

Exercise for health in old age: Comprehensive review examining the benefits and efficacy of interventions

Ejercicio para la salud en la vejez: Revisión exhaustiva de los beneficios y la eficacia de las intervenciones

*Didi Suryadi, **Nugroho Susanto, ***Eva Faridah, ****Ribut Wahidi, *****Y Touvan Juni Samodra, *Ahmad Nasrulloh, *****Mikkey Anggara Suganda, *****Isti Dwi Puspita Wati, ***Albadi Sinulingga, *Novita Intan Arovah, *Julian Dewantara
*Universitas Negeri Yogyakarta (Indonesia), ***Universitas Negeri Padang (Indonesia), ***Universitas Negeri Medan (Indonesia),
****STKIP Muhammadiyah Kuningan (Indonesia), *****Universitas Tanjungpura (Indonesia)

Abstract. The elderly are a growing age group and an integral part of modern society. The aging process brings significant health challenges, and therefore, exercise has an important role to play in maintaining the quality of life and well-being of older adults. This review aims to explore the role of health exercise in older adults, including its benefits, appropriate types of activities, and factors that influence exercise participation in this age group. Health exercise among older adults was the subject of this systematic review, focusing on the benefits and effectiveness of interventions. This study conducted a keyword search ("exercise activity of the elderly" OR "physical activity for the elderly" AND "benefits of exercise in the elderly" OR "effects of exercise in the elderly" AND "effectiveness of health interventions" OR "physical health of the elderly" AND "exercise health intervention" OR "fitness in old age") on databases (ScienceDirect: 1,2011 and PubMed 1,039) following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to identify articles that addressed the benefits and effectiveness of exercise health interventions in the elderly. Following the exclusion criteria, a total of 15 relevant articles were categorized. The review presented the benefits of health exercise in older adults. In the first group, a 12-week moderate-to-high intensity exercise program was shown to improve various aspects of physical and cognitive health in older adults. These included increases in body mass, functional capacity, muscle strength and reduced risk of age-related diseases. The second group highlighted the benefits of exercise through specific sporting activities, with improved sleep, decreased pain perception and protection from death anxiety. In addition, this group also demonstrated the effectiveness of various exercise therapies in supporting healthy aging. In the third group, the implementation of physical activity and lifestyle was shown to be effective in increasing physical activity levels among older adults and helping to prevent decline in physical function. This review highlights the importance of health exercise in improving the health and well-being of older adults. The findings can serve as a foundation for designing more effective interventions to support active and healthy lifestyles among older adults. This comprehensive strategy aims to enhance the overall well-being of the elderly population, fostering a better quality of life and mitigating the impact of age-related ailments. As such, it necessitates an approach that takes into account individual requirements and constraints. Beyond its health advantages, exercise holds significant social implications. Engaging in physical activity facilitates social interaction for older adults, helping them sustain connections with their community, friends, and family, thereby addressing the prevalent issue of social isolation. In this context, the involvement of family, healthcare professionals, and the community plays a pivotal role in supporting the elderly's participation in physical activities. Providing education, assistance, and cultivating a conducive environment for exercise are crucial measures to ensure an optimal quality of life for the elderly demographic.

Keywords: Sports health, sports benefits, physical activity, older age, active lifestyle

Resumen. Las personas mayores constituyen un grupo de edad cada vez más numeroso y forman parte integrante de la sociedad moderna. El proceso de envejecimiento conlleva importantes desafíos para la salud y, por lo tanto, el ejercicio tiene un papel importante que desempeñar en el mantenimiento de la calidad de vida y el bienestar de los adultos mayores. El objetivo de esta revisión es explorar el papel del ejercicio físico saludable en los adultos mayores, incluidos sus beneficios, los tipos apropiados de actividades y los factores que influyen en la participación en el ejercicio físico en este grupo etario. El ejercicio para la salud entre los adultos mayores fue el tema de esta revisión sistemática, que se centró en los beneficios y la efectividad de las intervenciones. Este estudio realizó una búsqueda por palabras clave ("actividad de ejercicio de los ancianos" OR "actividad física para los ancianos" AND "beneficios del ejercicio en los ancianos" OR "efectos del ejercicio en los ancianos" AND "efectividad de las intervenciones sanitarias" OR "salud física de los ancianos" AND "intervención sanitaria de ejercicio" OR "forma física en la vejez") en bases de datos (ScienceDirect: 1.2011 y PubMed 1.039) siguiendo las líneas guía de los Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) para identificar artículos que abordaran los beneficios y la efectividad de las intervenciones de salud con ejercicio en ancianos. Siguiendo los criterios de exclusión, se categorizaron un total de 15 artículos relevantes. La revisión presentó los beneficios del ejercicio para la salud en adultos mayores. La revisión presentó los beneficios del ejercicio físico para la salud en adultos mayores. En el primer grupo, se demostró que un programa de ejercicio de intensidad moderada a alta de 12 semanas mejoraba varios aspectos de la salud física y cognitiva en los adultos mayores. Entre ellos se incluía el aumento de la masa corporal, la capacidad funcional, la fuerza muscular y la reducción del riesgo de enfermedades relacionadas con la edad. El segundo grupo destacó los beneficios del ejercicio a través de actividades deportivas específicas, con mejora del sueño, disminución de la percepción del dolor y protección frente a la ansiedad ante la muerte. Además, este grupo también demostró la eficacia de diversas terapias de ejercicio para favorecer un envejecimiento saludable. En el tercer grupo, la implementación de la actividad física y el estilo de vida demostró ser eficaz para aumentar los niveles de actividad física entre los adultos mayores y ayudar a prevenir el deterioro de la función física. Esta revisión destaca la importancia del ejercicio físico para mejorar la salud y el bienestar de los adultos mayores. Los resultados pueden servir de base para diseñar intervenciones más eficaces en apoyo de estilos de vida activos y saludables entre los adultos mayores. Esta estrategia integral pretende mejorar el bienestar general de la población de edad avanzada, fomentando una mejor calidad de vida y mitigando el impacto de las dolencias relacionadas con la edad. Como tal, requiere un enfoque que tenga en cuenta las necesidades y limitaciones individuales. Más allá de sus ventajas para la salud, el ejercicio tiene importantes implicaciones sociales. La práctica de actividad física facilita la interacción social de las personas mayores, ayudándolas a mantener vínculos con su comunidad, amigos y familia, abordando así el problema del aislamiento social. En este contexto, la implicación de la familia, los profesionales sanitarios y la comunidad desempeña un papel fundamental a la hora de apoyar la participación de las personas mayores en actividades físicas. La educación, la asistencia y la creación de un entorno propicio para el ejercicio son medidas cruciales para garantizar una calidad de vida óptima a la población de edad avanzada.

Palabras clave: Salud deportiva, beneficios del deporte, actividad física, edad avanzada, estilo de vida activo

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Nugroho Susanto
nugrohosusanto@fik.unp.ac.id

Introduction

Health sports are physical activities that are done regularly with the main purpose of maintaining and improving the health of the body. It focuses on physical and mental maintenance, not just the attainment of peak athletic performance. In this discussion, we will outline some important aspects of health sports. Exercise can reduce the risk of heart disease, improve blood circulation, and lower blood pressure (Getty et al., 2018). Physical activity that occurs regularly helps regulate body weight, prevent obesity, and improve body composition (T. J. Samodra, 2021). In addition, it can help increase body strength, endurance, and flexibility (Hardinata et al., 2023; Supriatna et al., 2023; Suryadi, Yanti, et al., 2023), physical fitness (Athaya et al., 2023; Mashud et al., 2024; Rubiyatno et al., 2023; Suryadi, Suganda, et al., 2023), and can strengthen the immune system, making the body more resistant to infection.

Furthermore, exercising has a positive impact on health, especially through physical activity (Malm et al., 2019; Sebri et al., 2019). Organized physical activity plays an important role in health, especially physiological, psychological (Logue et al., 2018), and psychosocial health (Andersen et al., 2019). With organized physical activity, the average energy intake increases, resulting in an energy surplus. Other research reveals that exercise can help reduce the risk of chronic diseases such as type 2 diabetes, osteoporosis, and some cancers (Winding et al., 2018).

Exercise has a positive effect on preventing or alleviating mental illness, such as symptoms of depression. As explained by Andersen et al., (2019), exercise done in groups is more efficient in reducing somatic or mental health problems. Rodriguez-Ayllon et al., (2019) also argued the same about physical activity, which can improve mental health and reduce sedentary behavior. However, exercise also has negative effects such as a risk of injury, fatigue, and gastrointestinal discomfort after exercise (Mahesvi et al., 2023; Sumantri et al., 2023).

Exercise has a major positive impact on quality of life. By keeping the body in good shape, we can reduce the risk of various diseases, improve mental well-being, and increase life expectancy (Rubiyatno et al., 2023). Therefore, health and exercise should be an important part of a daily lifestyle. Furthermore, health exercise for the elderly has a very important role in maintaining their physical and mental health. The natural aging process brings significant changes to the body, including a decrease in muscle mass, bone density, and cardiorespiratory capacity. However, with proper exercise, many of these changes can be slowed or even avoided.

In the elderly, exercise is an important step to realize the importance of physical activity in maintaining the health and quality of life of the elderly. The elderly, as an age group that undergoes significant physical, mental and social changes, are often faced with a variety of health challenges (König & Isengard, 2023). The health of the elderly is a very

important issue in modern societies, as the elderly population in many countries continues to increase as demographic changes take place. One of the most important aspects of ensuring optimal health and quality of life for the elderly is exercise (Shin, 2021).

Studies have revealed that physical activity through exercise has been shown to have a tremendous positive impact on the health of older adults (Cheng et al., 2013). In various scientific studies, regular exercise has been shown to improve quality of life, reduce the risk of various chronic diseases, and support physical independence (Galle et al., 2023; Köroğlu et al., 2023). However, many older adults are less aware of these benefits, and they may view exercise as something difficult to do at their age. A study revealed in its research that yoga intervention has a positive impact on fitness in the elderly (Shin, 2021).

It is important to understand that exercise for older adults is not just about competition or specific physical achievements but rather about maintaining physical, mental, and social well-being. With the right approach and an exercise plan that suits individual needs, exercise can be a very effective tool in maintaining their health and improving their quality of life (Leirós-Rodríguez et al., 2018). Therefore, research and approaches that promote exercise for older adults are highly relevant and beneficial.

This article discusses multiple facets of physical activity for elderly individuals, encompassing its advantages, suitable forms of activities, considerations to take into account, and the potential roles of communities and authorities in promoting physical activity among older adults. This information can offer valuable insights and motivation for individuals, families, and communities concerned about the welfare of older individuals. Aerobic exercises like walking, cycling, or swimming are highlighted as beneficial for enhancing cardiorespiratory capacity, fortifying the heart, and mitigating the risk of cardiovascular ailments such as heart attacks and strokes (Nystoriak & Bhatnagar, 2018).

Materials and Methods

Search Strategy

The search for this study utilized the ScienceDirect and Pubmed databases. The initial exploration commenced with the Science Direct database, followed by Pubmed, recognized as one of the primary citation indexing systems globally, frequently consulted by researchers worldwide. The search strategy involved a combination of keyword variations ("exercise activity of the elderly" OR "physical activity for the elderly" AND "benefits of exercise in the elderly" OR "effects of exercise in the elderly" AND "effectiveness of health interventions" OR "physical health of the elderly" AND "exercise s t health intervention" OR "fitness in old age"). The search adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Mohamed Shaffril et al., 2019). PRISMA specifically emphasizes the reporting of review findings from ran-

domized trials, serving as a comprehensive guide for systematic reviews across various study types.

Exclusion Criteria

The exclusion criteria applied in this study were: (1) Articles not published in journals indexed in Scopus and Web of Science, (2) Articles in languages other than English, (3) Articles published beyond the last 5 years, specifically from 2019 to 2023, and (4) Articles lacking explicit mention of health sports in the elderly.

Procedure Final

An initial 2,246 publications were identified through database searches (ScienceDirect: 1,211 articles) and (Pubmed: 1,036 articles). After the exclusion criteria were followed, only 15 articles remained. Most of the items were discarded because the articles did not mention health exercise in the elderly. Finally, all articles were extracted from the source and analyzed through Mendeley software to remove duplicate articles. More details are shown in figure 1.

Results and Discussion

Each of the five categories (Author and Year excluded) listed in Table 1 was described and discussed in 1 article. Category of country is not shown, the article search focused

on sports health in the elderly. The results can be seen in Table 1.

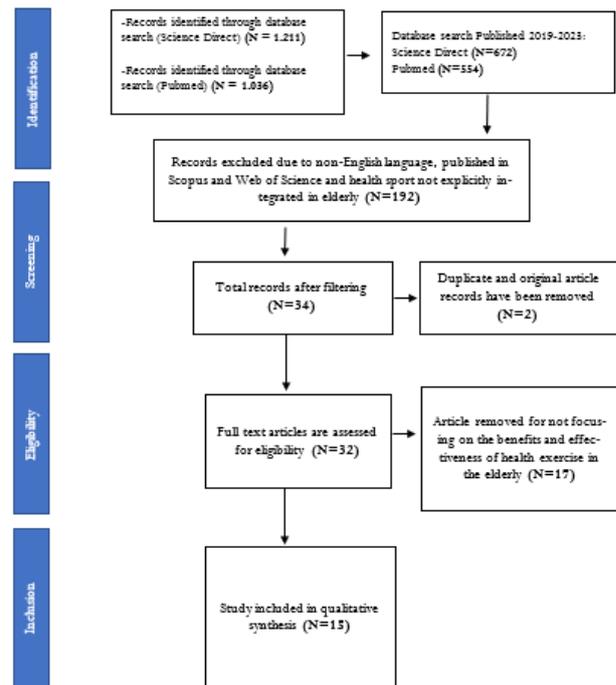


Figure 1. PRISMA Research Flowchart

Table 1. Summary of articles on health exercise in the elderly

Author(s) and Year	Research Methods and Types	Content	Research Objectives	Research Results
(Marcos-Pardo et al., 2019)	Experimental Research (Randomized controlled trial)	Moderate to high intensity resistance circuit training	To assess the impact of resistance circuit training at moderate to high intensity on different aspects of body composition, functional independence, muscle strength, and overall quality of life among older individuals.	(1) In women from the control group, there was no observed change before and after the intervention; however, men exhibited a rise in body mass index and total body weight following the intervention. (2) For both women and men, engaging in moderate to high-intensity resistance circuit training resulted in elevated total lean body mass, enhanced functional capacity, and notable improvements in both upper and lower muscle strength.
(Chen et al., 2023)	Experimental Research (true experimental design)	Moderate intensity comprehensive sports training	To investigate the effects of an eight-week comprehensive exercise training program with moderate intensity on sarcopenia indicators in older women.	The safety of a comprehensive exercise program with moderate intensity and its management were affirmed. While the vigorous exercise did not lead to a significant increase in walking speed, this exercise regimen demonstrated potential in postponing adverse effects on the overall quality of life in the sarcopenic elderly female population. Moreover, it contributed to enhancements in muscle mass, handgrip strength, and 5TCS.
(Rodziewicz-Flis et al., 2022)	Experimental Research (true experimental design)	12 weeks of dance training with balance exercises	(1) To assess the efficacy of a 12-week dance training program in comparison to balance training concerning fall risk, physical, and cognitive function. (2) To examine the correlation between physical and cognitive function and indicators of neurodegeneration and cognitive impairment in older individuals.	(1) Elderly women experienced enhanced physical performance and cognitive function after participating in a 12-week program that combined dance and balance training. Notably, dance training demonstrated a more pronounced impact on estimated physical and cognitive measures. (2) Engaging in physical activity emerges as a crucial element in the aging process, playing a pivotal role in averting physical and mental impairments. Furthermore, the implementation of dance training protocols emerges as a novel and effective strategy for promoting successful aging, linked to the preservation of both physical and cognitive functions.
(Hooshmand-Moghadam et al., 2020)	Experimental Research (true experimental)	12 weeks of resistance training (RT)	Examine the impact of a 12-week resistance training (RT) regimen on the serum concentrations of	The findings indicated a notable rise in serum concentrations of SIRT1, SIRT3, SIRT6 (P=0.02), PGC1-α, and telomerase enzymes. The 12-week

	design)		Sirtuin-1 (SIRT1), Sirtuin-3 (SIRT3), Sirtuin-6 (SIRT6), Peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1- α), and the telomerase enzyme in older men.	resistance training (RT) resulted in increased levels of proteins linked to the biological aging process in elderly men. This suggests that RT might offer positive effects on cellular aging and could potentially improve aging induced by impaired mitochondrial protein and enzymatic function.
(Song & Yu, 2019)	Experimental Research (Randomized controlled trial)	Moderate-intensity aerobic exercise	To assess the impact of a moderate-intensity aerobic exercise program on cognitive function and health-related quality of life in elderly individuals with mild cognitive impairment in China. Additionally, the study aims to investigate the potential mediating roles of depressive mood and sleep quality in the relationship between exercise and cognition..	This research portrays a favorable outcome of a 16-week collective moderate-intensity aerobic exercise initiative aimed at enhancing cognitive function and health-related quality of life in mildly cognitively impaired older adults living in the community. Furthermore, a decrease in depressive symptoms and enhanced sleep were initially recognized as potential mechanisms contributing to the link between exercise and cognition.
(Babaei Bonab & Parvaneh, 2022)	Semi-experimental study, with pretest-posttest design and control group	Twelve weeks of tai chi training	To investigate the impact of a 12-week tai chi exercise program on sleep quality, pain perception, and death anxiety in older women.	The outcomes indicated a significant enhancement in sleep quality for the experimental group compared to the control group following 12 weeks of Tai Chi practice. The results suggest that engaging in Tai Chi not only improves sleep quality but also diminishes pain perception, offering a protective effect against death anxiety in the elderly.
(Welford et al., 2022)	Experimental Research (Randomized controlled trial)	Yoga and aerobic exercise	(1) To evaluate and contrast the impacts of yoga and aerobic exercise (AE) on the well-being of older individuals who are physically inactive but otherwise healthy. (2) To examine and compare the incidence of adverse events linked to both yoga and aerobic exercise.	(1) In comparison to the control group, engaging in either yoga or aerobic exercise is linked to moderate treatment effects. (2) Participation in yoga or aerobic exercise demonstrates positive impacts on subjective well-being when contrasted with an inactive control group. Notably, yoga is associated with a lower incidence of injuries, making it potentially well-suited for older adults.
(Edna Mayela et al., 2023)	Experimental Research (Randomized controlled trial)	Multicomponent physical exercise	To evaluate the efficacy of a multicomponent physical exercise intervention delivered online in improving the physical performance of older adults.	These results indicate that online multi-component physical exercise interventions prove effective in enhancing the physical performance of older adults residing in the community. This improvement may play a role in diminishing functional dependence.
(Budui et al., 2019)	Experimental Research (true experimental design)	Intensive inpatient multidimensional rehabilitation program	To assess the immediate efficacy of an intensive inpatient multidimensional rehabilitation program, encompassing dietary modifications, exercise, and behavioral therapy, in elderly individuals with severe obesity.	Our three-week intensive inpatient multidimensional rehabilitation program yields substantial clinical and functional enhancements, showing comparable outcomes in both elderly and younger patients with severe obesity. Over the long term, these improvements may lead to an enhanced quality of life by effectively addressing obesity-related health issues and reducing frailty.
(Joo et al., 2019)	Experimental Research	Combined training program for 1 year	To investigate changes in body shape, physical fitness, and factors associated with cardiovascular health after a 1-year combination exercise program in rural elderly men.	There were no notable alterations in body weight, body mass index, body fat percentage, and muscle mass following the training period. However, the waist-hip ratio exhibited a significant decrease at the 6-month and 1-year follow-up assessments compared to the baseline. Although there was no statistically significant variance in grip strength, improvements were observed after 6 months and 1 year in tests involving standing correctly, standing on one leg, sitting and reaching, and walking for 2 minutes. No significant differences were observed in glucose levels, systolic and diastolic blood pressure, total cholesterol, low-density lipoprotein cholesterol, and triglycerides. Nevertheless, there was a noteworthy increase in high-density lipoprotein cholesterol after 1 year.
(Mascaró et al., 2022)	Experimental Research (Randomized controlled trial)	Six-Month Lifestyle Intervention	To evaluate the levels of physical activity and fitness status following a six-month lifestyle intervention involving dietary modifications and physical activity in adults diagnosed with non-alcoholic fatty liver disease (NAFLD) and metabolic syndrome (MetS).	In middle-aged individuals with non-alcoholic fatty liver disease (NAFLD) and metabolic syndrome (MetS), a lifestyle intervention spanning six months, incorporating dietary adjustments and consistent physical activity, enhances functional fitness. Patients adhering to a Mediterranean diet and engaging in regular exercise sessions experienced an increase in aerobic capacity within the six-month period.
(Schmidt et al., 2022)	Quantitative survey research	Physical activity based on self-	Examining the impact of a physical activity intervention for	The findings indicate that interventions incorporating established behavior change techniques and self-

		monitoring	community-dwelling older adults utilizing self-monitoring via Fitbits, feedback mechanisms, goal setting, and planning.	monitoring through wearable devices prove effective in promoting increased physical activity among older adults.
(Gomez-Bruton et al., 2020)	Studi EXERNET lansia longitudinal (Exernet Elder 3.0)	Age, Organized Physical Activity, and Sedentarism	(1) To delineate alterations in physical fitness over an 8-year follow-up period among a sizable cohort of Spanish adults aged 65 years and older who initially participated in organized physical activity (OPA). (2) To contrast variations in fitness levels across distinct age brackets (65 to 69 years, 70 to 74 years, and ≥75 years). (3) To assess the separate and joint impacts of changes in engagement with organized physical activity (OPA) and sitting time (ST) on physical fitness.	Reductions in variables related to fitness were observed after reaching the age of 65 in both genders, and individuals aged 75 and older exhibited the most substantial decline. Among men, those who persisted in engaging in organized physical activity (OPA) experienced lesser declines in balance, leg flexibility, and agility compared to those who ceased OPA during the follow-up period. Similarly, women who sustained OPA participation displayed lesser declines in all variables except balance compared to those who discontinued OPA during the follow-up.
(Stathi et al., 2022)	Experimental Research (REACT randomized controlled trial)	Physical activity and behavior maintenance program	To assess the potential of a community-based active aging intervention in averting the decline in lower limb physical function among older adults already facing a high risk of mobility limitations.	The findings indicate that, for older individuals at risk of mobility limitations, the REACT intervention demonstrates that a 12-month program involving physical activity and behavioral maintenance can effectively thwart the decline in physical function over a 24-month period.
(Sia et al., 2023)	A prospective observational study	Physical Activity in Patients with Motor Neuron Disease	To assess the validity of the Physical Activity Scale for Older Adults (PASE) as a tool for measuring physical activity (PA) in individuals with motor neuron disease (MND) and identify demographic and clinical factors that can predict participation in physical activity.	The preferred physical activity among individuals with motor neuron disease (MND) primarily involved activities within the home, and fatigue emerged as the predominant obstacle to participation. The study results indicate that the Physical Activity Scale for Older Adults (PASE) is a suitable tool for gauging self-reported levels of physical activity in ambulatory adults with MND. Insights into activity preferences and barriers underscore the importance of considering these factors when designing exercise programs for this population to enhance adherence and effectiveness.

Research Methods and Types

Based on the review of method categories and research types, twelve articles exclusively used experimental research (Babaei Bonab & Parvaneh, 2022; Joo et al., 2019), randomized controlled trials (Edna Mayela et al., 2023; Marcos-Pardo et al., 2019; Mascaró et al., 2022; Song & Yu, 2019; Stathi et al., 2022; Welford et al., 2022), true experimental design (Budui et al., 2019; Chen et al., 2023; Hooshmand-Moghadam et al., 2020; Rodziewicz-Flis et al., 2022). Furthermore, there were two articles using a quantitative survey approach (Schmidt et al., 2022) and a prospective observational study (Sia et al., 2023), and finally one article using the longitudinal elderly EXERNET study (Exernet Elder 3.0) (Gomez-Bruton et al., 2020). The average article uses experimental research and measurement instruments to collect research data

Content

The results showed a wide range of content related to health exercise in the elderly. In the first and second groups, the content related to exercise using sports activities, namely: Moderate to high intensity resistance circuit training (Marcos-Pardo et al., 2019), moderate intensity comprehensive exercise training (Chen et al., 2023), 12 weeks of dance training with balance training (Rodziewicz-Flis et al., 2022), 12 weeks of resistance training (RT)

(Hooshmand-Moghadam et al., 2020), and moderate intensity aerobic training (Song & Yu, 2019). Furthermore, twelve weeks of tai chi exercise (Babaei Bonab & Parvaneh, 2022), yoga exercise and aerobic exercise (Welford et al., 2022), multicomponent physical exercise (Edna Mayela et al., 2023), intensive inpatient multidimensional rehabilitation program (Budui et al., 2019), and combined exercise program for 1 year (Joo et al., 2019). The third group of content was related to physical activity and lifestyle: Six-month lifestyle intervention (Mascaró et al., 2022), physical activity based on self-monitoring (Schmidt et al., 2022), age, organized physical activity, and sedentarism (Gomez-Bruton et al., 2020), physical activity and behavioral maintenance program (Stathi et al., 2022), and physical activity in patients with motor neuron disease (Sia et al., 2023). As individuals age, maintaining both physical and mental well-being becomes essential (Oakman et al., 2020; Sepúlveda-Loyola et al., 2020). An effective approach to achieve this goal is by incorporating regular exercise routines tailored to their age. It is becoming increasingly clear that lifestyle factors such as diet, physical activity, smoking, and alcohol consumption play a significant role in shaping the prevalence of various chronic health conditions that affect individuals' health in midlife (Lambrinouadaki et al., 2013).

Objectives and Results of the Health Sports Research in the First Group

Based on this examination, the research goals and outcomes were categorized into three groups:

Health exercise in older adults applying moderate to high intensity exercise and 12 weeks of training: In this initial group, five articles were analyzed, including research on moderate to high intensity resistance circuit training (Marcos-Pardo et al., 2019), moderate intensity comprehensive exercise training (Chen et al., 2023), 12 weeks of dance training with balance training (Rodziewicz-Flis et al., 2022), 12 weeks of resistance training (RT) (Hooshmand-Moghadam et al., 2020), and moderate intensity aerobic exercise (Song & Yu, 2019). The first article investigated the impact of moderate to high-intensity resistance circuit training on various parameters such as body composition, functional autonomy, muscle strength, and quality of life in the elderly. Notably, the results revealed significant improvements in total lean body mass, functional capacity, and upper and lower muscle strength in both genders (Marcos-Pardo et al., 2019).

The second article focused on testing an eight-week moderate-intensity comprehensive exercise training program on sarcopenia parameters in elderly women. Findings indicated that this exercise program was safe and practical, contributing to enhancements in muscle mass, handgrip strength, and 5TCS despite insufficient intensity to increase walking speed (Chen et al., 2023). The third article had dual objectives: (1) to compare the effectiveness of a 12-week dance training with balance training on fall risk, physical and cognitive function, and (2) to evaluate the relationship between physical and cognitive function with markers of neurodegeneration and cognitive impairment in elderly individuals. The outcomes demonstrated that the dance and balance training program improved physical performance and cognitive function in elderly women, emphasizing the potential of dance training as an effective strategy for successful aging (Rodziewicz-Flis et al., 2022).

The fourth article aimed to explore the impact of 12 weeks of resistance training (RT) on serum levels of various proteins associated with the biological aging process in elderly men. The results highlighted a significant increase in serum levels of SIRT1, SIRT3, SIRT6, PGC1- α , and telomerase enzyme, suggesting that resistance training may have beneficial effects on cellular aging and mitigate aging-related impairments in mitochondrial protein and enzymatic function (Hooshmand-Moghadam et al., 2020). The fifth article aimed to evaluate the effects of a 16-week group-based moderate-intensity aerobic exercise program on cognitive function and health-related quality of life in Chinese elderly with mild cognitive impairment. The study demonstrated positive outcomes, indicating improvements in cognitive function and health-related quality of life. Additionally, it identified reduced depressive symptoms and enhanced sleep quality as potential mechanisms underlying the exercise-cognition relationship (Song & Yu, 2019).

Objectives and Results of the Health Exercise Research in Group Two

Health exercise in the elderly applies exercise through sports activities. In the second group, there are five articles that discuss twelve weeks of tai chi exercise (Babaei Bonab & Parvaneh, 2022), yoga exercise and aerobic exercise (Welford et al., 2022), multicomponent physical exercise (Edna Mayela et al., 2023), intensive inpatient multidimensional rehabilitation program (Budui et al., 2019), and a combined exercise program for 1 year (Joo et al., 2019). The first among them explores the impact of 12 weeks of tai chi exercise on sleep quality, pain perception, and death anxiety in elderly women. The results indicated a significant improvement in sleep quality after the experimental group engaged in Tai Chi practice for the specified duration, distinguishing it from the control group. This study demonstrated that participating in Tai Chi exercises not only enhanced sleep quality but also alleviated pain perception and mitigated death anxiety among the elderly (Babaei Bonab & Parvaneh, 2022).

The second study outlined two main objectives: 1) To compare the impacts of yoga and aerobic exercise (AE) on the well-being of physically inactive yet healthy older individuals, and 2) To evaluate and contrast the occurrence of adverse events linked with yoga and aerobic exercise. The outcomes revealed that: (1) Participation in yoga or aerobic exercise displayed moderate treatment effects in comparison to the control group. (2) Engaging in yoga or aerobic exercise showed positive effects on subjective well-being when compared to an inactive control group. Notably, yoga was associated with a lower incidence of injuries and could be especially well-suited for the elderly (Welford et al., 2022). Moving on to the third study, its aim was to assess the impacts of an online multicomponent physical exercise intervention on the physical performance of older adults. The results suggest that online interventions involving various physical exercises are successful in enhancing the physical performance of older adults residing in the community, potentially contributing to a decrease in functional dependence (Edna Mayela et al., 2023).

The fourth study aimed to evaluate the short-term effectiveness of an intensive inpatient multidimensional rehabilitation program, encompassing diet, exercise, and behavioral therapy, in elderly individuals with severe obesity. The outcomes revealed that our three-week intensive inpatient multidimensional rehabilitation program resulted in noteworthy and comparable clinical and functional improvements in both elderly and younger patients with severe obesity. This, over the long term, could potentially lead to an enhanced quality of life by better managing obesity-related health issues and reducing frailty (Budui et al., 2019). The fifth study aimed to investigate alterations in body composition, physical fitness, and cardiovascular health-related factors following a one-year combined exercise program in rural elderly men. The results indicated no significant changes in body weight, body mass index, body fat percentage, and muscle mass post-training. However, there was a

notable reduction in the waist-hip ratio at the 6-month and 1-year follow-up points compared to the baseline. Although grip strength did not exhibit statistically significant differences, there were significant improvements in tests such as standing correctly, standing on one leg, sitting and reaching, and walking for 2 minutes at the 6-month and 1-year marks. Moreover, there were no significant differences in glucose levels, systolic and diastolic blood pressure, total cholesterol, low-density lipoprotein cholesterol, and triglycerides. However, a significant increase in high-density lipoprotein cholesterol was observed after one year of the combined exercise program (Joo et al., 2019).

Objectives and Results of the Health Exercise Research in Group Three

In the third category focusing on health exercise in older age through physical activity and lifestyle, five articles were reviewed, including six-month lifestyle interventions (Mascaró et al., 2022), physical activity based on self-monitoring (Schmidt et al., 2022), age-related aspects, organized physical activity, and sedentarism (Gomez-Bruton et al., 2020), physical activity and behavioral maintenance programs (Stathi et al., 2022), and physical activity in patients with neuron motor disease (Sia et al., 2023). The first article aimed to evaluate the physical activity and fitness status following a six-month lifestyle intervention involving diet and physical activity in adults with non-alcoholic fatty liver disease (NAFLD) and metabolic syndrome (MetS). The results indicated that the six-month lifestyle intervention, incorporating a Mediterranean diet and regular exercise sessions, led to improved functional fitness in middle-aged patients with NAFLD and MetS, accompanied by an increase in aerobic capacity (Mascaró et al., 2022). The second article investigated the impacts of a physical activity intervention utilizing self-monitoring through Fitbits, along with feedback, goal setting, and planning, among community-dwelling older adults. The findings suggested that interventions based on established behavior change techniques and self-monitoring through wearable devices were effective in promoting increased physical activity levels among older adults (Schmidt et al., 2022).

Additionally, the third study aimed to achieve the following objectives: (1) describe the changes in physical fitness over an 8-year follow-up in a substantial sample of Spanish adults aged 65 years and older who initially participated in organized physical activity (OPA), (2) compare fitness changes among different age groups (65 to 69 vs. 70 to 74 vs. ≥ 75 years), and (3) assess the independent and combined effects of changes in OPA engagement and sitting time (ST) on physical activity fitness. The findings revealed a decline in fitness-related variables occurring after the age of 65 in both men and women, with older participants (≥ 75) experiencing the most significant decline. Men who sustained engagement in OPA exhibited lower declines in balance, leg flexibility, and agility compared to those who ceased OPA during the follow-up period. Women who continued with OPA demonstrated lower declines in all

variables except balance when compared to those who discontinued OPA during follow-up. These gender-specific distinctions underscore the importance of tailoring exercise interventions to maintain agility, walking speed, and endurance capacity in older individuals. For men, exercise programs should incorporate activities targeting balance maintenance and improvement, while programs for women should focus on preserving muscle strength (Gomez-Bruton et al., 2020). The fourth study aimed to investigate whether community-based active aging interventions could prevent a decline in lower limb physical function in older individuals already at high risk of mobility limitations. The results indicated that the REACT intervention, implemented in older individuals at risk of mobility limitations, demonstrated that a 12-month program integrating physical activity and behavior maintenance could effectively forestall the decline in physical function over a 24-month period (Stathi et al., 2022). In the fifth study, the objective was to assess the validity of the Physical Activity Scale for Older Adults (PASE) as a tool for measuring physical activity (PA) in individuals with motor neuron disease (MND) and to identify demographic and clinical factors predicting PA participation. The findings revealed that the most common form of physical activity for people with MND involved activities around the home, and the primary barrier to participation was slowness. The study suggested that the PASE could serve as a reliable tool for measuring self-reported PA levels in ambulatory adults with MND. Additionally, insights into activity preferences and barriers provided crucial considerations for designing exercise programs in this population to enhance adherence and effectiveness (Sia et al., 2023).

The aim of this article is to provide an overview of exercise-related health research focusing on exercise programs, physical activity, and activities among older adults. To achieve this goal, the review exclusively considered research articles discussing exercise in the elderly. The review is categorized into five sections: (i) Author and Year, (ii) Research Method and Type, (iii) Content, (iv) Research Objectives, and (v) Research Results. The country category was omitted, given that the article search concentrated on health sports in the elderly. The review is further divided into three groups: (i) health exercise in the elderly through moderate to high-intensity exercise and training over 12 weeks, (ii) exercise through sports activities, and (iii) physical activity and lifestyle. In the first group, applying moderate to high-intensity exercise and training for 12 weeks resulted in increased total lean body mass, enhanced functional capacity, and significant improvements in upper and lower muscle strength in both genders (Marcos-Pardo et al., 2019). It also contributed to an increase in muscle mass, handgrip strength, and 5TCS (Chen et al., 2023), enhanced physical performance and cognitive function in elderly women (Rodziewicz-Flis et al., 2022), increased protein levels associated with the biological aging process in elderly men (Hooshmand-Moghadam et al., 2020), and improved cognitive function and health-related quality of life in the

elderly with mild cognitive impairment, along with reduced depressive symptoms and improved sleep quality (Song & Yu, 2019).

In the second group, applying exercise through sports activities improved sleep quality, reduced pain perception, and protected older individuals from death anxiety (Babaei Bonab & Parvaneh, 2022),). It was associated with fewer injuries and proved particularly suitable for older adults (Welford et al., 2022), improved physical performance and contributed to the reduction of functional dependence (Edna Mayela et al., 2023), providing significant clinical and health-related improvements. It also resulted in substantial, similar clinical and functional improvements among elderly and younger patients with severe obesity. Additionally, it significantly decreased waist-hip ratio compared to baseline (Joo et al., 2019), and improved functional fitness in middle-aged patients with NAFLD and MetS (Mascaró et al., 2022). Furthermore, in the third group, the review showed that applying physical activity and lifestyle is effective in increasing physical activity among the elderly (Schmidt et al., 2022), Organized physical activity and sitting time were deemed essential for physical fitness in the elderly (Gomez-Bruton et al., 2020), It also helped prevent physical function decline over a 24-month period (Stathi et al., 2022), The most frequent choice for people with motor neuron disease (MND) was activities around the house, and the primary barrier to participation was fatigue (Sia et al., 2023). Therefore, when promoting an active and healthy lifestyle in older adults, it is important to consider the social, economic and health factors that influence an individual's decision to participate in physical activity (Suryadi, Komaini, et al., 2024). The existence of exercise, sporting activities, and active lifestyles have a positive impact on older people, these results are also supported by the review of the physical activity scale for older people (PASE) can be used as a tool to measure self-reported physical activity levels in outpatient adults with MND (Sia et al., 2023). Physical activity through exercise has been shown to have a tremendous positive impact on the health of the elderly (Cheng et al., 2013), and has a favorable impact on VO₂max endurance (Hardinata et al., 2023; Supriatna et al., 2023; Suryadi, Yanti, et al., 2023), physical fitness (Athaya et al., 2023; Mashud et al., 2024; Rubiyatno et al., 2023; Suryadi, Suganda, et al., 2023), and motor skills in children (Harianto et al., 2023; Y. T. J. Samodra et al., 2023; Suryadi, Nasrulloh, et al., 2024). However, it should be understood that in doing physical activity through exercise, it is necessary to pay attention to the intake of incoming fluids (Gunawan et al., 2023), because this can cause dehydration (Apriandi et al., 2023; Purnomo et al., 2023). The limitation of this study lies in the database used, which only takes research from the ScienceDirect and PubMed databases. Of course, there are still many more reliable databases such as Web of Science (WoS), Emerald and others.

Conclusions

Overall, this review presents findings from studies on

health and exercise among older adults. In the first group, a 12-week moderate-to-high-intensity exercise program was shown to improve various aspects of physical and cognitive health in older adults. These included increased body mass, functional capacity, muscle strength, and a reduced risk of age-related diseases. The second group highlighted the benefits of exercise through specific sporting activities, including improved sleep, decreased pain perception, and protection from death anxiety. In addition, this group also demonstrated the effectiveness of various exercise therapies in supporting healthy aging. In the third group, the implementation of physical activity and lifestyle was shown to be effective in increasing physical activity levels among older adults and helping to prevent decline in physical function. In addition to the significant physical benefits, the review also noted some risk factors that may affect exercise participation among older adults, such as discomfort or fatigue. These findings provide a foundation for designing better interventions, given the diverse needs and preferences of individuals in this age group. Overall, this study confirms the importance of health exercise in improving older adults' well-being and addressing age-related health challenges. Efforts to promote healthy and active lifestyles among older adults should take these findings into account by understanding the role of exercise in supporting older adults' physical and mental health. Such a holistic approach is expected to make a positive contribution to improving the quality of life of older adults and reducing the burden of age-related diseases. Future researchers can enhance their search by including additional keywords and exploring various databases such as ERIC, EBSCO (SPORTDiscus and Psychology & Behavioral Sciences Collection), and other relevant resources.

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Conflict of interests

There is no conflict of interest.

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Datos de los autores/as y traductor/a:

Didi Suryadi	didisuryadi.2023@student.uny.ac.id	Autor/a
Nugroho Susanto	nugrohosusanto@fik.unp.ac.id	Autor/a
Eva Faridah	evafaridah@unimed.ac.id	Autor/a
Ribut Wahidi	ributwahidi37@upmk.ac.id	Autor/a
Y Touvan Juni Samodra	tovan@fkip.untan.ac.id	Autor/a
Ahmad Nasrulloh	ahmadnasrulloh@uny.ac.id	Autor/a
Mikkey Anggara Suganda	mikkey-anggara-suganda@unucirebon.ac.id	Autor/a
Isti Dwi Puspita Wati	isti.dwi.puspita.w@fkip.untan.ac.id	Autor/a
Albadi Sinulingga	father@unimed.ac.id	Autor/a
Novita Intan Arovah	novita@uny.ac.id	Autor/a
Julian Dewantara	julian Dewantara.2023@student.uny.ac.id	Autor/a
Suhaini M. Saleh	pps.uny1@gmail.com	Traductor/a