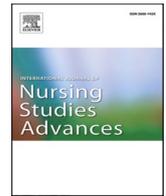


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Health gains from rehabilitation programs implemented by nurses for older people with impaired mobility and self-care deficit: A scoping review

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ABSTRACT

Introduction: Ageing is a multifactorial and progressive process that leads to a gradual decline in mental and physical function, directly impacting the ability to perform daily living activities and health-related quality of life. Thus, it is essential to develop strategies that prioritize the maintenance of the functional capacity and the enhancement of the quality of life and well-being of older adults.

Objective: This scoping review intends to map the rehabilitation programs, used by rehabilitation nurses, for promoting mobility and self-care, among older adults, to identify the main health gains resulting from the rehabilitation programs implemented.

Methods: This scoping review follows the JBI methodology and the results obtained are described according to the PRISMA-ScR guidelines, and was registered in the OSF (osf.io/zqkp3/). The electronic databases CINAHL Complete; Complete MEDLINE; Cochrane Central Register of Controlled Trials; Web of Science, Scopus, and Google Scholar, were searched in March 2025, for papers published in the last 10 years. Two researchers independently analyzed the papers for eligibility and extracted the data. Data on health gains whose association with the intervention was described were collected and synthesized, through narrative synthesis.

Results: The initial search yielded a total of 15,347 records, and after screening, 12 papers were included. The evaluation of the methodological quality and levels of evidence of the studies, according to the JBI Critical Appraisal Tool, concluded that the average quality score of the studies ranged from 67% to 100%. The results revealed a variety of interventions implemented, targeting different aspects of rehabilitation, with a wide range in the duration (15 to 60 min) and frequency of sessions (three to 56), as well as the use of diverse instruments to assess the effectiveness of the interventions. The health gains associated with the musculoskeletal system were reported most frequently, followed by those related to neurocognitive enhancements. Respiratory and renal gains were only reported by one study each.

Conclusions: This scoping review reinforces the evolving vision of nursing rehabilitation as a cornerstone of comprehensive healthcare, demonstrating its significant impact on enhancing

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health gains at several physiologic systems among older adults. Adopting a multiple physiological system-based framework for the analysis and implementation of these interventions may enhance the precision, accountability, and efficacy of care. Such poses nursing rehabilitation as an essential strategy in the continuum of care, advocating for its integration into healthcare systems and policies to support the health and sustainable recovery of the older population.

What is already known about the topic

What is already known

- Life expectancy at birth has been steadily rising across European countries, leading to an increase in the prevalence of complex health conditions.
- Enhancing the functionality of older adults benefits the individuals while supporting healthcare sustainability and societal well-being.
- Previous literature has highlighted the crucial role of nurses in the rehabilitation of older adults.

What this paper adds

- Nursing rehabilitation interventions frequently improve musculoskeletal and neurocognitive systems, with some evidence of benefits to respiratory and renal systems, underscoring the multi-systemic impact of these interventions.
- The results provide support for adopting a multi-system physiological framework in the design and implementation of nursing rehabilitation interventions to improve precision, efficacy, and outcome measurement.
- Nursing rehabilitation is an essential component of integrated healthcare for older adults, and should be included in healthcare systems and policy agendas to support sustainable recovery and aging.

1. Introduction

The average life expectancy at birth has been progressively increasing in European countries, reaching approximately 81.4 years in 2023 (Eurostat, 2024). Longevity allows for the pursuit of new life projects but also contributes to increasing the prevalence of various complex health conditions, commonly known as geriatric syndrome (OECD, 2023). The most common of these health conditions is frailty, which is characterized by reduced functional capacity and increased vulnerability to diseases. Frailty is associated with various adverse health outcomes, including falls, fractures, and institutionalization (Hakeem et al., 2023). Another typical condition of the geriatric syndrome is sarcopenia, which is estimated to affect 10 % to 16 % of older adults worldwide. It is an age-related condition characterized by the progressive loss of muscle mass and function, being associated with increased morbidity and a higher mortality rate (Yuan and Larsson, 2023).

Aging is a multidimensional process characterized by biological, psychological, and social changes that unfold heterogeneously across individuals (Ghisla et al., 2023). Although some older adults experience declines in physical or cognitive function (Fonseca et al., 2023; Vogelsang et al., 2019), many maintain high levels of independence and well-being throughout later life. Functional trajectories are strongly influenced by socioeconomic conditions, health behaviors, comorbidities, and environmental supports, which shape resilience and vulnerability in older age (Xu et al., 2022; Henriques et al., 2024; Henchoz et al., 2025 REF). Understanding this variability is essential for identifying individuals at risk of mobility limitations or self-care deficits and for designing targeted rehabilitation strategies (Fonseca et al., 2024; Robine and Jagger, 2005).

Activities of daily living are essential skills that support functional independence and are widely used as indicators of functional status (Katz, 1983). Difficulties in performing these tasks often lead to reliance on caregivers or assistive devices. Activities of daily living encompass both basic functions—such as mobility, feeding, dressing, and personal hygiene—and more complex instrumental activities that require cognitive and organizational abilities, namely medication and financial management, meal preparation, household tasks, and communication (Fonseca et al., 2023; Lawton and Brody, 1969; Martínez et al., 2021).

Monitoring mobility is fundamental to assessing functional capacity in older adults and identifying early deficits that warrant targeted rehabilitation nursing interventions (Ferreira et al., 2024). Prolonged inactivity and reduced mobility contribute to muscle weakness and sarcopenia (Guitar et al., 2023), which diminish strength and endurance and compromise the performance of activities of daily living (Kekäläinen et al., 2023). Evidence also shows that physical exercise stimulates neuroplasticity, enhances cerebral perfusion, and supports motor and cognitive recovery (Alves et al., 2024; Lee et al., 2022). These mechanisms are directly relevant to rehabilitation nursing, as nurses design, supervise, and adjust therapeutic exercise programs that leverage neuroplastic potential to improve mobility and self-care capacity. Together, these physiological and functional considerations reinforce the rationale for examining nurse-led mobility and self-care interventions aimed at preventing decline and promoting recovery in older adults.

Previous literature reviews have highlighted the crucial role of nurses in the rehabilitation of older adults within primary health care, particularly in the assessment, coordination, and management of care (Lorenz et al., 2024). Studies have identified key work

goals for nurses in geriatric rehabilitation (Vaalburg et al., 2023) and emphasized their main contributions to rehabilitation in inpatient geriatric units (Guitar et al., 2023). In fact, therapeutic exercises conducted by rehabilitation nurses result in health improvements when tailored to the needs of the individual, family or community (Faria et al., 2023; Pinho et al., 2024). Given the heterogeneity of aging trajectories, the physiological responsiveness to physical activity, and the clinical need to prevent functional decline, rehabilitation nurses are uniquely positioned to support older adults across care settings. Their role in assessment, intervention design, education, and interprofessional coordination provides the foundation for targeted rehabilitation strategies that address mobility limitations and self-care difficulties.

The current scoping review is novel as it focuses on nursing rehabilitation interventions sensitive to the reduction of mobility impairment and self-care deficits, without restricting the discussion to specific care environments or associated diseases and comorbidities. The main objective of this scoping review is to map the rehabilitation programs, used by rehabilitation nurses, for promoting mobility and self-care, among older adults, to identify the main health gains resulting from the rehabilitation programs implemented.

2. Materials and methods

To meet the objectives of this work, we decided to conduct a scoping review to identify, in a systematic and comprehensive way, the rehabilitation programs available for older adults with mobility impairments and self-care deficits. Additionally, the health benefits resulting from the implementation of these interventions will be assessed.

The scoping review follows the methodology of the Joanna Briggs Institute (JBI) (Aromataris et al., 2024). The results obtained are described under the Preferred Reporting Items for Systematic Reviews and Meta-Analyses with extension for scoping reviews (PRISMA-ScR) guidelines (Tricco et al. 2018). To ensure scientific transparency criteria, the scoping review protocol was registered in the Open Science Framework (OSF) (osf.io/zqkp3/).

2.1. Research question

The research question was formulated according to the PICO strategy (Melnyk et al., 2005): “What are the main health gains (O) of the rehabilitation programs (I) for older people with mobility impairment and self-care deficits (P), conducted by rehabilitation nurses (C)?”

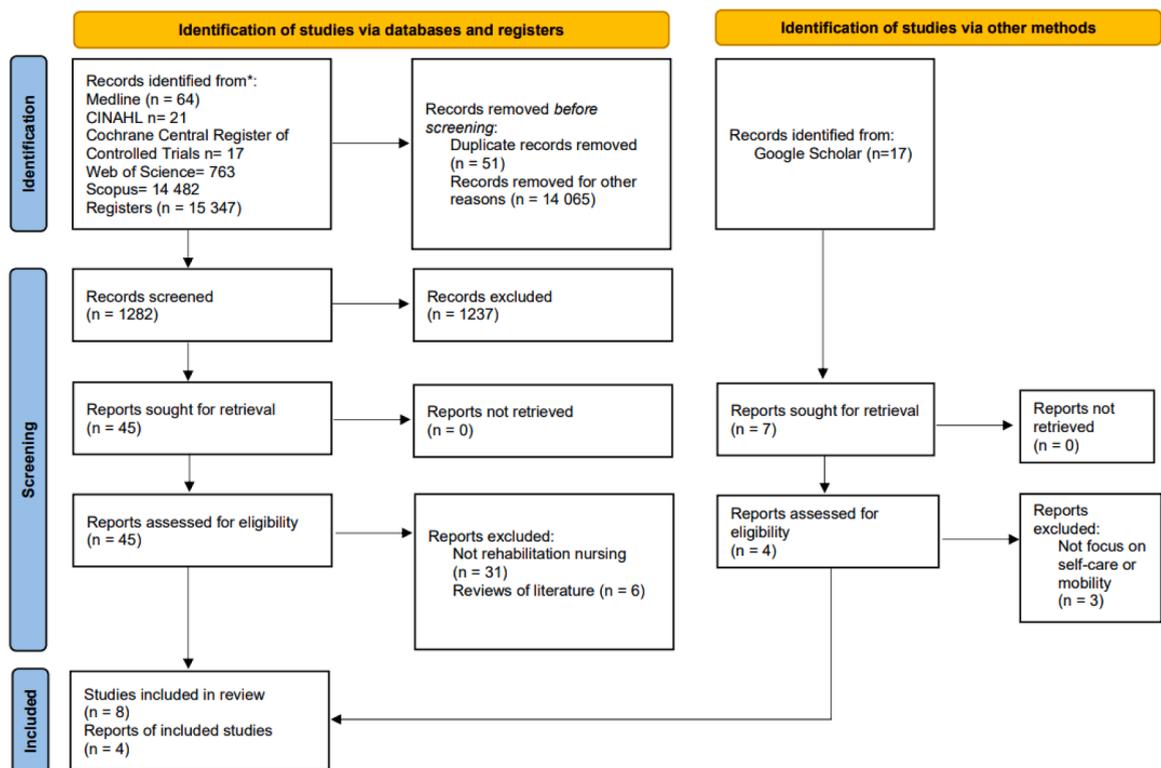


Fig. 1. Scoping review flowchart.

2.2. Eligibility criteria

The following eligibility criteria were defined: (1) population with a mean age around 60 years or older, with impaired mobility and self-care deficit; (2) implementation of rehabilitation programs conducted by nurses; (3) studies published between 2014 and 2025. The exclusion criteria were as follows: (1) studies with people with a mean age under 60 years of age and/or without mobility impairment and self-care deficit; (2) studies that did not report data on the implementation of rehabilitation programs conducted by nurses; (3) non-original studies (reviews, study protocols, commentary, editorials, journal articles, conference proceedings and abstracts, reports, guidelines and scale validations); (4) studies published before 2014; and (5) articles written in other languages than English, Spanish and Portuguese. The literature search was restricted to papers published between 2014 and 2025, to access the most up-to-date data on this field. Previous research suggests that the findings of most systematic reviews remain valid between five to 15 years (Shojania et al., 2007; Furuya-Kanamori et al., 2023), accurately reflecting the current knowledge in the field.

2.3. Data sources

Two researchers developed the search strategy, and a third researcher was used for conflict management. The search expression was introduced on the EBSCO Host platforms, with access to the following databases: CINAHL Complete; Complete MEDLINE; Cochrane Central Register of Controlled Trials; Web of Science, Scopus, and Google Scholar, in March 2025, selecting all articles published in the last 10 years.

2.4. Literature search and study selection

Descriptors validated by MESH/CINAHL Subject Headings were used, resulting in the following search expression: ((Rehabilitation Nursing) AND (aged OR elder*)) AND (Mobility Limitation OR Locomotion OR Physical Functional Performance OR Motor Activity)).

The studies obtained were uploaded to the Rayyan platform, where duplicate studies were screened. Then, two researchers independently analyzed the titles, keywords, and abstracts of all articles to make an initial selection of the articles of interest. After this selection, the full texts were analyzed to select the articles that answered our question, always considering inclusion and exclusion criteria. Although there was high agreement in the results obtained among the researchers (% agreement >90 %), whenever necessary, the collaboration of the third reviewer was requested to resolve moments of discord.

The studies were selected, always taking into account the interest of the topic for the study, using the inclusion and exclusion criteria already outlined. Thus, all articles relevant to the topic, obtained through scientific databases, were integrated. Having reached a consensus, each phase of this research was reflected in a PRISMA flowchart, displayed in Fig. 1.

2.5. Data extraction

During data extraction, tables were used to organize the data from the papers, namely: author, year of publication, country of origin, study objective, period of data collection, setting, participants and sample and data assessment. Specifically regarding the main characteristics and results of the programs implemented, data on rehabilitation program content and frequency, instruments and main results were retrieved. The most relevant results of each study were analyzed and synthesized, with a view to the subsequent presentation and interpretation of the results.

The data extraction phase was again carried out individually by two researchers, descriptively analyzing each of the included studies and comparing the results. Subsequently, with the results weighed by all researchers, their presentation, discussion and conclusion were carried out. Whenever necessary, a third researcher was consulted to consider points of greater disagreement.

2.6. Methodological quality assessment

The methodological quality of the articles was assessed using the JBI Levels of Evidence and Grades of Recommendation (Barker et al., 2023). Each item on the JBI checklist was scored as follows: "Yes" received 1 point, while "No" and "Unclear" received 0 points. Two reviewers independently evaluated the methodological quality of the included studies, and any discrepancies were resolved through discussion. The total score was calculated as a percentage of applicable checklist items, following the approach described by Camp and Legge (Camp and Legge, 2018). Based on this percentage, studies were categorized as follows: 60–69 % indicated medium-low quality, 70–79 % medium-high quality, 80–90 % high quality, and above 90 % excellent quality. Levels of evidence were determined in accordance with the JBI framework (Aromataris et al., 2024).

2.7. Data synthesis

The outcomes of the implemented interventions were regarded as health-related gains—a multidimensional concept encompassing clinical indicators (e.g., physical examinations, laboratory tests, imaging), self-reported measures, and observed changes (such as gait or movement fluctuations noted by healthcare providers or caregivers) reported by the patient or the healthcare professionals (Oleske and Islam, 2019). Data on health gains whose association with the intervention was described were extracted and synthesized, through narrative synthesis (Lucas et al., 2007). Subsequently, the main health gains were aggregated, based on the similarity of meaning, into four grouped according to the primary physiological system targeted: Musculoskeletal, Respiratory, Neurocognitive, and Renal.

3. Results

3.1. Study selection

Following PRISMA guidelines, the search results and screening process are detailed in Fig. 1 (Page et al., 2021). The initial search across six scientific databases yielded a total of 15,347 records. After removing 51 duplicates, 15,296 unique records were screened by title. Based on predefined eligibility criteria, including relevance to the research objectives, target population, type of intervention, year of publication, and study design, 14,065 records were excluded. As a result, 1282 articles were assessed through abstract reading. Of the 45 articles selected for full-text review, 31 were excluded for not reporting on rehabilitation programs conducted by nurses, and 6 were literature reviews. An additional search on Google Scholar identified 7 records, all pursued for retrieval. Three reports were excluded as they did not focus on self-care or mobility. Thus, a total of 12 papers were included in the present scoping review (Batista et al., 2019; Brown et al., 2016; Hassett et al., 2020; Kjernsholen et al., 2024; Nose et al., 2023; Nozoe et al., 2016; Palma et al., 2021; Rittharomya et al., 2020; Teixeira et al., 2023; Trindade et al., 2020; Wu et al., 2020; Yeh et al., 2020).

3.2. Methodological quality of studies

The evaluation of the methodological quality and levels of evidence of the studies, according to the JBI Critical Appraisal Tool, for each type of study, concluded that all the studies satisfied >60 % of the proposed quality criteria (Supplementary table). The average quality score of the studies ranged from 67 % to 100 %, with the majority of the studies classified as having excellent (Kjernsholen et al., 2024; Yeh et al., 2020) or high methodological quality (Batista et al., 2019; Hassett et al., 2020; Palma et al., 2021; Rittharomya et al., 2020) (Table 1; Teixeira et al., 2023; Trindade et al., 2020).

3.3. Study characteristics

Table 2 describes the main characteristics of the 12 studies included in this scoping review. The studies were conducted in Asian countries (2 in Japan, 1 in China, 1 in Taiwan and 1 in Thailand), European countries (4 in Portugal and 1 in Norway), the USA ($n = 1$), and Australia ($n = 1$). The data collection periods occurred between 2010 and 2022, but 5 studies did not report it (Nose et al., 2023; Nozoe et al., 2016; Palma et al., 2021; Rittharomya et al., 2020; Trindade et al., 2020). Almost all the studies ($n = 10$) took place in a hospital setting, with only 2 being conducted in the community (Kjernsholen et al., 2024; Nose et al., 2023).

The sample size ranged from one (Palma et al., 2021; Teixeira et al., 2023; Trindade et al., 2020) to 300 participants (Hassett et al., 2020), with 4 studies incorporating both experimental and control groups (Kjernsholen et al., 2024; Rittharomya et al., 2020; Wu et al., 2020; Yeh et al., 2020). The follow-up period of the participants ranged from 1–2 weeks (Batista et al., 2019) to 6 months (Kjernsholen et al., 2024) (Table 2).

3.4. Rehabilitation programs characteristics

All the studies implemented a structured rehabilitation program for older people with mobility impairment and self-care deficits (Table 4). Specifically, the interventions focused on several rehabilitation areas, namely mobility (Brown et al., 2016; Hassett et al., 2020), physical exercise education and training (Batista et al., 2019; Hassett et al., 2020; Nose et al., 2023; Rittharomya et al., 2020; Wu et al., 2020; Yeh et al., 2020), functionality (Palma et al., 2021; Teixeira et al., 2023), independence in activities of daily living (Kjernsholen et al., 2024; Nozoe et al., 2016), self-care (Trindade et al., 2020) and learning education (Nose et al., 2023). Intervention programs included sessions conducted by nurses, in a hospital, community setting or at home. While some interventions were delivered

Table 1
Quality score of JBI critical appraisal checklist.

Publication	JBI Quality score	Level of evidence
<i>Randomized Controlled Trials</i>		
Brown et al., 2016	11/13 (85 %)	1.c
Hassett et al., 2020	11/13 (85 %)	1.c
Rittharomya et al., 2020	11/13 (85 %)	1.c
Wu et al., 2020	10/13 (77 %)	1.c
Yeh et al., 2020	12/13 (92 %)	1.c
<i>Case Reports</i>		
Batista et al., 2019	7/8 (88 %)	4.d
Trindade et al., 2020	7/8 (88 %)	4.d
Palma et al., 2021	7/8 (88 %)	4.d
Teixeira et al., 2023	7/8 (88 %)	4.d
<i>Quasi-experimental studies</i>		
Nose et al., 2023	7/9 (78 %)	2.c
Kjernsholen et al., 2024	9/9 (100 %)	2.c
<i>Cohort Studies</i>		
Nozoe et al., 2016	8/12 (67 %)	3.c

Table 2
Overall description of the studies included ($n = 12$).

Publication	Country	Study objective	Period of data collection	Setting and Intervention Provider	Participants and sample	Data assessment
Brown et al., 2016	USA	To examine the effect of an in-hospital mobility program on post-hospitalization function and community mobility.	January 2010 -June 2011	Medical wards of 1 Medical Center Nurses and Physicians	Patients aged ≥ 65 years ($n = 100$)	Followed-up throughout hospitalization with 1-month post-hospitalization telephone follow-up
Nozoe et al., 2016	Japan	To investigate the changes in quadriceps muscle thickness in acute non-ambulatory stroke survivors.	NR	1 acute neurosurgical hospital Nurses, physicians from various departments, physical therapists, pharmacists, nutritionists	Patients with a diagnosis of intracerebral hemorrhage and ischemic stroke ($n = 16$)	Quadriceps muscle thickness was examined in their paretic and non-paretic limbs within the first week from admission (first week), 1 week after the first examination (second week), and 1 week after the second week examination (third week)
Batista, et al., 2019	Portugal	To develop skills in the area of Rehabilitation Nursing care, through structured intervention plans for older people with a deficit in self-care and mobility disorders	September - November 2018	Convalescence Unit of 1 Hospital Rehabilitation specialist nurses	Adults with mean age of 73 years with changes in motor function, with some self-care deficits ($n = 3$)	Participants were examined at baseline and after 1-2 weeks
Hassett, et al., 2020	Australia	To evaluate a tailored prescription of affordable digital devices in addition to usual care for people with mobility limitations admitted to aged care and neurological rehabilitation.	September 2014 - November 2016	3 Hospitals Nurses, medical specialists, occupational therapists, speech pathologists, social workers, nutritionists, orthoptists	Older adults with mobility limitations ($n = 300$)	Assessed face-to-face at 3 weeks and 6 months after randomisation and by mail or telephone at 12 weeks after randomisation
Rittharomya et al., 2020	Thailand	To evaluate the effectiveness of a Preoperative Quadriceps Exercise and Diet Control Program on self-efficacy, body mass index, pain, muscle strength, mobility, and quality of life in older adults.	NR	1 university hospital in Bangkok Nurses	Older adults awaiting knee arthroplasty were randomly assigned into an experimental ($n = 48$) and control ($n = 48$) group	The participant was observed on the 2, 8, and 12 weeks
Trindade, et al., 2020	Portugal	To identify the gains that are sensitive to rehabilitation nursing care in training for self-care in people with stroke.	NR	Stroke Unit from Hospital Rehabilitation specialist nurses	Stroke survivor ($n = 1$)	The participant was examined 4 days after hospitalization and at discharge
Wu et al., 2020	China	To determine the effectiveness of a telerehabilitation exercise training program based on a collaborative care model for acute stroke patients	December 2016 - December 2017	1 Hospital at the Department of Neurology Nurses, neurologists, and rehabilitation therapists	Older adults with stroke: intervention group ($n = 30$) and control group ($n = 31$)	The participant was observed on the day of discharge, the 4th week, 8th week, and 12th week after the patients were discharged.
Yeh et al. (2020)	Taiwan	To determine intradialytic cycling exercise's impact on physical function, muscle strength, and endurance in patients with end-stage renal disease undergoing hemodialysis.	June 2013 - August 2014	1 Hemodialysis Centre in a regional hospital Nurses and nephrologists	Regular haemodialysis adults and older adult patients, divided into experimental group ($n = 38$) and control ($n = 38$)	The participant was measured at baseline and after 4, 8, and 12 weeks of intradialytic cycling exercise
Palma, et al., 2021	Portugal	To identify the contributions of rehabilitation nursing care to the self-care of people with fractures of the upper third of the femur.	NR	1 Hospital Rehabilitation specialist nurses	Older adult hospitalized after a diagnosis of intertrochanteric fracture of the femur ($n = 1$)	The participant was examined at baseline, in the first postoperative day and at the time of hospital discharge
Nose et al. (2023)	Japan	To assess the effect of an intervention combining brain and physical function	NR	1 local public in the community Nurses, physicians	Older residents of the community ($n = 34$)	The participant was evaluated before and

(continued on next page)

Table 2 (continued)

Publication	Country	Study objective	Period of data collection	Setting and Intervention Provider	Participants and sample	Data assessment
		training with health education in older adults living at home		from various departments, physical therapists, pharmacists, and nutritionists		after the program (14 weeks).
Teixeira, et al., 2023	Portugal	To understand the significant gain from the practice of Specialist Nurse in Rehabilitation in raising awareness of Affected Hemispace in people post-stroke	March 2022	1 Hospital Rehabilitation specialist nurses	Stroke survivor with Affected Hemispace (n = 1)	The participant was examined at sessions 1, 4, 7 and 11
Kjernsholen et al., 2024	Norway	To examine the effect of a person-centered, interdisciplinary rehabilitation intervention compared to usual care in older adults experiencing functional decline in daily activities	August 2017 to January 2019	1 public health home care services Nurses, physical therapists, and occupational therapists	Home-dwelling older adults with functional decline: reablement group (n = 35) and usual care group (n = 30)	The participant was examined in 3 time points: baseline (T0) before study initiation, after intervention (T1), and at 6 months from baseline (T2)

NR, Not reported.

Table 3

Synthesis of how rehabilitation nurses operationalized clinical, educational, and coordinative actions across the included rehabilitation interventions.

Study	Assessment & Goal-Setting	Therapeutic Exercise / Mobility Training	Patient & Caregiver Education	Monitoring & Progress Evaluation	Interprofessional Coordination / Technology Use
Brown et al., 2016	Functional mobility assessment; identification of ambulation needs	Assisted ambulation; mobility promotion strategies	Education on safe mobility and activity engagement	Daily monitoring of ambulation and functional mobility	Coordination with ward team to support mobility
Nozoe et al., 2016	Neuromuscular assessment (quadriceps thickness)	Early mobilization; gait and orthotic-assisted exercises	Education on early rehab and ADL engagement	Weekly assessment of muscle changes	Collaboration with neurosurgical rehabilitation team
Batista et al., 2019	Comprehensive ENCS-based assessment; personalized goal-setting	Structured motor re-education and mobility training	Education for self-care performance	Pre- and post-intervention FIM monitoring	—
Hassett et al., 2020	Mobility and activity limitations assessment	Technology-assisted mobility training; VR exercises	Training in use of digital devices and safe mobility	Monitoring via activity sensors and structured follow-ups	Implementation of digital devices; interdisciplinary team involvement
Rittharomya et al., 2020	Baseline pain, ROM, and strength assessment	Quadriceps strengthening exercises	Health information on diet, exercise, and self-efficacy development	Scheduled follow-ups with progress checks	Phone-based support; coordination with surgical team
Trindade et al., 2020	Cognitive, swallowing, and functional assessment	Functional reeducation; ADL retraining	Self-care instruction and adaptive strategy teaching	Systematic monitoring using multiple scales (FIM, MBI, NIHSS)	Collaboration with stroke care team
Wu et al., 2020	Tele-assessment of motor deficits	Remote-guided breathing, balance, and gait training	Education for home-based telerehabilitation	Frequent reassessment via digital platform	Use of telehealth technology for real-time monitoring
Yeh et al., 2020	Baseline physical function and endurance assessment	Intradialytic aerobic + resistance cycling	Education on exercise engagement during dialysis	Repeated assessment of 6MWD and strength	Collaboration with dialysis team
Palma et al., 2021	Muscle strength, risk of falls, and functional status assessment	Pre- and postoperative functional and mobility training	Education on safety, ADLs, and adaptive techniques	Monitoring of balance, strength, and self-care ability	—
Nose et al., 2023	Cognitive and physical function assessment	Resistance training; balance and stepping exercises	Multimorbidity management education	Pre-post testing of cognitive and physical outcomes	Integration of cognitive training tools (magnetic number board)
Teixeira et al., 2023	Assessment of hemispace neglect and motor deficits	Cross-facilitation and sensory-motor stimulation exercises	Education on neglect compensation strategies	Monitoring across 11 sessions	Team coordination in stroke rehabilitation
Kjernsholen et al., 2024	Patient-specific functional goals; baseline ADL assessment	Balance, strength, and walking exercises in home context	Education for ADL performance and safe mobility	Follow-up at baseline, post-intervention, and 6 months	Integrated interdisciplinary reablement model

Note: Activities of Daily Living (ADLs).

exclusively by rehabilitation specialist nurses ($n = 4$), the majority were implemented through collaborative models involving nurses together with physicians, neurologists, physical therapists, occupational therapists, speech pathologists, pharmacists, nutritionists, nephrologists, social workers, and other allied health professionals. Each session ranged from 15 (Brown et al., 2016) to 60 min (Hassett et al., 2020), with studies describing a minimum of three (Trindade et al., 2020), and a maximum of 56 sessions (Nose et al., 2023) during the intervention.

The instruments used to evaluate the effectiveness of the interventions showed significant variability, with the Functional Independence Measure being the only scale used repeatedly in four studies (Batista et al., 2019; Palma et al., 2021; Teixeira et al., 2023; Trindade et al., 2020). Also, the Berg Balance Scale was applied in three studies (Palma et al., 2021; Trindade et al., 2020; Wu et al., 2020), while the Glasgow Coma Scale (Teixeira et al., 2023; Trindade et al., 2020), the Modified Barthel Index Scale (Trindade et al., 2020; Wu et al., 2020), and the Medical Research Council Muscle Scale (Palma et al., 2021; Teixeira et al., 2023) were all used in two studies each (Table 4).

3.5. Nursing actions across interventions

Across the included studies, the role of the rehabilitation nurse was operationalized through a set of clearly defined clinical, educational, and coordinative activities that shaped the structure and delivery of the interventions (Table 3). Core nursing actions included: (1) comprehensive assessment and goal-setting, such as evaluating mobility, muscle strength, balance, pain, and functional status to establish individualized rehabilitation objectives; (2) planning and tailoring rehabilitation programs aligned with patient needs, comorbidities, and recovery trajectories; (3) prescription, supervision, and progression of therapeutic exercise, including mobility training, resistance exercises, balance training, respiratory exercises, functional re-education, and telerehabilitation-based motor practice; (4) patient and caregiver education on self-care, safety strategies, adaptive techniques, and disease-related management; (5) behavioral coaching and motivational support to promote adherence, self-efficacy, and engagement in daily functional activities; (6) monitoring of clinical and functional progress through repeated assessment, outcome tracking, and adjustment of exercise parameters; and (7) interprofessional coordination with physiotherapists, physicians, dietitians, and social services to ensure continuity, alignment of goals, and safe discharge planning. Several studies also described the involvement of nurses in the implementation and management of digital or assistive technologies, including telerehabilitation systems and activity-monitoring devices. Collectively, these actions demonstrate that rehabilitation nurses served not only as intervention deliverers but also as clinical decision-makers who shaped treatment intensity, ensured adherence, and maintained fidelity to the rehabilitation program.

3.6. Main health gains of the rehabilitation programs

The main health gains of the rehabilitation programs reported in each study are displayed in Table 4. The results were grouped according to the primary physiological system targeted: Musculoskeletal, Respiratory, Neurocognitive, and Renal. The health gains associated with the musculoskeletal system were reported most frequently, followed by those related to neurocognitive enhancements.

Regarding the musculoskeletal system, Rittharomya et al. (2020), concluded that participants who received the intervention demonstrated significant gains in muscle strength, range of motion, mobility, and overall physical functionality. The program also contributed to pain reduction and improvements in daily movement capacity. Palma et al. (2021) reported similar benefits from a structured nursing rehabilitation plan, including both preoperative and postoperative care. Patients experienced enhanced muscle strength and improved postural balance. The intervention was particularly effective in minimizing the risk of musculoskeletal complications in the postoperative period. The structured plan of intervention for rehabilitation nursing proposed by Batista et al. (2019) resulted in gains for motor function, a conclusion corroborated by the results from Teixeira et al. (2023) which support an improvement on the person's functionality, insofar as there are gains at a sensory and motor level, after the intervention. Brown et al. (2016) introduced a mobility-focused intervention that encouraged ambulation through behavioral strategies. Compared to usual care, patients maintained higher levels of community mobility, indicating preserved musculoskeletal function and physical independence following hospitalization. Kjernsholen et al. (2024) implemented a home-based rehabilitation program focusing on balance, strength, and walking exercises, along with support for performing daily activities. The program effectively improved physical function and reduced dependency on home care services, highlighting its importance in promoting autonomy and physical resilience in older adults. In alignment with this, Yeh et al. (2020) concluded that intradialytic cycling exercise for patients undergoing haemodialysis can improve physical functional performance, increasing muscle strength and endurance. This method proved to be both safe and effective for improving health outcomes. Also, the study from Nose et al. (2023) provided substantial evidence that community-based combined programs can be beneficial for older adults, showing significant improvements in physical function. In the study from Hassett et al. (2020), the integration of digital devices, such as virtual reality games and activity monitors, into rehabilitation programs for hospitalized older adults proved effective in promoting physical activity. Over time, the intervention resulted in clinically significant improvements in mobility, underscoring the potential of technology-assisted approaches to enhance muscle strength and overall physical performance. Similarly, Wu et al. (2020) concluded that a collaborative care model based telerehabilitation exercise training could safely and effectively improve the recovery of motor function in patients with stroke.

Overall, eight studies described neurocognitive gains after the implementation of the interventions. Palma et al. (2021) reported greater self-care independence and better understanding of safety and adaptive strategies to support recovery. Overall, eight studies described neurocognitive gains after the implementation of the interventions. Palma et al. (2021) reported greater self-care independence and better understanding of safety and adaptive strategies to support recovery. Likewise, Trindade et al. (2020) concluded that the systematization of rehabilitation nursing care maximizes the potential and the functional capacity to perform self-care,

Table 4

Main characteristics and results of programs implemented among older people with mobility impairment and self-care deficit.

Publication	Rehabilitation program content	Program frequency	Instruments	Main results
Brown et al., 2016	Patients in the Mobility Program group were assisted with ambulation up to twice daily, and a behavioral strategy was used to encourage mobility. Patients in the Usual Care group received twice-daily visits.	Two sessions of 15–20 min, 7 days a week	- Katz ADL scale - University of Alabama at Birmingham Study of Aging Life-Space Assessment (LSA)	- The Mobility Program intervention enabled patients to maintain their prehospitalization community mobility. - Participants in the Usual Care group experienced clinically significant declines.
Nozoe et al., 2016	Evidence-based comprehensive stroke care includes early rehabilitation, which consists of mobilization, gait exercise combined with orthotic therapy, and conventional rehabilitation approaches to improve patients' independence in activities of daily living.	One session of 40–60 min, five times a week	- Measuring tape; - B-mode ultrasound imaging with an 8-MHz transducer.	- Quadriceps muscle thickness decreased in acute non-ambulatory stroke survivors not only in the paretic limb but also in the non-paretic limb, particularly during the period from admission to the second week.
Batista, et al., 2019	Structured plan of intervention for Rehabilitation Nursing	NR	- Elderly Nurse Core Set (ENCS) - Functional Independence Measure (FIM)	- Increase on functionality, self-care and patient satisfaction. - Gains in self-care, at the level of motor function.
Hassett et al., 2020	Access to devices to target mobility and physical activity problems (virtual reality video games, activity monitors and computer devices) for 6 months in hospital and at home	One session of 30–60 min, 5 days per week	- Performance-based SPPB (continuous version) - ActivPAL activity monitor	- Clinically important improvement in mobility at 3 weeks and 6 months after baseline, but this was not accompanied by greater time spent upright.
Rittharomya et al. (2020)	The Preoperative Quadriceps Exercise and Diet Control Program (PEDCP) is based on Bandura's self-efficacy theory and consists of providing health information, quadriceps training exercise, and monitoring through telephone	Session 1 (30 min): health information. Session 2 (45 min): Quadriceps training exercise. Weeks 2–12: Monitoring	- Self-Efficacy Expectation Questionnaire (SEEQ) - Numeric Pain Rating Scale (NPRS) - Hand-Held Dynamometry (HHD) - Timed-Up-and-Go Test (TUGT) - Mini-Osteoarthritis of Knee and Hip Quality of Life (Mini-OAKHQOL)	- The experimental group showed greater quadriceps muscle strength, range of motion, movement ability, and health-related quality of life while experiencing less pain at weeks 8 and 12. - There were no significant difference in body mass index.
Trindade, et al., 2020	Functional Reeducation Program	3 sessions, starting 4 days after hospitalization	- Glasgow Coma Scale (GCS) - NIH Stroke Scale (NIHSS) - Gugging Swallowing Screen Scale (GUSS) - Functional Independence Measure (FIM) - Modified Barthel Index Scale (MBI) - Berg Balance Scale - Oxford Scale	- The systematization of rehabilitation nursing care has demonstrated effectiveness in training the dependent person with stroke, to maximize the potential and the functional capacity to perform self-care.
Wu et al., 2020	Access the patient dysfunction with a video system, which enables remote guidance using a computer, projector, camera, and data storage for personalized remote rehabilitation instruction	Breathing exercises (2 times a week), joint activity maintenance and bed turning (2 times a day), and balance and walking training (once to twice a day).	- Fugl-Meyer Motor Function Assessment (FMA) - Berg Balance Scale - The Timed "UP & GO" test (TUG) - The 6-minute walking test (6MWT) - Modified Barthel Index Scale (MBI) - The Stroke-Specific Quality of Life Scale (SS-QOL)	- The intervention group showed a greater extent of improvement in motor function, balance, and quality of life.
Yeh et al. (2020)	The intradialytic cycling exercise, using stationary bikes with both aerobic and resistance exercises,	Each intradialytic cycling exercise was implemented for 30	- Trend of 6-minute walk distance (6MWD)	- The exercise group demonstrated significant improvements in the 6-minute walk distance in weeks 8 and

(continued on next page)

Table 4 (continued)

Publication	Rehabilitation program content	Program frequency	Instruments	Main results
	warm-up, main workout, and cool-down phases at a moderate intensity	min, starting at the second hour of treatment, for 12 weeks		12- - Sit-to-stand-to-sit performance significantly influenced the 6-minute walk distance, which can enhance physical functional performance by increasing muscle strength and endurance.
Palma, et al., 2021	Individual plan of intervention for Rehabilitation Nursing	Two sessions preoperatively and 7 postoperatively	- Braden Scale - Medical Research Council Muscle Scale (MRC) - Berg Balance Scale - Functional Independence Measure (FIM) - Morse Scale	- Gains on prevention of respiratory and musculoskeletal complications, increased muscle strength, improved balance, functional capacity for self-care, knowledge about safety measures and adaptive techniques. - High risk of falling was maintained.
Nose et al. (2023)	Health education focused on multimorbidity management, brain function training with simple arithmetic operations and reading aloud using a magnetic number board, and resistance physical training with equipment	Four 50-minute sessions/week for 14 weeks	- Trail Making Test (TMT) - Open-close stepping Test (OCS) - Functional Reach Test (FRT) - One-Leg Standing Time with Eyes Open (OLST) - Two-step test (TST)	- Significant improvements in brain function, physical function, body composition, and low-density cholesterol lipoprotein (LDL-C) were seen after the intervention.
Teixeira, et al., 2023	Affected Hemisphere stimulation program with an emphasis on cross-facilitation	11 session of 40–50 min, during 24 days	- Glasgow Coma Scale (GCS) - Catherine Bergego Scale (CBS) - Medical Research Council Muscle Scale Mofidicada (mMRC) - Functional Independence Measure (FIM)	- The awareness of affected hemisphere allowed to improve the person's functionality, insofar as there are gains at a sensory and motor level.
Kjernsholen et al., 2024	Balance, strength, and walking exercises are performed at home and in nearby outdoor areas, along with practicing daily activities	The reablement sessions lasted for 45 min, 3 times a week for a maximum of 16 weeks	- Patient-specific functional scale (PSFS) - Short physical performance battery (SPPB) - European Quality of Life Five Dimension Five Level Scale (EQ-5D-5 L)	- The reablement group showed greater improvements in physical function, maintained a higher quality of life, and required significantly fewer home care services compared to the usual care group.

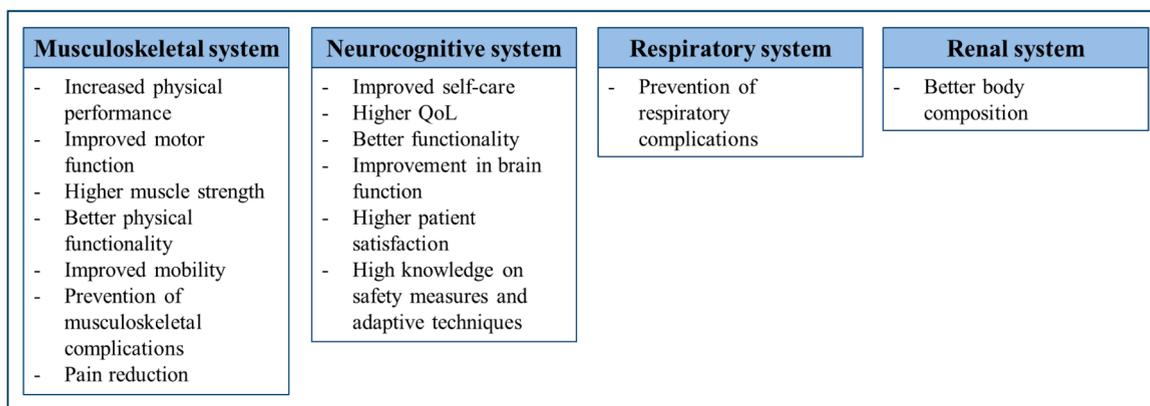


Fig. 2. Synthesis of the main health gains from rehabilitation programs implemented by rehabilitation nurses among older people with impaired mobility and self-care deficit.

Teixeira et al. (2023) described a functionality improvement, through gains at a sensory level, and Batista et al. (2019) reported an increase in functionality, self-care and patient satisfaction. Kjærnsøen et al. (2024), Rittharomya et al. (2020) and Wu et al. (2020) consistently described higher perception of quality of life after the implementation of the respective rehabilitation programs, while the study from Nose et al. (2023) concluded that an intervention that combined brain and physical function training and health education in older residents resulted in significant improvements in brain function.

Finally, the study from Palma et al. (2021) reported significant gains on the prevention of respiratory complications, while the study from Nose et al. (2023), focusing on health education, emphasized renal gains, reverberated in improvements in body composition and low-density cholesterol lipoprotein (LDL-C) following the intervention (Table 4).

A comprehensive overview of the main health gains from rehabilitation programs implemented by rehabilitation nurses among older people with impaired mobility and self-care deficit is illustrated in Fig. 2, to synthesize our main results.

4. Discussion

The current scoping review of the literature highlights the health gains associated with rehabilitation programs conducted by rehabilitation nurses for older individuals experiencing mobility impairments and self-care deficits. These benefits were observed across four physiological systems: musculoskeletal, neurocognitive, respiratory, and renal. The findings emphasize the variety of interventions implemented, targeting different aspects of rehabilitation, with a wide range in the duration and frequency of sessions, as well as the use of diverse instruments to assess the effectiveness of the interventions.

All studies implemented a structured rehabilitation program, conducted by nurses, which may have contributed to the positive results described. Previous literature recommends the inclusion of supervised sessions in rehabilitation training programs to effectively improve balance and muscle strength in older adults (Lacroix, et al., 2017). In this context, nurses can play a vital role by providing appropriate support, instruction, and guidance (National Academies of Sciences, Engineering, and Medicine, 2021), to facilitate the transfer of treatment goal ownership from the multidisciplinary team to the patient (Vaalburg et al., 2023). Furthermore, the inclusion of programs addressing different areas of rehabilitation reinforces the need to integrate physical, cognitive, psychological and educational components in healthy aging programs (Akgül Gök et al., 2023). This approach will promote the development and implementation of holistic interventions that encourage and support older adults in reaching their full potential of rehabilitation (Hopkins et al., 2016; Seinsche et al., 2023).

The variability in instruments used to assess different outcomes hampers the direct comparability of results across studies, ultimately impacting the reliability of research findings. This lack of standardization makes it difficult to conduct robust comparative analyses, such as meta-analyses, where data consistency between studies is crucial for drawing reliable conclusions (Hopkins and Rowlands, 2024). Therefore, efforts to standardize the content and evaluation of rehabilitation programs could significantly enhance the translation of scientific knowledge into evidence-based practices.

A significant finding of this review is the way in which nursing actions were operationalized across the analyzed interventions, emphasizing the unique and multifaceted contributions of rehabilitation nurses to patient recovery. These programs extended beyond the mere implementation of predefined exercise protocols, requiring nurses to integrate assessment, clinical judgment, therapeutic skills, and patient education into a cohesive and individualized rehabilitation process. Recent studies, have demonstrated that these approaches significantly improve patients' quality of life and functionality during the postoperative period, with measurable gains in activities of daily living and quality of life scores (SF-36) (Tong and Qin, 2025). Furthermore, literature highlights the role of nurses in coordinating interdisciplinary care and leveraging technological devices to ensure continuity of care across hospital, community, and home settings (Moersch, Vandermause and Fish, 2023; Vital, 2023). Together, these operationalized actions delineate the distinct role of rehabilitation nurses and clarify how their clinical expertise directly influenced the implementation, fidelity, and outcomes of the interventions included in this review. These findings underscore that the effectiveness of rehabilitation programs is not solely dependent on the content of the interventions but also on the expertise and active engagement of rehabilitation nurses in guiding, supporting, and individualizing the rehabilitative process.

Rehabilitation programs led by rehabilitation nurses for older adults facing mobility impairments and self-care deficits demonstrated measurable benefits across the musculoskeletal, neurocognitive, respiratory, and renal systems. The categorization by primary physiological systems may enhance the analysis of rehabilitation nursing strategies according to body system functionality, as well as the domains of patient recovery. The effectiveness of rehabilitation programs targeting mobility and self-care can be assessed by examining body system functionality and key domains of patient recovery, both of which are central to nursing practice in fostering autonomy, functional capacity, and overall well-being.

Nursing-led rehabilitation programs improved muscle strength, joint mobility, balance, and gait stability. These improvements directly contribute to fall prevention and the enhancement of independent walking. The programs also supported patients in regaining the ability to perform basic activities of daily living, such as bathing, dressing, and transferring, which are critical for autonomy (Ojo and Thiamwong, 2022), directly associated to enhanced quality of life and reduced hospitalization rates among older adults (Wiedemann et al., 2023).

Several studies reported improvements in the neurocognitive system, particularly in attention, memory, executive function, and reduced symptoms like fatigue, sleep disturbances, and emotional distress, issues that often exacerbate cognitive decline (Arrieta et al., 2020; Sáez de Astearu et al., 2019). Thus, early and continuous cognitive rehabilitation may contribute to promote the overall health and well-being of older adults.

In addition to the effects on the musculoskeletal and neurocognitive systems, significant improvements can also be observed in the respiratory system. Although fewer studies focused specifically on the respiratory system, some programs incorporated aerobic

components or breathing exercises that improved respiratory endurance. These interventions, when combined with physical mobilization, contributed to better oxygenation and reduced dyspnea during exertion. This is particularly relevant for older patients with comorbidities such as chronic obstructive pulmonary disease (COPD) or heart failure, where deconditioning is a major concern. Enhanced respiratory function supports improved tolerance and participation in physical activities (Ammous et al., 2023; Ribeiro et al., 2023), contributing to a more sustained engagement in rehabilitation (Hanada et al., 2020; Tian et al., 2024).

The promotion of mobility has shown beneficial effects on renal function and overall clinical outcomes. Regular physical activity contributes to improved circulatory efficiency, reduced fluid overload, and better blood pressure control, factors that directly impact renal perfusion and the efficacy of dialysis. Additionally, enhanced mobility supports metabolic regulation and may reduce the accumulation of uremic toxins, indirectly alleviating symptoms such as fatigue and muscle wasting (Zhang et al., 2022). Nurse-led interventions have been effective in managing cardiovascular risk factors and managing endocrine disorders such as hypertension and hyperlipidemia, particularly in patients with type 2 diabetes. Randomized controlled trials have demonstrated that nurse-led clinics can lead to better control of blood pressure and lipid profiles compared to conventional care. These improvements contribute to reduced risks of cardiovascular events like heart attacks and strokes (Lumu et al., 2024). Across all systems, the programs analyzed promoted recovery in domains such as functional independence, self-management, psychosocial well-being, and social participation, complementing the restoration of physical function (Gijzel et al., 2019; Wang et al., 2022).

Categorizing rehabilitation interventions and outcomes by physiological systems allows for a more organized and integrative understanding of recovery processes. This approach enhances multidisciplinary communication across the health system, facilitates the development of individual and tailored care plans, and enables the measurement and evaluation of specific health-related outcomes. Thus, this framework supports the development of evidence-based, patient-centered rehabilitation models that align with the multidimensional nature of aging and chronic disease.

The findings of this review support several actionable recommendations to strengthen rehabilitation nursing across the continuum of care. First, workforce development initiatives are critical to expanding the availability of rehabilitation nurses with expertise in gerontology, telerehabilitation, and community-based functional assessment. Recent studies emphasize the importance of equipping rehabilitation professionals with the skills to implement telerehabilitation effectively, particularly for older adults, by addressing barriers such as digital literacy and confidence in technology use (Pol et al., 2023). This emphasizes the need to invest in advanced competencies, ongoing professional development, and staffing models that support early, intensive, and individualized rehabilitation. Second, stronger intersectoral collaboration between hospital, primary care, and community services is essential to ensure continuity of functional recovery. Structured referral pathways, shared care plans, and interdisciplinary models—such as integrated care pathways for complex geriatric conditions—have been shown to enhance outcomes and position rehabilitation nurses as key coordinators of mobility and self-care interventions (Dellafiore et al., 2025). Third, at the policy level, integrating rehabilitation indicators—such as functional capacity, activities of daily living independence, mobility preservation, and community participation—into national aging and long-term care strategies would enhance accountability and guide resource allocation (Lista et al., 2025). Embedding rehabilitation nursing within health system planning and monitoring frameworks will support the delivery of comprehensive, equitable, and sustainable care for aging populations.

A previous review has focused on the identification of rehabilitation nurse interventions and their main goals for empowering older persons with mobility impairment and self-care deficit, concluding that these interventions frequently comprise conventional therapeutic exercise training, the application of functional electrical stimulation and neuromuscular bands, and the implementation of new technologies in rehabilitation (Costa et al., 2023). Our scoping review adds to current knowledge the main health gains from these rehabilitation programs on the musculoskeletal, neurocognitive, respiratory, and renal systems. However, some limitations should be acknowledged and discussed. Considerable variation in methodology was noted among the studies, particularly in terms of sample size, data collection duration, and the content and length of the rehabilitation programs implemented. Nevertheless, the methodological rigor of the current scoping review, including the selected databases, the careful search strategy, and the clear and objective definition of the inclusion and exclusion criteria, ensures that it review captures a comprehensive number of relevant studies. The literature search was restricted to studies published between 2014 and 2025 to ensure that the review captured the most contemporary evidence available. This time frame aligns with prior research indicating that the conclusions of systematic reviews typically remain valid for approximately five to fifteen years (Shojania et al., 2007; Furuya-Kanamori et al., 2023). Although this approach may have resulted in the exclusion of potentially relevant studies published before 2014, the evidence base retrieved is expected to accurately reflect current knowledge in the field. Consequently, we are confident that the findings of this scoping review remain consistent with the latest recommendations and practice guidelines in rehabilitation nursing.

This scoping review reinforces the evolving vision of nursing rehabilitation as a cornerstone of comprehensive healthcare, demonstrating its significant impact on enhancing health gains at several physiologic systems, among older adults. Thus, rehabilitation nursing interventions offer measurable benefits across multiple physiological systems in older adults with mobility impairment and self-care deficit. By mapping existing evidence, it underscores the pivotal role of nurses not only in delivering rehabilitation care but also in facilitating recovery, promoting autonomy, and improving quality of life for individuals across diverse settings. Also, our results reveal that adopting a system-based framework for the analysis and implementation of these interventions enhances the precision, accountability, and efficacy of care. Such poses nursing rehabilitation as an essential strategy in the continuum of care, advocating for its integration into healthcare systems and policies to support the health and sustainable recovery of the older population.

CRedit authorship contribution statement

Elisabete Alves: Writing – original draft, Validation, Methodology, Investigation, Funding acquisition, Formal analysis,

Conceptualization. **Ana Ramos:** Writing – review & editing, Validation, Methodology, Formal analysis. **Paula Pereira:** Writing – review & editing, Validation, Supervision, Investigation, Formal analysis, Data curation. **Mauro Lopes:** Writing – review & editing, Supervision, Formal analysis, Data curation. **César Fonseca:** Writing – review & editing, Validation, Supervision, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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Data availability

Data will be available upon request.

References

- Akgül Gök, F., Yazgan, E.Ö., Albayrak, G., Cagliyan Turk, A., 2023. The effect of empowerment interventions applied to geriatric patients receiving physical therapy on their depression and self-efficacy levels. *Soc. Work. Public Health* 38 (3), 209–220. <https://doi.org/10.1080/19371918.2022.2118924>.
- Alves, E., Gonçalves, C., Oliveira, H., Ribeiro, R., Fonseca, C., 2024. Health-related outcomes of structured home-based rehabilitation programs among older adults: a systematic literature review. *Heliyon*. 10 (15). <https://doi.org/10.1016/j.heliyon.2024.e35351>.
- Ammous, O., Feki, W., Lotfi, T., Khamis, A.M., Gosselink, R., Rebai, A., Kammoun, S., 2023. Inspiratory muscle training, with or without concomitant pulmonary rehabilitation, for chronic obstructive pulmonary disease (COPD). *Coch. Data. Syst. Rev.* (1) 2023.
- Aromataris, E., Lockwood, C., Porritt, K., Pilla, B., & Z, J. (2024). JBI manual for evidence synthesis.
- Arrieta, H., Rezola-Pardo, C., Kortajarena, M., Hervás, G., Gil, J., Yanguas, J.J., Iturburu, M., Gil, S.M., Irazusta, J., Rodríguez-Larrad, A., 2020. The impact of physical exercise on cognitive and affective functions and serum levels of brain-derived neurotrophic factor in nursing home residents: a randomized controlled trial. *Maturitas*. 131, 72–77. <https://doi.org/10.1016/j.maturitas.2019.10.014>.
- Barker, T.H., Stone, J.C., Sears, K., Klugar, M., Leonardi-Bee, J., Tufanaru, C., Aromataris, E., Munn, Z., 2023. Revising the JBI quantitative critical appraisal tools to improve their applicability: an overview of methods and the development process. *JBI Evid. Synth.* 21 (3), 478–493. <https://doi.org/10.11124/JBIES-22-00125>.
- Batista, A., Pires, E., Fonseca, C., Santos, V., 2019. Proposta Estruturada de Intervenção dos Cuidados de Enfermagem de Reabilitação, às Pessoas Idosas com Déficit no Autocuidado e Alterações do Foro Motor. *J. Aging Innov.* 8 (1), 14–35. <http://www.rdpc.uevora.pt/bitstream/10174/27339/1/2JAIv8E1.pdf>.
- Brown, C.J., Foley, K.T., Lowman, J.D., MacLennan, P.A., Razjouyan, J., Najafi, B., Locher, J., Allman, R.M., 2016. Comparison of posthospitalization function and community mobility in hospital mobility program and usual care patients a randomized clinical trial. *JAMA Intern. Med.* 176 (7), 921–927. <https://doi.org/10.1001/jamainternmed.2016.1870>.
- Camp, S., L, T., 2018. Simulation as a tool for clinical remediation: an integrative review. *Clin. Simul. Nurs.* 16, 48–61. <https://doi.org/10.1016/j.ecns.2017.11.003>.
- Costa, T., Lopes, M., Bia, F., 2023. The rehabilitation Nurse and the empowerment of older adults with mobility impairment and self-care deficits: a systematic literature review. In: Moguel, E., de Pinho, L.G., Fonseca, C. (Eds.), *Gerontechnology V. IWoG 2022. Lecture Notes in Bioengineering*. Springer, Cham. https://doi.org/10.1007/978-3-031-29067-1_32.
- Dellafiore, F., Guardamagna, L., Haoufadi, S., Cicognani, A., De Mola, A., Mazzone, B., Occhini, G., Brusini, A., Artioli, G., 2025. Interprofessional collaboration in primary healthcare: a qualitative study of general practitioners' and family and community nurses' perspectives in Italy. *Healthcare* 13 (21), 2794. <https://doi.org/10.3390/healthcare13212794>.
- Eurostat, 2024. Demography of Europe –2024 Edition. European Union. <https://doi.org/10.2785/911441>.
- Faria, A., da, C.A., Martins, M.M.F.P.S., Ribeiro, O.M.P.L., Ventura-Silva, J.M.A., Fonseca, E.F., Ferreira, L.J.M., Laredo-Aguilera, J.A., 2023. Effect of the active aging-in-place-Rehabilitation nursing Program: a randomized controlled trial. *Healthc. (Switz.)* 11 (2), 1–16. <https://doi.org/10.3390/healthcare11020276>.
- Ferreira, R., Pedrosa, A.R., Reis, N., Sousa, L., Nicolau, C., Ferreira, B., Rocha, B., Baixinho, C.L., 2024. Transitional care for older persons with need of geriatric rehabilitation nursing interventions. *BMC. Nurs.* 23 (1), 1–12. <https://doi.org/10.1186/s12912-024-02050-4>.
- Fonseca, C., Morgado, B., Alves, E., Ramos, A., Silva, M.R., Pinho, L., João, A., Lopes, M., 2024. The functional profile, depressive symptomatology, and quality of life of older people in the central alentejo region: a cross-sectional study. *Healthc. (Switz.)* 12 (22), 1–18. <https://doi.org/10.3390/healthcare12222303>.
- Fonseca, C., Ramos, A., Morgado, B., Quaresma, P., Garcia-Alonso, J., Coelho, A., Lopes, M., 2023. Long-term care units: a Portuguese study about the functional profile. *Front. Aging* 4 (May), 1–10. <https://doi.org/10.3389/fragi.2023.1192718>.
- Furuya-Kanamori, L., Lin, L., Kostoulas, P., Clark, J., Xu, C., 2023. Limits in the search date for rapid reviews of diagnostic test accuracy studies. *Res. Synth. Methods* 14 (2), 173–179. <https://doi.org/10.1002/jrsm.1598>.
- Ghisla, V., Chocano-Bedoya, P.O., Orav, E.J., Abderhalden, L.A., Sadlon, A., Egli, A., Krützfeldt, J., Kanis, J.A., Bischoff-Ferrari, H.A., 2023. Prospective study of ageing trajectories in the European DO-HEALTH study. *Gerontology* 69 (1), 57–64. <https://doi.org/10.1159/000523923>.
- Gijzel, S.M.W., Whitson, H.E., van de Leemput, I.A., Scheffer, M., van Asselt, D., Rector, J.L., Olde Rikkert, M.G.M., Melis, R.J.F., 2019. Resilience in clinical care: getting a grip on the recovery potential of older adults. *J. Am. Geriatr. Soc.* 67 (12), 2650–2657. <https://doi.org/10.1111/jgs.16149>.
- Guitar, N.A., Connelly, D.M., Prentice, K., Nguyen, A., McIntyre, A., Tanlaka, E.F., Snobelen, N., 2023. The role of nurses in inpatient geriatric rehabilitation units: a scoping review. *Nurs. Open* 10 (10), 6708–6723. <https://doi.org/10.1002/nop2.1951>.
- Hakeem, F.F., Maharani, A., Todd, C., O'Neill, T.W., 2023. Development, validation and performance of laboratory frailty indices: a scoping review. *Arch. Gerontol. Geriatr.* 111 (February), 104995. <https://doi.org/10.1016/j.archger.2023.104995>.

- Hanada, M., Kasawara, K.T., Mathur, S., Rozenberg, D., Kozu, R., Hassan, S.A., Reid, W.D., 2020. Aerobic and breathing exercises improve dyspnea, exercise capacity and quality of life in idiopathic pulmonary fibrosis patients: systematic review and meta-analysis. *J. Thorac. Dis.* 12 (3), 1041–1055. <https://doi.org/10.21037/jtd.2019.12.27>.
- Hassett, L., van den Berg, M., Lindley, R.I., Crotty, M., McCluskey, A., van der Ploeg, H.P., Smith, S.T., Schurr, K., Howard, K., Hackett, M.L., Killington, M., Bongers, B., Togher, L., Treacy, D., Dorsch, S., Wong, S., Scrivener, K., Chagpar, S., Weber, H., Sherrington, C., 2020. Digitally enabled aged care and neurological rehabilitation to enhance outcomes with activity and Mobility Using technology (AMOUNT) in Australia: a randomised controlled trial. *PLoS Med.* 17 (2), e1003029. <https://doi.org/10.1371/journal.pmed.1003029>.
- Henchoz, Y., Fustinoni, S., Seematter-Bagnoud, L., Avendano, M., 2025. Socioeconomic status across the life-course and frailty in older age: evidence from Switzerland. *Int. J. Public Health* 70, 1608102. <https://doi.org/10.3389/ijph.2025.1608102>.
- Henriques, A., Ruano, L., Fraga, S., Soares, S., Barros, H., Talih, M., 2024. Life-course socio-economic status and its impact on functional health of Portuguese older adults. *J. Biosoc. Sci.* 56 (1), 36–49. <https://doi.org/10.1017/S0021932023000093>.
- Hopkins, R.O., Mitchell, L., Thomsen, G.E., Schafer, M., Link, M., Brown, S.M., 2016. Implementing a mobility program to minimize Post-intensive care syndrome. *AACN. Adv. Crit. Care* 27 (2), 187–203. <https://doi.org/10.4037/aacnacc2016244>.
- Hopkins, W.G., Rowlands, D.S., 2024. Standardization and other approaches to meta-analyze differences in means. *Stat. Med.* 43 (16), 3092–3108. <https://doi.org/10.1002/sim.10114>.
- Katz, S., 1983. Assessing self-maintenance: activities of daily living, mobility, and instrumental activities of daily living. *J. Am. Geriatr. Soc.* 31 (12), 721–727. <https://doi.org/10.1111/j.1532-5415.1983.tb03391.x>.
- Kekäläinen, T., Luchetti, M., Sutina, A., Terracciano, A., 2023. Functional capacity and difficulties in activities of daily living from a cross-national perspective. *J. Aging Health* 35 (5–6), 356–369. <https://doi.org/10.1177/08982643221128929>.
- Kjernsholen, J., Schou-Bredal, I., Kaarens, R., Soberg, H.L., Sagen, A., 2024. A prospective intervention study with 6 months follow-up of the effect of reablement in home dwelling elderly: patient-reported and observed outcomes. *Arch. Rehabil. Res. Clin. Transl.* 6 (1), 100311. <https://doi.org/10.1016/j.arct.2023.100311>.
- Lacroix, A., Hortobágyi, T., Burskens, R., Granacher, U., 2017. Effects of supervised vs. Unsupervised training programs on balance and muscle strength in older adults: a systematic review and meta-analysis. *Sports Med.* 47 (11), 2341–2361. <https://doi.org/10.1007/s40279-017-0747-6>.
- Lawton, M.P., Brody, E.M., 1969. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist* 9, 179–186. <https://doi.org/10.1093/geront/9.3.Part.1.179>.
- Lee, A.Y.L., Wong, A.K.C., Hung, T.T.M., Yan, J., Yang, S., 2022. Nurse-led telehealth intervention for rehabilitation (Telerehabilitation) among community-dwelling patients with chronic diseases: systematic review and meta-analysis. *J. Med. Internet Res.* 24 (11), 1–15. <https://doi.org/10.2196/40364>.
- Lista, A.J., de Pinho, L.G., Correia, T., Afonso, C., Cardoso, I., Fonseca, C., 2025. Psychosocial and rehabilitation interventions and health gains in older persons in long-term care: a systematic review. *Int. J. Nurs. Stud.* 172, 105219. <https://doi.org/10.1016/j.ijnurstu.2025.105219>.
- Lorenz, V., Seijas, V., Gattinger, H., Gabriel, C., Langins, M., Mishra, S., Sabariego, C., 2024. The role of nurses in rehabilitation in primary health care for ageing populations: a secondary analysis from a scoping review. *SAGE Open Nurs.* 10. <https://doi.org/10.1177/23779608241271677>.
- Lucas, P.J., Baird, J., Arai, L., Law, C., Roberts, H.M., 2007. Worked examples of alternative methods for the synthesis of qualitative and quantitative research in systematic reviews. *BMC. Med. Res. Methodol.* 7, 1–7. <https://doi.org/10.1186/1471-2288-7-4>.
- Lumu, W., Bahendeka, S., Kibirige, D., Wesonga, R., Mutebi, R.K., 2024. Effectiveness of a nurse-led management intervention on systolic blood pressure among type 2 diabetes patients in Uganda: a cluster randomized trial. *Clin. Diabetes. Endocrinol.* 10 (1), 16. <https://doi.org/10.1186/s40842-024-00173-w>.
- Martínez, N., Connolly, C.D., Pérez, A., Calero, P., 2021. Self-care: a concept analysis. *Int. J. Nurs. Sci.* 8 (4), 418–425. <https://doi.org/10.1016/j.ijnss.2021.08.007>.
- Melnyk, B.M., Fineout-Overholt, E., Stetler, C., Allan, J., 2005. Outcomes and implementation strategies from the first U.S. evidence-based practice leadership summit. *Worldviews Evid.-Based Nurs.* 2 (3), 113–121. <https://doi.org/10.1111/j.1741-6787.2005.00022.x>.
- Moersch, L.S., Vandermause, R.K., Fish, A.F., 2023. Immobility and the high risk of not recovering function in older adults: a focused ethnography. *Rehabil. Nurs.* 48 (2), 40–46. <https://doi.org/10.1097/RN.0000000000000400>.
- National Academies of Sciences, Engineering, and Medicine; National Academy of Medicine; Committee on the Future of Nursing 2020–2030, 2021. In: Flaubert, J.L., Le Menestrel, S., Williams, D.R., Wakefield, M.K. (Eds.), *The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity*. National Academies Press, US).
- Nose, D., Inoue, H., Imaki, K., Saku, K., Miura, S., Ichiro, 2023. Effects of a 14-week community health program of exercise and learning/education in older adults: a single-arm pre-post comparison study. *Geriatr. Nurs. (Minneapolis)* 51, 1–8. <https://doi.org/10.1016/j.gerinurse.2023.02.012>.
- Nozoe, M., Kanai, M., Kubo, H., Kitamura, Y., Shimada, S., Mase, K., 2016. Changes in quadriceps muscle thickness in acute non-ambulatory stroke survivors. *Top. Stroke Rehabil.* 23 (1), 8–14. <https://doi.org/10.1179/1945511915Y.0000000002>.
- Ojo, E.O., Thiamwong, L., 2022. Effects of nurse-led fall prevention programs for older adults: a systematic review. *Pac. Rim. Int. J. Nurs. Res. Thail.* 26 (3), 417–431.
- Oleske, D., Islam, S., 2019. Role of epidemiology in the biopharmaceutical industry. *Pharmacovigilance: A Practical Approach*. Elsevier, pp. 69–87.
- Organisation for Economic Co-operation and Development, 2023. Health at a glance: OECD indicators. In: Choice reviews online, 47. OECD Publishing. <https://doi.org/10.5860/choice.47-4774>.
- Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., Moher, D., 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 372. <https://doi.org/10.1136/bmj.n71>.
- Palma, M., Teixeira, H., Pino, H., Vieira, J., Bule, M.J., 2021. Rehabilitation program for the person with fracture of the upper femur end: case study. *Rev. Port. Enferm. Rehabil.* 4 (2), 6–17. <https://doi.org/10.33194/rper.2021.182>.
- Pinho, A.M., Pires, J., Façanha, J., Cera, M.C., 2024. Impact of a rehabilitation project in the community: quasi-experimental study. *Rev. Port. Enferm. Rehabil.* 7 (1), 1–9. <https://doi.org/10.33194/rper.2024.388>.
- Pol, M., Qadeer, A., van Hartingsveldt, M., Choukou, M.A., 2023. Perspectives of rehabilitation professionals on implementing a validated home telerehabilitation intervention for older adults in geriatric rehabilitation: multisite focus group study. *JMIR Rehabil. Assist. Technol.* 10, e44498. <https://doi.org/10.2196/44498>.
- Ribeiro, R., Oliveira, H., Goes, M., Gonçalves, C., Dias, A., Fonseca, C., 2023. The effectiveness of nursing rehabilitation interventions on self-care for older adults with Respiratory disorders: a systematic review with meta-analysis. *Int. J. Env. Res. Public Health* 20 (14). <https://doi.org/10.3390/ijerph20146422>.
- Rittharomya, J., Aree-Ue, S., Malathum, P., Orathai, P., Belza, B., Kawunwonggowit, V., 2020. The effectiveness of preoperative quadriceps exercise and diet control program for older adults waiting for total knee arthroplasty: a randomized controlled trial. *Pac. Rim. Int. J. Nurs. Res. Thail.* 24 (4), 485–501.
- Jean-Marie, Robine, Jagger, C., 2005. The relationship between increasing life expectancy and healthy life expectancy. *Ageing Horiz.* 3, 14–21. <https://www.ageing.ox.ac.uk/files/AH-3-Robine-and-Jagger.pdf%60Ahttp://www.ageing.ox.ac.uk/download/21>.
- Sáez de Asteasu, M.L., Martínez-Velilla, N., Zambom-Ferraresi, F., Casas-Herrero, Á., Cadore, E.L., Galbete, A., Izquierdo, M., 2019. Assessing the impact of physical exercise on cognitive function in older medical patients during acute hospitalization: secondary analysis of a randomized trial. *PLoS. Med.* 16 (7), e1002852. <https://doi.org/10.1371/journal.pmed.1002852>.
- Seinsche, J., Jansen, C.P., Roth, S., Zijlstra, W., Hinrichs, T., Giannouli, E., 2023. Multidimensional interventions to increase life-space mobility in older adults ranging from nursing home residents to community-dwelling: a systematic scoping review. *BMC. Geriatr.* 23 (1), 412. <https://doi.org/10.1186/s12877-023-04118-3>.
- Shojania, K.G., Sampson, M., Ansari, M.T., Ji, J., Doucette, S., Moher, D., 2007. How quickly do systematic reviews go out of date? A survival analysis. *Ann. Intern. Med.* 147 (4), 224–233. <https://doi.org/10.7326/0003-4819-147-4-200708210-00179>.
- Teixeira, M., Silva, F., Mesquita, M., Pestana, A., Pestana, H., 2023. Intervenção do Enfermeiro de Reabilitação na Pessoa com Negligência Hemiespacial – Estudo de Caso. *Rev. Port. Enferm. Rehabil.* 6 (2), e341. <https://doi.org/10.33194/rper.2023.341>.
- Tian, Z., Jiang, Y., Zhang, N., Zhang, Z., Wang, L., 2024. Analysis of the current State of COPD nursing based on a bibliometric approach from the web of science. *Int. J. Chron. Obs. Pulmon. Dis* 19, 255–268. <https://doi.org/10.2147/COPD.S440715>.
- Tong, Y., Qin, X., 2025. Perioperative nursing interventions based on the enhanced recovery after surgery concept for patients with gynecological malignancies: a retrospective study. *Med. (Baltimore)* 104 (30), e43290. <https://doi.org/10.1097/MD.00000000000043290>.

- Tricco, A.C., Lillie, E., Zarin, W., O'Brien, K.K., Colquhoun, H., Levac, D., Moher, D., Peters, M.D.J., Horsley, T., Weeks, L., Hempel, S., Akl, E.A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M.G., Garrity, C., Lewin, S., Godfrey, C.M., Macdonald, M.T., Langlois, E.V., Soares, S.S., 2018. No title. RISMA extension for scoping reviews (PRISMA-ScR). *Checkl. Explan.* 117 (7), 467–473. <https://doi.org/10.7326/M18-0850>.
- Trindade, I., Marranita, S., Sousa, L., 2020. Capacitação da pessoa com dependência para o autocuidado : estudo de Caso Capacitación de la persona con dependencia para el autocuidado. *J. Aging Innov.* 9 (3), 164–183. <https://doi.org/10.36957/jai.2182-696X.v9i3-9>.
- Vaalburg, A.M., Boersma, P., Wattel, E.M., Ket, J.C.F., Hertogh, C.M.P.M., Gobbens, R.J.J., 2023. Supporting older patients in working on rehabilitation goals: a scoping review of nursing interventions. *Int. J. Older. People Nurs.* 18 (4), e12542. <https://doi.org/10.1111/opn.12542>.
- Vital, C.J., Nathanson, B.H., 2023. Effects of the interruption management strategy "stay S.A.F.E." during medication administration. *Rehabil. Nurs.* 48 (2), 65–74. <https://doi.org/10.1097/RNJ.0000000000000404>.
- Vogelsang, E.M., Raymo, J.M., Liang, J., Kobayashi, E., Fukaya, T., 2019. Population aging and health trajectories at older ages. *J. Gerontol. - B Psychol. Sci. Soc. Sci.* 74 (7), 1245–1255. <https://doi.org/10.1093/geronb/gbx071>.
- Wang, J., Zhang, Y., Chen, Y., Li, M., Jin, J., 2022. Nurse-led motor function rehabilitation program for acute ischemic stroke: a randomized pilot study. *J. Nurs. Res.* 30 (6), E249. <https://doi.org/10.1097/jnr.0000000000000529>.
- Wiedenmann, T., Held, S., Rappelt, L., et al., 2023. Exercise based reduction of falls in communitydwelling older adults: a network meta-analysis. *Eur. Rev. Aging Phys. Act.* 20 (1). <https://doi.org/10.1186/s11556-023-00311-w>.
- Wu, Z., Xu, J., Yue, C., Li, Y., Liang, Y., 2020. Collaborative care model based telerehabilitation exercise training program for acute stroke patients in China: a randomized controlled trial. *J. Stroke Cerebrovasc. Dis.* 29 (12). <https://doi.org/10.1016/j.jstrokecerebrovasdis.2020.105328>.
- Xu, J., Xu, J., Chen, Y., Wang, Y., Qin, G., Gao, J., 2022. Associations between trajectories of social participation and functional ability among older adults: results from the china health and retirement longitudinal study. *Front. Public Health* 10, 1047105. <https://doi.org/10.3389/fpubh.2022.1047105>.
- Yeh, M.L., Wang, M.H., Hsu, C.C., Liu, Y.M., 2020. Twelve-week intradialytic cycling exercise improves physical functional performance with gain in muscle strength and endurance: a randomized controlled trial. *Clin. Rehabil.* 34 (7), 916–926. <https://doi.org/10.1177/0269215520921923>.
- Yuan, S., Larsson, S.C., 2023. Epidemiology of sarcopenia: prevalence, risk factors, and consequences. *Metab, Clin, Exp* 144 (February), 155533. <https://doi.org/10.1016/j.metabol.2023.155533>.
- Zhang, F., Bai, Y., Zhao, X., Huang, L., Wang, W., Zhou, W., Zhang, H., 2022. Therapeutic effects of exercise interventions for patients with chronic kidney disease: an umbrella review of systematic reviews and meta-analyses. *BMJ Open.* 12 (9), e054887. <https://doi.org/10.1136/bmjopen-2021-054887>.