on scientific evidence by rehabilitation nurses.

**Descriptors:** Rehabilitation Nursing; Exercise; Bibliometrics; Publications.

#### RESUMO

**Objetivo:** mapear a enfermagem de reabilitação e o exercício físico. **Métodos:** estudo bibliométrico realizado nas bases SCOPUS, MEDLINE (via PubMed) *Web of Science* e Repositório Científico de Acesso Aberto de Portugal, com utilização do *software* VOSviewer. Foram aplicadas técnicas de coocorrência de palavras-chave, títulos, análise de coautoria, agrupamento por modularidade e aplicação de leis para validação. **Resultados:** foram analisadas 96 publicações, com 153 autores e 44 colaborações em coautoria. Autores como André Novo, Bruno Delgado e Eugénia Mendes foram os mais produtivos nessa temática. A produção científica aumentou significativamente após 2020. A Revista Portuguesa de Enfermagem de Reabilitação, a Escola Superior de Enfermagem de Coimbra e o Instituto Politécnico de Bragança concentram a maior parte da produção científica. As palavras-chave evoluíram de enfoques clínicos para abordagens integradas de promoção da funcionalidade e autonomia. Foram identificados quatro clusters temáticos. **Conclusão:** o exercício físico é uma ferramenta central no cuidado de Enfermagem de Reabilitação. Cada vez mais publicações em Enfermagem de Reabilitação colocam-no como estratégia predominante de cuidado. **Contribuição para a prática:** valorização da prescrição de exercício baseada em evidências científicas por enfermeiros de reabilitação. **Descritores:** Enfermagem em Reabilitação; Exercício Físico; Bibliometria; Publicações.

## Introduction

The Rehabilitation Nursing plays a crucial role in enhancing functionality, autonomy, and quality of life for individuals with diverse clinical conditions<sup>(1-2)</sup>. Recently, physical exercise has been widely recognized as a therapeutic tool in Rehabilitation Nursing, offering a structured, evidence-based clinical intervention with a direct impact on functional recovery, disability prevention, and overall well-being<sup>(3-4)</sup>. It differs from physical activity in its systematic and prescribed nature, as well as its focus on clinical goals, and is often incorporated into rehabilitation programs<sup>(5)</sup>.

The importance of regular physical activity and exercise in promoting health and well-being has been widely recognized by leading international organizations, such as the World Health Organization and the American College of Sports Medicine (ACSM)<sup>(6-7)</sup>. In the field of Rehabilitation Nursing, this premise is echoed in the competency profile of nurses specializing in rehabilitation nursing, which states that these professionals teach, instruct, and train techniques and technologies (including physical activity and exercise) to be used to maximize motor, cardiac, and respiratory performance, considering the individual's goals and their health plan<sup>(8)</sup>.

This role is reinforced in the descriptive statements of specialized practice, where intervention at the levels of activity and physical exercise is highlighted as central to promoting and/or facilitating functional recovery and autonomy. It simultaneously contributes to increased well-being and self-care, while also preventing complications. It is, therefore, an intervention with a cross-cutting impact on improving the quality of life of people with acute or chronic conditions and/or functional limitations. Furthermore, it is also important to note that nurses specializing in rehabilitation nursing possess specific skills in designing, implementing, and evaluating plans and programs, particularly in promoting physical activity, functional capacity, and performance capacity, in line with the latest international guidelines<sup>(9)</sup>.

Scientific production in the field of Rehabilita-

tion Nursing has demonstrated a growing interest in prescribing physical exercise as a therapeutic intervention, which can be framed within various theoretical frameworks of the discipline. Among these, the Self-Care Theory, the Theory of Transitions, the Health Promotion Theory, and the Theory of Good Living<sup>(10)</sup> stand out. Their premises enable a holistic and person-centered approach, guiding the practice of nurses specializing in rehabilitation nursing in promoting health, functionality, and lasting well-being.

With the growing scientific production related to this topic, it is necessary to conduct a bibliometric analysis to understand the evolution, trends, and thematic structure of research in Rehabilitation Nursing associated with physical exercise. This article aimed to map rehabilitation nursing and physical exercise.

## Methods

This bibliometric review study followed five main steps, in accordance with guidelines recognized in the literature: definition of the objective, data collection, data processing and standardization, bibliometric analysis using VOSviewer, and application of bibliometric laws<sup>(11-12)</sup>.

### Data collection

The data were obtained in March 2025 from the SCOPUS, Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, and the Web of Science (WoS) databases, as well as from the Open Access Scientific Repository of Portugal (RCAAP). Documents written by specialist nurses in Rehabilitation Nursing in Portugal, published up to 2024, were included. The registration of the authors as Specialist Nurses in Rehabilitation Nursing in Portugal was confirmed on the institutional website of the Portuguese Order of Nurses.

An advanced search was used in RCAAP, and the terms "physical exercise," "rehabilitation nursing," and "nursing in rehabilitation" were included alternately in the title, subject, and description fields.

In MEDLINE, via PubMed, the search was performed with the following expression: (“rehabilitation nursing”[MeSH Terms] OR (“rehabilitation”[All Fields] AND ‘nursing’[All Fields]) OR “rehabilitation nursing”[All Fields]) AND (“exercise”[MeSH Terms] OR “exercise”[All Fields] OR “exercises”[All Fields] OR “exercise therapy”[MeSH Terms] OR (“exercise”[All Fields] AND ‘therapy’[All Fields]) OR “exercise therapy”[All Fields] OR “exercising”[All Fields] OR “exercise s”[All Fields] OR “exercised”[All Fields] OR ‘exerciser’[All Fields] OR “exercisers”[All Fields]). Only documents published by Portuguese rehabilitation nurses were found.

In Web of Science, the search term “(rehabilitation nursing) AND (exercise)” was used. For the search in the “Core Collection,” the “Topic” option and the Portugal filter in the “Countries/Regions” option were used. In addition, the data were refined to include only articles published by Portuguese rehabilitation nurses.

In SCOPUS, considering the indexing of the Portuguese Journal of Rehabilitation Nursing in this database, a two-step search strategy was used: first, the journal as mentioned above was excluded, and second, a search was performed in the journal for articles with the term “exercise” in the title, keywords, or abstract. First moment: (TITLE-ABS-KEY (“rehabilitation nursing”) AND TITLE-ABS-KEY (exercise) AND NOT SRCTITLE (magazine AND Portuguese AND of AND nursing AND of AND rehabilitation)) AND (LIMIT-TO (AFFILCOUNTRY, “Portugal”)); 2nd moment: (SRCTITLE (magazine AND Portuguese AND nursing AND rehabilitation) AND TITLE-ABS-KEY (exercise)) AND (LIMIT-TO (AFFILCOUNTRY, “Portugal”)).

### Data processing and normalization

Microsoft Excel was used to clean the data, remove duplicates, standardize spellings, and check consistency between fields.

Subsequently, a corpus file (.txt) was created, containing expressions extracted from keywords, titles, and authors, organized by document, with one

term per line, and grouped by publication, as required by VOSviewer software. The *scores* (.txt) file is optional but was used to assign a relevance score to each term, which allows VOSviewer to prioritize the most significant concepts during map construction. These scores were calculated proportionally to the relative frequency of the terms in the dataset. A customized thesaurus (.txt) file was also created to standardize idiomatic variants and different spellings for the same concept (e.g., “physical activity” vs. “physical activity”; “self-care” vs. “self-care”); accents were also eliminated, and recurring expressions were merged with underscores when necessary to ensure integrity when read by VOSviewer; this file allowed the final map to be read without any spelling errors.

In the case of academic works, namely master’s theses, the criterion adopted was to consider both the student author of the work and the respective advisors/co-advisors as authors. This decision was based on the relevance of the scientific and methodological contributions of the advisors in the production of these documents, ensuring a more comprehensive analysis of co-authorship networks in the context of Rehabilitation Nursing.

All files were validated to ensure exact correspondence between the number of documents and the required data structure, thus ensuring the integrity of the analyses generated.

### Bibliometric analysis using VOSviewer software

The analysis was performed using VOSviewer software (version 1.6.19). Four main networks were constructed: co-authorship between authors, co-occurrence of titles and keywords, and thematic clustering. The modularity-based clustering technique enabled the identification of the main semantic clusters.

### Application of bibliometric laws

Bradford, Lotka, and Zipf’s laws were applied for validation<sup>(13-14)</sup>. Bradford’s law states that three sources account for a large part of scientific produc-

tion. The three main ones were Portuguese Journal of Rehabilitation Nursing (17 articles), the Coimbra School of Nursing (11 master’s theses), and the Bragança Polytechnic Institute (8 master’s theses). Lotka’s law states that the distribution of authors shows that a small number of authors account for a large proportion of documents. Notably, these include André Novo (27 documents), Bruno Delgado (14 documents), Eugénia Mendes (14 documents), Leonel Preto (13 documents), and Maria Manuela Martins (10 documents). Zipf’s Law: The most frequent keywords were rehabilitation nursing (57 occurrences), physical exercise (29 occurrences), cardiac rehabilitation (18 occurrences), rehabilitation (12 occurrences), and functional capacity (10 occurrences).

Results

After excluding duplicate documents found in different databases, 96 published documents were selected for inclusion. The first document found was published in 2013. Bibliometric analysis revealed a sharp increase in scientific production from 2020 onwards. The distribution of documents shows that between 2013 and 2019, the number of publications was low and sporadic, while between 2020 and 2024, there was a progressive consolidation. The year with the highest number of publications was 2023 (20), followed by 2020 and 2022 (14) (Figure 1).

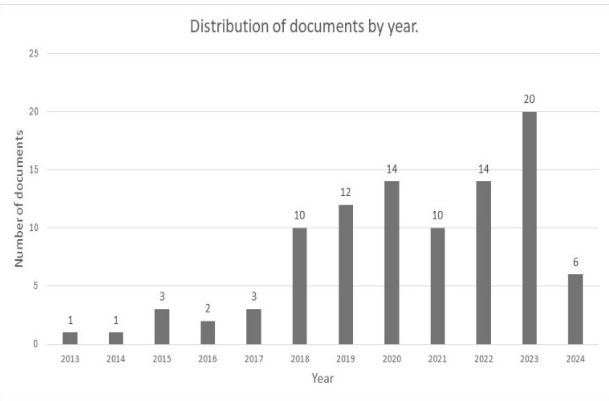


Figure 1 – Distribution of document production by year. Portugal, 2025

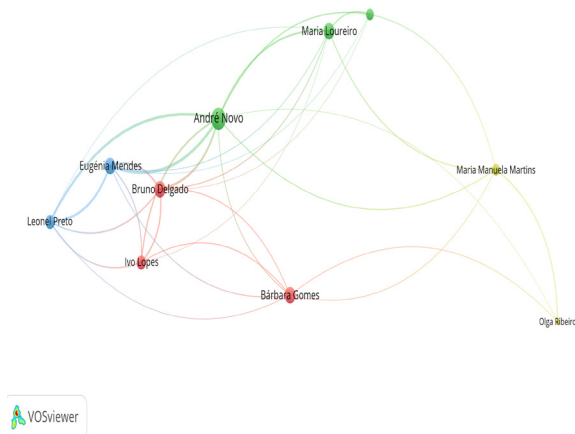
Regarding the origin of the publications, there was a significant concentration in the Portuguese Journal of Rehabilitation Nursing and in institutional repositories of higher education. The Revista Portuguesa de Enfermagem de Reabilitação leads with 17 published documents, followed by the institutional platform of the Escola Superior de Enfermagem de Coimbra, with 11 papers, and the Instituto Politécnico de Bragança (IPB) with 8 documents. Also noteworthy are the International Congress of Rehabilitation Nursing and the Santa Maria School of Health, both of which have 7 publications. This pattern highlights the importance of higher education institutions in disseminating knowledge in rehabilitation nursing and physical exercise. Articles published in the Portuguese Journal of Rehabilitation Nursing, and master’s theses developed at the Coimbra School of Nursing and the IPB accounted for more than 40% of the publications.

Analysis of the type of document revealed that most of the scientific output analyzed corresponds to master’s theses, totaling 46 (53%) documents. Next are scientific articles, with 32 (37%) publications; conference proceedings, with 12 (14%); book chapters, 6 (7%); and one editorial. These data reflect the strong presence of guided academic research, particularly in graduate nursing programs, as the primary source of production in this area. Most publications were written in Portuguese.

A total of 153 unique authors were identified, of whom 37 participated in co-authorship, totaling 44 registered partnerships. This number reveals a significant collaboration network, although still concentrated in specific institutional centers. The principal authors are André Novo, with 27 publications, followed by Bruno Delgado and Eugénia Mendes, both with 14 publications, Leonel Preto with 13, and Maria Manuela Martins with 10 publications. Arménio Cruz (8), Luís Sousa, Ivo Lopes, Maria Loureiro (7), Bárbara Gomes (6), Catarina Ribeiro, and Olga Ribeiro (5) are the other rehabilitation nurses who appear in this bibliometric analysis with five or more publications.

Figure 2 illustrates the co-authorship network,

where nodes represent authors and the size of each node indicates the number of publications. The lines reflect co-authorship collaborations, and the colors distinguish groups (clusters) of authors with greater proximity and frequency of collaboration. This co-authorship network was constructed based on authors with five or more publications, provided that co-authorship relationships between them were identified.



**Figure 2** – Co-authorship network between authors with the highest scientific output (more than 5 publications) in the field of Rehabilitation Nursing and Physical Exercise. Portugal, 2025

Analysis of the number of authors per publication reveals that most articles were co-authored, reflecting a growing trend toward collaboration in scientific production in Rehabilitation Nursing and physical exercise. Specifically, only one document was published by a single author, while the other 95 involved two or more authors. Most publications consisted of articles with three authors (31), followed by those with two authors (29). Documents with five (15) and six (10) authors also stood out, highlighting multidisciplinary or interinstitutional work teams in many of the studies analyzed. Articles with up to eight authors were also identified. Most of the documents (31) had

three authors, followed by documents with two (29 documents), five (15 documents), and six authors (10 documents).

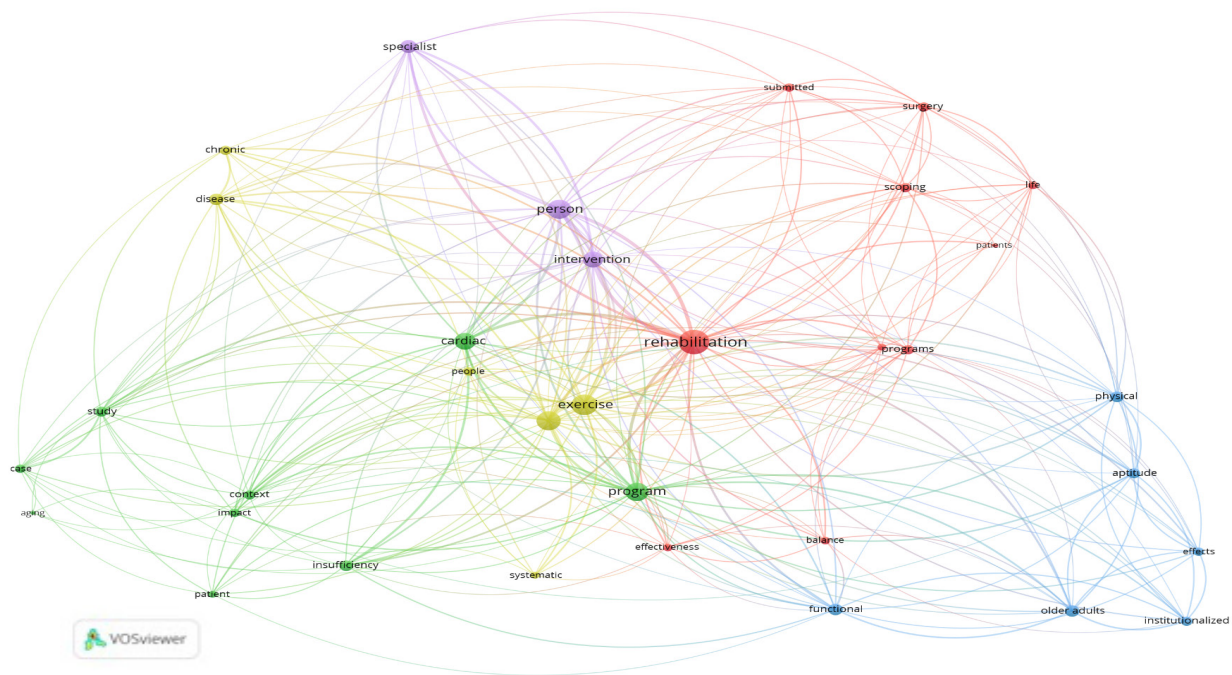
As already mentioned, in the case of master's theses, the authors and their respective advisors were counted, which contributes to the total number of co-authors in some documents.

The analysis of the document titles revealed a thematic evolution over time, allowing us to identify variations in research focuses within the field of Rehabilitation Nursing with an emphasis on physical exercise. The data were segmented into two periods: 2013-2019 and 2020-2024, allowing for a qualitative and quantitative comparison of the most frequent terms.

During the first period (2013–2019), the predominant terms in the titles were “exercise,” “rehabilitation,” “elderly,” and “functional capacity.” In the second period (2020–2024), although classic terms such as “physical exercise,” “rehabilitation,” and “rehabilitation nursing” remain relevant, new research focuses have emerged, evidenced by the higher frequency of words such as “self-care,” “empowerment,” “well-being,” “quality of life,” and “health strategies.”

Figure 3 shows the network of the most frequent words in the titles of the documents included in this bibliometric analysis. The nodes represent the terms, with their size proportional to the number of occurrences; the lines indicate co-occurrence relationships between the terms, and the colors identify thematic clusters automatically grouped by the VOSviewer algorithm, suggesting common areas of research. It can be observed that terms such as “nursing,” “exercise,” “rehabilitation,” “elderly,” “disease,” and “functionality” form the main nuclei of articulation, highlighting the central topics of the scientific production analyzed.





**Figure 3** – Cooccurrence map of terms extracted from the titles of documents on Rehabilitation Nursing and physical exercise. Portugal, 2025

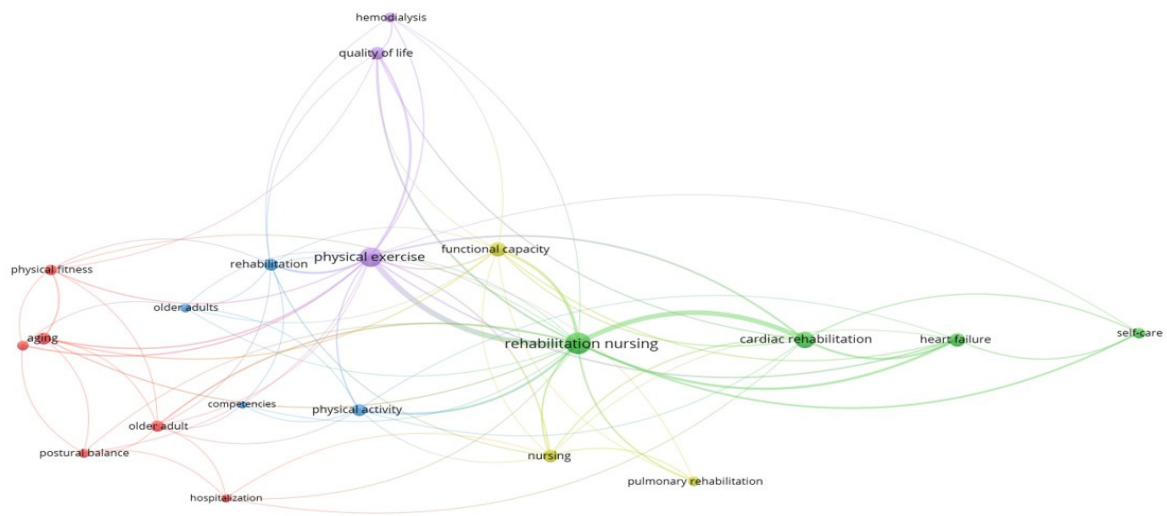
The analysis of keywords identified by the authors in their works indicated a thematic evolution between the periods 2013-2019 and 2020-2024. In the first period, expressions such as “physical exercise,” “self-care,” and “rehabilitation” predominated. In the second period, terms such as “telerehabilitation,” “empowerment,” “aging,” and “quality of life” emerged.

Figure 4 presents a visualization map developed with VOSviewer software, constructed from the co-occurrence of keywords in the analyzed documents. Each node represents a keyword, with the size proportional to its frequency of occurrence; the connections indicate co-occurrences in the same document; the colors differentiate the thematic clusters automatically formed by the clustering algorithm; it can be observed that the terms “physical exercise,” “rehabilitation nursing,” and “cardiac rehabilitation” are central, with themes such as “quality of life,” “functional capacity,” “aging,” “heart failure,” and “self-care” organized around them.

Based on the analysis of the clusters shown in

Figure 3 and the mapping of keywords (excluding the central terms “rehabilitation nursing” and “physical exercise”), it is possible to observe the emergence of distinct thematic domains, which can be interpreted in light of different nursing theories. The theoretical analysis of the clusters highlights how physical exercise, as a central practice, is integrated into multiple theoretical approaches to care.

The identification of the central terms of each cluster was based on visual analysis of Figure 3. This was complemented by a direct inspection of the list of keywords generated by the software, allowing for the inclusion of relevant terms with a lower frequency of occurrence, such as “pain,” which, despite not being among the most frequent, semantically integrates the group. Based on this analysis, four thematic clusters were identified that organize the principal conceptual axes present in scientific production on Rehabilitation Nursing and physical exercise. Each cluster groups together closely related terms, revealing specific areas of research (Figure 5).



**Figure 4** – Cooccurrence network of keywords in publications on Rehabilitation Nursing and physical exercise. Portugal, 2025

Cluster	Number of terms	Key terms
1 – Ageing and functionality	9	elderly, institutionalization, aging, postural balance, functional capacity, physical activity, competence, physical fitness, hospitalization
2 – Chronic conditions and cardiac rehabilitation	8	cardiac rehabilitation, heart failure, hemodialysis, self-care, adherence, respiratory rehabilitation, diabetes, telerehabilitation
3 – Quality of life and well-being	6	quality of life, well-being, motivation, empowerment, health strategies, health education
4 – Clinical context and pain	5	pain, surgery, orthopedics, fracture, rehabilitation

**Figure 5** – Summary of the clusters identified and their central terms. Portugal, 2025

The analysis of keyword clusters related to Rehabilitation Nursing and physical exercise reveals four principal thematic axes, which, when interpreted in consideration of nursing theories, allow us to understand how knowledge and practice are structured in this field. Among the various theories, four stand out for their strong correspondence with the emerging themes: Self-Care Theory, Transition Theory, Health Promotion Theory, and Well-Being Theory. Four major clusters were then identified: 1 – Aging and Functionality; 2 – Chronic Conditions and Cardiac Rehabilitation; 3 – Quality of Life and Well-being; and 4 – Clinical Context and Pain.

## Discussion

To our knowledge, no articles have investigated this topic. The absence of bibliometric studies in this field highlights an essential gap in the mapping of knowledge produced by nurses specializing in rehabilitation nursing in Portugal. This approach allows us not only to identify thematic trends and collaborative networks, but also to recognize guidelines that should be explored in future research.

In 2019, a scoping review on knowledge production in rehabilitation nursing in Portugal was published, but it did not include a bibliometric analysis.

sis<sup>(15)</sup>. In addition to this article, others have been published on rehabilitation in general<sup>(16-18)</sup> and rehabilitation nursing at the international level<sup>(19)</sup>. However, none of them is a bibliometric analysis of scientific production in rehabilitation nursing and physical exercise in Portugal.

Physical exercise has been progressively integrated as a fundamental practice in Rehabilitation Nursing care in various clinical contexts<sup>(20-21)</sup>. The scientific output analyzed demonstrates a growing appreciation of this intervention, both in clinical practice and in teaching and research<sup>(18)</sup>. There is a diversity of applications for physical exercise, ranging from cardiovascular rehabilitation to aging, and also a theoretical convergence around models that favor autonomy, adaptation to change, and the promotion of quality of life<sup>(15-19)</sup>.

The analysis of the clusters enabled us to identify key areas of research that reflect emerging concerns in professional practice, namely strengthening functionality in the elderly, self-care in chronic diseases, digital rehabilitation (e.g., telerehabilitation and artificial intelligence)<sup>(22)</sup>, and psychosocial well-being<sup>(23)</sup>. These themes align with global health priorities and highlight the potential of Rehabilitation Nursing to respond to the challenges of population aging, multimorbidity, and the digital transition of care<sup>(24)</sup>.

When discussing the titles of the documents, it becomes clear that they initially focused on physical interventions for the elderly population and the functional gains expected from rehabilitation programs from 2013 to 2019. Between 2020 and 2024, other terms, such as “risk of falling,” “hospitalization,” and “physical activity,” emerged, reinforcing a concern with promoting autonomy and preventing complications in institutional contexts. This change indicates a broadening of the approach, going beyond physical function and incorporating subjective dimensions of care, as well as the protagonism of the person in the rehabilitation process.

Additionally, there has been an increase in the use of terms associated with technological innovation in care, such as “telerehabilitation,” which may be re-

lated to the impact of the COVID-19 pandemic on the provision of care. The reorganization of care provision in the field of Rehabilitation Nursing. This transition suggests a maturation of scientific production, shifting from an approach predominantly focused on clinical and functional interventions to a more comprehensive view, centered on the person, their autonomy, and the social and emotional determinants of health. When performing the same analysis for keywords, comparing the periods 2013-2019 and 2020-2024, there is evidence of a maturing of scientific production and a progressive broadening of the focus of studies.

Despite the growth in scientific output after 2020, the field of Rehabilitation Nursing remains concentrated, with scientific output still dominated by a few authors, journals, and institutions, which may indicate a certain dependence on specific centers for the advancement of knowledge in this area. However, this concentration of scientific output can also be interpreted from the perspective of Lotka’s Law. This represents both a weakness and an opportunity: there is room to expand interinstitutional collaboration, foster internationalization, and promote publication in different languages and indexed platforms. A more equitable distribution of authorship and scientific production could contribute to a reconfiguration of the field, reinforcing epistemological diversity and diversity of contexts of practice.

Regarding the relationship between Nursing Theories and Models, these offer a solid basis for understanding the emerging thematic structure of scientific production, allowing for an integrated reading between scientific evidence and the theoretical framework of Rehabilitation Nursing practice, with a focus on physical exercise<sup>(10)</sup>.

Within the scope of the results found, four clusters can be discussed. The first, Aging and Functionality, encompasses terms such as elderly, physical activity, functional capacity, and institutionalization, highlighting an apparent concern with promoting autonomy and functionality during the aging process. Self-Care Theory provides the basis for this approach by considering physical exercise as a tool that sup-



ports a person's ability to care for themselves, preventing dependence and promoting self-control of health.

Cluster 2 – Chronic conditions and cardiac rehabilitation – groups words associated with cardiac rehabilitation, heart failure, hemodialysis, and self-care, relating to contexts of chronic diseases and adaptation to new health conditions. In this domain, Transition Theory is particularly relevant, as it values the intervention of nurses as facilitators of people's adaptation to significant changes in their health. Physical exercise, in this context, is a therapeutic strategy that helps to reconfigure functional identity and overcome the barriers imposed by disease.

Cluster 3 - Quality of life and well-being - brings together terms such as quality of life, motivation, well-being, and health strategies, aligning with Health Promotion Theory. This theory emphasizes the importance of nursing interventions that focus on empowering individuals to adopt healthy lifestyles, with physical exercise being a key priority in achieving this goal. Health promotion is understood here as a continuous process of empowerment and informed decision-making. The Theory of Good Living also stands out as a reference aligned with the broader and more integrative clusters of the analysis (clusters 1, 2, and 3). This theory views physical exercise as a foundational axis of well-being, promoting not only health and balance but also citizenship, social justice, and active participation in life. Well-being broadens the traditional view of health and quality of life, valuing people's cultural and social context.

Cluster 4 – Clinical context and pain – includes terms such as pain, surgery, fracture, and orthopedics, and can be interpreted in consideration of Pain Relief Theory, albeit with less centrality than the others. The management of pain and discomfort through movement and exercise is a reality in surgical and orthopedic contexts, highlighting the importance of person-centered care.

No significant thematic clusters related to other specific populations, such as pediatric, mental health, or palliative care populations, were identified. This finding suggests that there are still areas to be de-

veloped and explored in the field of physical exercise prescription in Rehabilitation Nursing.

The implications of this study reinforce the importance of integrating physical exercise as a structural component of intervention plans in Rehabilitation Nursing<sup>(5)</sup>. It also suggests the need to expand interdisciplinary and multicenter research, with particular emphasis on the validation of specific interventions, their applicability in different contexts, and the assessment of their impact on health indicators<sup>(2,23-26)</sup>. From a political and educational perspective, the results support the systematic inclusion of physical exercise prescription and supervision in the curricula and practices of nurses specializing in Rehabilitation Nursing.

The results obtained should be interpreted considering the strategic priorities of the Portuguese and European health systems, which emphasize the promotion of health literacy, active aging, and personalized care. Rehabilitation Nursing finds here a privileged space for action, where the prescription of physical exercise is one of its distinguishing competencies.

## Study limitations

This study has some limitations that should be considered when interpreting the results. First, the analysis was based on data from the SCOPUS, MEDLINE (via PubMed), Web of Science, and RCAAP platforms, which may not reflect all relevant scientific production on the topic.

Additionally, the VOSviewer software used for network analysis does not allow for the semantic refinement of complex expressions, which may have led to the exclusion or fragmentation of relevant terms during the processing. The normalization of keywords, titles, and author names was performed manually, which, despite the care taken, may have introduced errors or inaccuracies in groupings.

Another aspect to highlight is that no citation analysis was performed, as many of the identified documents are master's theses, which limits the assess-

ment of the impact or influence of the included documents.

## Contributions to practice

The use of evidence-based exercise prescriptions by rehabilitation nurses represents a significant advance in professional practice, promoting safer, more effective, and personalized care. This approach ensures that the interventions adopted are supported by robust scientific studies, reducing risks and optimizing results. Evidence-based exercise prescription contributes to improving care, both in hospital and community settings, by promoting the prevention of complications, controlling comorbidities, and facilitating functional recovery.

This approach strengthens the professional autonomy of nurses, consolidating their active role in the interdisciplinary management of health care. However, the effective implementation of this practice still faces challenges, such as the need for specific educational resources and institutional policies that promote the integration of exercise prescription as an essential competency in Rehabilitation Nursing.

## Conclusion

The bibliometric analysis revealed the temporal evolution of publications, including the principal authors, titles, keywords, institutions, and places of publication, as well as the central themes, organized into four clusters. The results show a growing appreciation of physical exercise as a structuring intervention in Rehabilitation Nursing practice, with a clear theoretical basis and diverse clinical applicability. This mapping provides relevant contributions to future research, professional practice, and the consolidation of the disciplinary identity of the specialty.

## Authors' contribution

Conception and design or analysis and inter-

pretation of data; Drafting of the manuscript or critical revision of intellectual content; Final approval of the version to be published and Agreement to be accountable for all aspects related to the accuracy or integrity of any part of the manuscript being appropriately investigated and resolved: Novo AFMP, Parola VSO, Mendes MER, Preto LSR, Martins MMFPS, Schoeller SD.

## References

1. Lima AM, Martins MMFS, Ferreira MSM, Sampaio F, Schoeller SD, Parola VSO. Rehabilitation nursing: differentiation in promoting the autonomy of the elderly. *Rev Port Enf Reab.* 2021;4(1):15-22. doi: <https://doi.org/10.33194/rper.2021.v4.n1.152>
2. Delgado B, Lopes I, Mendes T, Lopes P, Sousa L, López-Espuela F, et al. Self-care in heart failure inpatients: what is the role of gender and pathophysiological characteristics? A cross-sectional multicentre study. *Healthcare (Basel).* 2021;9(4):434. doi: <https://dx.doi.org/10.3390/healthcare9040434>
3. Preto LSR, Novo AFMP, Mendes MER. Relationship between physical activity, muscle strength and body composition in a sample of nursing students. *Rev Enferm Ref.* 2016;4(11):81-9. doi: <https://doi.org/10.12707/RIV16028>
4. Preto LSR, Gomes JRL, Novo AFMP, Mendes MER, Granero-Molina J. Effects of a rehabilitation nursing program on the functional fitness of institutionalized elderly. *Rev Enferm Ref.* 2016;4(8):55-63. doi: <https://doi.org/10.12707/RIV15019>
5. Sousa L. Atividade física e exercício físico: fundamentos e aplicações em enfermagem de reabilitação. *Rev Port Enf Reab.* 2019;2(1):4-5. doi: <http://doi.org/10.33194/rper.2019.v2.n1.e>
6. American College of Sports Medicine. ACSM's Guidelines for Exercise Testing and Prescription, Eleventh Edition. Philadelphia: Wolters. Philadelphia: Wolters Kluwer; 2021.
7. World Health Organization (WHO). WHO guidelines on physical activity and sedentary behaviour [Internet]. 2020 [cited Apr. 13, 2025]. Available from: <https://www.who.int/publications/i/item/9789240015128>

8. Ordem dos Enfermeiros (OE). Regulamento n.º 392/2019 - Regulamento das Competências específicas do enfermeiro especialista em Enfermagem de Reabilitação. Diário da República, 2ª série - n.º 85 - 3 de maio de 2019 [Internet]. 2019 [cited Apr. 13, 2025]. Available from: <https://diariodarepublica.pt/dr/detalhe/regulamento/392-2019-122216893>
9. Novo A, Loureiro M, Delgado B, Vaz S, Manuela Martins M, Dornelles Schoeller S. Atividade e exercício físico em Enfermagem de Reabilitação: análise documental baseada em evidência e Teorias de Enfermagem. *Rev Port Enf Reab*. 2025;8(2):e41115. doi: <https://doi.org/10.33194/rper.2025.41115>
10. Smith MC. Nursing theories and nursing practice. Philadelphia: F.A. Davis Company; 2019.
11. Klarin A. How to conduct a bibliometric content analysis: Guidelines and contributions of content co-occurrence or co-word literature reviews. *Int J Consum Stud*. 2024;48:e13031. doi: <https://doi.org/10.1111/ijcs.13031>
12. Öztürk O, Kocaman R, Kanbach DK. How to design bibliometric research: an overview and a framework proposal. *Rev Manag Sci*. 2024;18(11):3333-61. doi: <http://dx.doi.org/10.1007/s11846-024-00738-0>
13. Chen Y, Leimkuhler FF. A relationship between Lotka's law, Bradford's law, and Zipf's law. *J Am Soc Inform Sci*. 1986;37(5):307-14. doi: 10.1002/(SICI)1097-4571(198609)37:5<307::AID-ASIS>3.0.CO;2-8
14. Schubert A, Schubert G. Law-making "pioneers" of scientometrics. *Orvosi Hetilap*. 2016;157(2):74-8. doi: <https://doi.org/10.1556/650.2015.30279>
15. Fernandes CS, Gomes JA, Magalhães BM, Lima AMN. Produção de conhecimento em enfermagem de reabilitação portuguesa-scoping review. *J Health NPEPS*. 2019;4(1):282-301. doi: <http://dx.doi.org/10.30681/252610103378>
16. Yuan G, Shi J, Jia Q, Shi S, Zhu X, Zhou Y, et al. Cardiac rehabilitation: a bibliometric review from 2001 to 2020. *Front Cardiovasc Med*. 2021;8:672913. doi: <https://doi.org/10.3389/fcvm.2021.672913>
17. Azizan A, Azmi A, Yusof MYPM. Bibliometric analysis on geriatric rehabilitation in scopus database (1948-2022). *Top Geriatr Rehabil*. 2024;40(1):60-8. doi: <https://doi.org/10.1097/TGR.0000000000000423>
18. Dong Y, Weng L, Hu Y, Mao Y, Zhang Y, Lu Z, et al. Exercise for stroke rehabilitation: a bibliometric analysis of global research from 2001 to 2021. *Front Aging Neurosci*. 2022;14:876954. doi: <https://doi.org/10.3389/fnagi.2022.876954>
19. Spasser MA, Weismantel A. Mapping the literature of rehabilitation nursing. *J Med Libr [Internet]*. 2006 [cited Apr. 13, 2025];94(2 Suppl):137-42. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC1463035/>
20. Faria ACA, Martins MMFPS, Aguilera JAL, Ribeiro OMPL, Silva JMAV. Construction and validation of a rehabilitation nursing program for fragile elderly. *Rev Bras Enferm*. 2022;75(Suppl 4):e20210562. doi: <https://doi.org/10.1590/0034-7167-2021-0562>
21. Garcia D, Sousa L, Bico I. Exercício físico no doente renal crónico de estágio 5 submetido a hemodiálise: estudo de caso. *Rev Port Enf Reab*. 2020;3(S1):56-62. doi: <http://doi.org/10.33194/rper.2020.v3.s1.7.5781>
22. Gu M, Huang H. Effect of early rehabilitation nursing on neurological function and quality of life of patients with hemiplegia after stroke: a meta-analysis. *Medicine (Baltimore)*. 2023;102(34):e34919. doi: <http://dx.doi.org/10.1097/MD.00000000000034919>
23. Pereira RSS, Martins MMFPS, Pereira AMS, Vargas CP, Antunes L, Lourenço MCG, et al. Quality of rehabilitation nursing care for inclusion and accessibility: development of an instrument. *Rev Rene*. 2025;26:e94665. doi: <https://dx.doi.org/10.36517/2175-6783.20252694665>
24. Niezbecka-Zajac J, Łuba Z, Mazurek A, Pacian A. Prospects, possibilities and determinants of rehabilitation in nursing. *Wiad Lek*. 2025;78(3):591-4. doi: <https://doi.org/10.36740/WLek/202524>
25. Tao S, Zhang Q, Gao M, Zhang Y, Liu J, Zhao H. Effect of postpartum pelvic floor rehabilitation nursing on patients' compliance. *Minerva Med*. 2023;114(2):272-3. doi: <https://dx.doi.org/10.23736/S0026-4806.21.07509-1>
26. Ma H, Wang J, Sun J, Pan K, Wu K, Sun C, et al. Effect of cardiopulmonary rehabilitation nursing on exercise endurance and quality of life of stable COPD patients. *Am J Transl Res [Internet]*. 2021 [cited Apr. 13, 2025];13(6):7356-62. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC8290647/>



This is an Open Access article distributed under the terms of the Creative Commons