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The Impact of Aerobic Activity Programs on Quality of Life and Cardiovascular Fitness in the Elderly: A Review

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Abstract

Aerobic activity is a gradual and targeted activity designed to enhance the body's ability to utilize cardiac and respiratory capacity (oxygen) effectively in the elderly. The growing number of elderly people and their long-term effects on psychological factors affecting their quality of life. This review aims to evaluate and synthesize scientific evidence on the effects of aerobic activity programs on quality of life and cardiovascular fitness in the elderly. This analysis uses the Preferred Reporting for Systematic Review and Meta-analysis (PRISMA) method. A systematic search was conducted by searching the Cochrane Database of Systematic Reviews, Embase, and Pubmed, independently using the terms "Aerobic", "Elderly", "Cardiovascular fitness", "Prevention", "Quality of life", "QoL", "exercise", "training", "sports", and "Physical". A total of 11 studies were included, demonstrating that engagement in aerobic physical activity leads to significant improvements in various health parameters among the elderly. These enhancements encompass cardiovascular health, physical function, and emotional well-being. A moderate, measured aerobic exercise program integrated into a daily routine can greatly benefit the health and vitality of the elderly. Such activities improve cardiovascular health, enhance physical function, and boost mental and emotional well-being, contributing to a better quality of life as we age.

Keywords: aerobic, elderly, cardiovascular fitness, preventive, quality of life

INTRODUCTION

Aerobic physical activity, especially in the elderly, is an accumulation of exercise disciplines that can be done in a measurable and structured manner through approaches according to the type of exercise in general(1). Aerobic exercise has many benefits to improve the correction of incorrect body posture and can increase the flexibility of bone joints, and can improve the cardiovascular and respiratory systems for the benefit of physical fitness. The combination of aerobic physical activity training for the elderly tends to be done intensively, structured, and measured, especially in fitness centers that must be accompanied by doctors, physiotherapists, and personal trainers (2). This initiative aims to support elderly clients with suboptimal body weight, as excess weight can strain joints. By focusing on muscle movements, clients can alleviate joint stress and enhance mobility. Establishing elderly groups or communities facilitates structured aerobic exercise programs, particularly for those with postural complaints, thereby improving flexibility, muscle strength, and balance. Such activities can significantly enhance the quality of life for older adults. Therefore, it is strongly recommended that the elderly engage in aerobic physical activity to promote health and fitness. An aerobic exercise program serves as a preventive strategy to maintain cardiovascular fitness in easily accessible locations for older adults (3).

The elderly have engaged in basic physical activity, such as exercising in bed and doing little movements inside their residences. However, the movement activities carried out tend not to be able to increase the capacity of the cardiovascular system optimally as they age (4). This will pose a great risk because it affects movement patterns, balance, and muscle weakness in doing exercise. On the other hand, several exercise movements are carried out using sup-

port assistance so that they can maintain body function dynamically and statically when doing aerobic exercise movements. This is useful for keeping the elderly from falling easily or requiring more assistance, or even assistance with professional equipment (5). In short, the currently known benefits are the relationship between the support of the benefits of aerobic exercise programs, providing optimal impacts on the cardiovascular fitness system for the elderly, although it should be noted that aerobic exercise still does not provide optimal impacts on overall cardiovascular fitness. The current challenge is that elderly individuals engaging in consistent aerobic exercise programs will experience gradual improvements in their physical fitness. Concurrently, the psychological benefits gained can positively influence mental health, particularly in those over 50 years of age (6). Future situations and challenges may help reduce fear and anxiety in the daily lives of the elderly. Therefore, a well-structured aerobic exercise program can offer a calming effect and a positive experience following cardiovascular fitness activities, fostering the development of enjoyable routines for older adults (7).

This study aims to provide scientific evidence and a comprehensive review demonstrating that aerobic exercise programs can serve as effective guidelines for independent implementation, given their minimal associated risks (8). Another objective is to highlight that improper execution of aerobic movements can lead to issues such as muscle weakness, tension, stiffness, and decreased functional activity. Conversely, adherence to proper standards tailored to the elderly can enhance cardiovascular health, balance, and correct posture. This review will demonstrate that while aerobic exercise is a "gentle" activity, it is essential to engage regularly with healthcare professionals, including doctors, physiotherapists, and personal trainers, for monitoring and evaluation of potential exercise-related injuries (9). Individuals engaging in regular aerobic exercise should possess adequate heart and respiratory function and have no history of arthritis, heart disease, or chronic respiratory disorders. It is crucial for paramedics and instructors to be aware of participants' health conditions, particularly in cardiovascular and pulmonary areas, and to ensure proper body posture. Support may include regular health education and insurance policies that cover treatment for injuries sustained during aerobic programs, promoting healthy lifestyle changes among the elderly (10).

METHOD

This article was prepared by analyzing using the review method. Reviews are carried out by browsing articles related to aerobic activity. This analysis used the Preferred Reporting for Systematic Reviews and Meta-analysis (PRISMA) method. The literature search period in this review is between 2018 and 2023, with an emphasis on studies that focus on the impact of aerobic exercise programs in the elderly for better quality of life. The keywords used in the literature search were "aerobic exercise programs in the elderly", "the impact of aerobic exercise in the elderly", and "quality of life in the elderly". A structured systematic search was conducted by searching the Cochrane Database of Systematic Reviews, Embase, Pubmed, and PsychInfo independently using the following combined terms: "Aerobic", "Elderly", "Cardiovascular fitness", "Preventive", "Quality of life (QoL)", "exercise", "training", "sport", and "Physical".

The search keywords used were as follows: “benefits of physical activity”, “aerobic activity for the elderly”, “benefits of physical exercise for the elderly”, “aerobic exercise to improve cardiovascular fitness”, and “best exercise to improve quality of life”. The analysis was carried out by grouping the research results into components of physical condition. The grouping process is done by using a table. The grouping results are then analyzed according to the existing trends. This is done to ensure the writing is kept up to date, re-

flecting the latest research findings.

A total of 457 articles were identified through database searches based on relevant keywords. After a thorough screening process, 201 articles were selected for full-text review. Of these, 56 articles were excluded, resulting in 156 articles for comprehensive analysis. Ultimately, only 11 articles met the inclusion criteria relevant to the review's focus on the impact of aerobic exercise programs on improving the quality of life in the elderly.

1. **Inclusion criteria**

The criteria of this study are as follows:

a) Randomized controlled trials (RCTs) investigating the effects of any type of aerobic exercise program as an exercise intervention that has a positive impact on lifestyle patterns, QoL, depressive symptoms, and/or cognition in the elderly

b) Studies investigating aerobic exercise in older adults in the upper and lower extremities

c) Studies investigating combined aerobic exercise interventions when the control group received the same non-exercise component of the intervention (e.g., exercise + medication versus medication alone) in the elderly

d) If multiple publications were retrieved describing the same group, only the sample with the largest overall sample size and/or original data was included

2. Exclusion criteria

a) Studies investigating different types of aerobic or anaerobic exercise in intervention and control groups

b) Study abstracts (without full text available) that lack sufficient information about the exercise intervention and related details that can not be traced from the authors.

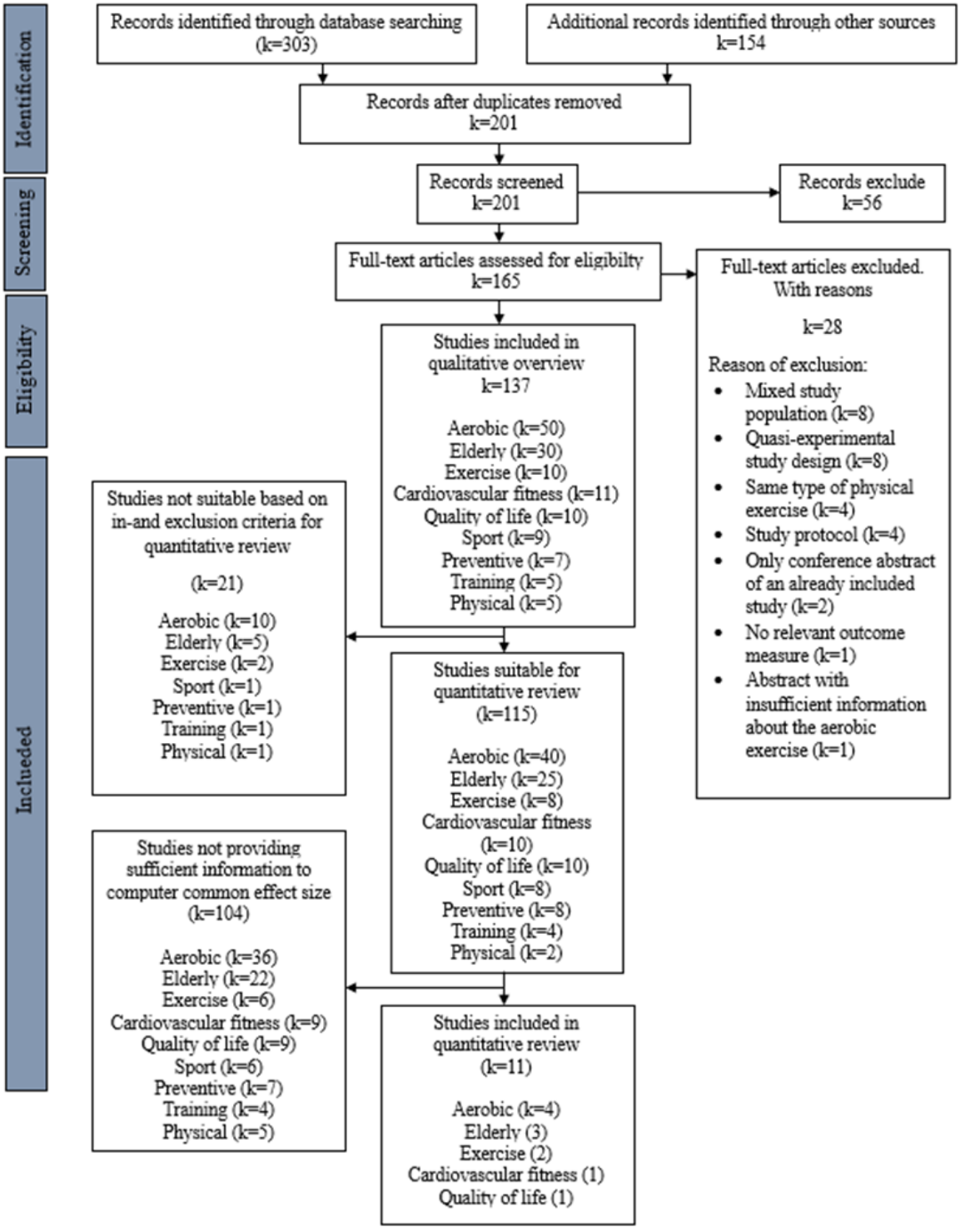

Figure. 1 PRISMA flow chart of literature search. Aerobic, Elderly, Exercise, Cardiovascular fitness, and Quality of life

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RESULT

The benefits of aerobic activity for the elderly are increasingly supported by research. Regular aerobic exercise has a significant positive impact on the overall quality of life for this age group. As individuals enter the latter stages of life, aerobic activity provides various advantages that enhance both physical and psychological well-being.

A meta-analysis study conducted by Xu et al (2024) explained that the benefits of physical activity using an aerobic exercise program have been shown to have a significant impact of 33% in improving the quality of life of the elderly. Thus, a structured aerobic exercise program, such as duration, intensity, type of aerobic program, culture, and history of comorbidities with instructor assistance, will have a positive effect on the survival of the elderly. A suitable exercise program for the elderly is carried out by walking and cycling according to the comfort of the individual. It is explained that the contribution of walking exercise with a duration of 30 minutes per day will increase body metabolism and optimize blood pressure and pulse in the elderly. Then, a low-intensity cycling exercise program will support an increase in the capacity of heart and lung function, especially VO2max in the elderly. Walking and cycling exercises contribute to the quality of life of the elderly for the future.

1. Aerobic Sessions

An aerobic training program provides more than just a caution for beginners; it offers valuable guidance and support to ensure safe and effective participation (11). Men who regularly engage in aerobic exercise tend to be more experienced and efficient than women. Men aged 50 may experience progress over several years due to aerobic training, which can enhance strength, elasticity, and flexibility during injury recovery. However, anaerobic exercise may have a more detrimental impact compared to aerobic activities. It is essential to focus on addressing weaknesses rather than strengths, especially as recovery becomes more challenging with age. For individuals over 50 who have been running consistently for over ten years, the risk of injury increases due to chronic degenerative conditions. (12). Those doing 5 or 6 weekly sessions should reduce this to 4 or 5. Any sessions previously dedicated to running should be dedicated to a less traumatic activity (light exercise) or the gym. Another impact of aerobic exercise is that it can increase the functional capacity of the heart and muscle strength to be effective and efficient(13).

2. The benefits of aerobic activity

Physical activity in the form of aerobic exercise involves psychological improvements in the short and long term and produces psychological well-being(14). Personal benefits derived from physical activity include:

a) Increased self-confidence and awareness
b) Improved mood with decreased depression and anxiety levels
c) Positive changes in self-perception
d) Increased energy and ability to deal with daily activities
e) increased enjoyment of exercise and social contact, better mental alertness, and clarity.
f) Improve the quality of life in daily activities (easier life)

3. Physical Outcomes

Aerobic physical activity positively affects self-esteem, which can influence vascular system disorders, such as hypertension and diabetes, common among the elderly, as well as certain mood disorders (15). Leisure-time aerobic activities offer significant antidepressant effects for elderly individuals with chronic diseases. Beginners in aerobic exercise can experience efficient benefits, with progress that may persist for several years, thereby reducing the risk of cardiovascular disease. This reduction is attributed to aerobic exercise's role in optimizing factors that enhance the quality of life in the elderly, including strength, elasticity, and flexibility. As a general basic principle, it is necessary to have varied exercises to train large muscles (quadriceps

femoris, hamstrings, and biceps femoris) (16). This approach helps mitigate the risk of falls in the elderly. Those who have been running regularly for about two years face a heightened risk of chronic injuries. For elderly individuals engaging in 3 to 5 sessions of light aerobic exercise per week, reducing to 4 or 5 sessions can yield significant benefits, enhancing heart capacity and muscle efficiency. Aerobic activity offers numerous benefits that extend beyond physical health, including improved cardiovascular fitness (17).

Exercise programs incorporating physical aerobics significantly enhance the quality of life in the elderly, contributing to increased self-confidence, fitness, and optimal mental health. A 2023 study by Davis found that regular aerobic activity positively impacted self-esteem, body image, and overall psychological well-being by 34% in this population (18). Similar research by Andersen in 2023 demonstrated that participation in an aerobic exercise program leads to improved sleep quality, reduced stress levels, and a 12% increase in life satisfaction among the elderly. This underscores the significant role of routine physical activity in enhancing the quality of life for older adults. Another study conducted by Brown (2023), Smith (2022), and Martinez (2022) also explained the influence and positive effects of 23% of aerobic activity training programs that have an impact on cognitive function in the elderly which contributes to a higher quality of life through improved brain health, improved cardiovascular health, increased energy levels, improved overall quality of life, involvement in social activities leading to reduced feelings of isolation and increased sense of well-being in the elderly. Furthermore, previous research conducted by Clark, Johnson, White, Williams, and Thompson in 2021 strongly supports aerobic exercise for the elderly which explains the benefits and contributions of exercise that have an impact on metabolic health, physical function, mental well-being, social interactions among older adults, increased muscle strength, increased balance, decreased risk of falls, can control mood, and emotional well-being leading to improved quality of life for the elderly for the future. This study is further supported by Permadi in 2019, which reported a 53% increase in cardiovascular function capacity (VO2Max) due to aerobic exercise, positively impacting the quality of life in the elderly. Therefore, it can be concluded that the components of aerobic exercise significantly enhance the quality of life for older adults and help prevent premature death from conditions such as heart disease and chronic respiratory diseases.

Table 1. Aerobic activity search review for elderly

Author	Year	Publication	Result
Davis, L. M. T. B	2023	Health Psychology Research	The research highlighted that regular aerobic activities positively impacted self-esteem, body image, and overall psychological well-being.
Xu, L.	2023	International Journal of Environmental Research and Public Health	The study of results suggests that aerobic or resistance training interventions significantly improved cognitive ability in older adults.
Brown, E. F.	2023	Aging Research and Reviews	This study highlighted the positive effects of aerobic activity on cognitive function in elderly, contributing to a higher quality of life through enhanced brain health
Smith, A. B	2022	Journal of Aging and Physical Activity	The study found that regular aerobic activity in elderly was associated with improved cardiovascular health, increase energy levels, and enhanced overall quality of life.
Martinez, G. H.	2022	Journal of Aging Studies	The research indicated that participating in group-based aerobic classes positively influenced social engagement, leading to reduced feelings of isolation and improved sense of well-being.
Clark, P. A	2022	Journal of Physical Activity and Health	The research demonstrated that regular participation in aerobic activities positively influenced metabolic health, contributing to better overall health and quality of life for aging individuals.
Johnson, C. D.	2021	Gerontology and Geriatric Medicine	The research demonstrated that engaging in structured aerobic exercise led to significant improvements in physical function, mental well-being, and social interaction among older adults.
White, J. K.	2021	Journal of Applied Physiology	The study demonstrated that regular aerobic exercise was associated with increased muscular strength, improved balance, and reduced risk of falls, contributing to an enhanced overall quality of life for older adults.
Williams, M. R.	2021	Journal of Geriatric Psychiatry and Neurology	The study highlighted that aerobic exercise had a positive impact on mood regulation and emotional well-being in older adults, leading to an improved quality of life.
Thompson, R. S.	2021	Journal of Aging and Physical Activity	This study emphasized that older adults engaging in aerobic exercise experienced improvements in cognitive performance, memory, and mental clarity, leading to enhanced quality of life.
Permadi, A. W.	2019	Warmadewa Medical Journal	The results of this study prove that doing aerobic exercise can have a significant impact on cardiovascular function capacity (VO2 Max) on the quality of life in the elderly.

DISCUSSION

Aerobic exercise activity has proven to be a valuable strategy for the elderly to enhance their quality of life through a wide range of benefits (19). The studies discussed highlight the importance of regular aerobic exercise in enhancing physical, mental, and emotional well-being, thereby improving overall quality of life for the elderly. Findings indicate that different aerobic exercise programs yield varying impacts on quality of life. For instance, exercising for 30 minutes per day versus 60 minutes results in distinct outcomes. Similarly, the intensity of exercise, three times a week compared to five, produces significantly different evaluations among older adults. Thus, variations in duration, intensity, and type of aerobic program influence outcomes, yet all contribute positively to the quality of life for the elderly. (20).

The discussion below elaborates on these benefits and their implications:

a) **Cardiovascular and Physical Benefits**

The studies consistently reveal that regular aerobic activity positively influences cardiovascular health among the elderly (21). Improved cardiovascular fitness contributes to better blood circulation, oxygen delivery, and overall heart health. This translates into increased endur-

ance, a reduced risk of heart disease, and enhanced physical capacity. Additionally, enhanced physical functionality—evidenced by improved muscular strength, balance, and a reduced risk of falls—is crucial for maintaining an independent and active lifestyle as individuals age (22).

b) Cognitive and Neuropsychological Effects

The research indicates a connection between aerobic exercise and cognitive function in older adults (23). Studies emphasize that regular aerobic activities lead to improvements in cognitive performance, memory, and mental clarity. This finding has significant implications, as cognitive health is essential for maintaining autonomy and quality of life. Regular exercise may help mitigate cognitive decline and promote overall brain health in the elderly (24).

c) Mental and Emotional Impact

Aerobic activity is consistently linked to enhanced mood regulation, reduced stress, and improved emotional well-being among the elderly. Regular participation in aerobic exercises can significantly contribute to a more positive mental state and overall emotional health in this demographic. (25). Engaging in regular exercise stimulates the release of endorphins, the "feel-good" neurotransmitters, which contribute to a more positive emotional state. This biochemical response helps enhance mood and overall emotional well-being, particularly in the elderly. (26). This positive impact on mental health is integral to fostering an overall sense of contentment and life satisfaction (27).

d) Social and Mental Implications

The studies underscore the role of aerobic activities in fostering social engagement and alleviating feelings of isolation(28). Group-based aerobic classes are shown to positively influence social interactions and improve overall psychological well-being(29). Engaging in physical activity in a social setting enhances the sense of community, combats loneliness, and adds a meaningful dimension to older adults' lives.

e) Application in Special Populations

Aerobic exercise is linked to better sleep quality and reduced stress levels among the elderly (30). Improved sleep patterns contribute to daytime alertness, cognitive performance, and overall vitality (31). Stress reduction, a significant concern for aging populations, further underscores the holistic benefits of aerobic activity for well-being (32).

f) Limitations and Future Directions

The studies highlight the positive effects of aerobic exercise on metabolic health, contributing to better overall health outcomes (33). Weight-bearing activities, in particular, promote bone density and reduce the risk of osteoporosis (34). These physical improvements play a vital role in maintaining functional independence and reducing the risk of injuries.

CONCLUSION

Exercise programs involving aerobic activity offer numerous benefits beyond physical health, significantly impacting psychological well-being in the elderly. Regular aerobic exercise enhances cardiovascular health and improves mental health. It is advisable for these programs to be supervised by a medical team, including doctors, physiotherapists, fitness instructors, and nurses. Key findings suggest that older adults should engage in aerobic exercise 4 to 5 times a week to promote a healthier lifestyle and improve their quality of life as they age. This approach can lead to a more active and fulfilling life for the

elderly.

While this review acknowledges its limitations, including variability in study results, there is a need for more research on the impact of aerobic exercise on quality of life in older adults. Future studies could compare different aerobic programs, such as walking versus cycling, over 24 to 48 months. Regular and structured aerobic exercise should be integrated into lifestyle routines to support the health and vitality of a broader range of elderly individuals, helping them lead active and fulfilling lives in the future.

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