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# Sports Health in Older Age: Prevalence and Risk Factors - Systematic Review
# Salud deportiva en la vejez: prevalencia y factores de riesgo - Revisión sistemática

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**Abstract.** Exercise prevalence in older adults often shows low levels, with a considerable portion of this demographic being physically inactive. Myriad studies have also depicted gender disparities in exercise prevalence, highlighting that men tend to engage in more physical activity compared to women. The primary objective of this research is to highlight sports health in older age, prevalence, and risk fac-tors through a systematic review. This research employs a systematic review method by searching reputable journal databases such as Science Direct and Pubmed. The inclusion criteria in this study were articles published in the last five years related to exercise in the elderly, addressing topics such as exercise prevalence, risk factors for exercise, physical activity participation, the health of the elderly, and barriers to exercise. The exclusion criteria in this study were articles published in non-reputable journals. The researchers selected and analyzed 16 articles meeting the inclusing criteria for this systematic review. For standard operations, this study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) assessment. The research findings reveal that within the first group, various risk factors significantly impede exercise in older adults, including chronic health conditions such as heart disease and diabetes. In addition, factors such as lack of knowledge about the benefits of exercise, fear of injury, and social isolation contributed to reduced participation in physical activity. Furthermore, the findings with-in the second group underscore the significance of information that various exercises through health sports activities to support body health in old age. The results of the third group show that some treatments of sports health therapy are suitable for the elderly. Understanding these multifaceted factors is paramount to design effective interventions to increase sports participation in the elderly. Therefore, the promotion of active and healthy lifestyles in older adults should consider the social, economic and health factors that influence individuals' decisions. This holistic approach can contribute to improving the quality of life and well-being of older adults, concurrently reducing the burden of age-related diseases.
**Keywords**: active lifestyle, older age, physical activity, Sports Health

**Resumen.** La prevalencia del ejercicio en los adultos mayores a menudo muestra niveles bajos, y una parte considerable de este grupo demográfico es físicamente inactivo. Numerosos estudios también han mostrado disparidades de género en la prevalencia del ejercicio, destacando que los hombres tienden a realizar más actividad física en comparación con las mujeres. El objetivo principal de esta investigación es resaltar la salud deportiva en la vejez, la prevalencia y los factores de riesgo a través de una revisión sistemática. Esta investigación emplea un método de revisión sistemática mediante la búsqueda en bases de datos de revistas acreditadas como Science Direct y Pubmed. Los criterios de inclusión en este estudio fueron artículos publicados en los últimos cinco años relacionados con el ejercicio en personas mayores, abordando temas como la prevalencia del ejercicio, los factores de riesgo para el ejercicio, la participación en actividades físicas, la salud de las personas mayores y las barreras para el ejercicio. Los criterios de exclusión en este estudio fueron artículos publicados en revistas no acreditadas. Los investigadores seleccionaron y analizaron 16 artículos que cumplían con los criterios de inclusión para esta revisión sistemática. Para operaciones estándar, este estudio sigue la evaluación de Elementos de informes preferidos para revisiones sistemáticas y metanálisis (PRISMA). Los hallazgos de la investigación revelan que dentro del primer grupo, varios factores de riesgo impiden significativamente el ejercicio en los adultos mayores, incluidas enfermedades crónicas como enfermedades cardíacas y diabetes. Además, factores como la falta de conocimiento sobre los beneficios del ejercicio, el miedo a lesionarse y el aislamiento social contribuyeron a una menor participación en la actividad física. Además, los resultados del segundo grupo subrayan la importancia de la información de que diversos ejercicios a través de actividades deportivas saludables ayudan a la salud del cuerpo en la vejez. Los resultados del tercer grupo muestran que algunos tratamientos de terapia de salud deportiva son adecuados para personas mayores. Comprender estos factores multifacéticos es fundamental para diseñar intervenciones efectivas para aumentar la participación deportiva en las personas mayores. Por lo tanto, la promoción de estilos de vida activos y saludables en los adultos mayores debe considerar los factores sociales, económicos y de salud que influyen en las decisiones de los individuos. Este enfoque holístico puede contribuir a mejorar la calidad de vida y el bienestar de los adultos mayores y, al mismo tiempo, reducir la carga de enfermedades relacionadas con la edad.
**Palabras clave:** estilo de vida activo, edad avanzada, actividad física, salud deportiva

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## Introduction

The aging process is a natural stage in every individual's life, but it does not mean that we should give up on optimal quality of life. The elderly often face various health challenges, including a decline in physical function, an increased risk of chronic diseases, and mental health issues (Cheng et al., 2013). Therefore, efforts to maintain health become increasingly important, and one key to achieving this is through exercise (Silva et al., 2019). Some research has also revealed that physical activity through exercise has a positive impact on physical fitness (Rubiyatno et al., 2023; Suryadi et al., 2023). Health exercise for the elderly is not just about maintaining physical fitness but also about preserving optimal

quality of life (Bäckmand, Kaprio, Kujala, Sarna, & Fogelholm, 2006). With a commitment to regular exercise, the selection of suitable types of exercise, and attention to safety factors, the elderly can enjoy significant physical and mental benefits throughout their aging process (Shin, 2021). Healthy lifestyle habits, which encompass engaging in regular physical activity, maintaining a nutritious diet, abstaining from smoking, moderating alcohol consumption, and managing stress, play a crucial role in preventing metabolic cardiovascular disease risk factors (Ndejjo, Musinguzi, Nuwaha, Bastiaens, & Wanyenze, 2022). These risk factors include conditions like hypertension, excess weight or obesity, diabetes, and high levels of lipids in the blood. Research conducted in sub-Saharan Africa has shown that cardiovascular diseases are one of the leading causes of death and morbidity (Tateyama et al., 2019). These risk factors include conditions like hypertension, excess weight or obesity, diabetes, and high levels of lipids in the blood.

Furthermore, exercise plays a central role in maintaining the health and quality of life of the elderly. In recent decades, scientific research has increasingly emphasized the importance of physical activity in the prevention and management of various health issues often associated with aging (Cheng et al., 2013). This includes not only physical issues such as muscle strength, balance, and the risk of falling but also has an impact on mental and social health. This is reinforced by research that suggests that to achieve significant health benefits, it is recommended that all adults participate in moderate-intensity aerobic physical activity for at least 150-300 minutes per week (Hollis et al., 2020).

It is also recommended to engage in muscle-strengthening activities that involve all major muscle groups at least 2 days or more per week (Hollis et al., 2020). By following these guidelines, individuals can maximize the health benefits obtained from physical activity, including improved cardiorespiratory fitness and muscle strength. Physical activity that is appropriate to an individual's ability can also enhance heart health, reduce the risk of type 2 diabetes, and strengthen the immune system (Kazemi Pordanjani, Banitalebi, Roghani, & Hemmati, 2023). Residential areas characterized by (Kartschmit et al., 2020) residential areas characterized by a strong emphasis on walkability can potentially boost both physical activity associated with transportation and recreational activities. As a result, this can reduce the likelihood of obesity and obesity-related health issues, including type 2 diabetes (T2D). Additionally, exercise also helps maintain emotional and mental balance, reduce the risk of depression, and improve sleep quality (X. Liu, Wang, & Cao, 2023). Moreover, exercise can promote beneficial social interactions, helping the elderly maintain connections with friends, family, and the community. This is crucial in addressing the social isolation often experienced by some elderly individuals.

Health exercise for the elderly can help reduce the risk of diseases such as type 2 diabetes, osteoporosis, and some types of cancer (Gharakhanlou & Bonab, 2022). In other words, exercise has a positive impact on mental health. It can help reduce stress, anxiety, and depression, as well as improve sleep quality and overall well-being. In this article, we will explore various aspects of the role of health exercise for the elderly, including its benefits, suitable types of activities, and how family members, healthcare professionals, and the community as a whole can support efforts to encourage the elderly to stay physically active (Grgic et al., 2020). Based on various reviews, it provides important information about the importance of exercise in maintaining the health and quality of life of the elderly. Research on health exercise in old age continues to evolve with increasing awareness of the importance of physical activity in maintaining the well-being of the elderly population.

This study aims to discuss and highlight the sports health in older age, prevalence and risk factors through a systematic review.

## Materials and Methods

### *Studi Design*

This research uses a systematic review method by searching journal databases such as Science Direct and Pubmed. The search process began with the utilization of the Science Direct database and then expanded to Pubmed, which is recognized as a leading citation indexing system. Pubmed is extensively accessed by researchers globally. The search strategy encompassed a range of keyword variations such as ("Exercise in the Elderly" AND "Elderly Exercise Prevalence" AND "Exercise Risk Factors in the Elderly" AND "Elderly Physical Activity Participation" AND "Elderly Health" AND "Elderly Physical Activity Prevalence" AND "Barriers to Exercise in the Elderly" AND "Exercise as Prevention in the Elderly"). This exploration adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Mohamed Shaffril, Samah, Samsuddin, & Ali, 2019). Furthermore, PRISMA places significant emphasis on review reports that assess randomized trials, serving as a foundation for reporting systematic reviews across various research domains (Moher, Liberati, Tetzlaff, & Altman, 2009).

### *Eligibility criteria*

The inclusion criteria in this study were articles published in the last 5 years and articles discussing exercise in the elderly, prevalence of exercise in the elderly, risk factors for exercise in the elderly, physical activity participation in the elderly, health of the elderly, and barriers to exercise in the elderly. The exclusion criteria in this study were articles published in non-reputable journals.

### *Procedure*

In the first stage, a total of 747 articles were identified

through database searches (ScienceDirect: 535 articles) and (Pubmed: 212 articles). Next, in the second stage, 213 articles were screened based on the suitability of the title and abstract. In the third stage, 22 articles were ordered for further processing. At this stage, we filter based on the overall suitability of the article. Then in the final stage 16 articles were selected that met the inclusion criteria and analyzed for this systematic observation. For standard operations, this study follows the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) assessment.

## Results

The five categories (Author and Year excluded) listed in Table 1 were described and discussed in 1 article. This result examines 16 article manuscripts in the form of research methods and types, content, research objectives, and research results. The results can be seen in table 1.

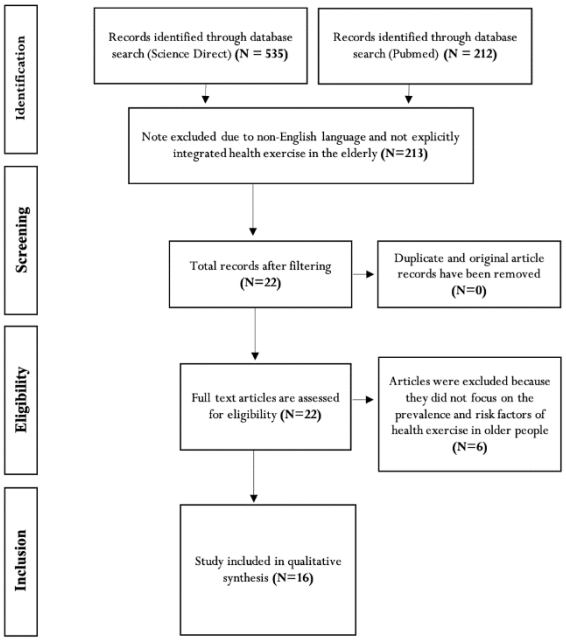


Figure 1. PRISMA flowchart of the article selection process

Table 1.
Summary of Articles on Health Exercise in the Elderly

| Author and Year | Research Methods and Types | Content | Research Objectives | Research Results |
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| (Achttien, van Lieshout, Wensing, van der Sanden, & Staal, 2019) | Quantitative study, This study design used cross-sectional secondary analysis. (n = 2184; mean age 71.6 ± 8.94), from 34 general practitioner panels. | 1) Symptoms of depression and lack of physical activity 2) Primary and secondary prevention, and between men and women | This cross-sectional study investigated (1) the association between depressive symptoms and physical inactivity, and (2) whether this association differs between primary and secondary prevention patients, and between men and women. | The results showed that depressive symptoms were associated with low levels of physical activity. This association did not differ in men and women, nor in primary and secondary prevention patients. |
| (Ito et al., 2019) | Quantitative research, A cross-sectional study was conducted with 829 adults (534 men and 295 women), aged 40 to 79 years. | Diet and abdominal obesity among middle-aged and elderly Japanese. | The objective of this research was to explore the links between dietary habits and abdominal obesity in middle-aged and elderly individuals in Japan. This investigation employed both waist circumference (WC) and visceral fat (VF) as indicators. | Two primary dietary patterns were distinguished: the "healthy Japanese" and "seafood and alcohol" patterns. The score for the healthy Japanese dietary pattern was found to have an inverse correlation with waist circumference (WC) and visceral fat (VF) but only in men. For WC, the measurements were 84.9 cm (95% CI, 83.7–86.1), 83.9 cm (95% CI, 82.7–85.1), and 82.4 cm (95% CI, 81.2–83.6), with a Ptrend = 0.006. For VF, the measurements were 94.0 cm2 (95% CI, 85.6–102.4), 89.4 cm2 (95% CI, 81.1–97.7), and 80.4 cm2 (95% CI, 72.5–88.4), with a Ptrend = 0.027, across the lowest to the highest tertile of scores for the healthy Japanese dietary pattern in men. In contrast, the seafood and alcohol dietary pattern did not exhibit any significant associations with WC and VF. |
| (Han, Xing, Huang, & Wang, 2023) | Quantitative research, A cross-sectional survey study was conducted involving 627 community-dwelling elderly in three cities in Hebei Province. | Lifestyles that support elderly health | To investigate the determinants of health-promoting lifestyles among older individuals, considering the principles of social-ecosystem theory. | The health-promoting lifestyle of elderly individuals in Hebei Province was found to be generally at a relatively low level within the spectrum of "good." Among the factors influencing this, the frequency of exercise, the level of attention given to elderly health by their children, and the type of occupation held before retirement were identified as significant contributors to the health-promoting lifestyle of the elderly. |
| (Sia, Connors, & Morgan, 2023) | Quanti-tative research, A prospective observational study involving 100 outpatient participants with MND. | Physical Activity in Patients with Motor Neuron Disease | The primary objective of this research was to assess the validity of the Physical Activity Scale for the Elderly (PASE) as a means of gauging physical activity (PA) among individuals diagnosed with Motor Neuron Disease (MND). Additionally, the study aimed to pinpoint the demographic and clinical variables that can forecast participation in physical activity within this specific population. | The findings indicated that physical activity (PA) engagement was generally minimal, as indicated by a median PASE score of 57. The PASE displayed a moderate association with ALSFRS-R total scores (correlation coefficient rho=0.607; p<0.000) and FVC (correlation coefficient rho=0.250; p=0.030). Through standard multiple regression analyses, it was revealed that the most influential predictor of PA levels was disease severity, represented by the ALSFRS-R total score (β=0.54; 95% confidence interval 0.02, 0.06). The preferred physical activities among individuals with MND primarily revolved around their households, and |

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| | | | | the primary obstacle to participation was fatigue. |
| (Rodziewicz-Flis et al., 2022) | Quantitative research, Experiment. 30 older women (aged 73.3 ± 4.5) | Dance and balance training for 12 weeks | The primary objective of this study was to assess the relative effectiveness of a 12-week dance training program when compared to balance training in terms of reducing fall risk and enhancing physical and cognitive functions. Additionally, the study's secondary objective was to investigate the connections between physical and cognitive functions and the circulating markers associated with neurodegeneration and cognitive impairments in older individuals. | The findings indicated enhancements in several areas, including the 6-Minute Walk Test ($p = 0.0001$ for both Dance Group (DG) and Balance Group (BG)), walking speed ($p = 0.0001$ for both DG and BG), and the Timed Up and Go (TUG) test, which showed improvement only in DG ($p = 0.0013$). Both DG and BG demonstrated an increase in the number of correct responses during dual-tasking ($p = 0.014$ and $p = 0.005$, respectively). DG, in particular, displayed an increase in the total number of reactions ($p = 0.013$). The enhancement in cognitive and physical functions was linked to elevated levels of APP ($p = 0.036$ and $p = 0.014$) and decreased serotonin concentrations ($p = 0.042$ and $p = 0.049$) in DG and BG, respectively. |
| (Babaei Bonab & Parvaneh, 2022) | Quantitative research, This study was a semi-experimental study that used a pretest-posttest design and involved a control group. This study involved 80 elderly women | Twelve weeks of tai chi training | The primary objective of this study was to examine the impact of 12 weeks of tai chi exercise on the sleep quality, perception of pain, and levels of death anxiety in elderly women. | The findings showed that following 12 weeks of Tai Chi exercises, there was a notable improvement in sleep quality within the experimental group, as indicated by a significant difference ($P<0.01$) when compared to the control group. Additionally, the experimental group exhibited a decrease in pain perception and death anxiety rate ($P<0.01$) compared to the control group. These results indicate that engaging in Tai Chi exercises not only enhanced sleep quality but also reduced pain perception and helped alleviate death anxiety among the elderly. |
| (Park, Park, & Jee, 2023) | This study used an experimental design, in which seventy-six participants were randomly assigned to one of four groups: a control group (CON), a slow walking group (SWG), a moderate walking group (MWG), or a fast walking group (FWG). | Practice walking at different speeds | This research examined alterations in body composition, muscle contractility, and immune cell levels in the elderly through the utilization of three different walking techniques. | Engaging in brisk walking among older individuals enhances muscle contractility, and this is anticipated to positively impact immunocyte function. This is achieved through the potential increase or preservation of muscle mass and the reduction of fat mass over a 12-week period. |
| (Chen et al., 2023) | Quantitative research, experimental study involving 49 elderly women | Moderate-intensity comprehensive exercise program | To evaluate the effects of an eight-week comprehensive exercise training program with moderate intensity on sarcopenia indicators in older women. | In the experimental group (EG), there were noteworthy improvements in ASM (0.26 kg), SMM (0.18 kg), and SMI (0.10 kg/m2). Significant differences in group-by-time interactions were observed for ASM [$F(1,47) = 6.25$, $\eta2 = 0.12$] and SMI [$F(1,47) = 6.77$, $\eta2 = 0.13$]. Muscle strength in the EG increased by 0.8 kg, and there were significant differences in the group-by-time interaction for handgrip strength [$F(1,47) = 6.8$, $\eta2 = 0.13$] following the eight-week intervention. Gait speed improved by 0.05 m/s, and the time required for the 5-time chair stand decreased by 0.27 seconds in the EG, with significant differences in group-by-time interactions for the 5-time chair stand [$F(1, 47) = 6.35$, $\eta2 = 0.12$] when compared to baseline measurements. |
| (Hooshmand-Moghadam et al., 2020) | Quantitative research, Experiment. A total of 30 elderly men (with a mean age of 66.23 ± 0.57 years) were randomly allocated into two separate groups: a resistance training (RET) group consisting of 15 people and a control group (CTR) also consisting of 15 people. | 12 weeks of resistance training on serum levels of cellular aging parameters | In this study, we examined the impact of a 12-week resistance training (RT) program on the serum levels of Sirtuin-1 (SIRT1), Sirtuin-3 (SIRT3), Sirtuin-6 (SIRT6), Peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1-α), and the telomerase enzyme in elderly men. | The findings demonstrated a notable increase in the serum levels of SIRT1 ($P = 0.001$), SIRT3 ($P = 0.001$), SIRT6 ($P = 0.02$), PGC1-α ($P = 0.001$), and the telomerase enzyme ($P = 0.001$) in the group that underwent resistance training (RET). Furthermore, a significant distinction was observed between the RET and CTR groups in terms of their serum levels of SIRT1 ($P = 0.001$), SIRT3 ($P = 0.001$), SIRT6 ($P = 0.037$), PGC1-α ($P = 0.007$), and the telomerase enzyme ($P = 0.001$). |
| (Song & Yu, 2019) | Quantitative research, Experiment with randomized controlled trials conducted in a randomized and single-blind manner. Sample size of 60 participants | Moderate intensity aerobic exercise program | This research sought to assess the impact of a moderate-intensity aerobic exercise regimen on the cognitive abilities and overall quality of life among older Chinese individuals with mild cognitive impairment. Additionally, it aimed to investigate how depressive mood and sleep quality might influence the connection between exercise and cognitive function. | Participants in the intervention group experienced notably greater enhancements in cognitive function ($\beta = 1.895$; 95% confidence interval [CI] = 1.421, 2.368; $p < 0.001$) and health-related quality of life ($\beta = 0.605$; 95% CI= 0.295, 0.914; $p < 0.001$) when compared to the control group throughout the pre-test and post-test periods. The link between exercise and cognition was significantly influenced by a reduction in depressive symptoms (indirect effect: $\beta = -0.705$; 95% CI: −1.028, −0.382) and an improvement in sleep quality (indirect effect: $\beta = -0.205$; 95% CI: −0.122, 0.831). |

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| (Riyanto, Lahinda, Nugroho, & Hidayat, 2020) | Quantitative research, Quasi-experimental, with the research design "Pretest-Posttes With Control Group Design. The population in this study were the elderly at Posyandu Mekarja-ya 2, totaling 30 people. | Elderly senny | To determine the effect of elderly gymnastics on fitness | Analyzing the disparities in physical fitness outcomes between the experimental and control groups, it was found that the significance level (two-tailed) was 0.006. Consequently, exercise for the elderly has a substantial influence on enhancing the physical fitness of this demographic. This study's findings offer valuable insights into the advantages of regular elderly exercise in improving the fitness levels of older individuals. One effective method for enhancing the physical fitness of the elderly is to engage in such exercise routines. |
| (Freene et al., 2021) | Mixed methods, quantitative and qualitative research | Aboriginal Heart Reha-bilitation Program and Torres Strait Islanders | This research assesses the enhancement of accessibility for Aboriginal and Torres Strait Islander women to participate in a culturally responsive (CR) program within a non-Indigenous healthcare service, while also focusing on enhancing cultural safety among the health workforce. | The adaptable culturally responsive (CR) program within a non-Indigenous setting established a culturally secure space for Aboriginal women, although the number of referrals was limited. Of significance, the integration of cultural sensitivity training and active involvement in program delivery boosted the confidence of healthcare professionals when dealing with Aboriginal individuals. |
| (I.-T. Liu et al., 2020) | Quantitative research, Experimental, Single-blind randomized controlled trial. A voluntary sample of participants (N=80) who scored between 15 and 26 on the Mini-Mental Examination were included. | Exercise Therapy in Elderly Patients | The primary goal of our investigation was to assess whether strength training or aerobic exercise could provide significantly greater advantages concerning the daily life activities of elderly dementia patients. Additionally, we aimed to ascertain the impact of exercise on cognitive function, depression, and various biochemical markers. | Our research reveals that a concentrated 4-week exercise regimen, whether it involves strength or aerobic training, has been shown to deliver notable advantages to elderly individuals suffering from dementia. Furthermore, aerobic training was found to have an additional positive impact on serum brain-derived neurotrophic factor. |
| (Chobe, Patra, Chobe, & Metri, 2022) | Penelitian kuantitatif, Experiment. eventy-two elderly persons (average age 63.3 ± 6.44 years) | Efficacy of Integrated Yoga and Ayurveda Rasayana on cognitive function in the elderly | This research delves into the impact of a combined intervention involving Yoga and Ayurveda Rasayana on cognitive function in older individuals dealing with mild cognitive impairment. | The study determined that both Ayurveda Rasayana and Integrated Yoga interventions were successful in enhancing cognitive function in elderly individuals with mild cognitive impairment (MCI). Notably, when these interventions were combined, they demonstrated significant improvements in learning, attention, processing speed, and working memory compared to the individual responses in elderly individuals with MCI. |
| (Aas et al., 2020) | Quantitative research, Acute exper-iment, This investigation included a subset of participants (n=24) from a previously published study of 34 frail elderly men and women. | Acute and chronic strength training on skeletal muscle autophagy | In order to check protein degradation indicators in muscle tissue samples (specifically, the vastus lateralis muscle) obtained from twenty-four frail elderly individuals, both men and women, with an average age of 86 years (ranging from 79 to 93 years), we conducted this investigation. | The ten-week training program did not influence the initial levels of autophagy mRNAs and proteins, nor did it affect markers of the ubiquitin-proteasome system. This indicates that a relatively brief period of strength training may not be enough to raise the baseline rate of protein degradation in frail elderly individuals. |
| (Wadsworth & Lark, 2020) | Quantitative research, open-label randomized controlled trial. Male and female volunteers (N=117; 82.5±7.9 years). | Whole Body Vibration Training on Physical Function of the Frail Elderly | The aim of this study was to assess whether whole-body vibration (WBV) exercise could be a viable and advantageous method for addressing sarcopenia and age-related reductions in mobility and functional abilities among the frail elderly while ensuring safety and effectiveness. | The results suggest that a 16-week regimen of low-intensity whole-body vibration (WBV) exercise offers a readily accessible and effective means for frail elderly individuals to achieve enhanced physical function. |

Based on the review of method categories and types of research, three articles exclusively employed a quantitative approach with a cross-sectional study (Achttien et al., 2019; Han et al., 2023; Ito et al., 2019). Furthermore, one article utilized mixed research (quantitative and qualitative) (Freene et al., 2021), and eleven other articles adopted a quantitative approach with experimental research designs (Aas et al., 2020; Babaei Bonab & Parvaneh, 2022; Chen et al., 2023; Chobe et al., 2022; Hooshmand-Moghadam et al., 2020; I.-T. Liu et al., 2020; Park et al., 2023; Riyanto et al., 2020; Rodziewicz-Flis et al., 2022; Song & Yu, 2019; Wadsworth & Lark, 2020). Additionally, one article utilized an observational study (Sia et al., 2023). On average, these articles employed measurement instruments in their data collection processes.

## Discussion

Based on this review, the research objectives and outcomes they developed are evident and categorized into three groups:

A number of risk factors also play a crucial role in inhibiting exercise in the elderly, including chronic health conditions such as heart disease and diabetes. Additionally, lack of knowledge about the benefits of exercise, fear of injury, and social isolation can reduce participation in physical activity: In this first group, there are five articles discussing depression symptoms and lack of physical activity (Achttien et al., 2019), dietary patterns and abdominal obesity (Ito et al., 2019), dance and balance exercises for twelve weeks (Rodziewicz-Flis et al., 2022), physical activity in individu-

als with motor neuron disease (Sia et al., 2023), and lifestyles that support elderly health (Han et al., 2023). The first article aimed to investigate (1) the relationship between depressive symptoms and reduced physical activity, and (2) whether this relationship differed between primary and secondary prevention patients, and between men and women. The findings indicated that a connection existed between reduced physical activity and the presence of depressive symptoms. This correlation remained consistent across both genders and among patients in both primary and secondary prevention (Achttien et al., 2019). The second article aimed to explore the links between dietary habits and abdominal obesity in middle-aged and elderly individuals in Japan. This investigation employed both waist circumference (WC) and visceral fat (VF) as indicators. The dietary pattern that promotes health was found to have a negative correlation with waist circumference (WC) and visceral fat (VF) among middle-aged and elderly men (Ito et al., 2019).

Further to the third article, the main objective of this study was to assess the relative effectiveness of a 12-week dance training program when compared to balance training in terms of reducing the risk of falls and improving physical and cognitive function. Additionally, the study's secondary objective was to investigate the connections between physical and cognitive functions and the circulating markers associated with neurodegeneration and cognitive impairments in older individuals. The findings demonstrated that a 12-week program involving dance and balance training led to enhancements in the physical performance and cognitive function of elderly women. Nonetheless, based on the results observed in this study, it is suggested that dance training has a more pronounced impact on the assessed physical and cognitive parameters (Rodziewicz-Flis et al., 2022). The fourth article aims to assess the validity of the Physical Activity Scale for the Elderly (PASE) as a tool to measure physical activity (PA) among individuals diagnosed with Motor Neuron Disease (MND). The results of the study indicate that the PASE proves to be a valuable instrument for assessing physical activity engagement among individuals with MND. This efficient and straightforward assessment can be applied effectively in both clinical and research environments (Sia et al., 2023). Fifth article to investigate the determinants of health-promoting lifestyles among older individuals, taking into account the principles of social-ecosystem theory. As a result, it is essential for individuals, families, and society to collaborate in promoting healthy lifestyles and fostering the pursuit of well-being among the elderly, facilitating their journey towards healthy aging (Han et al., 2023).

Tai Chi exercises for twelve weeks, varied pace walking exercises, comprehensive moderate-intensity exercises, twelve-week resistance training, moderate-intensity aerobic exercises, and elderly senny in the elderly: In this second group, there are six articles discussing Tai Chi exercises for twelve weeks (Babaei Bonab & Parvaneh, 2022), varied pace walking exercises (Park et al., 2023), comprehensive moderate-intensity exercises (Chen et al., 2023), twelve-week resistance training (Hooshmand-Moghadam et al., 2020), moderate-intensity aerobic exercises (Song & Yu, 2019), dan elderly senny (Riyanto et al., 2020). The first article aimed to examine the impact of twelve weeks of Tai Chi exercise on sleep quality, pain perception, and death anxiety among elderly women. The results show that engaging in Tai Chi exercises not only improves sleep quality but also reduces pain perception and helps alleviate death anxiety among the elderly (Babaei Bonab & Parvaneh, 2022). The second article aimed to assess changes in body composition, muscle contractility, and immune cell levels in the elderly through the utilization of three different walking techniques. The results indicate that brisk walking in the elderly enhances muscle contractility, which is estimated to have a positive impact on immunocyte function (Park et al., 2023). The third article aimed to evaluate the effects of an eight-week comprehensive exercise training program with moderate intensity on sarcopenia indicators in older women. The moderate-intensity comprehensive exercise regimen was established as a secure and user-friendly fitness program. While the training intensity level was deemed inadequate to enhance gait speed, this exercise protocol holds promise in slowing down overall outcomes in senior females with sarcopenia living in the community. It also contributes to the enhancement of muscle mass, handgrip strength, and 5TCS (Chen et al., 2023).

The aim of the fourth article was to examine the impact of a 12-week resistance training (RT) program on the serum levels of Sirtuin-1 (SIRT1), Sirtuin-3 (SIRT3), Sirtuin-6 (SIRT6), Peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1-α), and the telomerase enzyme in elderly men. The results showed that a 12-week RT program increased the levels of proteins associated with biological aging processes in elderly men. RT appears to have beneficial effects on cell aging and also improves mitochondrial protein dysfunction and aging due to enzymatic function (Hooshmand-Moghadam et al., 2020). In the fifth article, the objective was to assess the impact of moderate-intensity aerobic exercise on cognitive ability and overall quality of life among elderly individuals in China with mild cognitive impairment. Additionally, the study aimed to investigate how depressive mood and sleep quality could affect the relationship between exercise and cognitive function. The results provide evidence that moderate-intensity aerobic exercise significantly enhances cognitive ability and overall quality of life among the elderly (Song & Yu, 2019). Lastly, the sixth article aimed to determine the impact of elderly gymnastics on fitness. This study's findings offer valuable insights into the advantages of regular elderly exercise in improving the fitness levels of older individuals. One effective method for enhancing the physical fitness of the elderly is to engage in such exercise routines (Riyanto et al., 2020).

Cardiac rehabilitation for Aboriginal and Torres Strait Islander populations, exercise therapy, integrated yoga and Ayurvedic rasayana therapy, acute and chronic strength training, and whole-body vibration training in the elderly:

In this second group, there are five articles discussing cardiac rehabilitation for Aboriginal and Torres Strait Islander populations (Freene et al., 2021), exercise therapy (I.-T. Liu et al., 2020), integrated yoga and Ayurvedic rasayana therapy (Chobe et al., 2022), acute and chronic strength training (Aas et al., 2020), and whole-body vibration training (Wadsworth & Lark, 2020). The first article aimed to assess the improved accessibility for Aboriginal and Torres Strait Islander women to participate in culturally responsive (CR) programs within non-Indigenous health services, while also focusing on enhancing cultural safety among healthcare providers. The results show that integrating cultural sensitivity training and active involvement in program delivery enhances the confidence of healthcare professionals when working with Aboriginal individuals (Freene et al., 2021). The second article aimed to assess whether strength training or aerobic exercise can provide significantly greater benefits in the activities of daily living for elderly dementia patients. Additionally, they aimed to determine the impact of exercise on cognitive function, depression, and various biochemical markers. Their research revealed that a 4-week concentrated exercise program, whether involving strength or aerobic exercises, has proven to offer significant benefits to elderly individuals with dementia. Furthermore, aerobic training was found to have an additional positive impact on brain-derived neurotrophic factor levels (I.-T. Liu et al., 2020).

The third article aimed to investigate the impact of a combined intervention involving Yoga and Ayurveda Rasayana on cognitive function in elderly individuals with mild cognitive impairment. The results provide information that the integrated Ayurveda Rasayana and Yoga intervention successfully improved cognitive function in elderly individuals with mild cognitive impairment (Chobe et al., 2022). The fourth article aimed to assess protein degradation indicators in muscle tissue samples, specifically the vastus lateralis muscle, obtained from twenty-four frail elderly individuals, both men and women, with an average age of 86 years (ranging from 79 to 93 years). The ten-week training program did not affect the baseline levels of mRNA and protein autophagy, nor did it influence ubiquitin-proteasome system markers (Aas et al., 2020). Finally, in the fifth article, the aim was to evaluate whether whole-body vibration exercise (WBV) could be a feasible and beneficial method to address sarcopenia and age-related declines in mobility and functional ability among frail elderly individuals while ensuring safety and effectiveness. The results suggest that a 16-week regimen of low-intensity whole-body vibration (WBV) exercise provides a readily accessible and effective means for frail elderly individuals to enhance physical function (Wadsworth & Lark, 2020).

The purpose of this article is to conduct a review of scientific systematic concerning the prevalence and risk factors of health exercise in the elderly. To achieve this objective, only research articles in the ScienceDirect and PubMed databases were considered. This review is categorized into five groups: (i) Author and Year, (ii) Method and Research Type, (iii) Content, (iv) Research Objectives, and (v) Research Findings. The review is divided into three groups: (i) discussing depression symptoms and lack of physical activity, dietary patterns and abdominal obesity, dance and balance exercises for twelve weeks, physical activity in individuals with motor neuron disease, and lifestyles that support elderly health. (ii) Twelve-week tai chi exercises, walking exercises at different paces, comprehensive moderate-intensity exercises, resistance training for twelve weeks, moderate-intensity aerobic exercises, and elderly senny exercises. (iii) Aboriginal and Torres Strait Islander cardiac rehabilitation, Sports Exercise Therapy, integrated yoga and ayurvedic rasayana therapy, acute and chronic strength training, and whole-body vibration training. This review indicates that in the first group, lack of knowledge about the benefits of exercise, fear of injury, and social isolation can reduce participation in physical activities (Achttien et al., 2019; Han et al., 2023; Ito et al., 2019; Rodziewicz-Flis et al., 2022; Sia et al., 2023). Various exercises are implemented to support the health of the elderly (Babaei Bonab & Parvaneh, 2022; Chen et al., 2023; Hooshmand-Moghadam et al., 2020; Park et al., 2023; Riyanto et al., 2020; Song & Yu, 2019). In the elderly, various treatments related to sports health therapy are suitable for application (Aas et al., 2020; Chobe et al., 2022; Freene et al., 2021; I.-T. Liu et al., 2020; Wadsworth & Lark, 2020).

From the systematic review findings, several factors contribute significantly to inhibiting physical activity among older adults. Chronic health conditions such as heart disease and diabetes are major barriers. In addition, lack of awareness about the benefits of exercise, fear of injury and social isolation can also hinder participation in physical activity. Environmental factors, such as weather conditions and unfavorable physical environments, can also hinder older people's willingness to exercise. A comprehensive understanding of these factors is essential to create effective interventions aimed at increasing exercise engagement in older adults. Therefore, when promoting an active and healthy lifestyle in older adults, it is imperative to consider the social, economic and health factors that influence an individual's decision to participate in physical activity. The limitation of this study lies in the database used, which only takes research from the ScienceDirect and PubMed databases. Of course, there are many more reliable databases such as Web of Science (WoS), Emerald and others.

## Conclusions

Based on a review on health exercise in older adults, it can be concluded that the prevalence of exercise in this age group is variable and often low. Some of the risk factors that influence exercise participation include chronic health conditions such as heart disease and diabetes, lack of knowledge about the benefits of exercise, fear of injury and social isolation. In addition, physical environmental factors and inclement weather can also be barriers. To increase exercise

participation in older adults, it is important to understand these factors and design effective interventions. Promotion of an active and healthy lifestyle in older adults should take into account the social, economic and health factors that influence an individual's decision to exercise. With the right efforts, it can encourage older people to stay active, improve their health, and enhance their quality of life at an advanced stage. The findings indicated that the research methodologies employed in investigating the prevalence and risk factors associated with health exercise in the elderly primarily consisted of quantitative and mixed research (combining quantitative and qualitative approaches). Most articles included in the analysis utilized measurement tools during the data collection process. Subsequent researchers may enhance their search by incorporating additional keywords and exploring various databases such as ERIC, EBSCO (SPORTDiscus and Psychology & Behavioral Sciences Collection), and other relevant resources. There is a pressing need for further global exploration of this subject through comprehensive systematic review or mapping studies, including bibliometric and scientometric analyses. Furthermore, it is imperative to conduct in-depth research regarding health-oriented sports activities for the elderly.

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**Conflict of interests**

There is no conflict of interest.

**References**

Aas, S. N., Tømmerbakke, D., Godager, S., Nordseth, M., Armani, A., Sandri, M., … Raastad, T. (2020). Effects of acute and chronic strength training on skeletal muscle autophagy in frail elderly men and women. *Experimental Gerontology*, *142*, 111122. https://doi.org/10.1016/j.exger.2020.111122

Achttien, R., van Lieshout, J., Wensing, M., van der Sanden, M. N., & Staal, J. B. (2019). Symptoms of depression are associated with physical inactivity but not modified by gender or the presence of a cardiovascular disease; a cross-sectional study. *BMC Cardiovascular Disorders*, *19*(1), 95. https://doi.org/10.1186/s12872-019-1065-8

Babaei Bonab, S., & Parvaneh, M. (2022). The effect of twelve weeks of tai chi exercises on sleep quality, pain perception, and death anxiety in elderly women. *Annales Médico-Psychologiques, Revue Psychiatrique*, *180*(9), 905–911. https://doi.org/10.1016/j.amp.2022.01.019

Bäckmand, H., Kaprio, J., Kujala, U. M., Sarna, S., & Fogelholm, M. (2006). Physical and psychological functioning of daily living in relation to physical activity. A longitudinal study among former elite male athletes and controls. *Aging Clinical and Experimental Research*, *18*, 40–49. https://doi.org/10.1007/BF03324639

Chen, B., Chen, Y., Shin, S., Jie, C., Chang, Z., Ding, H., & Yang, H. (2023). Effect of a moderate-intensity comprehensive exercise program on body composition, muscle strength, and physical performance in elderly females with sarcopenia. *Heliyon*, *9*(8), e18951. https://doi.org/10.1016/j.heliyon.2023.e18951

Cheng, S. J., Yu, H. K., Chen, Y. C., Chen, C. Y., Lien, W. C., Yang, P. Y., & Hu, G. C. (2013). Physical activity and risk of cardiovascular disease among older adults. *International Journal of Gerontology*, *7*(3), 133–136. https://doi.org/10.1016/j.ijge.2013.03.001

Chobe, S., Patra, S. K., Chobe, M., & Metri, K. (2022). Efficacy of Integrated Yoga and Ayurveda Rasayana on cognitive functions in elderly with mild cognitive impairment: Non-randomized three-arm clinical trial. *Journal of Ayurveda and Integrative Medicine*, *13*(1), 100373. https://doi.org/10.1016/j.jaim.2020.11.003

Freene, N., Brown, R., Collis, P., Bourke, C., Silk, K., Jackson, A., … Northam, H. L. (2021). An Aboriginal and Torres Strait Islander Cardiac Rehabilitation program delivered in a non-Indigenous health service (Yeddung Gauar): a mixed methods feasibility study. *BMC Cardiovascular Disorders*, *21*(1), 222. https://doi.org/10.1186/s12872-021-02016-3

Gharakhanlou, B. J., & Bonab, S. B. (2022). The effect of 12 weeks of training in water on serum levels of SIRT1 and FGF-21, glycemic index, and lipid profile in patients with type 2 diabetes. *International Journal of Diabetes in Developing Countries*, *42*(4), 727–734. https://doi.org/10.1007/s13410-021-01032-5

Grgic, J., Garofolini, A., Orazem, J., Sabol, F., Schoenfeld, B. J., & Pedisic, Z. (2020). Effects of Resistance Training on Muscle Size and Strength in Very Elderly Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Sport Medicine*, *50*, 1983–1999. https://doi.org/10.1007/s40279-020-01331-7

Han, Y., Xing, F., Huang, J., & Wang, M. (2023). Associated factors of health-promoting lifestyle of the elderly based on the theory of social ecosystem. *Atención Primaria*, *55*(9), 102679. https://doi.org/10.1016/j.aprim.2023.102679

Hollis, N. D., Zhang, Q. C., Cyrus, A. C., Courtney-Long, E., Watson, K., & Carroll, D. D. (2020). Physical activity types among US adults with mobility disability, Behavioral Risk Factor Surveillance System, 2017. *Disability and Health Journal*, *13*(3), 100888. https://doi.org/10.1016/j.dhjo.2020.100888

Hooshmand-Moghadam, B., Eskandari, M., Golestani, F., Rezae, S., Mahmoudi, N., & Gaeini, A. A. (2020). The effect of 12-week resistance exercise training on serum levels of cellular aging process parameters in elderly men. *Experimental Gerontology*, *141*, 111090. https://doi.org/10.1016/j.exger.2020.111090

Ito, T., Kawakami, R., Tanisawa, K., Miyawaki, R., Ishii, K., Torii, S., … Higuchi, M. (2019). Dietary patterns and abdominal obesity in middle-aged and elderly Japanese adults: Waseda Alumni's Sports, Exercise, Daily Activity, Sedentariness and Health Study (WASEDA'S Health Study). *Nutrition*, *58*, 149–155. https://doi.org/10.1016/j.nut.2018.05.029

Kartschmit, N., Sutcliffe, R., Sheldon, M. P., Moebus, S., Greiser, K. H., Hartwig, S., … Rudge, G. (2020). Walkability and its association with prevalent and incident diabetes among adults in different regions of Germany: results of pooled data from five German cohorts. *BMC Endocrine Disorders*, *20*(1), 7. https://doi.org/10.1186/s12902-019-0485-x

Kazemi Pordanjani, M., Banitalebi, E., Roghani, M., & Hemmati, R. (2023). Ursolic acid enhances the effect of exercise training on vascular aging by reducing oxidative stress in aged type 2 diabetic rats. *Food Science and Nutrition*, *11*(2), 696–708. https://doi.org/10.1002/fsn3.3105

Liu, I.-T., Lee, W.-J., Lin, S.-Y., Chang, S.-T., Kao, C.-L., & Cheng, Y.-Y. (2020). Therapeutic Effects of Exercise Training on Elderly Patients With Dementia: A Randomized Controlled Trial. *Archives of Physical Medicine and Rehabilitation*, *101*(5), 762–769. https://doi.org/10.1016/j.apmr.2020.01.012

Liu, X., Wang, G., & Cao, Y. (2023). The effectiveness of exercise on global cognitive function, balance, depression symptoms, and sleep quality in patients with mild cognitive impairment: A systematic review and meta-analysis. *Geriatric Nursing*, *51*, 182–193. https://doi.org/10.1016/j.gerinurse.2023.03.013

Mohamed Shaffril, H. A., Samah, A. A., Samsuddin, S. F., & Ali, Z. (2019). Mirror-mirror on the wall, what climate change adaptation strategies are practiced by the Asian's fishermen of all? *Journal of Cleaner Production*, pp. 232, 104–117. https://doi.org/10.1016/j.jclepro.2019.05.262

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Journal of Clinical Epidemiology*, *62*(10), 1006–1012. https://doi.org/10.1016/j.jclinepi.2009.06.005

Ndejjo, R., Musinguzi, G., Nuwaha, F., Bastiaens, H., & Wanyenze, R. K. (2022). Understanding factors influencing uptake of healthy lifestyle practices among adults following a community cardiovascular disease prevention programme in Mukono and Buikwe districts in Uganda: A qualitative study. *PloS One*, *17*(2), e0263867. https://doi.org/10.1371/journal.pone.0263867

Park, S., Park, S.-K., & Jee, Y.-S. (2023). Effects of walking training at different speeds on body composition, muscle contractility, and immunocytes in the elderly: A single-blinded randomized controlled trial. *Archives of Gerontology and Geriatrics*, *106*, 104871. https://doi.org/10.1016/j.archger.2022.104871

Riyanto, P., Lahinda, J., Nugroho, A. I., & Hidayat, S. H. (2020). Effect of elderly senny to elderly fitness. *Enfermería Clínica*, *30*, 67–70. https://doi.org/10.1016/j.enfcli.2020.06.016

Rodziewicz-Flis, E. A., Kawa, M., Skrobot, W. R., Flis, D. J., Wilczyńska, D., Szaro-Truchan, M., … Kaczor, J. J. (2022). The positive impact of 12 weeks of dance and balance training on the circulating amyloid precursor protein and serotonin concentration as well as physical and cognitive abilities in elderly women. *Experimental Gerontology*, *162*, 111746. https://doi.org/10.1016/j.exger.2022.111746

Rubiyatno, Perdana, R. P., Fallo, I. S., Arifin, Z., Nusri, A., Suryadi, D., … Fauziah, E. (2023). Analysis of differences in physical fitness levels of extracurricular futsal students: Survey studies on urban and rural environments. *Pedagogy of Physical Culture and Sports*, *27*(3), 208–214. https://doi.org/10.15561/26649837.2023.0304

Sepúlveda-Loyola, W., Rodríguez-Sánchez, I., Pérez-Rodríguez, P., Ganz, F., Torralba, R., Oliveira, D. V., & Rodríguez-Mañas, L. (2020). Impact of Social Isolation Due to COVID-19 on Health in Older People: Mental and Physical Effects and Recommendations. *The Journal of Nutrition, Health & Aging*, *24*, 938–947. https://doi.org/10.1007/s12603-020-1500-7

Shin, S. (2021). Meta-analysis of the effect of yoga practice on physical fitness in the elderly. *International Journal of Environmental Research and Public Health*, *18*(21), 11623. https://doi.org/10.3390/ijerph182111663

Sia, T., Connors, K. A., & Morgan, P. (2023). Physical Activity in People With Motor Neuron Disease: Validity of the Physical Activity Scale for the Elderly as a Measuring Tool. *Archives of Physical Medicine and Rehabilitation*, *104*(1), 102–107. https://doi.org/10.1016/j.apmr.2022.09.007

Silva, F. M., Petrica, J., Serrano, J., Paulo, R., Ramalho, A., Lucas, D., … Duarte-Mendes, P. (2019). The sedentary time and physical activity levels on physical fitness in the elderly: A comparative cross sectional study. *International Journal of Environmental Research and Public Health*. *16*(19), 3697. https://doi.org/10.3390/ijerph16193697

Song, D., & Yu, D. S. F. (2019). Effects of a moderate-intensity aerobic exercise programme on the cognitive function and quality of life of community-dwelling elderly people with mild cognitive impairment: A randomised controlled trial. *International Journal of Nursing Studies*, *93*, 97–105. https://doi.org/10.1016/j.ijnurstu.2019.02.019

Suryadi, D., Suganda, M. A., Sacko, M., Samodra, Y. T. J., Rubiyatno, R., Supriatna, E., … Okilanda, A. (2023). Comparative Analysis of Soccer and Futsal Extracurriculars: A Survey Study of Physical Fitness Profiles. *Physical Education and Sports: Studies and Research*, *2*(1), 59–71. https://doi.org/10.56003/pessr.v2i1.182

Tateyama, Y., Musumari, P. M., Techasrivichien, T., Suguimoto, S. P., Zulu, R., Dube, C., … Kihara, M.

(2019). Dietary habits, body image, and health service access related to cardiovascular diseases in rural Zambia: A qualitative study. *PloS One*, *14*(2), e0212739. https://doi.org/10.1371/journal.pone.0212739

Wadsworth, D., & Lark, S. (2020). Effects of Whole-Body Vibration Training on the Physical Function of the Frail Elderly: An Open, Randomized Controlled Trial. *Archives of Physical Medicine and Rehabilitation*, *101*(7), 1111–1119. https://doi.org/10.1016/j.apmr.2020.02.009

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