

Impact of a supervised exercise program on the quality of life of elderly individuals¹
Impacto de um programa de exercício supervisionado na qualidade de vida dos idosos
Impacto de un programa de ejercicio supervisado en la calidad de vida de las personas mayores

[Research Article]

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Resumo

O estudo visou avaliar o impacto de um programa supervisionado de exercícios de força na qualidade de vida (QV) de pessoas idosas. Participaram do grupo experimental 92 pessoas idosas de ambos os sexos ($= 67 \pm 6.07$ anos), participantes de um programa supervisionado de exercícios físicos. Todos os participantes responderam uma anamnese, o *Revised Physical Activity Readiness Questionnaire (rPAR-Q)* para assegurar a integridade física dos participantes e o *World Health Organization Quality of Life (WHOQOL-OLD)*, antes (AD) e após o treinamento (AS). Os resultados demonstraram que na AD a QV dos participantes do estudo se caracterizou como “Alta” ($= 17,81 \pm 2,17$), aumentando ($\% = 4,8\%$, $p = 0,003$) na AS ($= 18,66 \pm 1,67$). O desfecho desse estudo permite afirmar que a realização de um programa supervisionado de exercícios de força impacta positivamente na qualidade de vida de pessoas idosas.

Palavras-chave: exercícios, idosos, qualidade de vida.

Abstract

The study aimed to assess the impact of a supervised strength exercise program on the quality of life (QoL) of elderly individuals. The experimental group consisted of 92 elderly people of both genders (mean age $= 67 \pm 6.07$ years), who participated in a supervised physical exercise program. All participants completed a medical history questionnaire, the Revised Physical Activity Readiness Questionnaire (rPAR-Q) to ensure the physical well-being of the participants, and the World Health Organization Quality of Life (WHOQOL-OLD) before (pre-training) and after (post-training) the exercise program. The results showed that the QoL of the study participants was characterized as "High" (mean $= 17.81 \pm 2.17$) in the pre-training assessment, increasing by 4.8% ($p = 0.003$) in the post-training assessment (mean $= 18.66 \pm 1.67$). The outcome of this study allows us to conclude that participating in a supervised strength exercise program has a positive impact on the quality of life of elderly individuals.

Keywords: exercises, elderly, quality of life.

Resumen

El estudio tuvo como objetivo evaluar el impacto de un programa supervisado de ejercicios de fuerza en la calidad de vida (CV) de las personas mayores. En el grupo experimental participaron 92 personas mayores de ambos sexos (edad media = 67 ± 6.07 años), que formaron parte de un programa supervisado de ejercicios físicos. Todos los participantes completaron una anamnesis, el Cuestionario Revisado de Preparación para la Actividad Física (rPAR-Q) para garantizar la integridad física de los participantes y el Índice de Calidad de Vida de la Organización Mundial de la Salud (WHOQOL-OLD), antes (AD) y después del entrenamiento (AS). Los resultados mostraron que en la AD, la CV de los participantes del estudio se caracterizó como "Alta" (media = 17.81 ± 2.17), aumentando en un 4.8% ($p = 0.003$) en la AS (media = 18.66 ± 1.67). Los resultados de este estudio permiten afirmar que la participación en un programa supervisado de ejercicios de fuerza tiene un impacto positivo en la calidad de vida de las personas mayores.

Palabras clave: ejercicios, personas mayores, calidad de vida.

Introduction

Aging, once considered a phenomenon, is now a reality in most societies and can be understood as a multifactorial process influenced by psychological, social, biological, and functional aspects that reduce physical capacity and compromise performance in activities of daily living. Such changes can lead to pathological and terminal conditions, directly affecting the elderly's ability to adapt to their environment, which results in poor quality of life - a term that takes on various interpretations depending on how it is employed. Therefore, according to Haraldstad, K, et al. (2019), this concept has been the focus of numerous studies in recent decades in various fields of knowledge and has received different connotations depending on the time and context in which it has been used.

Given the rapid aging of society, there is an urgent need to expand discussions on the factors that impact the quality of life of the elderly population and make them more

susceptible to falls, as the measurement of quality of life plays an essential role in public health to assess the well-being of the elderly.

Unfortunately, over the years, there is a natural tendency for the elderly to decrease their autonomy, and these changes affect anthropometric, muscular, pulmonary, neural, cardiovascular, and joint levels, as well as their independence, as per Pinheiro et al. (2019). The neuromuscular changes caused by the aging process have an impact on the functionality of elderly individuals, contributing to low exercise tolerance, increased functional dependence, which can lead to a higher risk of falls, fractures, hospitalizations, and mortality, according to Pillatt et al. (2019).

According to Paiva et al. (2020), "women, being more long-lived, as well as elderly individuals with multiple comorbidities and taking a higher number of medications, are more predisposed to accidents."

The alterations taking place within the body, encompassing changes in morphology, functionality, biology, and psychology, often lead to a decline in overall functional capacity. This decline, in turn, increases susceptibility and raises the likelihood of developing diseases, particularly non-communicable chronic diseases (NCDs), as supported by the findings of Alexandrino et al. (2020).

Accumulated evidence in recent years shows that non-pharmacological approaches, such as adopting physical exercise programs and proper nutrition, constitute initial strategies in the treatment of chronic conditions in the elderly. According to Pillatt et al. (2019), engaging in physical exercise can significantly enhance the musculoskeletal and metabolic functions of elderly individuals, positively impacting their overall well-being and health. Physical activities have been shown to improve various physical attributes, including grip strength, lower limb strength, mobility, physical performance, muscle mass, balance, walking speed, and step length. Moreover, these exercises have also demonstrated benefits in terms of psychological well-being, such as a reduced occurrence of falls, lower self-reported fear of falling, and an improved overall health status. Additionally, cognitive functions, such as processing speed, working memory, and executive functions, can experience enhancements as a result of regular physical activity.

Sousa et al. (2019) state that "on the other hand, it is known that quality of life is an indispensable requirement for physical activity practitioners, and vice versa. This is

because, in addition to promoting various benefits such as respiratory capacity, cardiac reserve, reaction time, recent memory, cognition, and social skills, it also yields results in terms of strength gain and autonomy in the elderly, contributing positively to their independence and improving the quality of life of this group."

Given the points presented, the primary aim of this study is to evaluate how a supervised strength exercise program affects the quality of life among senior citizens.

Methods

The present study was conducted in the form of a quasi-experimental, quantitative, cross-sectional descriptive study.

Universe, Sampling, and Sample

The study's universe comprises elderly individuals served by the Basic Health Units (UBS) in the following neighborhoods of Aracaju city: Aeroporto, Atalaia, Castelo Branco, Coroa do Meio, Farolândia, Grageru, Inácio Barbosa, Jabotiana, and Ponto Novo. The covered UBSs are as follows: UBS Antônio Alves; UBS Augusto Franco; UBS Augusto César Leite; UBS Ávila Nabuco; UBS Dona Sinhazinha; UBS Fernando Sampaio; UBS Geraldo Magela; UBS Hugo Gurgel; UBS Dr. Max de Carvalho; UBS Madre Tereza de Calcutá; and UBS Manoel de Souza Pereira.

Initially, all UBSs were visited. The elderly individuals who frequent these UBSs were invited to attend a preliminary lecture held at the Farolândia Campus, where the project, evaluations, expected benefits, ethical aspects, and any questions were explained. At the end of the lecture, an invitation was extended to them to participate in the project.

Volunteers from the UBSs were requested to provide a medical certificate clearing them for physical exercise, a referral from their respective UBS, and identification (ID) and CPF (Individual Taxpayer Identification Number) and bring these documents to the Laboratory of Biosciences of Human Motility – LABIMH.

Upon arrival at the LABIMH, they were screened according to inclusion criteria (being over 60 years old and committing to participating in a physical exercise program by signing the Informed Consent Form) and exclusion criteria (having motor limitations or comorbidities that would prevent them from participating in exercise programs).

All pre-selected individuals were screened for safety in participating in a physical exercise program using the Revised Physical Activity Readiness Questionnaire (rPAR-Q).

Research ethics

The study complied with the rules of Resolution 466/12 of the National Health Council, dated December 12, 2012 (Resolution No. 466, 2012), which deals with the norms for conducting research involving human subjects, as well as the Helsinki Declaration (World Medical Association [WMA], 2008).

For access to healthcare units, approval was granted by the Coordination of the Center for Continuing Health Education (CEPES). In light of this, each Primary Healthcare Unit (UBS) received an Institution Information Form (TII) specifying all procedures, risks, and precautions.

Furthermore, each voluntary participant expressed their willingness by signing the Informed Consent Form (ICF), which contained the same information as the Institution Information Form (TII) and included all details regarding risks and benefits, as well as the social significance of the research with advantages for the study subjects. These aspects were duly explained to the elderly individuals.

The research was initially approved by the Ethics Committee for Research Involving Human Subjects at the Tiradentes University on March 26, 2020, under opinion number 3,936,886 - CAAE: 26524719.4.0000.5371.

Diagnostic Assessment (DA)

After the completion of preliminary procedures (participant recruitment, ethical precautions related to participant safety and ethics, stratification into groups), all study participants underwent diagnostic assessment, during which sociodemographic data were collected through anamnesis and the Quality of Life variable was assessed using the World Health Organization Quality of Life questionnaire for the elderly, the WHOQOL-OLD, both the assessment and the intervention were carried out by the researchers from MASTERFITTS.

The questionnaire consists of 24 Likert-scale questions (ranging from 1 to 5 points), divided into six domains: "Sensory Functioning" (SF), "Autonomy" (AUT), "Past, Present, and Future Activities" (PPF), "Social Participation" (SP), "Death and Dying" (DD), and "Intimacy" (INT). The scores from the 6 facets are combined to produce the overall score (QoL-OLD).

The classification of QoL is categorized into three levels, with reference scores (MELLO et al., 2016) shown in Table 1.

Table 1: Quality of Life Classification (QOL)

QOL	Score
High	between 14.1 and 20
Medium	between 11 and 14
Low	bellow 10.9

Source: Mello et al., (2016).

Intervention

The strength training protocol, implemented with the participants, involved a two-week familiarization period, followed by 16 weeks of training consisting of two weekly sessions conducted in the afternoon, totaling 32 sessions.

Strength exercises, based on a circuit of resistance exercises using machines (weightlifting), were prescribed based on the perceived effort scale of OMNI-Res (Robertson et al. 2003), similar to those used in the study by Kukkonen-Harjula et al. (2007).

The cardiovascular component of the circuit was quantified in terms of intensity using the Borg Rating of Perceived Exertion (RPE) scale (Borg, 1982).

Both perceived effort scales utilized levels 2 and 3 during the familiarization phase. During the 16-week training period, the load was adjusted so that participants perceived the effort at levels 7 to 8 (Strong). This criterion also served as feedback for load adjustment every two weeks.

The neuromuscular training consisted of the following sequence of exercises: barbell biceps curl, leg extension machine, triceps pushdown on the high pulley, hamstring curl machine, dumbbell shoulder press, bench squat with a plate on the chest, pec fly, leg press, front lat pulldown, plank, and finally, pelvic lift, with a two-minute rest between sets.

The strength exercises were performed at a moderate speed in both the eccentric and concentric phases, taking approximately 2 seconds per cycle. Rest intervals between sets and between exercises were always at least 2 minutes, and three sets were performed, with 12 to 14 repetitions per set. The elderly participants in the project performed the proposed physical exercises in a circuit format, which emphasized strength training while respecting individual differences.

Flexibility training, which was performed both in the warm-up and at the end of the workout, was also assessed for intensity using the PERFLEX perceived effort scale (Dantas et al., 2008). In the warm-up, submaximal intensity (stretching - levels 31 to 60 of PERFLEX) was used, while at the end, maximal intensity (flexibility - levels 61 to 80 of PERFLEX) was applied.

Physical Education and Physiotherapy professionals were responsible for training the elderly participants in the study, ensuring that intensity levels and volumes were respected. Before commencing training, all participants had to perform a general warm-up consisting of exercises and stretching (levels 31 to 60 of PERFLEX) and elevate their heart rate for ten minutes.

After completing the training, participants underwent a cool-down phase, consisting of flexibility exercises (levels 61 to 80 of PERFLEX) for approximately 10 minutes. On a daily basis, data were collected from study participants, including heart rate (prior to training), blood pressure, perceived effort related to cardiovascular, neuromuscular, and flexibility training (all after training).

Summative Assessment (SA)

At the end of the 1st phase of intervention (16 weeks), all research participants underwent a new round of assessments, using the same procedures as the diagnostic evaluation.

Statistical Analysis

The data were organized and analyzed using Microsoft Office Excel® 2016. Descriptive statistics were performed to characterize the studied sample. Measures of central tendency and dispersion were used to describe the collected data, as indicated in the consulted literature (Costa Neto, 1995; Thomas; Nelson; Silverman, 2007; Triola, 2017).

Subsequently, the normality of the collected data was checked using the Shapiro-Wilk test. This determined the use of the T-Test for independent parametric samples and the Mann-Whitney test for independent non-parametric samples.

Significance Level and Experiment Power

In order to maintain the scientific rigor of the research, this study adopted a significance level of $p < 0.05$, indicating a 95% probability that the assertions made during the investigation are accurate or inaccurate (alpha error), allowing for a 5% probability of results occurring by chance. The experiment's power (beta error) was evaluated with an acceptance level corresponding to 80%. All assertions were limited to the specific study, depending on the level of acceptance within the universe indicated by the experiment's power.

Results

A total of 92 participants ($= 67 \pm 6.07$ years) took part in the study, and sociodemographic data were collected through anamnesis. The sample predominantly consisted of females (83.7%) of white ethnicity (39.6%) and mostly married, as shown in Table 2. In addition, there was no sample loss due to the project being a free opportunity for elderly people to attend the gym.

Table 2. Sociodemographic characteristics of volunteers

SOCIODEMOGRAPHIC DATA		N=92
	N	%

SEX	Female	7	83.
		7	7
<hr/>			
	Male	1	16.
		5	3
<hr/>			
AGE	60-64 years	2	27.
		6	9
<hr/>			
	65-69 years	3	37.
		5	9
<hr/>			
	70-75 years	1	18.
		7	9
<hr/>			
	75 years or more	1	15.
		4	6
<hr/>			
ETHNICITY	White	3	39.
		6	6
<hr/>			
	Black	2	28.
		5	6
<hr/>			
	Brown	2	30.
		9	8
<hr/>			
	Indigenous	1	1.1
<hr/>			
	Uninformed	1	1.1
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MARITAL STATUS

Married	3	39.
	6	6

Single	2	25.
	3	3

Divorced	1	12.
	1	1

Widower	2	23.
	1	1

EDUCATIONAL LEVEL

Graduate	2	14.
	3	1

Incomplete Graduation	5	5.6
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Specialized Postgraduate	2	2.2
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Never studied	4	4.3
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Complete Primary Education	7	7.6
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Incomplete Primary Education	2	27.
	5	2

Complete High School	2	30.
	8	4

Incomplete High School	8	8.9
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MONTHLY INCOME

Up to 02 minimum wages	5	58.
	3	8

From 02 to 04 minimum wages	2	24.
	3	4

From 04 to 10 minimum wages	1	16.
	5	7

Uninformed	1	1.1
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PROFESSIONAL OCCUPATION

Retiree	3	40
	6	

Merchant	2	2.2
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Pensioner	2	2.2
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None	2	2.2
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Dressmaker	3	3.3
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Housewife	1	17.
	6	8

General Services	1	1.1
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Bank Officer	1	1.1
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School Coordinator	1	1.1
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	Microentrepreneur	1	1,1
	Uninformed	2	26.
		4	7
ACTIVITY PERFORMED	Study and Word	4	6.1
	Work and Takes care of family members	5	58.
		2	8
	Study only	5	7.6
	Study and Takes care of family members	4	6.1
	Study, Takes care of family members and Work	1	1.5
	Uninformed	2	27.
		5	8

HEALTH-RELATED INDICATORS

AMOUNT OF CIGARETTES PER DAY	More than 30 cigarettes	1	1.1
	From 11 to 30 cigarettes	1	1.1
	Up to 10 cigarettes	5	5.6

	Do not smoke	8	92.
		3	2
	Uninformed	2	2
DRINKS	More than 15	1	1.1
		1	
	Less than 5	2	29.
		7	3
	Do not drink	6	69.
		4	6
DISEASES	High blood pressure	4	44.
		1	6
	Diabetes	1	29.
		8	3
	Other diseases	2	19.
		7	6
	Do not have	6	6.5

Subtitle: N- number of participants; %- percentage.

Furthermore, it is observed in health-related indicators that 92.2% do not smoke, 69.6% do not drink alcoholic beverages and have high blood pressure (44.6%), prevalently.

Table 3 presents the sample group's quality of life data, collected in the diagnostic assessment and summative assessment.

Table 3: Quality of life of the sample group

DESCRIPTIVE STATISTICS

Assessment	Diagnostic	Summative
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Mean	15.65	16.44
Median	16	16.95
Mode	16.5	17.16
Standard error	0.16	0.17
Standard deviation	1.89	1.46
Coefficient of Variation (CV)	5.2%	

It can be seen in Table 3 that in the diagnostic assessment the quality of life of the study participants can be characterized as “High” (= 1.89), a classification that was maintained in the summative assessment (= 1.46).

The Shapiro Wilk normality test highlights that the data are non-parametric for both assessments, so Mann-Whitney was used to find the value of $U = 3117$ and p-extract 0.000647 (DA) and 0.001294 (SA), the values can be seen in table 4.

Table 4: Shapiro Wilk normality test

Assessment	Diagnostic	Summative
W-stat	0.97	0.93
p-value	0.040	0.001
alpha	0.05	0.05
normal	no	no

According to the WHOQOL-OLD questionnaire, the quality of life of the elderly population is assessed through six facets: “Sensory Functioning” (SF), “Autonomy” (AUT), “Past, Present and Future Activities” (PPF), “Social Participation” (SP), “Death and Dying” (DD) and “Intimacy” (INT) which are intrinsically related to essential aspects for maintaining quality of life. In view of this, we see significant growth in the SF (5.55%), AUT (6.66%) and SP (6.66%) modalities, whereas PPF, DD and INT remained stable, as can be seen be observed in table 5.

Table 5: Quality of Life Assessment Facets

WHOQOL-OLD	Assessment Diagnosis		Assessment Summative		CV%
	Average	%	Average	%	
Facets					

Sensory Functioning	4.5	18.4	4.75	18.8	5.55
Autonomy	3.75	15.3	4	15.8	6.66
Past, Present and Future Activities	4	16.3	4	15.8	0
Social Participation	3.75	15.3	4	15.8	6.66
Death and Dying	4.5	18.4	4.5	17.8	0
Intimacy	4	16.3	4	15.8	0

Discussion

This study investigated the impact of a supervised strength training program on the quality of life of the elderly, addressing relevant issues related to aging and the importance of physical activity in this stage of life. It's worth noting that aging is associated with a decline in physiological systems that ultimately lead to a limitation of physical capacity, negatively impacting functional mobility. This limitation can affect the ability to perform daily activities and maintain quality of life (Samorinha et al., 2019). In this regard, the research results showed a significant improvement in the quality of life of the elderly who regularly participated in the physical exercise program.

In the current context, population aging is a reality, and the associated challenges are becoming increasingly evident. Aging is a multifactorial process that affects not only physical health but also the psychological, emotional, and social well-being of individuals (Trennepohl et al., 2020). Often, the decline in neuromuscular and physical functions can lead to a reduction in the quality of life, making the elderly more vulnerable to falls and pathological conditions. Falls in the elderly represent not only a serious public health problem but also a significant individual burden (Mittaz et al., 2019).

The study highlighted the importance of physical activity in promoting the quality of life of the elderly. The results revealed an average increase of 4.7% in the overall quality of life of participants after 16 weeks of regular participation in the exercise program. This is particularly significant, considering that quality of life is a fundamental factor for the health and well-being of the elderly (Sousa et al., 2019).

Furthermore, the demographic data of the research participants showed a diverse sample in terms of gender, age, ethnicity, marital status, educational level, and monthly income, with the majority being female, aged 65-69, white, married, with completed high school education, and predominantly with a monthly income of 2 minimum wages. This is closely related to high diagnostic evaluation scores (15.65), as elderly individuals with better living conditions are more likely to be independent, resulting in better quality of life (Araujo et al., 2019). Nonetheless, the p-value of the F test was 0.82, which indicates internal homogeneity, therefore, the sample group was considered unique given the indifference between the female and male elements that make up it. However, it is important to emphasize that the elderly population is diverse, and therefore, health approaches need to adapt to different social contexts.

For example, in sensory functioning, there was a 4.8% increase in SA compared to DA, highlighting the improvement in sensory perception among participants. The autonomy facet also recorded a 6.66% increase, demonstrating a notable increase in the ability of the elderly to carry out their daily activities independently. Furthermore, social participation, another important aspect of quality of life, showed a gain of 6.66%, indicating greater interaction and engagement with the community.

It is important to note that while some facets, such as "Past, Present, and Future Activities," "Death and Dying," and "Intimacy," did not show significant changes, it is crucial to recognize that these aspects can be influenced by a range of other factors, such as income, housing, family support, and more. However, the fact that other facets showed notable improvements still underscores the effectiveness of the strength training program as an important component in overall quality of life improvement.

Therefore, the responsibility for developing fall prevention programs through home exercises is already known, as they improve the biopsychosocial health of the elderly. Unfortunately, adherence to these practices tends to decrease over time. In order

to address this issue and better inform about the most effective exercise modalities, the Test-and-Exercise (T&E) program was created. Through this program, patients are empowered to build their own exercise regimen using a mobile application, booklet, and cards, along with eight coaching sessions with physiotherapists. These professionals are responsible for enhancing the function, independence, and quality of life of this population (Mittaz Hager, A. G et al., 2019).

Despite coaching being highly recommended as a strategy to increase patient engagement, it is crucial to direct the physiotherapy profession towards a deeper understanding and application of person-centered practice principles. This is emphasized in the home-based T&E program, which encourages physiotherapists to view patients as collaborators in the treatment process. Furthermore, it motivates patients to actively participate in their own treatment process, such as in the selection of tasks to be trained, necessitating a shift in the care culture. Implementing a new treatment strategy is a challenge, as physiotherapists do not automatically adopt it even after training. In the scope of this study, annual meetings and refresher courses are conducted, providing physiotherapists with the opportunity to share experiences under the supervision of the management committee (Mittaz Hager, A. G et al., 2019).

The facets "Past, Present, and Future Activities," "Death and Dying," and "Intimacy" showed irrelevant results, as they remained stable. However, other studies have demonstrated the effectiveness of physical activity in expanding the hope and will to live among the elderly population (Dos Santos et al., 2019). In conclusion, this research contributes to the understanding of the benefits of physical activity in the quality of life of the elderly, emphasizing its importance in disease prevention, promotion of mental health, and improvement of autonomy. The research underscores the need for supervised exercise programs adapted to the needs of the elderly, as well as the importance of multidisciplinary approaches to promote healthy aging.

Conclusion

The results of this study offer a comprehensive view of the positive impact of a supervised strength training program on the quality of life of elderly individuals. Substantial improvements were observed in quality of life 'facets after training, which have had significant increase in averages and percentages indicating a real improvement

in the quality of life of the participants. In addition to individual gains in quality of life facets, the results of this study also have significant implications for public policy. The evidence that a supervised exercise program can positively impact the quality of life of elderly individuals suggests that the promotion of such programs should be considered an important strategy for governments and public health agencies. This may include allocating resources for the creation of accessible exercise programs and promoting initiatives that encourage elderly individuals to participate in these programs.

In conclusion, this study not only demonstrates the tangible benefits of strength training on the quality of life of elderly individuals but also highlights the importance of such programs in formulating public policies aimed at active and healthy aging of the elderly population. The gains observed in various facets of quality of life indicate that promoting an active and healthy lifestyle can have a lasting and positive impact on the lives of the elderly, improving their well-being and contributing to a more inclusive society and dignified aging.

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